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General manager: Pálma Veress

Publisher: Masterholding Trust Befektetési Kft., member of the Promenade Publishing Group

Address: 7. Montevideo Street, 1037 Budapest

Postaddress: 1300 Budapest, Pf. 176

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Responsible publisher: Managing Director of the Masterholding Trust Kft.

Editorial secretary: Krisztina Labancz, phone:

+36 70 589 9272, e-mail: labancz.krisztina@promenade.hu

Layout editor: Mónika Angyal,

e-mail: angyal.monika@promenade.hu

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The Bioethics and Vaccination Refusal

“I have the right to refuse vaccination because it will harm my child. I will protect him by not allowing him to be vaccinated,” says a worried mother.

Is she right? Is she wrong? To address these questions, we must consider the rights of the parent, the patient, and the community. Let's start from the beginning. Morality is a system of norms grounded in values that a human community generally recognizes and considers binding. It regulates relationships among members of the community, as well as between communities. In other words, morality is a system of social norms that governs the behavior of individuals and groups. Within this framework, ethics – as a discipline – seeks to answer questions such as: What should I do? What kind of person should I be? What kind of life should I lead? How should individuals relate to others, to society as a whole, to other living beings, and to the natural environment? Ethics aims to provide reasoned, argument-based answers to these questions.

Bioethics may be defined as the systematic philosophical examination of the moral questions arising from modern biology and medicine (Figure 1).

The earliest traditions of Western medical ethics are associated with Hippocrates (Figure 2) (460–370 BC) and the Hippocratic Oath. The central tenets of the oath are to help the patient – *Salus aegroti suprema lex esto* (“The health of the sick is the supreme law”) – and to do no harm (*nil nocere*).

Four fundamental principles underlie medical ethics and should be considered when addressing any moral dilemma: respect for autonomy, nonmaleficence (“do no harm”), beneficence, and justice (1).

Today, respect for autonomy is often regarded as the primary principle. The term derives from *autos* (self) and *nomos* (law), referring to independence and self-determination.

It holds that the decisions and actions of autonomous individuals should not be constrained unless they cause harm to others. In healthcare, this principle is operationalized through the doctrine of informed consent; that is, the patient has the right to refuse a medical intervention, including vaccination (2, 3).

Figure 1. Bioethics in healthcare.



Historically – and, in some settings, still today – this principle has been interpreted as a process in which the physician provides information and the patient or family member subsequently agrees to the proposed examination, treatment, or vaccination. However, simply providing information does not, in itself, ensure true informed decision-making.

Although autonomy has been a central concept in philosophy for several centuries, its integration into medical practice is relatively recent. In this contemporary framework, clinical decisions are not made by the physician alone but by the patient, based on adequate medical information.

The relationship between vaccination and respect for autonomy represents a classic point of tension in bioethics, reflecting the need to balance individual freedoms with the protection of public health.

The relationship between vaccination and respect for autonomy is

Figure 2. Bronze statue of Hippocrates



grounded in the ethical framework of informed consent, which affirms the individual's right to self-determination over their own body, including the decision to accept or refuse medical interventions. This principle may conflict with public health goals grounded in beneficence, which prioritize collective safety, thereby creating a fundamental ethical tension between individual freedom and the common good (4, 5).

This relationship may be summarized as follows:

Requirement for informed consent/refusal (4).

Respect for autonomy requires that vaccination be voluntary, based on adequate information regarding risks and benefits, and free from coercion.

Informed consent. Autonomous individuals should be able to make their own healthcare decisions, including whether to accept vaccination.

Informed refusal. Respect for autonomy also encompasses the right to refuse vaccination, even when such a decision is not considered medically advisable by healthcare authorities (4).

Vaccination is widely regarded as one of the greatest public health achievements of the twentieth century, having saved millions of lives and significantly increased life expectancy. However, in countries with well-established immunization programs, vaccination may be viewed as a "victim of its own success," as the low incidence of vaccine-preventable diseases has diminished public awareness of the historical burden posed by many once-devastating infectious diseases (6, 7).

Vaccine hesitancy remains high. According to a survey conducted by the World Health Organization Strategic Advisory Group of Experts on Immunization (WHO SAGE), up to 90% of individuals report hesitancy regarding at least one aspect of vaccination (8–11).

Rates of outright vaccine refusal are substantially lower, at approximately 5%. Nevertheless, vaccine hesitancy – particularly in high-income countries – represents a major contributor to suboptimal vaccination coverage and has been associated with outbreaks of vaccine-preventable diseases. In recent years, multiple measles outbreaks across Europe and North America have highlighted the consequences of insufficient vaccination coverage (6, 12).

Vaccination can be understood as a public good: it provides direct protection to the individual while also protecting those who cannot be vaccinated through community (herd) immunity. From an ethical standpoint, preventing the spread of infectious disease and safeguarding the community aligns with the principle of beneficence.

The ethical tension surrounding mandatory vaccination arises from the state's prioritization of population health, which may restrict individual freedom to decline vaccination.

The concept of harm to third parties is central in this context. From a bioethical perspective, individual autonomy is not absolute. Limitations on personal freedom

may be ethically justified if refusal of vaccination poses a significant risk to the health of others – an application of the harm principle (4, 13, 14).

Respect for autonomy does not imply abandoning efforts to improve vaccination uptake. Rather, it supports the use of autonomy-enhancing communication strategies, as opposed to coercive or controlling approaches.

Providing accurate, evidence-based information, fostering trust, and addressing concerns transparently support respect for autonomy while facilitating vaccine uptake.

Motivational interviewing represents an effective communication approach in this context, emphasizing respectful engagement to understand hesitant individuals rather than relying on coercive, punitive, or controlling language.

Certain contexts present additional complexity for the application of autonomy, particularly in pediatric vaccination. In pediatrics, parental autonomy must be balanced against the "best interests of the child." In some circumstances, the state may override parental refusal if the child is at significant risk. Similarly, in the case of healthcare workers, ethical controversies arise regarding mandatory vaccination policies, requiring a balance between the individual's right to refuse and their duty of care to vulnerable patients (4).

Although vaccination policies and recommendations vary across countries, each case is unique and may require an individualized, patient-centered approach, particularly when addressing vaccine hesitancy among parents (14, 15). In bioethics, the assessment of autonomy is not always straightforward, particularly in the context of minors, individuals with mental illness, or situations involving strong emotional influence, such as that experienced by concerned parents. Autonomous decision-making requires the capacity for free and informed deliberation, without undue physical or psychological constraints. However, the exercise of autonomy must not infringe upon the autonomy or well-being of others.

These considerations also apply to vaccine refusal. In many cases, parents or caregivers are not adequately informed about the diseases that vaccination can prevent. Even in settings where vaccination is mandatory, dismissing discussion with statements such as "there is nothing to discuss" is counterproductive. Meaningful dialogue remains essential. Healthcare professionals have a responsibility to provide clear, comprehensive information to parents or caregivers, as only then can valid informed consent be obtained.

A key ethical consideration is that when a properly informed individual consents to or refuses vaccination, the decision may be considered autonomous; however, the broader impact of that decision on the community must also be taken into account (16, 17).

Summary. The relationship between vaccination and autonomy reflects a tension among the principles of non-maleficence (do no harm), beneficence (do good), and individual freedom. In Hungary, the system of mandatory, age-based vaccinations illustrates that, in certain

contexts, the public interest may take precedence over individual autonomy, whereas autonomy predominates in the case of recommended (non-mandatory) vaccinations. Herd immunity, although not always readily apparent, represents a valuable public good that benefits the entire population. Once high levels of population immunity are achieved, the marginal individual benefit of vaccination may appear limited, and perceived risks may seem to outweigh benefits. For this reason, vaccination can be framed

as an altruistic act. When individuals do not fulfill their moral obligation to contribute to herd immunity, mandatory vaccination policies may be ethically justified, as states have a responsibility to preserve herd immunity as a public good. Education and effective communication regarding the ethical rationale for vaccination are essential to promote understanding of the societal implications of individual decisions (13).

László Szabó

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The road from personal protection to universal immunization against chickenpox in Hungary

Zsófia Mészner

Heim Pál National Pediatric Institute

Corresponding author: Zsófia Mészner, e-mail: zmeszner@gmail.com

Abstract

Varicella is a highly contagious disease. In countries without a vaccination program, the majority of incident cases (52–78%) occur in children under 6 years of age, increasing to 89–96% among those under 12 years of age. Complications of chickenpox occur in approximately 5% of all cases, resulting in hospitalizations and, rarely, death.

The author briefly summarizes her experience with an interactive, although short-lived, educational website addressing varicella disease burden and prevention, highlighting frequently asked questions and common misconceptions related to varicella-zoster infections in Hungary.

Universal vaccination against varicella rapidly reduces disease incidence, resulting in reductions in both individual disease burden and societal costs. Despite these benefits, there is no standardized varicella immunization policy across Europe. Funded or partially funded varicella vaccination programs are in place in 21 European countries as of 2026, including Hungary, where universal vaccination has been implemented since 2019. Since the introduction of the universal two-dose varicella vaccination program in Hungary, substantial reductions in case numbers and rates of associated complications have been clearly demonstrated. Unfortunately, misconceptions about the true burden of varicella disease still persist. As a result, the important social and economic benefits of the program are not fully recognized by a minority group in Hungary who oppose vaccines in general and attempt to avoid immunization, particularly against measles and, even more so, against chickenpox.

Keywords: chickenpox, varicella, shingles, herpes zoster, immunization, universal varicella vaccination, live attenuated vaccine, misconceptions

Introduction and Background

As a pediatric infectious disease specialist, I have worked for decades at the largest hospital for infectious diseases, the Municipal Hospital “Saint László,” where I have encountered numerous complications of chickenpox. Since the 1970s, varicella-zoster virus (VZV) infection has become a treatable disease due to the discovery of acyclovir (1). A decade later, at the end of the 1980s, the possibility of prevention became available worldwide, and since 2003 in Hungary as well (2). In this paper, I aim to describe the long process of moving from personal protection to universal immunization in Hungary in 2019, and to present both the benefits and the challenges of the currently ongoing VZV vaccination program.

Varicella is a highly contagious disease. In countries without a vaccination program, the majority of incident cases (52–78%) occur in children under 6 years of age, increasing to 89–96% among those under 12 years of age (3). A systematic literature review (SLR) examining the varicella disease burden across 31 European countries estimated a total of 5.5 million varicella cases annually before the introduction of childhood immunization, including 3 million cases in children under 5 years of age (4). In Central and Eastern Europe (CEE), annual incidences of community-acquired varicella in children under 5 years of age ranged from 7,108 per 100,000 in Romania to 11,640 per 100,000 in Slovenia (5). Incidences of varicella-related hospitalizations in CEE were also highest in this age group, ranging from 22–27 per 100,000 children in Romania to 36–44 per 100,000 in Slovenia (3).

Although varicella is usually a mild to moderate illness (2–6), a small proportion of cases are severe, including complications such as secondary bacterial skin or soft tissue infections, respiratory syndromes, and neurological manifestations (e.g., cerebellar ataxia, encephalitis). The risk of severe varicella infection, or even death, is higher in young children, older adults, immunocompromised individuals, and those with underlying health conditions (1). However, the susceptibility of even healthy children to skin and neurological complications underscores the importance of recognizing the prevention of this disease as a public health priority (7).

Varicella prevention with the live attenuated vaccine

Vaccination against varicella reduces the number, size, and duration of varicella outbreaks (9) and rapidly decreases disease incidence over time (8), thereby reducing societal and financial costs. Unfortunately, the highest-risk group – immunocompromised individuals – cannot directly benefit from prevention with a live attenuated vaccine (2); however, universal immunization of all children can reduce their risk of infection through herd protection.

World Health Organization (WHO) guidelines recommend routine childhood immunization against varicella in settings where high (>80%) and sustained vaccine coverage can be achieved and where the disease represents an important public health concern in the context of affordability (10). Following the general recommendation of one-dose varicella vaccination for routine use in children aged 12 months and older in the United States in 1995, significant improvements were observed in the number of varicella cases, varicella-related ambulatory visits, hospitalizations, and deaths. By the year 2000, the incidence of disease had decreased by 75% (coverage rate 84%), and a 75–80% reduction in hospital treatment had been achieved. Varicella-related deaths decreased by 75–92% among children and adolescents and by 74% among adults. However, the problem of breakthrough varicella cases – defined as the appearance of a pruritic maculopapulovesicular rash occurring more than 42 days after vaccination with no other apparent cause – has persisted (12). Breakthrough varicella may result from primary vaccine failure (PVF) or secondary vaccine failure (SVF) (PVF: failure to develop a protective immune response after vaccination; SVF: gradual waning of immunity over time). As noted by the European Centre for Disease Prevention and Control, “The experience of outbreaks in vaccinated populations has shown that varicella vaccination decreases the number, size, and duration of varicella outbreaks, and that these decreases are far greater with a two-dose schedule.” Based on this evidence, the current recommendation for varicella prevention is a two-dose schedule with a minimum interval of 4–12 weeks between doses.

Varicella prevention programs in Europe

According to the website of the European Centre for Disease Prevention and Control (ECDC) in 2026, a total of 20 countries, plus the United Kingdom, have varicella-zoster virus (VZV) prevention programs in place. Some programs are universal and compulsory (e.g., Bulgaria, Italy, Hungary, and Latvia), while others target specific age groups, such as adolescence (e.g., Belgium).

Immunization system in Hungary

In Hungary, the incidence of vaccine-preventable diseases has decreased primarily for those diseases included in the compulsory vaccination schedule. Since the early 1950s, an age-related vaccination calendar within the National Immunization Program (NIP) has been successfully implemented. Compulsory vaccines are fully reimbursed by the Ministry of Health and have achieved vaccination coverage rates exceeding 98%. Vaccines not included in the national schedule are optional, and some of these are partially reimbursed (11).

The varicella vaccine has been available in Hungary since 2003; however, until 2019 it was available only on the private market. As a consequence, vaccination coverage remained relatively low (approximately 20%), and only a small proportion of vaccinated individuals received the recommended two doses. Despite ongoing efforts since 2003 – including professional recommendations and continuous education of healthcare providers and parents – the number of vaccinated individuals reached a plateau. Therefore, new strategies were required to further increase awareness of the disease (12).

A short lived – from 2003 to 2007 – web page about chickenpox to improve VZV disease awareness

Based on personal experience with widespread misconceptions about VZV infections in society, I decided to launch an interactive educational webpage to provide parents with information on the clinical features, treatment options, and prevention of this infection. During the five-year period of its existence, the webpage received more than 10,000 visitors, and approximately every fourth parent submitted questions by email. Questions could be posted publicly or sent privately. Every six months, I summarized the most frequently asked questions in the hope of assisting parents in choosing preventive measures and clarifying common misconceptions. The majority of the questions concerned the clinical aspects of VZV infections. Unfortunately, several emails suggested that some parents had not read the information about the infection available on the website. It also became clear that many parents believed there was an “optimal” number of varicella vesicles. If the disease was mild, with only a dozen

lesions, they worried about whether adequate immunity would develop – although, in fact, these children would likely achieve effective protection. A common attitude expressed was: “It is much better to get chickenpox than to be vaccinated against it.” Some parents even organized “chickenpox parties” for susceptible children in an attempt to ensure infection, without considering the risk of complications. Perhaps the most difficult correspondence involved pregnant women who had already become infected and regretted not choosing preventive vaccination. At times, it was ethically challenging to contradict the recommendations of other colleagues who had suggested clearly suboptimal acyclovir dosing regimens. The experiences gathered through this initiative were later incorporated into several educational programs for medical students and into postgraduate training courses for nurses, midwives, and general practitioners.

Activities to introduce a universal varicella prevention program

In Hungary, the system for pediatric continuous medical training involves participation in training courses for every practitioner – pediatrician or general practitioner. Once every five years, each practitioner has to participate in a 3-day course – online participation is also possible – ending with an online exam. As the topic of immunization is also part of these training programs, varicella-zoster prevention can regularly be included. Slowly but continuously, vaccine coverage against varicella increased; however, as this prevention was voluntary and not reimbursed, the estimated coverage increased gradually but never exceeded 35% of all eligible children. Not surprisingly, this level of coverage could not substantially alter the incidence of reported chickenpox cases – over 50 thousand/year, with one or two fatalities. Considering the high contagiousness of the infection, a substantial number of cases have likely not been reported.

Pediatricians from both scientific societies – the Hungarian Society of Pediatrics and the Hungarian Society of Infectious Diseases and Clinical Microbiology – reg-

ularly communicated at their conferences and in scientific papers the need for the introduction of a universal varicella prevention program. The Vaccination Advisory Committee – a group of experts from regulatory and clinical fields meeting regularly under the public health network to assist the decisions of the Chief Medical Officer in immunization issues – started negotiations about a universal program, and finally the decision was made to initiate it in 2019.

Since 2019, the reported varicella cases to the National Centre for Public Health and Pharmacy decreased from the previous over 52 thousand cases/year – for example, in 2005: 52,608 cases, 1 fatality – to 11–12 thousand cases/year; in 2024: 11,748 cases, which represents a great success of the program, considering the SARS-CoV-2 epidemic, which posed a challenge for immunization programs worldwide.

The majority of the population welcomes this prevention; the minority that remains unconvinced is not specifically campaigning against varicella prevention but against vaccines in general, with their primary focus directed toward the MMR vaccine.

As a vaccine consultant, I still receive letters from parents who would rather choose the disease for their children, being unaware of the existing risks for complications. Especially the re-emergence of invasive *Streptococcus pyogenes* infections within the last decade poses a considerable risk for skin superinfections. As a complication of varicella, deep necrotizing fasciitis had been one of the major threats before the introduction of the universal VZV program – it has now practically disappeared, serving as a clear sign of improvement. Various neurological complications, mainly in previously healthy children, such as varicella cerebellitis, Hunt syndrome, and varicella encephalitis – although not frequent, but requiring hospitalization in each case – have also become practically extinct. Our Hungarian network for onco-hematologic pediatric patients has not reported a single case of progressive varicella within the last five years.

In conclusion the universal varicella prevention as part of our NIP is a major step forward in reducing the varicella disease burden in Hungary.

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Reasons for refusing vaccinations

Ágnes László¹, László Szabó^{1,2}

¹Department of Family Care Methodology, Faculty of Health Sciences, Semmelweis University, Budapest

²Heim Pál National Pediatric Institute, Budapest

Corresponding author: László Szabó szabo.laszlo.md@gmail.com

Abstract

Vaccination is the most effective preventive option. The number of people refusing vaccination is increasing worldwide, including in Hungary. We conducted a survey to investigate the reasons for this using a questionnaire-based method. A total of 145 people completed the questionnaire. Our study confirmed that individuals with lower levels of education, older individuals, and those living in rural areas are more likely to refuse vaccination. We found that the most important source of information regarding vaccinations is the opinion of a specialist, closely followed by the internet. However, there is a general lack of adequate information, which needs to be improved.

Keywords: *Vaccinations, vaccine refusers, prevention, information*

Introduction

The vaccination system has long protected children from childhood diseases that used to be serious (1). One might think that every young parent would be happy that their unborn child is protected and no longer threatened by diseases that previously had tragic outcomes. However, this is not the case. Today, anti-vaccination sentiment is spreading more and more widely, with many people considering vaccines to be poison and even risking punishment to “save” their children from them.

I chose this topic for my thesis because one of our relatives became pregnant, and like any enthusiastic, inexperienced, but responsible mother expecting her first baby, she tried to learn as much as possible about having a child. As a first step, she wanted to obtain information from various forums and articles on the Internet. She spent long hours browsing and searching, and found many contradictory articles. Among them were two opposing camps regarding vaccinations, which were in conflict with each other. She had doubts about how true all the horror stories about vaccines were. If those claims were true, why are vaccines mandatory? She tried to obtain more information to gain even more knowledge on the subject, but she became increasingly uncertain. The next time we met, she asked me what I, as a future child protection officer, thought about this topic. Of course, I explained why mandatory vaccinations were important based on what I had learned at university, but I did not understand what she

was questioning and where she was obtaining this information from. Her doubts arose as a result of what she had read on the World Wide Web. This piqued my curiosity, and I also began researching the Internet. I did not have to search long; I found a large anti-vaccination group on a social network. First, I started reading the articles, then the comments, and I was shocked to see how harsh (often aggressive) the discussions about vaccines were. I looked up the articles that anti-vaccinationists were referring to, and I was surprised to find that there are so many similar articles circulating on the Internet that are very easy to find. Reading them can raise doubts even among those who are fundamentally pro-vaccination.

I relied on what I learned at university, but I was intrigued by the fact that people who were previously supporters had also “switched” to the side of anti-vaccinationists, even though their children had received vaccines as infants. I wondered what kind of information results in such a major shift in perspective. This phenomenon is not limited to our country. Anti-vaccination sentiment is also gaining ground in the United States, Spain, and Austria. In Hungary (fortunately), this movement is still in its infancy, but we need to pay attention, because it shows a growing trend that could affect the entire society.

The development of antivaccination

The anti-vaccination movement dates back to Jenner's discovery. When vaccination of the population began,

many people were afraid of the consequences and did not believe in its effectiveness. However, the skeptics' objections gradually diminished when they observed the results of vaccination with their own eyes: fewer and fewer people contracted the disease, and smallpox was eventually eradicated (2).

The major anti-vaccination movement was sparked by an article published in 1998. *Dr. Andrew Wakefield* published a study in the prestigious British medical journal *The Lancet*. This research, based on 12 cases, claimed to have found a causal link between the MMR vaccine (measles, mumps, and rubella) and autism. Wakefield encouraged parents to vaccinate their children separately, one year apart, instead of receiving the combined vaccine (3). The news received extensive media coverage in the United Kingdom, which significantly undermined public confidence in vaccination. Parents avoided the combined vaccine, and the separate components quickly sold out due to the sudden increase in demand. As a result, the vaccination rate among two-year-olds dropped from 91% to 88% within a year and continued to decline. While in 1994, 90% of women in England believed the MMR vaccine was safe, by the early 2000s only 60% held this view. The use of the combined vaccine declined dramatically, and healthcare professionals feared the resurgence of epidemics that had previously been controlled.

The article quickly reached the United States, where anti-vaccination groups formed rapidly, encouraging parents to refuse not only the MMR vaccine but also other vaccines. As a result, an estimated 125,000 children born in the United States in the early 2000s were not vaccinated (4).

The study also sparked intense debate within the medical community. After publication, it was revealed that *Wakefield* had falsified several aspects of the data, including claims that symptoms of autism appeared a few days after vaccination. In reality, only one of the 12 subjects was diagnosed with autism, and this child had already shown symptoms prior to the study. Since then, hundreds of thousands of studies have been conducted in children, none of which have demonstrated a link between the MMR vaccine and autism. The original results have never been replicated, including by *Wakefield* himself. It has also been reported that *Wakefield* was paid to find evidence against the MMR vaccine. According to other sources, he had filed a patent application for a measles vaccine a few months prior to the study.

The Lancet has since retracted the article (5), and the author of the fraudulent study was suspended by the General Medical Council (GMC), the body responsible for maintaining the UK medical register. However, despite the confirmed fraud and the fact that the anti-MMR vaccine campaign was influenced by financial interests, the article had a lasting impact. The "genie of vaccine resistance" has been released from the bottle, and it appears that it will not be easy to put it back.

Nowadays, there is a large amount of misinformation, data, and "studies" available on the internet, similar to

the MMR vaccine–autism link, which are widely cited and accepted by vaccine skeptics, even when the sources are unknown or not credible. For example, claims are made that vaccines are carcinogenic or toxic, or that they contain aluminum, mercury, aborted human fetal tissue, and formaldehyde (6). However, according to many anti-vaccination proponents, epidemics declined not due to vaccines but because of improved living conditions, hygiene, and nutrition. Numerous misconceptions and beliefs circulate regarding the harmful side effects of vaccines; however, *Wakefield's* falsified study was the first in this series.

Therefore, I became interested in the situation of vaccine refusal in Hungary.

Material and Methods

Data were collected using a questionnaire. We created an online, self-administered questionnaire using Google Drive. This method allows the questionnaire to be distributed quickly to the target group – vaccine refusers – for whom anonymity is particularly important.

The questionnaire consisted of 23 closed-ended questions, with an option at the end to provide individual opinions and comments.

Participants and data collection:

Social networking sites are widely used on the internet, where users can join groups based on shared interests. Here, we identified the "Vaccine Critics Life Protection Association" community, which openly opposes and criticizes vaccines. The group has 6,327 members. We initially attempted to collect data from this group, but the administrator declined. We then approached other smaller communities, but with limited success. Subsequently, we contacted healthcare workers and child welfare professionals to help distribute the questionnaire among individuals who completely or partially disagree with vaccination or are uncertain. At the same time, we also shared the questionnaire on forums related to vaccination and alternative education. With the initial questions of the questionnaire, we aimed to map the characteristics of the respondents, while the second part of the questionnaire was designed to explore their opinions.

Based on responses to the second group of questions, respondents were classified into the following four categories:

Pro-vaccination

We considered respondents to be pro-vaccination if they agreed with the current vaccination schedule, did not feel that their rights were restricted by legal requirements, and stated that, even if vaccination were optional, they would still vaccinate their child. They were also not concerned about harmful side effects or complications.

1. Rather pro-vaccination

We classified respondents as rather pro-vaccination if they did not fully accept the current vaccination schedule but would vaccinate against diseases with more serious consequences (e.g., polio, diphtheria, etc.). Some individuals in this group also believed that pharmaceutical companies are primarily profit-driven and felt that their rights were restricted by mandatory vaccination laws. Several respondents indicated that they might change their opinion if provided with comprehensive information; therefore, their position was somewhat uncertain. They expected minor complications and expressed doubts and reservations, but generally considered the benefits of vaccination to outweigh the risks.

2. Rather anti-vaccination

We categorized respondents as rather anti-vaccination if they did not categorically reject vaccines but considered many of them harmful or, at best, unnecessary. They typically felt that their rights were limited by mandatory vaccination requirements. This group also included skeptics who did not hold their views with absolute certainty. Their general opinion was that vaccines were more harmful than beneficial.

3. Anti-vaccination/vaccination denial

We categorized respondents who would not vaccinate their child as vaccination deniers. In contrast to legal requirements, this attitude represents such a strong position that we classified these respondents as categorical vaccine deniers. Their stance is firm, and they do not expect any benefits from vaccination.

Results

Respondents' demographic characteristics

A total of 145 individuals completed the questionnaire. Of these, 92 were female (63.4%) and 53 were male (36.6%). By age distribution, 2 respondents (1.4%) were under 20 years of age, 94 (64.8%) were between 21 and 30 years, 28 (19.3%) were between 31 and 40 years, 13 (9.0%) were between 41 and 50 years, and 8 (5.5%) were over 51 years of age.

Regarding place of residence, 79 respondents lived in the capital, 15 in large cities, 31 in other cities, and 20 in villages. Overall, 125 respondents (86.2%) were urban residents, and 20 (13.8%) were rural residents.

The largest respondent group consisted of urban, university-educated men under 30 years of age (29 individuals). The second largest group was urban, university-educated women under 30 years of age (20 individuals). The rural male group (9 individuals) showed the lowest level of engagement with the topic (independent of age and education). Overall, apart from the young urban male graduate group, most male respondents were not highly engaged with vaccination-related information. Only 53 respon-

dents had children, while 92 did not. When asked whether they had vaccinated or would vaccinate their child, 21 respondents answered no and 124 answered yes. A total of 141 respondents reported being fully vaccinated, 3 reported being partially vaccinated, and 1 respondent stated that they had not received any vaccinations. After vaccination, 26 respondents experienced mild or moderate symptoms or complications (typically fever, redness, or pain), while 119 did not report any such symptoms. To the question "Do you know anyone in your environment who refuses vaccination?", 45 respondents answered yes and 100 answered no.

Respondents' opinions

Figure 1 shows, in terms of frequency, respondents' views on the possible reasons for vaccine refusal. Six answer options were provided, and multiple responses were allowed. A total of 296 responses were received from 145 respondents. According to the responses, 31% attributed vaccine refusal to perceived complications, 27% to hearing negative information about vaccines, 10% believed that vaccines cause illness, and 84% believed that vaccines weaken the immune system. Additionally, 5.7% reported personal negative experiences, and 5% believed that vaccines weaken the body, making individuals more susceptible to other diseases. The remaining responses fell into an "other" category, with the most common explanations including lack of knowledge, insufficient information, and exposure to unreliable sources. The detailed responses are presented in Table 1.

The next question yielded an approximately 50/50 split. Seventy-one respondents stated that vaccines do not have harmful side effects, while 74 believed that they do. Only those who answered "yes" were asked a follow-up question regarding specific side effects. In this question, two predefined answer options were provided, multiple

Figure 1. Reasons for antivaccination according to respondents (number of responses)

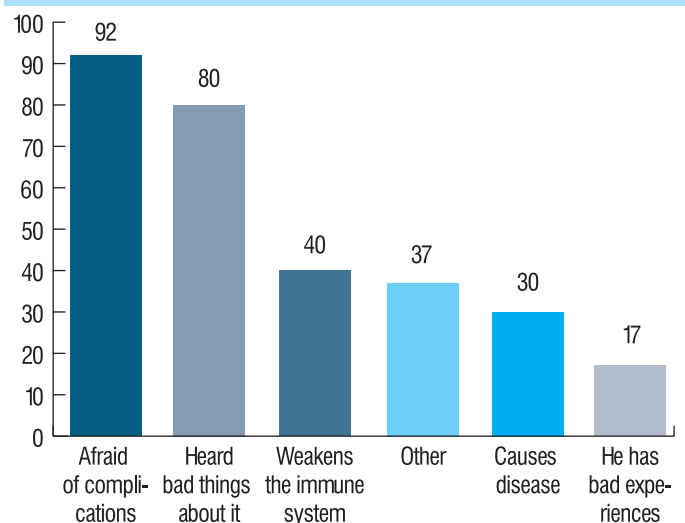


Table 1. Lists other reasons for refusing vaccination. (Figure 1 details 37 cases)

"The greatest enemy of science is the brazen confidence of incompetence..."
"Horror news on the internet and gaps in health knowledge"
"Children of an uneducated, gullible, impressionable hippie nature"
"Human stupidity, ignorance, inability to interpret details in context"
"Unnecessary media hysteria (e.g. bird flu) fueled by the profit-hungry vaccine lobby"
"Scares from irresponsible quacks"
"Ignorance, distorted news in the media"
"There's a lot of false information circulating on the web, and many people immediately believe everything on popular sites that spread fake news. That means they don't follow up on things."
"Pseudoscientific publications"
"They are deceiving people"

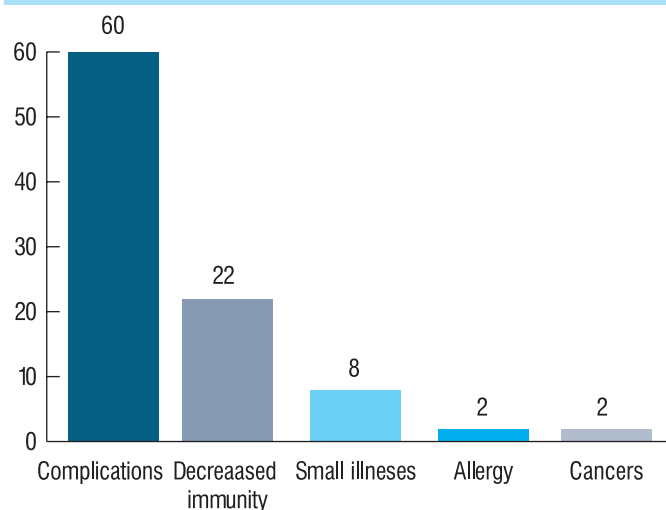
responses were allowed, and respondents could also provide additional answers in an "other" field. A substantial proportion (81%) identified complications as the primary side effect, 30% believed that vaccines weaken the immune system, 11% mentioned mild illness and fever, and 3% each reported a carcinogenic effect and a potential role in the development of allergies. The numerical distribution of responses is shown in *Figure 2*.

Regarding the statement that there is a connection between the MMR vaccine and autism, 32 respondents agreed and 113 disagreed. Additionally, 29 respondents believed that unvaccinated children are healthier, while vaccinated children are made ill, weakened, and exposed to various complications; 116 respondents did not support this view.

Many respondents object to legal regulation. They would prefer to decide for themselves which diseases they or their children should be vaccinated against. They perceive vaccination laws as too strict and as restricting their right to make decisions regarding their child's health. A total of 36 respondents expressed this view and would prefer a change in regulation, while 109 respondents accepted the current legal framework.

Among those who completed the questionnaire, 50 agreed with the statement that pharmaceutical companies' profit motives are behind vaccination policies and that this is why an increasing number of vaccines are becoming mandatory. In contrast, 95 respondents believed that these factors do not influence vaccination policies.

The next question addressed sources of information about vaccinations. Most respondents (111) reported obtaining information from healthcare professionals. Eighty-four respondents used the Internet as an information source, of whom 26 also relied on social media. Family members, acquaintances, and friends also played an important role, with 51 respondents reporting that they rely on information from their social environment. Twenty-six

Figure 2. Reported adverse effects of vaccination according to respondents (number of cases)

respondents reported using magazine articles and books. Television ranked last among the listed sources, with 14 respondents selecting it. Three respondents provided answers in the "other" category, specifying doctors and nurses; these were therefore included in the "healthcare professionals" category. In total, 291 responses were received from 145 respondents, and the percentage distribution is shown in *Figure 3*.

When asked whether access to detailed information could change their views on vaccination, 43 respondents believed that their opinions might change, while 102 respondents stated that they were confident in their current knowledge and would maintain their original position.

The next question addressed perceptions of the consequences of refusing vaccination. Five answer options were provided, and multiple responses were allowed. A total of 108 respondents were primarily concerned about endangering their own children, 98 were concerned about the re-emergence of epidemics, and 82 believed that refusing vaccination would also endanger others. Seventy respondents were aware that refusal would constitute

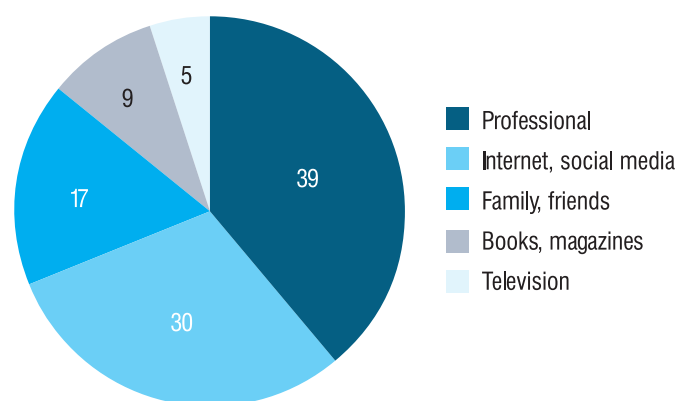
Figure 3. Percentage distribution of information sources

Figure 4. Perceived consequences of refusing vaccination according to respondents (%)

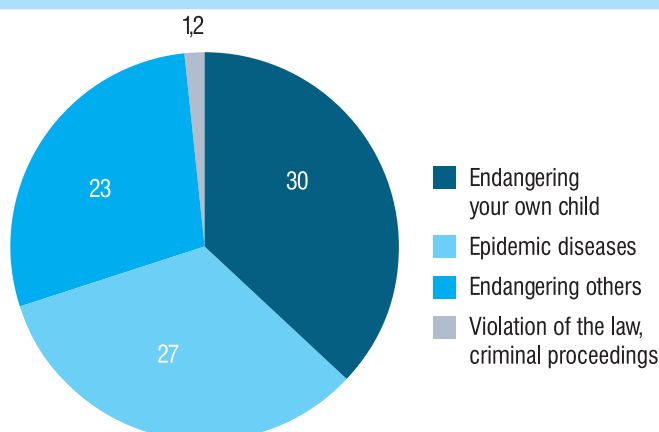
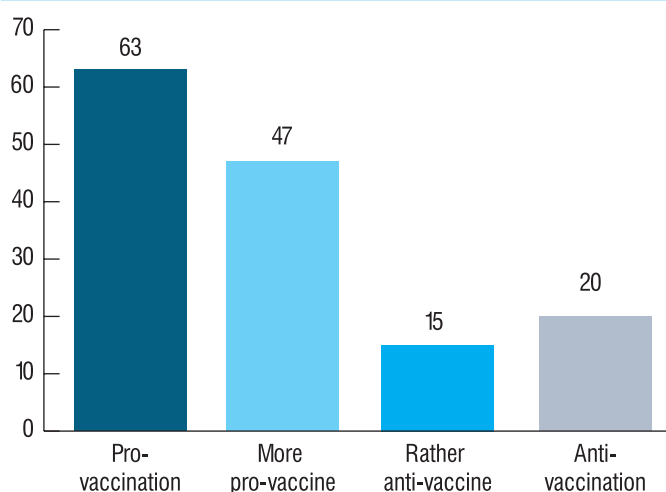


Figure 5. Distribution of respondent attitudes



a legal violation, and 55 respondents were aware that criminal proceedings could be initiated. For presentation purposes, the latter two categories were combined in the figure. In total, 358 responses were received, and the percentage distribution is shown in *Figure 4*.

Thirty respondents were unaware that mandatory vaccinations are a legal obligation and that refusal constitutes a violation of the law, whereas 115 respondents were aware of this requirement.

Regarding mandatory vaccinations in Hungary, most respondents identified diphtheria (67 respondents), followed by measles (61), tuberculosis (56), mumps (54), rubella (53), tetanus (52), pertussis (52), and hepatitis (45). It should be noted that in this category, respondents did not distinguish between hepatitis A, B, and C, and several mentioned multiple types. Polio was mentioned by 44 respondents, and meningitis by 12 respondents. It is important to note that *Haemophilus influenzae* type B can also cause meningitis as well as ear, nose, and throat infections. Some respondents either misunderstood the question or were insufficiently familiar with vaccina-

tion terminology. Nine respondents each listed BCG and MMR as diseases, four mentioned Hib, and three mentioned DTPa. These are vaccine abbreviations used in childhood immunization schedules rather than disease names. Two respondents also incorrectly included HPV and rotavirus vaccines among mandatory vaccinations. Overall, these findings indicate that most respondents have a general understanding of which diseases are targeted by vaccination; however, there is a clear need for more comprehensive and accurate information.

The study also explored whether respondents who oppose vaccination believe there are alternative methods to prevent infectious diseases. According to 119 respondents (82.1%), no alternative exists, while 26 respondents (17.9%) believed that alternative approaches could replace vaccination in disease prevention. Among those who supported alternatives, eight respondents mentioned homeopathy, five mentioned herbal remedies, three suggested a healthy or "proper" diet (including the GAPS diet), and two respondents proposed bioenergetics as a substitute for vaccination.

In the final question, respondents were given the opportunity to provide their opinions freely. This section was considered the most informative. Selected responses were quoted verbatim after minor stylistic corrections and are presented in *Table 2*, grouped into six categories. The first group includes respondents who clearly believe that vaccinations are important and that questioning their usefulness is irresponsible. The second group consists of respondents who believe that certain vaccines are unnecessary, particularly those targeting diseases perceived as mild and not causing permanent harm. The third group includes vaccine refusers who oppose all vaccinations and believe that children should not be "poisoned." According to these respondents, vaccines have exclusively harmful effects that weaken the body's natural defenses. They also believe that vaccines primarily serve the financial interests of pharmaceutical companies, without regard for public health, and that government policies reinforce this through legal mandates. This group contained the most aggressive and offensive responses. The fourth group consists of respondents who reported a lack of adequate information. These opinions emphasized that there is insufficient detailed information regarding vaccines, including their composition, effects, benefits, and risks. The fifth category includes respondents who feel that their personal freedoms are restricted by mandatory vaccination policies.

The final category includes views suggesting that growing doubts about vaccination are due to a lack of credible information sources or, alternatively, to misinformation and general disbelief among the population.

In summary, the distribution of the 145 respondents is shown in *Figure 5*. Overall, 44% were pro-vaccination, 32% were rather pro-vaccination, 10% were rather anti-vaccination, and 14% were anti-vaccination or vaccination deniers. Among respondents with higher education,

Table 2. Individual opinions on vaccination in 6 groups

Supports vaccination and considers it important	"I support vaccinations; even if they were not mandatory, I would still give them. However, it would be better if the regulations were less rigid. For example, if a child is ill or recovering, vaccination should be postponed for a few weeks."
	"I hate antivaccination people. All of them. I hope they realize that, because of their unvaccinated child's poor immune system, they are putting everyone else's children at risk."
	"Vaccination is needed not only to protect our own children (for whom any normal parent would do everything possible), but also to protect those who cannot be vaccinated for medical reasons. Due to uninformed deniers, preventable diseases have again become relevant in epidemic statistics. These individuals are completely deaf to reason and do not realize they are endangering their own health and that of others."
	"I would not refuse vaccination for my child. Side effects or not, it is clear that vaccines save countless lives."
Agrees only with certain vaccinations	"Some vaccines are absolutely necessary, but others, such as chickenpox, I would not administer. It is better for a child to contract certain diseases at a young age, as this strengthens immunity."
	"No one has the right to endanger others or their own children by allowing the return of already controlled epidemics. Chickenpox is acceptable if it runs its course, but tuberculosis would cause serious problems without vaccination."
	"Vaccines are important, but those that have already been banned in several countries due to proven harm should not be used."
Does not support any type of vaccination (vaccine deniers)	"Be normal and stop being the state's servant for lethal injections!"
	"If you want to be a protector, children will regress and die of diseases before your eyes, and their lives will be destroyed. If you are heartless, you can become a 'protector'—a disgusting invertebrate. I hope that when you have a child, you vaccinate them and experience the suffering we parents go through because of this lie. Jenner killed his own son, but they forget to mention that. Vaccination is useless."
	"Most medicines, including vaccines, are simply poisoning people. This is the result of the pharmaceutical industry working in close cooperation with the state, while alternative medicine is suppressed. People spend more and more money on drugs that make them sicker. It is a vicious cycle. It is a shame that the state supports this through legislation."
	"Vaccinations should rather be called harmful injections. They have no objectively proven benefit (excluding so-called statistical data produced by pseudoscience). Their risks are significant. Responsible doctors do not recommend them; others protect professional reputation without considering patient harm. They violate the Hippocratic Oath."
	"As far as I know, one of the basic principles of medicine is 'do no harm.' Vaccine ingredients contain components that are considered toxic to humans (e.g., mercury compounds, etc.), which, as far as I know, have been banned in Western countries for years, presumably for good reason. It is unlikely that something is harmful in the West but beneficial here, right? Therefore, if all risks of a given intervention are not fully known, it is better not to use it, as the potential harm may outweigh the benefits."
Considers information insufficient	"Refusing vaccination is dangerous, but lack of information (often even minimal information from the pediatrician) leads many parents to this behavior."
	"My children received all mandatory vaccines. However, the pediatrician provides no information about what is being administered, why it is needed, or what would happen without it. I receive no information, even though the doctor is obliged to inform me. If I ask, I only receive general, stereotypical answers."
Opposes legal obligation	"We would prefer vaccinations to be optional, as in many Western European countries!!!"
	"The main problem in Hungary is the lack of an individualized vaccination schedule. I cannot decide when and which vaccines my child receives. This limits my freedom and endangers my child's health."
Judgment based on misinformation or ignorance	"Ignorance" (appears twice)
	"Human stupidity and incorrect sources of information."
	"The main reasons are lack of information and pseudoscientific articles. I do not believe medication should be used for every problem. However, for infectious diseases with serious or fatal consequences, responsibility is much greater."
	"The main reasons are lack of information and pseudoscientific articles. I do not believe medication should be used for every problem. However, for infectious diseases with serious or fatal consequences, responsibility is much greater."
	"Some parents trust information from the Internet or acquaintances more than their doctor. They are afraid of side effects and feel sorry for their children. I also believe vaccine information is not equally accurate everywhere, and some people do not understand it properly."

79% were in favor or rather in favor of vaccination, while 21% were anti-vaccination or rather anti-vaccination. In the group with lower educational attainment, 69% were in favor or rather in favor, and 31% were anti-vaccination or rather anti-vaccination. Differences were also observed according to place of residence (urban vs. rural). Respondents were grouped into two categories: an urban category (including respondents from the capital and large cities; 94 individuals, 64.8%) and a rural category (including respondents from small towns and villages; 51 individuals, 35.2%). In the urban group, 82% were pro-vaccination, while 18% were anti-vaccination or rather anti-vaccination. In the rural group, 65% were pro-vaccination and 35% were anti-vaccination or rather anti-vaccination. Due to the small number of older respondents, the two upper age groups were combined. Thus, three age categories were compared: under 30 years (96 individuals; 66%), 30–40 years (28 individuals; 19%), and over 40 years (21 individuals; 15%). The distribution of attitudes within these groups was as follows: among respondents under 30, 79 (82.3%) were in favor and 17 (17.7%) were against vaccination; among those aged 30–40, 17 (60.7%) were in favor and 11 (39.3%) were against; and among those over 40, 14 (66.7%) were in favor and 7 (33.3%) were against. Based on my experience, I had assumed that many individuals vaccinate their children despite personal beliefs, primarily in order to comply with legal requirements. This was confirmed in the present study, as 14 of the 35 vaccine-denier respondents reported that they had vaccinated their children. This represents 40% of the vaccine-denier group.

Discussion

“There are hardly any practicing physicians in Hungary today who have ever seen measles, and even laypeople have no realistic understanding of the disease,” says infectious disease specialist *András Lakos* (7). In our country, vaccination coverage can be considered high even by international standards. A large proportion of the population has received recommended vaccines, and the relatively small number of “black sheep” is also protected by herd immunity; therefore, there is currently no realistic threat of resurgence of these serious diseases.

Many individuals, particularly younger people, are interested in obtaining information about vaccinations. This is a positive development. Unlike previous generations, they do not accept information passively; instead, they seek to understand what is happening to their children and are willing to invest time and effort into acquiring knowledge.

According to our study, respondents still most commonly begin their information-seeking process with healthcare professionals. However, in many cases this does not lead to satisfactory outcomes. Brief or standardized answers are no longer sufficient for this generation, so they turn to alternative sources of information. The Internet,

which has grown rapidly in recent years, is a clear example. Both the questionnaire and interview data indicate that the World Wide Web has become the second most common source of vaccination-related information after healthcare professionals. It is widely accessible, and due to freedom of information, it contains a wide range of articles and opinions, both supportive and critical of vaccination. This represents a double-edged phenomenon: while it increases access to information and transparency, it also carries risks. Although healthcare professionals and vaccinators remain the primary sources of information, many respondents indicated that they would prefer greater media coverage of vaccination-related topics. This suggests that parents often find it faster and more convenient to obtain information online than to consult healthcare professionals directly (8). However, individuals seeking information without adequate professional guidance can easily encounter misleading or extreme views, as numerous antivaccination blogs, articles, forums, and opinions are widely available online. As a result, a parent who does not receive sufficient professional explanation or reassurance may gradually become more strongly antivaccination. Once an individual has firmly adopted a position, it is considerably more difficult to change their views than when they were still uncertain (9). Based on my respondents, I assume that a substantial proportion of parents fall into the category of uncertainty. This group is more easily influenced toward pro-vaccination attitudes than individuals with firmly established anti-vaccination beliefs.

Another issue is the limited availability and difficult access to up-to-date Hungarian-language literature on the subject. Physicians are often insufficiently engaged with this topic, and relatively few have in-depth knowledge of it. In addition, insufficient emphasis is placed on communication with patients. When addressing current misinformation, controversies, or media debates, healthcare professionals may either fail to communicate clearly, appear overly defensive, lack credibility, or be perceived as unengaging. Healthcare professionals should take advantage of opportunities to appear in public and emphasize clear, accessible, and credible communication. Vaccinology requires continuous learning and self-education, and it is essential that vaccinating physicians also prioritize this.

Based on the questionnaire results and personal experience, a significant proportion of vaccine deniers are distrustful of those who hold opposing views. They are often unwilling to engage in constructive dialogue and may dismiss opposing arguments without consideration. Rather than addressing the content of arguments, they tend to reject the source itself, making it extremely difficult to change their views. According to *Zsófia Mészner* (10), vaccination counseling settings are often where the most challenging communication occurs with individuals who oppose vaccination, do not recognize its importance, and may exhibit strongly negative behavior.

This study demonstrates that, partly due to insufficient in-depth information provided by professionals and partly due to misinformation available on the Internet, the proportion of individuals who refuse vaccination or question its usefulness is currently relatively high. If this trend cannot be halted, the situation is likely to worsen (11).

At present, vaccinations are mandatory by law, with sanctions applied to those who refuse. This is partly justified by high vaccination coverage and the absence of epidemic threats. However, our research shows that many parents partially or completely disagree with vaccination and comply only due to legal obligations. In our view, this is not an ideal situation. It would be preferable for a greater proportion of parents to vaccinate their children based on conviction rather than compulsion.

It should not be forgotten, and should not be doubted, that every parent wants the best for their child. Even the most committed antivaccination individuals believe, with strong conviction, that they are acting in the best interest of their child. In many cases, they possess extensive knowledge; however, partly due to preexisting biases, they often reach incorrect conclusions.

We hypothesized a relationship between educational attainment and attitudes toward vaccination and antivaccination.

Individuals with higher education levels were found to be more pro-vaccination than those with lower education levels, in contrast to the statement by *Smith* (12).

We also hypothesized that vaccine acceptance differs according to place of residence (urban vs. rural). Vaccine acceptance was higher among urban residents than among rural residents.

In addition, we hypothesized an association between age and vaccination attitudes. The highest rate of vaccine refusal was observed in the over-40 age group.

Based on our experience, we believe that many individuals vaccinate their children despite personal beliefs, primarily in order to comply with legal requirements. As a result, a substantial proportion of vaccine-denier respondents still vaccinated their children. In this study, this accounted for 40% of vaccine-denier respondents, which represents a significant proportion. Without legal requirements, nearly 10% of all children subject to mandatory vaccination might remain unvaccinated, which would correspond to several thousand cases annually.

According to our assumptions, parents (or prospective parents) with uncertain knowledge and misconceptions typically seek information from the World Wide Web. Based on our study, it can be concluded that the most important source of information regarding vaccinations is the opinion of healthcare professionals, consistent with the findings of *Salmon et al.* (13); however, the Internet closely follows this as a secondary source. Responses also indicated that other information sources are significantly less influential, suggesting that individuals can be most effectively reached through health-

care professionals and online platforms. The Internet has therefore become an unavoidable medium for acquiring health-related information. The second part of our hypothesis – that people are insufficiently informed about vaccinations – was supported by the presence of numerous misconceptions and false beliefs, particularly among vaccine deniers. One example is the alleged association between the MMR vaccine and autism, which has been refuted by multiple studies; however, 22% of respondents in this study still believed this connection to be true.

They also tend to prefer alternative therapies that they believe could replace mandatory vaccinations.

According to our study, 18% of respondents believe that vaccines can be replaced by alternative methods, a finding that is also consistent with *Salmon* (13). We consider this to be a misconception, as prior to the development of vaccines, only traditional or natural remedies were available for centuries, during which numerous epidemics occurred despite repeated attempts at treatment. It is also evident, as previously noted in relation to other misconceptions, that individuals who accept inaccurate or questionable information often rely primarily on Internet sources.

On the one hand, it is encouraging that more than three-quarters of respondents are either rather or clearly pro-vaccination; on the other hand, it is concerning that nearly one-quarter have reservations regarding the usefulness of vaccination.

Conclusion

What should be done? Fortunately, there is currently no major problem. Vaccination coverage remains high, and the majority of parents continue to trust healthcare professionals. Our research has shown that a large proportion of parents, particularly those uncertain about their knowledge, are seeking reliable information.

Information dissemination should therefore play a more prominent role than in the past. Healthcare professionals should maintain an active presence on the Internet, particularly in response to antivaccination content. It is important to promote accurate knowledge and address misinformation; in other words, engagement with opposing views is necessary. Individuals with antivaccination views often raise reasonable questions and logical concerns (e.g., “If Hungarian practice is so effective, why is it not adopted in other countries?”; “Are there vaccines considered unsafe and banned elsewhere that are still mandatory in Hungary?”; “If this approach is correct, why is vaccination optional in other countries?”; “Are all currently mandatory vaccines truly necessary?”; and “How do the benefits of each vaccine compare with the risks of non-vaccination?”). These and many other questions must be addressed comprehensively and transparently.

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Personal interviews on reasons for refusing vaccinations

Ágnes László¹, László Szabó^{1,2}

¹Department of Family Care Methodology, Faculty of Health Sciences, Semmelweis University, Budapest

²Heim Pál National Pediatric Institute, Budapest

Corresponding author: László Szabó szabo.laszlo.md@gmail.com

Abstract

The number of people refusing vaccination is increasing worldwide, including in Hungary. I conducted a survey and three personal interviews to explore the reasons for this trend. I found that the most important source of information about vaccinations is the opinion of healthcare professionals, although the Internet closely follows as a secondary source. Overall, there appears to be a general lack of reliable information.

Keywords: vaccination, antivaccination, internet, interview

Introduction

In the developed world today, maintaining health for as long as possible has become increasingly important. The principle of prevention, particularly primary prevention, is gaining wider acceptance. This approach is beneficial not only for individuals – since it is better to remain healthy than to treat disease – but also from an economic perspective, as prevention is less costly than treatment. Vaccination remains the most effective preventive measure. Twenty years ago, refusal of vaccination would rarely have been considered by my parents or their circle of acquaintances. What, then, explains the growing resistance to vaccination today? Is it due to the easy accessibility of large amounts of information on the Internet and the ability of communities with shared interests to communicate more effectively? Or is it related to the influence of the media, where serious vaccine-related cases receive extensive coverage? Perhaps it is also due to the emergence of a generation that has not experienced epidemic diseases firsthand and therefore lacks awareness of their potentially severe consequences.

My interest in this topic was prompted by the observation that, although vaccination is fundamentally beneficial, many individuals perceive it negatively. Many parents who refuse vaccination believe that they are acting in the best interest of their children. I was therefore interested in understanding how and on what basis antivaccination atti-

tudes develop. In reviewing online discussions, I noted that many individuals reported dissatisfaction with the information provided by healthcare professionals. When parents sought information about vaccinations from pediatricians, the response was often brief – for example, stating simply that vaccination is necessary to prevent epidemic diseases – or limited to referencing legal requirements. As a result, many parents were left with unresolved doubts, which undermined their trust in professional health information and led them to seek answers from individuals who oppose vaccination. In our previous article, we described data collection using questionnaires; in the present study, we present findings from personal interviews.

The aim of this study was to explore the opinions of individuals who oppose vaccination and to identify the reasons underlying their attitudes. I sought to determine where individuals obtain information about vaccinations and to examine the misconceptions and beliefs that may influence antivaccination views. In addition, I aimed to assess awareness of legal regulations regarding vaccination and to evaluate the extent to which these regulations influence parental decision-making and exert coercive pressure.

Material and method

I conducted in-depth interviews as part of this study. Compared with questionnaires, this method is more per-

sonal and informal, allowing respondents to express their opinions in greater detail and depth. It also enabled me to respond immediately to ideas expressed during the conversation. However, compared with questionnaires, a limitation of this method is that it allows access to a much smaller number of participants. At the same time, it provides deeper insight into how individual beliefs and convictions are formed.

I sought interview participants who held antivaccination or partially antivaccination views, as these perspectives were the focus of the study. Identifying suitable interviewees proved to be challenging. In my experience, there are more pro-vaccination individuals than antivaccination individuals – at least within my own social environment – so initially I was unable to identify appropriate participants. As mentioned earlier in the description of the sample, I located a group on a social media platform dedicated to antivaccination views, with a substantial number of members and followers. I contacted the administrator and editor of the group and requested an interview; however, I received a negative and hostile response. According to their explanation, they had previously participated in a similar interview several years earlier, which they believed had been misrepresented. I attempted to contact them again, but this resulted in an even stronger refusal. Subsequently, I attempted to recruit participants through other channels, including online forums and groups related to alternative education; however, none of these individuals agreed to participate in interviews. During the preparation of this study, I observed that individuals with strongly antivaccination views are often reluctant to openly express their opinions, possibly due to legal considerations. In addition, online interactions suggested that discussions on this topic are frequently emotionally charged, sometimes characterized by strong language, limited argumentation, and rejection of opposing viewpoints. Therefore, I discontinued this approach.

Ultimately, by chance, I was able to identify participants within my extended social network (friends of acquaintances) who agreed to take part in the interviews.

I prepared a set of standard questions but allowed flexibility in adapting them to the direction of each conversation; therefore, the final questions differed slightly among the three interviews. The conversations were recorded using a digital voice recorder with the knowledge and consent of the interviewees. The recordings were subsequently transcribed with minor stylistic corrections, while preserving the original meaning of the responses. Throughout the interviews, I aimed to remain neutral and did not attempt to influence or persuade participants, as my primary objective was to understand their perspectives, regardless of whether I personally agreed with them.

The questions were adapted to the participants' life situations and ages.

Most questions overlapped with those used in the questionnaire, as both the subject matter (vaccination) and the

Table. Questions and topics of the personal interview

Opinion on mandatory vaccinations (usefulness or harm)
What do they base their opinions on?
Where do you get information about vaccinations?
Have you tried to get information from a professional?
According to statistics, thanks to vaccinations, several diseases that used to be serious and potentially fatal have declined or disappeared in Hungary. What is your opinion on this?
Her opinion on legal obligation.
Can vaccines be replaced with alternative therapies?
Who is responsible for providing information about vaccinations?
Did you seek medical advice and what was the result?
Negative experience with vaccinations.
How informed are parents about vaccinations before having a child?

study objectives (understanding opinions) were consistent across methods. The main topics covered by the interview questions are presented in the accompanying *table*.

Results

Interview 1

What is your opinion on mandatory vaccinations?

I do not know enough about the topic to be able to take a clear position either for or against it. About twenty years ago, when my children were babies or small children and I was personally involved in the topic, this question did not even arise, since vaccination was mandatory. If I were now in a position to decide, I would certainly look into the matter thoroughly. I would like to add that I did not take my children for vaccinations wholeheartedly. I believe in inner intuition – if you like, in our instincts. I believe in natural processes, so based on the principle of nature, I did not agree with vaccinations, but I trusted their bodies; if there were any potentially harmful effects of vaccinations, their bodies would protect them. I feel – and therefore I believe – that these vaccinations are unnecessary or, in worse cases, harmful. Therefore, I did not believe then, and I do not believe now, in the usefulness of vaccinations. In addition, I think that children may later become afraid of doctors because of the negative experiences associated with vaccinations.

So, if it had not been mandatory, would you have vaccinated your children?

That is correct in that case, I would not have vaccinated them. I believe that healthy children should not be subjected to unnecessary procedures, but sick children should be treated. I think it is unnecessary to burden

children with a negative experience for a very small reason, because of an event that may occur in the future. In my opinion, no one can avoid their fate. My heart ached when my completely healthy children were vaccinated with vaccines containing unknown substances. I would have vaccinated them only against diseases that are very likely to occur and threaten serious complications.

What are these diseases?

I don't know – perhaps diphtheria. If I were in a decision-making position right now, I would look into it. I am sure that some, perhaps most, of the vaccines are unnecessary. Every year, some elderly people die after receiving the flu vaccine.

Do you think vaccines are harmful?

I cannot judge this clearly. However, it is true that when I was a child, there were not as many children with behavioral disorders or allergies as there are today. We did not even hear about so many problems such as hyperactivity, autism, dyslexia, dysgraphia, and who knows how many others. Children are allergic to milk, flour, and many other things. I am not saying that these are clearly the result of vaccines, but I would not be surprised if it turned out that they were. In addition, I have heard and read about cases where vaccines caused serious complications.

Do you have any direct bad experiences (from your family or friends) with vaccinations or their complications?

None. I only know of such cases by hearsay.

In recent decades, diseases that previously had serious consequences have decreased significantly. What is your opinion on this?

I am not at all convinced that this can be attributed to vaccinations. We live much better, we eat better and more varied food (vitamins, minerals, herbs), and our hygiene conditions are not comparable to those of a few decades ago. Medical science has also developed considerably. I rather attribute the decline of these old, devastating childhood diseases to these factors.

How informed were you about vaccinations when your children were small, and how informed are you on the subject now?

I was not, and am still not, sufficiently informed – either then or now. However, there is so much conflicting information to be heard and read on the subject that it might not help in making a decision. I would basically rely on my feelings when making a decision.

If you wanted to know more about this topic now, where would you start gathering information?

I would start in the most obvious place – on the Internet. You can obtain a lot of information with just a few clicks. If something remained unclear, I would turn to a specialist.

Based on our conversation so far, I believe that you do not agree with making vaccinations mandatory by law.

That's right, I do not agree.

What would be the correct "official" attitude in your opinion?

Everyone should be allowed to do what they want. Those who would like to vaccinate their children should do so, those who do not should do so too and be left alone. All decisions and all responsibility regarding the child rest on the shoulders of the parent anyway. So be it! In my opinion, forcing vaccinations by law is a dictatorial attitude.

At that time, did you talk to a specialist about your doubts about vaccinations? Did you get help or information?

Our pediatrician was basically a naturopathic doctor. However, he did not try to talk us out of vaccinations or make us uncertain. At the same time, I did not get the feeling that he completely agreed with vaccinations. Twenty years ago, it was a different world. Vaccinations were mandatory, and there was no possibility of appeal. At that time, few people thought of objecting. Therefore, we did not talk about it, because there was no alternative.

Do you think alternative methods can replace vaccinations?

I do not believe in them.

Who do you think is responsible for providing information about vaccinations?

I think it is primarily the responsibility of healthcare professionals – pediatricians and other healthcare workers.

What do you think is the reason for the anti-vaccination movement?

People are becoming more and more aware, and they want others to make decisions for them less and less. The effects of dictatorship are slowly disappearing, and society is maturing. Whoever has the responsibility should also have the right to decide. Along with responsibility, people should also be given the freedom to make decisions.

Interview 2

What is your opinion on the usefulness and possible harmfulness of mandatory vaccinations?

I think they are harmful. We have no idea how they are made or what they contain, yet they must be given to our children. I had them administered because I did not have much information at the time, but I had my doubts even then. Fortunately, there were no consequences other than redness and short-term fever. With my current mindset, I would try to avoid them somehow, although I know it is not easy.

Are you aware that not getting vaccinated can have criminal consequences?

Yes, I know – that is why I said it is not easy. However, I know that there are people who have managed to avoid them.

On what basis do you think vaccines are harmful?

You can read on the Internet what toxic compounds they contain. I'm not a chemist, so I cannot judge how harmful a given compound may be. I was also quite disturbed by how they are made – for example, using monkey brains, child embryos, and similar materials. As far as I know, AIDS was also transmitted from monkeys to humans through the consumption of infected monkey brains in Africa. So such things should not be injected into my child. Many people have been infected with serious diseases (AIDS, hepatitis), for example through blood transfusions. That is something doctors tend to remain rather silent about.

Where do you get your knowledge about vaccinations from?

Primarily from the internet and newspapers.

Have you tried talking to a professional about your doubts?

Of course. When I first went to the pediatrician with my daughter (although she had already received the first vaccination in the hospital), I wanted to discuss my concerns with the doctor, but he was absolutely not cooperative. He dismissed me in two sentences and clearly had neither the time nor the inclination to talk to me. The health visitor could only tell me to believe that vaccination is beneficial and that many diseases have disappeared thanks to it. She also explained that the probability of serious complications is much lower than the risk of becoming ill due to lack of vaccination. However, she was unable to dispel my doubts. Therefore, I began searching for information on the internet. Based on what I read there, I progressed from being skeptical to becoming anti-vaccination.

Can you give me some examples that changed your opinion?

I have never been a firm believer in vaccination. I have read that in several Western countries certain vaccines have been banned because they were found to be harmful, whereas they are still administered here. In addition, I have heard and read about several cases in which completely healthy young children became seriously ill as a complication of vaccination (e.g., autism). Fortunately, such facts can no longer be concealed.

So you think that vaccinations have no positive effect?

I do not think so; in fact, I consider them rather dangerous for the reasons mentioned above. It is certainly not by chance that some vaccinations have been banned in Western countries.

According to statistics, thanks to vaccinations, several diseases that used to be serious or even fatal have been reduced or disappeared in Hungary. What is your opinion on this?

It is not at all clear that this is due to vaccinations!

So what do you think?

There can be many contributing factors: better living conditions, improved nutrition, higher intake of vitamins, alternative remedies, and so on.

In your opinion, can alternative remedies replace vaccinations?

I am not claiming that these alone can replace vaccinations, but I am sure that in the worst case they are ineffective. At the same time, I do believe that some of them are effective.

Which of these do you consider effective?

I am not a blind believer in alternative remedies, and I am not very knowledgeable on this topic, but, for example, Chinese medicine has been established for hundreds of years. I am also convinced that, unlike Western medicine, it considers and treats the person as a whole, not only a specific organ, such as the kidneys. I know that acupuncture, acupressure, herbal therapy, etc. are considered effective. I am not certain that they achieve the intended effect, but I believe some of them may. Homeopathy is also becoming an increasingly accepted therapy. The main advantage of these methods is that they do not “poison” people. However, Western medicine does not accept these approaches.

Do you think that the state would not only allow, but would directly prescribe something that is harmful or toxic?

Why not? Alcohol or cigarettes are also harmful, yet they are available.

But these are not mandatory to buy or consume.

Let it be the same with vaccinations: those who want them should receive them, and those who do not should be left alone and not punished. It is time for people in Hungary to be treated as individuals capable of independent information processing and decision-making.

Can you imagine that, after thorough pro-vaccination information addressing your concerns, your opinion could change?

I do not think this is impossible, but at present I do not see a strong or committed effort to provide adequate information from any side. It is likely that, if the pediatrician had not simply dismissed me at the time, but had instead explained the usefulness of vaccines, justified their safety, and addressed my concerns – treating me as a partner – then I might now be pro-vaccination. Instead, the doctor behaved as if the matter was not open for discussion, emphasizing that I should not “take up their time,” that I should simply trust them because vaccination is mandatory. This reflects what I perceive as a typical attitude among Hungarian physicians: you have no role in questioning or understanding, you should simply comply because I am the doctor. I find this approach highly discouraging.

So you don't trust doctors?

There must be others. Fortunately, I have had limited contact with them, but my personal experiences have been negative, so I currently prefer to avoid further contact.

You can read a lot about the so-called pharmaceutical lobby and possible connections between pharmaceutical companies, states, and medical societies. What is your opinion on this?

Yes, I have also read about this, and I do not consider it impossible. However, it is difficult to find reliable infor-

mation on this topic, and those involved are clearly careful not to publish verifiable facts. Therefore, such reports may be true, but they may also be malicious fabrications.

In your opinion, do parents – especially those expecting children or raising young children – have sufficient information to make a responsible decision about vaccination?

Information provided by the healthcare system is practically nonexistent. The state simply enforces vaccination through legal obligation, and the matter is considered settled. Fortunately, it is now easy to access information online, so I believe that – mainly thanks to the Internet – the necessary knowledge for a responsible decision can be obtained. Everyone can go as deep into the topic as they wish. Ultimately, people should be allowed to decide freely.

Aren't you afraid that there is a large amount of misinformation on the Internet, which may lead to incorrect decisions?

If by this you mean that there are many antivaccination opinions, then this is true. However, I do not believe that most of them are necessarily false. Pro-vaccination opinions are also widely available. It is also true that low-quality, defamatory content exists on both sides. These should simply be disregarded, and only well-argued, rational opinions should be considered when making a decision. In my view, it is clear that these positions can be compared, debated, and the more convincing argument should prevail. Both sides should express their views, present their reasoning, and attempt to refute the other; based on this, individuals can decide whom to believe.

Interview 3

What is your opinion on the usefulness and possible harmfulness of mandatory vaccinations?

My partner and I are planning to have a child in the near future, so I consider it not only important but also necessary, as a responsible future parent, to obtain as much information as possible about vaccinations. Thanks to the Internet, anyone who is genuinely interested can access a wide range of information. Based on this information, I have also come to identify as antivaccination.

Which websites, blogs, or forums do you use to obtain information?

Initially, I read everything I could find on the topic of vaccinations. It is difficult to navigate the large volume of information, but after reading many articles, blogs, and associated comments, I formed my antivaccination position.

On the basis of what information did you reach this position?

As you are probably aware, in several Western European countries (e.g. Germany), vaccinations are not mandatory but only recommended. These countries cannot be considered underdeveloped. If vaccinations were truly

as effective as the healthcare system claims, why would Western countries not adopt this “perfect” system? If the situation were so clear-cut, why is there no uniform policy worldwide, or at least within the European Union? Either many countries are acting irresponsibly regarding public health, or only a few states – including ours – possess the “correct” knowledge. This appears inconsistent to me.

Have you tried to obtain information from a specialist?

If by specialist you mean a physician, then no. I would be interested in what, for example, a paediatrician would say if I attended an appointment and stated that, as a future mother, I would like to receive detailed information about vaccinations. Alternatively, that I disagree with vaccinations but am open to being convinced.

You do not dispute that, due to vaccinations, diseases which once caused hundreds of thousands of deaths among infants and young children have been significantly reduced? This is supported by objective statistical data.

I do dispute this. A significant proportion of the childhood diseases mentioned were, in my view, reduced not due to vaccination, but due to improved hygiene and better nutrition. The role of vaccination is, at best, neutral. Statistical data, furthermore, can be interpreted or presented in ways that support different conclusions. Churchill is often quoted as saying: “I only believe statistics that I have falsified myself.”

What do you mean by the statement that the role of vaccines is neutral at best?

I mean that vaccines contain various compounds that may be harmful to the human body, for example mercury. Because of such components, some vaccines have been banned in Western countries, which I do not believe is coincidental. I consider it fortunate if vaccines at least do no harm, as the immune system may neutralize their effects. However, this does not always occur. One of the fundamental principles of medicine is often stated as “first, do no harm.” At the same time, there are many reports on the internet describing children who developed serious illnesses, and in some cases permanent damage, following vaccination. These accounts are often accompanied by photographs and detailed personal testimonies from parents. These are clearly not fabricated stories. Even official pro-vaccination sources acknowledge that “in rare cases” adverse effects may occur. However, for a parent, it is not reassuring that vaccination is considered beneficial in general, while their own child may be classified as a rare statistical exception.

Then you also do not agree with the view that these serious diseases would re-emerge if vaccination were abolished?

I do not agree with this. In my view, the entire vaccination system essentially serves the interests of the pharmaceu-

tical industry. There is significant financial incentive involved, and the medical profession also benefits from it. From this perspective, it becomes the role of physicians to use their professional authority to persuade as many people as possible to take medications that are, in their view, unnecessary. This involves maintaining a sense of threat and fear, followed by reassurance that solutions exist. Vaccination is only one component of this system. It is reasonable to assume that if a physician receives a significant part of their income from pharmaceutical companies or distributors, they will support the products of those companies. In this sense, I believe the medical profession has been influenced by the pharmaceutical industry.

Do you also consider the state to be complicit in this process, given that vaccinations are mandatory by law and refusal is a punishable offence?

The role of the state is not entirely clear. In the more favourable interpretation, the medical profession – due to the reasons mentioned above – may be misleading decision-makers who lack sufficient expertise in this field, and as a result, they approve vaccination policies supported by medical authority.

In the less favourable interpretation, the state may also be involved in this system. However, regarding the outcome, it makes little difference whether the state is misled or actively involved. Ultimately, it follows the direction set by the pharmaceutical industry and the medical profession.

So you do not trust doctors?

I am not claiming that all doctors are part of a corrupt system. I am aware that there are conscientious physicians, and I have also encountered doctors who express antivaccination views. Therefore, there are clearly professionals with differing perspectives. However, I believe that some physicians are influenced by financial incentives, which may override patient interests. This is my personal conviction.

Do you have any direct negative experiences with vaccines?

Fortunately, no. At the same time, I maintain my position that if I have a child, I will do everything possible to avoid vaccinations. I am aware that this is currently difficult in Hungary, but I hope that the situation may change in the coming years.

What do you think the state should do in this matter?

It should not be a legal obligation. We should recognize that this is the 21st century, not the Middle Ages, and certainly not a dictatorship. I believe it would be appropriate to allow those who wish to vaccinate to do so, but also to leave those who do not wish to expose their children to such interventions free to decide. Just as parents have the right to choose which school to enroll their child in, they should also have the right to decide whether to request vaccination.

At the same time, many people remain uncertain about this topic. If I were in the position of the state, I would attempt to persuade those concerned through proper information and communication, rather than imposing decisions through authority or legal coercion. In my view, there is still significant room for improvement in public information.

Can you imagine any circumstances or arguments that could change your opinion?

I do not think so. As mentioned earlier, I have read a considerable amount about vaccinations, including both pro- and anti-vaccination sources. However, the arguments and viewpoints of the antivaccination side appear more convincing to me. This does not include extreme or emotionally charged opinions from either side.

Do you think there are any medicines or methods that can replace vaccination?

I believe in the body's self-healing capacity and the functioning of the immune system. In my view, everything should be done to ensure that infants and children (and people in general) remain as healthy, strong, and resilient as possible, after which the human body is capable of overcoming illnesses. I also believe in the beneficial effects of natural substances, such as herbs and other naturally occurring compounds. However, I do not consider these to be curative; rather, I see them as supportive or strengthening agents. I reject synthetic substances whose composition and effects are, in my view, insufficiently transparent. If one examines the ingredients of processed foods, it becomes evident how many artificial additives are present. In comparison, there is also limited transparency regarding the composition of medicines.

In your opinion, do those most affected by vaccination – namely parents who are expecting children or raising young children – have sufficient information to make a responsible decision?

I am not aware of the exact proportion of informed individuals. My impression is that increasing numbers of people are engaging with this topic. Thanks to the Internet, anyone who is interested can access a wide range of information. At the same time, there are certainly many who do not actively consider the consequences of vaccination, either because they believe it is unnecessary to do so if vaccination is mandatory, or because they assume that the state already ensures what is correct and therefore independent inquiry is unnecessary. These attitudes may reflect long-standing habits. However, it is important for the state to acknowledge that the world is changing significantly compared to, for example, thirty years ago, and that communication and approaches need to adapt accordingly. If this does not happen, an increasing number of people may become distrustful.

Summary and results of the interviews

When I began working on my thesis, I did not expect such a high level of interest in the topic. While preparing the questionnaire, I encountered numerous individual opinions, and many discussions also emerged within my personal environment. For the interviews, I specifically sought participants with antivaccination views. As the work progressed, I realized that this topic – like many others – is not simply black or white. Several statements made by interviewees were highly thought-provoking. The opinions of respondents and interviewees covered a very broad spectrum. Even among individuals identifying as antivaccination, views differed significantly in detail. These attitudes are influenced by multiple factors, including opinions from acquaintances, information obtained from the media, and expert statements. A particularly recurring element was the importance attributed to information received from healthcare professionals.

All three of my interviewees are at different stages of their lives.

My first interviewee is a divorced mother of three children. She lives in Budapest, is 55 years old, holds a college degree, and shares her household with her three adult children. The topic of vaccination is currently not relevant for her, as she does not yet have grandchildren. According to her account, she did not vaccinate her children entirely out of personal conviction, but primarily due to legal obligation. If the law allowed it, she would not have administered vaccinations today, except possibly in cases of diseases that are likely to occur and carry a risk of serious complications. She reported no direct negative experiences. Rather, she believes that a healthy child's body should not be exposed to unknown substances, particularly if these may have potential adverse effects. She expresses a preference for natural processes, internal balance, and instinct-based decision-making. In her view, "we should return to a more natural lifestyle, natural foods, a calm and balanced life, and a more direct, personal way of experiencing the world, without fear. I am aware that these ideas may appear idealistic, but on an individual level we should respond differently to the world. The way the world functions today is everyone's responsibility. I strive to act 'for the better': I accept what is, but I only do what does not cause harm."

Despite this, I perceived some uncertainty in her views, particularly regarding more radical antivaccination positions that categorically reject vaccination and consider it inherently harmful.

Based on the classification used in the questionnaire analysis, I would therefore place her in the "rather anti-vaccination" category.

My second interlocutor lives in Budapest, is 36 years old, married, and has one child who has received the mandatory vaccinations. According to the mother, at the time of vaccination she did not have as much information as she does currently, and at that time she did not question the usefulness of vaccinations. In the meantime, howev-

er, she encountered and read extensive information regarding potential adverse effects of vaccination, possible diseases, and concerns related to exposing a child's body to unknown substances instead of allowing the natural development of resistance and immune function. During the interview, she emphasized several times that she attempted to consult her pediatrician to obtain reassurance regarding her questions and concerns; however, she felt that the physician dismissed her by stating that vaccinations were necessary and beneficial. At that time, the Internet began to play an increasingly important role as an information source. In the absence of satisfactory medical explanations, she – like many other parents – turned to online sources to address her questions and uncertainties. There she encountered numerous articles, posts, and opinions which, rather than alleviating her concerns, reinforced her doubts. She now holds a clearly antivaccination position, expresses distrust toward physicians, and believes that vaccinations do more harm than good. She also considers alternative therapies preferable in the sense that, even if they are ineffective, they do not cause harm. In her view, the state should allow parents to make free decisions regarding when and which vaccinations their child receives.

Based on this, I classify my second interviewee as a vaccination refuser.

My third interviewee is a 27-year-old woman who is currently planning to start a family. She lives with her partner in a shared apartment in Budapest and is consciously preparing for motherhood. Among other decisions, she has already determined that she does not wish to vaccinate her future children. She primarily obtains information from the Internet, and based on this, she has formed an antivaccination position. She did not attempt to seek information from medical professionals, as in her view pharmaceutical companies, in cooperation with certain physicians, influence state decisions. Consequently, she approaches official medical recommendations with a high level of distrust and does not accept them as reliable sources of information. Her position is that vaccines are clearly harmful. She rejects all synthetically produced medicines and places greater trust in natural substances and remedies, such as medicinal herbs and the body's self-healing capacity. She is also convinced that the reduction of epidemics cannot be attributed to vaccination, but rather to improved living conditions and better nutrition.

Based on her responses, I also classify my third interviewee as a vaccination refuser.

This interpretation is further supported by statements made by all three interviewees, for example: "I would start in the most obvious place, on the Internet. You could get a lot of information with a few clicks."

The second part of my hypothesis – that people are not sufficiently informed about vaccinations – is also reflected in the presence of numerous misconceptions and false information, particularly among vaccination refusers.

Discussion

I would like to note that recently I have had numerous conversations with friends and acquaintances on this topic, and I have also gained considerable information and insight through reading opinions on various internet forums. These experiences were not systematically documented and are not recalled in full detail, but they have significantly influenced my perspective on the subject. Their impact is also reflected in the conclusions of this work.

I am convinced that vaccinations are beneficial, and at a societal level their positive effects far outweigh their potential risks. Many once-feared childhood diseases have either disappeared or significantly declined due to vaccination programs. The younger generation is often unfamiliar with these diseases and tends to take the current situation for granted. In Hungary, vaccination coverage can be considered high by international standards. A large proportion of the population is vaccinated, and the remaining unvaccinated individuals are largely protected through herd immunity, meaning that, for the time being, there is no significant risk of re-emergence of these diseases.

In this part of my thesis, I examined respondents' knowledge and opinions regarding vaccination through interviews. My findings are not entirely reassuring.

Many people, particularly younger individuals, show interest in obtaining information about vaccination. Based on my research, they typically begin by seeking information from healthcare professionals. However, this often does not lead to satisfactory outcomes. Generic or overly brief responses are frequently insufficient for this generation, leading them to seek alternative sources of information. The Internet, which has grown rapidly in recent years, is an obvious example. It is widely accessible, and due to the freedom of information, a vast range of articles and opinions – both supportive and critical of vaccination – can be found on virtually any topic. This situation is double-edged. On the one hand, it increases access to information; on the other, it facilitates exposure to misinformation and extreme viewpoints. Parents often find it more convenient and faster to obtain information online than to consult healthcare professionals (1). As a result, individuals without sufficient professional guidance may easily encounter misleading or unfounded claims circulating in antivaccination blogs, forums, and articles. Consequently, parents who initially have doubts or unanswered questions may gradually adopt strong antivaccination views. Once individuals have firmly committed to such beliefs, it becomes significantly more difficult to change their position than when they were still uncertain (2). Based on my respondents, I assume that a considerable proportion of parents fall into the category of uncertainty. In my view, it is considerably easier to guide these individuals toward a pro-vaccination stance than to change the views of firmly established antivaccination individuals.

A significant proportion of vaccination refusers tend to distrust those who represent opposing views. They are often unwilling to engage in structured or civilised debate and may dismiss counterarguments without substantive reasoning. According to Zsófia Mészner (3), the Vaccination Counselling service is frequently the setting in which the most challenging communication occurs with individuals who oppose vaccination, do not recognise its importance, and may exhibit strongly emotional or aggressive behaviour.

It has been demonstrated that, partly due to insufficient in-depth information provided by healthcare professionals and partly due to the spread of misconceptions on the Internet, the proportion of individuals who refuse vaccination or question its usefulness is currently considerable. If this trend cannot be addressed, it is likely to worsen over time (4).

At present, vaccination is mandated by law, and non-compliance may result in sanctions. This regulatory framework is partly justified by the generally high vaccination coverage and the absence of significant epidemic threats. However, according to my research, a considerable number of parents either partially or completely disagree with vaccination and comply primarily due to legal obligation. In my view, this is not an optimal situation. It would be preferable for vaccination to be based primarily on informed conviction rather than compulsion.

It is important to emphasise that every parent seeks the best for their child. Even strongly antivaccination individuals are typically motivated by a sincere belief that they are acting in their child's best interest. In many cases, they possess a certain level of information; however, due in part to pre-existing beliefs and biases, they may draw incorrect conclusions from available data.

In contrast to Smith's findings (5), my results suggest that individuals with higher levels of education are more likely to be pro-vaccination than those with lower levels of education.

According to my assumption, parents (or prospective parents) with uncertain knowledge and misconceptions typically obtain information from the World Wide Web. Based on my study, it can be concluded that the most important source of information regarding vaccination is the opinion of healthcare professionals, similarly to the findings of Salmon et al. (6); however, this is closely followed by the Internet. Consequently, the Internet has become an unavoidable medium for acquiring health-related information. This observation was also supported by all three of my interviewees. The second part of my hypothesis – that individuals are not sufficiently informed about vaccinations and that misconceptions and false beliefs are widespread, particularly among vaccination refusers – was also confirmed by my findings. A typical example is the assumed association between the MMR vaccine and autism, which has been refuted by numerous scientific studies, yet 22% of respondents still endorsed this belief. Furthermore, 18% of respondents

believed that vaccines could be replaced by alternative methods, a view also reported by *Salmon et al.* (6). In my opinion, this represents another misconception, as prior to the introduction of vaccines only traditional and natural remedies were available, during which time recurrent epidemics caused significant morbidity and mortality despite their use.

Overall, the Internet has indeed become an unavoidable medium for obtaining information on vaccination, as also reflected in the interviews. At the same time, my findings confirm that insufficient knowledge, as well as the presence of misconceptions and misinformation – particularly among vaccination refusers – remains a significant issue.

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Characteristics and prevention options for obesity, hypertension, and diabetes mellitus in children and adolescents

– Basic concepts

Barbara Hegyi, Andrea Kovács

Family Care Methodology Department, Health Science Institute, Semmelweis University Budapest

Based on a university thesis

Corresponding author: Andrea Kovács, e-mail: kovacs.andrea197006@gmail.com

Abstract

This thesis focuses on the healthy lifestyle habits of children and adolescents. The aim was to obtain as accurate data as possible in order to support and promote health education during childhood. The consequences of an unhealthy lifestyle, such as obesity and the associated health problems, are already evident in childhood. Healthy nutrition and regular physical activity are considered of paramount importance, particularly in early life, as these habits significantly influence health outcomes in adulthood. During the research, the lifestyle habits of students living in two different agglomeration areas were examined. This publication presents the basic theoretical concepts underlying the study.

Keywords: healthy lifestyle, childhood and adolescent obesity, prevention

Introduction

Lifestyle habits are typically formed in childhood, and the family, as the primary socialization environment, plays a key role in shaping food preferences, leisure activities, and the importance attributed to health within an individual's value system (1). The development of a health-conscious lifestyle should begin in childhood in order to prevent later overweight and obesity, as well as the associated diseases. Childhood obesity is one of the most serious public health problems of the 21st century, and its prevalence is increasing at an alarming rate (2). For this reason, the basic concepts are presented in this paper.

Theoretical background, conceptual definitions

Definition of health

"Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity." This definition was first formulated in 1946 at the World Health Conference held in New York. It was subsequently incorporated into the Constitution of the World Health Organization (WHO) and officially adopted in 1948. Furthermore, the concept of health has undergone significant changes over the past decades, and its interpretation continues to evolve in line with contemporary scientific and social developments (3). These

List of abbreviations

WHO: World Health Organization; **MDOSZ:** Hungarian Dietitians' Association; **BMI:** Body Mass Index; **EHI:** National Health Development Institute; **EHI-GYI:** National Health Development Institute, Children's Health Directorate; **COSI:** Childhood Obesity Surveillance Initiative; **NETFIT®:** National Unified Student Fitness Test

changes are illustrated in the summary presented in Table 1 (4). In addition to WHO definitions, Table 1 also includes contributions from significant researchers who have introduced additional perspectives to the conceptual understanding of health.

Determinants of health

Factors influencing health can be divided into two main categories: external and internal factors. External factors include the natural environment, such as climate and air quality, as well as the social environment, which encompasses living and working conditions. Internal factors include lifestyle, biological characteristics, and individual predispositions. Lifestyle refers to the set of regular activities performed by individuals, such as work, nutrition, physical activity, rest, and recreation. Biological characteristics include inherited traits such as body constitution, personality features, and predisposition to certain diseases. Environmental influences comprise both natural and social components, including family, peers, and the workplace. Within the determinants of health, the interaction between genetic factors, the external environment, lifestyle, social environment, and healthcare is commonly emphasized. In this context, lifestyle accounts for 43% of health determinants, genetic factors for 27%, environmental influences for 19%, and healthcare services for 11% (4). These proportions highlight the dominant role of lifestyle in maintaining health. Figure 1 summarizes the “Factors influencing health”.

Definition of lifestyle

Lifestyle is a system of activities that individuals perform in their daily lives. It includes the types of activities carried out, the average time spent on them, the locations where they take place (e.g. home, workplace), the people involved, the reasons for performing them, and the meaning these activities have for each individual (5).

Principles and conditions of a healthy lifestyle

Children primarily adopt their lifestyle patterns from their family environment. The family lifestyle can have a preventive effect, particularly when it is characterized by healthy habits. However, during adolescence, the influence of peers becomes increasingly significant, and alongside family patterns, the social environment also becomes an important determinant. If an unhealthy lifestyle becomes accepted and habitual within the family or immediate environment, children are likely to adopt similar patterns (6). *A healthy lifestyle can be achieved by adhering to the following principles:*

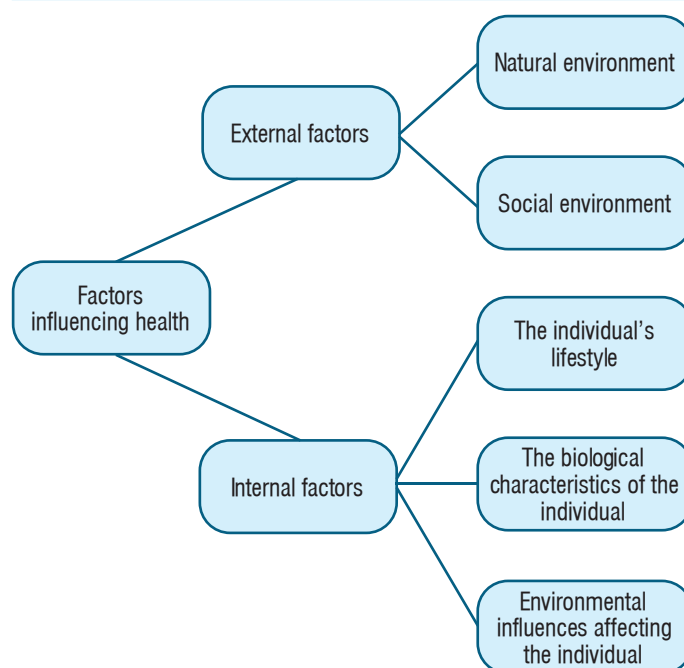
Proper nutrition

Proper nutrition is a fundamental prerequisite for a healthy lifestyle, including what, when, and how we eat

Table 1. Conceptual changes in health over the past years (own editing) Source: Hidvégi (4)

AUTHOR	DATE	CONCEPTUAL CHANGES IN HEALTH
WHO	1946	Health is defined as a state of complete physical, mental, and social well-being.
WHO (Copenhagen)	1984	Individual and social conditions of existence and individual responsibility come to the forefront.
WHO (Ottawa)	1986	Includes individual knowledge, social factors, and the physical environment.
WHO (Adelaide)	1988	Improvement of population health status requires governmental-level action.
Seedhouse	1986	Health is interpreted at the individual level; being healthy means different things for different people, while basic conditions must be considered.
Antonovsky	1987	Human existence is characterised not by balance and health, but by loss of balance, disorder, and suffering.
Insel és Roth	2007	The question is not whether someone is healthy or ill, but where they are located on the health–disease continuum.

Figure 1. Factors influencing health (own editing) Source: Hidvégi (4)



(7). Parents significantly influence their child's health awareness. Eating habits and nutritional knowledge developed in early childhood largely determine later habits and can also have a long-term impact on adult life. Early childhood is a critical period for the development of health consciousness and personality. Eating habits are formed at an early stage, as children are exposed to food choices that shape taste preferences and eating behavior (8).

Fluid intake

The consumption of adequate amounts of high-quality water is essential for maintaining health, as approximately 70% of the human body consists of water. Water plays a key role in maintaining ideal body weight and sustaining physical performance. It is involved in nearly all biological, mechanical, and chemical processes occurring in the body. The consumption of commercially available sweetened beverages (e.g. carbonated soft drinks) is not recommended for children or adults, as they may have adverse effects on health (9).

Regular physical exercise

The relationship between regular physical exercise and health has been recognized for thousands of years. In modern society, its importance has further increased, as many health problems are partly associated with sedentary lifestyles. Regular physical activity has beneficial effects on the human body and is one of the key factors in maintaining health. Sport contributes to several aspects of development in children and adolescents, including healthy personality development, physical and psychological maturation, and the reduction of the risk of certain childhood diseases. Therefore, ensuring daily physical activity in childhood is essential. In Hungary, this has been supported by the introduction of daily physical education lessons based on the National Core Curriculum (NAT) since 2015, representing an important step toward improving the health status of young people (4).

Mental balance

Adolescence and early adulthood represent particularly sensitive periods in terms of psychological well-being. During this life stage, individuals are more vulnerable, and the risk of emotional difficulties, psychological problems, and mental disorders increases. These challenges may range from temporary mild difficulties to more serious conditions and can significantly influence mood, behaviour, and overall quality of life (10).

Rest

Due to time pressure and busy lifestyles, individuals often reduce the time allocated to rest, assuming that this increases efficiency. However, this assumption is incorrect. The more fatigued a person is, the longer it takes to complete tasks effectively and accurately (7). This issue is also relevant in childhood and adolescence. A common problem is excessive screen time, which negatively affects rest, sleep quality, learning, and leisure time. Children and adolescents often prioritize television, smartphones, or other digital devices over homework or sufficient sleep. This can lead to reduced academic performance, fatigue, and concentration difficulties in school. Therefore, en-

suring adequate quantity and quality of sleep, rest, and relaxation is of fundamental importance for both physical and mental well-being (11).

Childhood obesity

Childhood obesity is one of the most serious public health challenges of the 21st century (12). Its prevalence has increased significantly over recent decades, with rising trends observed in both developing and developed countries (13).

Obesity prevalence

Global data

In Africa, the number of overweight children under the age of 5 has increased by nearly 23% since 2000. In 2022, almost half of all overweight or obese children under 5 lived in Asia. Among children and adolescents aged 5–19, the prevalence of overweight increased from 8% in 1990 to 20% in 2022. In 2022, the proportion of overweight was similar between sexes, affecting 19% of girls and 21% of boys. Globally, overweight and obesity are now more prevalent than undernutrition, with the exception of certain regions in sub-Saharan Africa and Asia. Obesity is associated with a higher risk of mortality compared to undernutrition worldwide. It is estimated that at least 2.8 million people die each year as a consequence of being overweight or obese (2, 14).

Domestic data

The WHO Regional Office for Europe established the Childhood Obesity Surveillance Initiative (COSI), a standardized monitoring system for childhood obesity in the European Region. The aim of this initiative is to provide comparable data for tracking trends in childhood obesity across countries and to ensure up-to-date and reliable epidemiological information (15). The biennial survey, which has included more than forty countries since 2007, collects standardized data on overweight and obesity prevalence among children aged 6–9 years using uniform protocols and measurement instruments. During data collection, school health professionals measure height and weight. Based on comparisons of available Hungarian data from 2010 and 2016, the prevalence of overweight and obesity appears to have stabilized, likely as a result of implemented public health and policy interventions. In Hungary, approximately one in four children is overweight or obese, while severe obesity affects around 2.5% of children. This corresponds to approximately 460,000 overweight and 50,000 severely obese children nationwide. Childhood obesity is not evenly distributed across social

groups and shows marked regional variation. It is more common among children whose parents are overweight, have lower educational attainment, or are in a disadvantaged financial situation. Regionally, the prevalence of obesity is approximately twice as high in Northern Hungary and Southern Transdanubia compared to Central Hungary. These disparities reflect similar patterns observed in adult populations (13).

Definition and measurement of obesity

According to the World Health Organization (WHO), obesity is defined as an abnormal or excessive accumulation of body fat to a degree that may have adverse health consequences (14).

Several methods are available for the assessment of obesity and body fat percentage. In research settings, techniques such as underwater weighing (densitometry), multifrequency bioelectrical impedance analysis (BIA), and magnetic resonance imaging (MRI) are used. In clinical practice, more accessible methods include the measurement of waist circumference, skinfold thickness, and the calculation of body mass index (BMI) (16).

The most widely used method in both clinical practice and epidemiological studies is BMI. It is calculated as body weight (kg) divided by the square of height (m^2) (17).

Based on WHO classification (*Table 2*), BMI is used to categorize individuals as overweight or obese (17).

In childhood, body mass index (BMI) values are not interpreted using adult cut-off points. Instead, age- and sex-specific percentile charts are applied (18).

Percentile curves allow healthcare professionals to visually monitor the development of a child's height and weight over time. These charts provide reliable information not only for infants but also for adolescents. They enable comparison both between children of the same age group and, more importantly, longitudinally within the same child to assess individual growth patterns (19).

The following internationally accepted percentile cut-off values are used for the assessment of obesity: values between the 75th and 90th percentile indicate overweight or suspected overweight, values between the 90th and 97th percentile indicate definite overweight, and values above the 97th percentile indicate obesity. Values above these thresholds require increased attention from healthcare professionals. These indicators support the timely detection of nutritional disorders and help differentiate between normal weight and overweight status. In Hungary, according to Decree 49/2004. (V. 21.) ESzCsM, district health visitors regularly measure body weight and height in children aged 0–6 years and compare the results with national reference standards using methodological guidelines, percentile charts, and growth indices. During school age, measurements are continued by school health services. Annual reports from health

Table 2. Overweight or obesity according to BMI

BMI	
25 – 29.9	Overweight
30 – 34.99	Grade I obesity
35 – 39.99	Grade II obesity
≥ 40	Grade III (severe) obesity

visitors are evaluated by specialists of the National Institute for Health Development (NEFI) Child Health Directorate, and aggregated data are published on its official website (18). Anthropometric measurements are also part of routine school health screenings. According to Decree 26/1997. (IX. 3.) NM, these examinations are carried out in grades 2, 4, 6, 8, 10, and 12. Final diagnosis is established by school physicians or general practitioners based on the measured data. The methodological guideline “Guidelines and Tables for the Assessment of Childhood Nutrition” (2003) provides the framework for classifying overweight and obesity, based on data from the National Longitudinal Child Growth Study (12).

Phases of obesity, critical periods of its development

The **dynamic phase** of fat accumulation is characterized by the proliferation of newly formed fat cells and is typical during specific life stages, including the first 12 months of life, the age of 5–6 years, and the prepubertal period.

The **static phase** of fat accumulation is typical in adulthood, where existing fat cells are primarily filled rather than newly formed. Dietary fat intake may influence this process, potentially even during the intrauterine period (20).

At least three critical periods in the development of childhood obesity can be distinguished:

Prenatal period: Maternal overnutrition or malnutrition can lead to metabolic changes in the fetus, which may have long-term effects on appetite regulation and energy balance in the child.

Rebound (adiposity rebound) period: In this phase, after an initial decline in body fat, adipose tissue begins to increase again, typically around 6 years of age. Several studies suggest that children who experience an earlier rebound (before approximately 5.5 years of age) have a higher risk of developing persistent obesity into adulthood.

Pubertal period: Adolescence represents the final critical period. During this stage, significant changes occur in both the amount and distribution of body fat. In girls, body fat percentage increases from approximately 17% to 24%, while in boys it decreases. However, boys experience a marked increase in central (abdominal) fat deposition, which increases nearly fivefold, whereas in girls the increase is approximately threefold (21).

Causes of obesity

Obesity is a multifactorial condition affecting children across all age groups. It results from a complex interaction of biological, developmental, behavioral, genetic, and environmental factors. In recent years, the roles of epigenetic mechanisms, the gut microbiome, as well as intrauterine and intergenerational influences have become increasingly recognized in the development and prevalence of obesity (22).

Genetic factors

Animal studies suggest that genetic influences primarily affect the regulation of energy balance in obesity development. Obesity also shows a strong familial pattern. In general, children of lean parents tend to remain lean, while children of average-sized parents tend to have average body composition. Among obese children, both parents are obese in approximately 30–40% of cases, while in 70–80% of cases at least one parent is obese. Among siblings, it is relatively uncommon for an obese child to have a non-obese sibling (23).

Environmental factors

The rise in obesity prevalence is largely driven by environmental changes over recent decades. These include the widespread availability of energy-dense, nutrient-poor foods, frequent consumption of sugary beverages, and increasingly sedentary lifestyles. Across all age groups, there is a marked preference for high-calorie processed foods over fruits and vegetables (24). It is also important to consider the impact of modern technology, as children spend a significant proportion of their free time using electronic devices, which reduces opportunities for physical activity. A study conducted among Canadian children found that increased access to electronic devices and nighttime screen use was associated with reduced sleep duration. This in turn may contribute to weight gain, poorer dietary quality, and lower levels of physical activity (25).

Psychological causes

Psychological factors contributing to obesity include emotional instability, depression, and disturbances in parent–child and other interpersonal relationships. In early mother–child interactions, an insecure maternal role may be observed, where the mother struggles to appropriately interpret and respond to the infant’s needs. In such cases, feeding may be used as a primary response to crying, even in the absence of hunger. Over time, the child may learn to associate eating with emotional relief, leading to the use of food as a coping mechanism for stress or discomfort rather than responding to physiological hunger cues (26).

Consequences of obesity

Childhood obesity has a broad range of consequences, affecting physical health as well as psychological and social well-being. In addition to increasing the risk of multiple medical conditions, obesity may negatively influence self-esteem, school performance, and overall quality of life. It is therefore not only a medical issue but also a significant psychosocial concern (16).

Health problems

Childhood obesity is associated with a wide range of serious health complications, including non-alcoholic fatty liver disease, sleep apnoea, diabetes mellitus, asthma, cardiovascular diseases, hypercholesterolaemia, glucose intolerance, and insulin resistance, as well as various additional physical and psychological problems. Although many of these conditions can be improved or prevented through weight normalization, some may persist into adulthood and can contribute to premature mortality later in life. Among the most clinically relevant complications in obese children are diabetes mellitus, sleep apnoea, and cardiovascular diseases, which occur with particularly high frequency and severity (16).

Diabetes mellitus

Diabetes mellitus is a metabolic disorder characterized primarily by impaired carbohydrate metabolism, although lipid and protein metabolism are also affected during disease progression. The underlying mechanism involves either an absolute or relative deficiency of insulin, or impaired insulin action. In childhood, insulin deficiency is most commonly observed and is classified as type 1 diabetes mellitus. However, there is an increasing prevalence of conditions associated with insulin resistance and reduced insulin effectiveness, including type 2 diabetes mellitus and other less common forms of the disease (27).

In the context of this thesis, particular attention is given to type 2 diabetes mellitus.

The symptoms of type 2 diabetes often develop gradually over a longer period and may be less specific, which makes them easier to overlook. *Table 3* presents the most important warning signs.

Table 3. Symptoms indicating type 2 diabetes mellitus

♦ overweight
♦ weight gain
♦ constant hunger, binge eating, cravings for sweets
♦ weakness and increased fatigue
♦ blurred vision, difficulty focusing
♦ slow wound healing
♦ darkening of the skin in the armpits and neck
♦ frequent numbness of the extremities

Insulin resistance often precedes the development of type 2 diabetes mellitus, during which blood glucose levels may still remain within the normal range. However, early recognition and treatment of this condition is important, as it can prevent later complications such as cardiovascular disease, renal damage, cataracts, visual impairment, blindness, and diabetic foot complications. If any of the listed symptoms are observed in a child, prompt consultation with a paediatrician is recommended (28).

The diagnosis of diabetes mellitus is based on blood glucose measurements. Blood glucose levels are regulated by complex neural and hormonal mechanisms and may fluctuate even under physiological conditions, for example increasing after food intake (29).

The normal fasting blood glucose level is up to 6.0 mmol/L. Values between 6.1 and 7.0 mmol/L may indicate impaired glucose metabolism or prediabetes, while values above 7.0 mmol/L are diagnostic of diabetes mellitus (29).

High blood pressure

High blood pressure (hypertension) is a condition in which the pressure exerted on the walls of the heart and blood vessels is elevated above normal values. Blood pressure consists of two components: systolic blood pressure, which represents the peak pressure during cardiac contraction, and diastolic blood pressure, which represents the lowest pressure during cardiac relaxation. Hypertension as a chronic condition may already cause health problems in early childhood. Although it is rare in infancy (approximately 1%), it becomes increasingly common in school-age children, particularly among those who are overweight, where prevalence may reach 20–30%. Hypertension is often asymptomatic for a long period. Symptoms typically appear only in more severe or long-standing cases, or when blood pressure reaches critically high levels (30).

The most common symptoms of hypertension in childhood are summarized in *Table 4*.

In adults, normal blood pressure values are relatively clearly defined: an optimal value is approximately 120/80 mmHg, and values should generally not exceed 140/90 mmHg. In children, however, blood pressure interpretation is more complex, as it varies depending on age, sex, and body size.

For example, in a newborn a few days old, a blood pressure of approximately 80/50 mmHg is considered normal. With increasing age, blood pressure gradually rises in a pattern similar to a growth curve. Age- and height-specific percentile charts are therefore used to determine the upper limit of normal blood pressure for each child. These values progressively approach adult ranges during adolescence, where values above approximately 120/80 mmHg require attention. In the past, hypertension in children was typically considered secondary to an underlying disease. However, there is an increasing number of overweight adolescents and young adults presenting in clinical practice with elevated blood pressure. Mild, weight-related increases in blood pressure can often be improved through weight reduction and lifestyle modification. Therefore, regular blood pressure measurement is recommended during routine medical examinations. In older children, annual screening is appropriate, including school health examinations. In overweight children, more frequent monitoring is particularly important. If blood pressure exceeds the normal range, repeated measurement under resting conditions is recommended. Persistently elevated values require specialist evaluation (31).

Socio-emotional consequences

Childhood obesity also has a significant impact on the social and emotional well-being of children and adolescents. Affected individuals often experience stigma and bullying, as obesity is among the least socially accepted conditions in childhood. Discrimination may begin at an early age, and children may be excluded from activities requiring physical performance. Obese children may perceive themselves as less capable or slower, which can further limit participation in physical and social activities. These experiences often contribute to reduced self-esteem, decreased self-confidence, and a negative body image, all of which may also negatively influence academic performance (32). The social consequences of obesity may further reinforce difficulties in weight management. Overweight children may withdraw from social situations to avoid negative feedback, spending more time at home where food may become a source of comfort. This may also lead to fewer friendships, reduced social interaction, and increased sedentary behaviour (16).

Prevention and treatment options

Healthy nutrition, SMART PLATE®

Healthy nutrition is essential for the optimal growth, as well as the physical, mental, and intellectual development of children. The quality of the diet has a direct impact on

Table 4. Most common symptoms of high blood pressure in childhood (30)

- ♦ developmental delay
- ♦ irritability
- ♦ headache, chest pain
- ♦ flushing and increased sweating
- ♦ dizziness
- ♦ nausea
- ♦ vision impairment
- ♦ frequent nosebleeds

current health status, and it also influences cognitive performance, including learning ability, concentration, and school achievement. Proper nutrition plays an important role in the prevention of long-term health problems as well. Childhood is a particularly sensitive period in terms of the development of lifestyle habits and individual eating behaviours (33). Nutritional surveys conducted in Hungary indicate that risk factors for chronic diseases, such as unhealthy diet and physical inactivity, are already present in childhood. The “Health behaviour of school-aged children” survey conducted by the National Institute for Health Development in 2014 highlighted that only one third of children consume fruit and vegetables at least once a day. In contrast, approximately 30% of children consume sweets daily, 20% regularly consume carbonated soft drinks, and nearly 10% consume energy drinks. Among adolescents aged 11–18 years, 70.7% are of normal weight, 12.1% are overweight, and 2.7% are obese. A notable proportion of undernutrition is also present, particularly among girls, which is likely related to frequent dieting and weight-loss behaviours. In addition to dietary risk factors, physical inactivity is also a major issue, with 65% of girls and approximately half of boys in grades 5–11 not meeting the recommended levels of physical activity (34).

The Hungarian Dietetic Association (MDOSZ) developed the SMART PLATE® nutritional guideline for the 6–17 age group to support the development of a healthy diet in school-aged children in an easily understandable way. Its creation was motivated by the fact that previous dietary recommendations had become outdated and required revision. The guideline is based on a plate model, which is visually intuitive and therefore particularly suitable for educational purposes. Its development took into account earlier nutritional recommendations, the domestic food supply, Hungarian dietary habits, as well as relevant legislation, such as EMMI Decree 37/2014. (IV.30.) on nutritional and health regulations for public catering (34).

The structure of the SMART PLATE® for children aged 6-17

Figure 2 shows that the inner part of the plate is divided into concentric circles. In addition to illustrating the relative proportions of different food groups, it also indicates which foods should be consumed in larger or smaller amounts within each group (35).

The energy and nutrient requirements of children depend on several factors, including sex, age, body weight, and level of physical activity. Increasing emphasis is placed on the conscious selection of high-quality, nutrient-dense foods within the main food groups. The practical application of nutritional guidelines is supported by supplementary materials that take into account the varying physiological needs of primary and secondary school-aged children. Parents can estimate their children's energy requirements and appropriate

portion sizes based on age, sex, and physical activity using the energy requirement calculator and portion guide available on the SMART PLATE® website. Depending on individual needs, dietary recommendations are available for daily energy intakes of 1600 kcal, 2000 kcal, and 2600 kcal. The accompanying information materials assist in estimating portion sizes by comparing them to familiar everyday objects (e.g. the size of a glasses case or a smartphone).

The principles and main messages of the SMART PLATE® for children aged 6-17 are as follows:

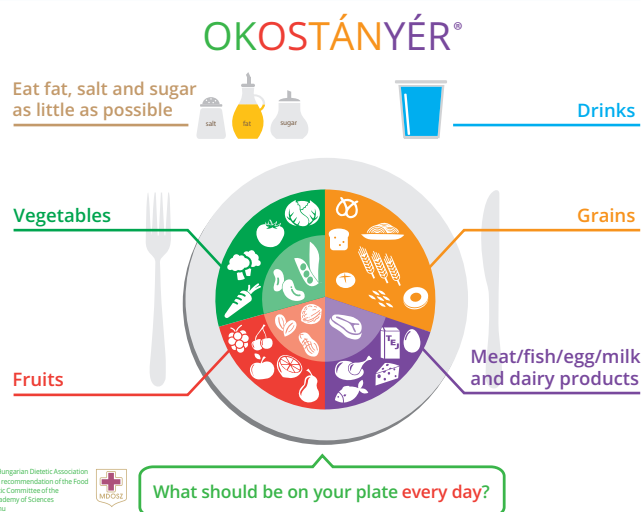
1. Vegetables and fruits:

At least half of the plate should consist of vegetables and fruits. These food groups are essential sources of vitamins, minerals, and dietary fibre, contributing to overall health, maintenance of energy balance, and healthy body weight. A minimum of four servings per day is recommended, of which at least one should be fresh and raw. Potatoes are not included in this daily recommendation. In addition, a handful of unsalted oil seeds (e.g. walnuts, almonds, hazelnuts, pumpkin seeds, sunflower seeds) is recommended at least twice a week.

2. Cereals:

Three servings of cereals per day are recommended, with at least one serving consisting of whole grain products (e.g. whole grain bread or side dishes). Cereals and cereal-based foods such as bread, pasta, rice, oats, and bulgur are important components of a healthy diet, providing energy, vitamins, minerals, and dietary fibre.

Figure 2. SMART PLATE® for children aged 6–17 Source: National Association of Hungarian Dietitians, 2018 (33) (OKOSTÁNYÉR® in Hungarian)



3. Meat, fish, eggs:

Protein sources with moderate fat content, such as meat, fish, and eggs, should be consumed regularly and in a varied manner. These foods support muscle development and various physiological functions. Fish consumption is recommended at least once per week, while offal and liver should be consumed no more than once weekly.

4. Milk and dairy products:

A daily intake of three servings of milk and dairy products is recommended. These foods are important sources of calcium, which is essential for the development and maintenance of healthy bones and teeth. Low-fat or reduced-fat versions are preferred.

5. Moderate fat, sugar and salt:

Excessive intake of fat, sugar, and salt should be avoided, as they contribute to the development of cardiovascular diseases, obesity, and other health problems. Preference should be given to low-fat cooking methods and reduced salt use in food preparation.

6. Fluid intake:

Water (tap water or mineral water) is the most appropriate choice for hydration. Fruit and vegetable juices, sweetened teas, soft drinks, smoothies, and milk-based drinks (e.g. cocoa, milk coffee) should only be consumed occasionally and in small quantities to diversify fluid intake. Energy drinks are not recommended due to their high caffeine and sugar content. Alcoholic beverages are also not recommended for children. A daily fluid intake of at least 8 glasses (8 × 1.5–3 dl) is recommended, of which at least 5 glasses should be plain drinking water (36).

Table 5 provides the recommended fluid intake for children at moderate temperatures and with moderate physical activity:

It is recommended that 70–80% of the fluid requirements indicated in the table are covered by beverages, while the remaining 20–30% is obtained from food. These needs are influenced by several factors, including age, body weight, health status, environmental temperature, and level of physical activity. The higher a person's body weight, the greater their fluid requirements; therefore, ensuring adequate hydration is particularly important in cases of overweight and obesity. During physical activity, in hot weather, or in the presence of illness (e.g. fever), fluid requirements may increase up to two- to threefold. In such situations, special attention should be paid to continuous fluid intake and appropriate mineral replacement (36).

Regular physical activity

The World Health Organization (WHO) defines physical activity as any bodily movement produced by skeletal muscles that requires energy expenditure. This includes

**Table 5. Recommended daily fluid intake (own compilation)
Source: National Association of Hungarian Dietitians (36)**

AGE	RECOMMENDED DAILY INTAKE	
	BOYS	GIRLS
2-3 years	1.3 liters	
4-8 years	1.8 liters	
9-13 years	2.1 liters	1.9 liters
14-18 years	2.5 liters	2 liters

Table 6. WHO recommendations for regular physical activity for children and adolescents aged 5-17 years (14)

- ♦ Physical activity recommendations for children and adolescents aged 5-17
- ♦ At least 60 minutes of moderate-to-vigorous physical activity daily, mainly aerobic
- ♦ Vigorous-intensity aerobic activity and muscle- and bone-strengthening exercises at least 3 times per week
- ♦ Limitation of sedentary behavior, especially screen time during leisure time

Table 7. Positive effects of physical activity in children and adolescents

Positive effects of physical activity
♦ Improved physical fitness (cardiorespiratory fitness and muscle strength)
♦ Improved cardiometabolic health (blood pressure, lipid profile, glucose and insulin sensitivity)
♦ Improved bone health
♦ Improved cognitive function and school performance
♦ Improved mental health (reduced symptoms of depression)
♦ Reduced risk of obesity

activities performed during leisure time, household tasks, and occupational physical activity. It is important to emphasize that both moderate- and vigorous-intensity physical activity have beneficial effects on health. Regular physical activity is a key component of a healthy lifestyle and plays a significant role in the prevention of many chronic diseases. Physical inactivity is a leading risk factor for mortality from non-communicable diseases. Individuals who are insufficiently active have a 20–30% higher risk of mortality compared to those who are sufficiently active (37).

The WHO recommendations for children and adolescents aged 5–17 years are shown in Table 6.

Table 7 shows the positive effects of physical activity on children and adolescents.

To increase physical activity levels, coordinated action is required at both national and community levels to create more opportunities for participation. This includes the development of appropriate policies and interventions across multiple sectors in order to promote and support regular physical activity in the population (37).

Health promotion, health education

The role of the school health worker and the educational institution in health promotion

The school health worker plays a key role in the development and maintenance of a healthy lifestyle. They actively contribute to the transfer and shaping of health-related knowledge within the educational system, combining theoretical education with practical examples. The “Public Health for a Healthy Nation” programme emphasizes the importance of prevention and aims to prioritise health-related activities implemented in the school environment. Act LXXIX of 1993 on Public Education guarantees students the right to free health care within educational institutions. Furthermore, Decree 20/2012. (VIII. 31.) of the Ministry of Education and Science defines the responsibilities of educational institutions in relation to the health development of children and students. The aim of comprehensive health development is to support the physical and mental well-being of students during their school years. Within this framework, school nursing represents a preventive health service aimed at promoting healthy lifestyles, creating a safe and supportive school environment, reducing health-risk behaviours, preventing disease, and conducting regular screenings and health assessments. It also includes the development of health-promoting skills. The school health worker supports students in recognising the importance of health and in taking responsibility for maintaining it. Effective communication is essential in this role and is a skill that can be developed. In the long term, an assertive communication style is considered more effective and beneficial, as it contributes to a more positive and co-operative working environment. The developmental role is also essential when introducing preventive practices at the local level, taking into account the specific characteristics of the given environment. It is important to assess both the positive and negative characteristics of each school, as every institution is different. Knowledge of the environment, students, teachers, financial conditions, and attitudes is essential for informed decision-making and implementation of changes. For example, when promoting healthy nutrition, it is necessary to evaluate the school canteen offer, as effective dietary improvement cannot be achieved without the availability of healthy al-

ternatives. The school health worker must cooperate effectively with educational staff in daily practice to ensure a healthy and supportive environment for students. The school health worker is therefore one of the key representatives of healthcare within the school setting (38).

The role of the family in health education

The family plays a key role in the development of health awareness in young people; therefore, it is essential that parents communicate openly with their children about health-related topics. It is of utmost importance that parents set an example that supports a healthy and high-quality lifestyle (39). The role of the family in health education is highly complex, as it involves multiple responsibilities. The family not only provides protection and support, but also transmits knowledge about life and the surrounding world. These factors strongly influence the child's behaviour and value system through parental example, thereby shaping personality development (40). It is particularly important to establish appropriate lifestyle habits and values from early childhood, as these largely determine the direction of later life. Education and habit formation play a central role in this process. The family represents the primary environment influencing the child's development, as it is within the family that daily routines are established, including regular physical activity. Learning the importance of sport and exercise is a key family value, contributing to the development of health-conscious behaviour (39). A child's physical and mental health is also strongly influenced by nutrition, in addition to a stable family environment, regular physical activity, and adequate sleep. Healthy eating habits are not inherited but are learned, primarily in early childhood within the family context, through parental example. If healthy eating patterns are established early, they are more likely to persist into adulthood. As in many aspects of child-rearing, parental role-modelling is particularly important in relation to nutrition. Children tend to imitate adult behaviour and often wish to eat and drink what their parents consume. Therefore, one of the most effective ways to introduce children to healthy eating is for parents to follow a healthy diet themselves and set a consistent example (41).

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Until All Children Smile...



Characteristics and prevention options for obesity, hypertension, and diabetes mellitus in children and adolescents

Barbara Hegyi, Andrea Kovács

Family Care Methodology Department, Faculty of Health Sciences, Semmelweis University, Budapest.

Corresponding author: Andrea Kovács, e-mail: kovacs.andrea197006@gmail.com

Abstract

My thesis focuses on the healthy lifestyle habits of children and adolescents. The aim of the study was to obtain as accurate data as possible in order to support and promote health-conscious lifestyle education during childhood. The consequences of an unhealthy lifestyle – such as obesity and the associated health problems – are already present in childhood. I consider healthy nutrition and regular physical activity to be of paramount importance, particularly during early life stages, as these habits significantly influence health outcomes in adulthood. During my research, I examined the lifestyle habits of students living in two different agglomeration areas and investigated differences in their nutritional patterns and physical activity levels. Two methods were applied in the study. Primarily, an online questionnaire consisting of 18 questions was used, which was completed by 116 students attending urban schools and 54 students attending rural schools. In the thesis, health, determinants of health, and the principles of a healthy lifestyle are given prominent attention, with a particular focus on the prevention and consequences of childhood obesity, as well as available preventive strategies. Based on the responses obtained, urban students appear to follow a healthier lifestyle. It can also be concluded that urban students have greater opportunities for physical activity and access to a wider variety of sports.

Keywords: *healthy lifestyle, childhood and adolescent obesity, prevention*

Introduction

Lifestyle habits are typically established during childhood, and the family – as the primary socialisation environment – plays a decisive role in shaping food preferences, leisure activities, and the importance attributed to health within an individual's value system (1). The development of a health-conscious lifestyle should begin in early childhood in order to prevent overweight and obesity, as well as the associated diseases later in life.

Childhood obesity is one of the most significant public health challenges of the 21st century and is increasing at

an alarming rate (2). Over the past three decades, the prevalence of adult obesity has more than doubled globally, while adolescent obesity has quadrupled since the 1990s. According to World Health Organization (WHO) data, in 2022, 37 million children under the age of 5 were overweight worldwide. Among children and adolescents aged 5–19, more than 390 million were overweight, of whom approximately 160 million were obese (3).

Hungarian epidemiological data also indicate an increasing prevalence of health problems among children related to unhealthy dietary habits. Previous studies support the growing burden of childhood overweight and obesity in

List of abbreviations

WHO: World Health Organization; **MDOSZ:** Hungarian Dietitians' National Association; **BMI:** Body Mass Index; **NEFI:** National Health Development Institute; **NEFI-GYI:** National Health Development Institute Children's Health Directorate; **COSI:** Childhood Obesity Surveillance Initiative; **NETFIT®:** National Unified Student Fitness Test

Hungary. This trend is partly attributed to low levels of physical activity and excessive time spent in sedentary behaviours, such as the use of digital devices. In addition, the consumption of fruits and vegetables among children remains insufficient. Daily consumption of sweets and sugar-sweetened beverages affects approximately 30% of students, contributing to excessive caloric intake (4). The most common health problems arise from nutrient deficiencies and the excessive intake of sugar, refined flour, and food additives. These dietary patterns, combined with physical inactivity, may lead to a range of physical and mental health issues, including hormonal imbalances, obesity, type 2 diabetes, chronic iron deficiency, impaired muscular and immune function, disorders of the nervous and digestive systems, dental caries, and behavioural and performance-related problems (5).

As a future child welfare nurse and healthcare professional, I consider the physical and mental development of children to be of paramount importance, including education on healthy nutrition and the role of regular physical activity. During my studies, I have become increasingly aware of the challenges in school-based child welfare, particularly in promoting healthy lifestyle behaviours among children. The present study also addresses these issues by examining students from two different agglomeration areas. Regarding the target population, students aged 9–14 years were selected, as at this stage of development children begin to make more independent decisions regarding their dietary and physical activity habits, while still being amenable to positive influence through appropriate parental, school, and child health professional support.

Materials and methods

For data collection, I used an online questionnaire consisting of 18 questions. The wording was adapted to ensure that it was easily understandable for children. The questionnaire was completed anonymously, and a specific target group was defined for the study. Prior to data collection, I contacted the principals of the participating schools. In addition, parental consent forms were prepared and completed with the parents/guardians of the students involved in the study. Students whose parents/guardians provided consent completed the online questionnaire during school computer lessons.

During data processing, I applied a descriptive approach. The completed questionnaires were analysed in detail, and the data were organised using Microsoft Excel.

Sample description

The research was conducted in two schools that differ in terms of geographical location and maintaining authority. The target population consisted of students in grades

5–8, aged 9–14 years. Participants were recruited from a Rural Primary School and Kindergarten, as well as an Urban Secondary School and Dormitory in my place of residence. A total of 170 students participated in the study.

Rural Primary School and Kindergarten

The village is one of the largest settlements in the Rábaköz region. The population is predominantly Roman Catholic, with religious practice playing an important role in community life. The school initially operated as a four-grade primary school, and in 1994 it was expanded into an eight-grade institution. As the only school in the settlement, it also fulfils the local government's public education obligations. Regarding ethnic composition, the proportion of Roma students in the school ranges between 20% and 23%. In this institution, I conducted my survey among students in grades 5–8, with a total of 54 participants.

Urban Secondary School and Dormitory

The institution operates three types of educational programmes: an eight-year secondary school programme, a four-year secondary school programme (including a one-year language preparatory year), and the Arany János Talent Development Programme. Talent development plays a significant role in both the four-year programme and the language preparatory classes, with an increased emphasis on foreign language instruction. The eight-year secondary school programme has been operating since 1992. Its main profile is the identification and development of talented students. The Arany János Talent Development Programme (AJTP), launched in 2000, provides opportunities for talented students from small settlements and socially disadvantaged backgrounds. It includes a preparatory (catch-up) year. Students participating in the AJTP live in dormitories. The programme aims to address educational gaps and improve access to further education opportunities.

A total of 116 students from grades 5–8 of the eight-year secondary school completed the questionnaire.

Results

In the rural school, there are 88 students in grades 5–8, of whom 54 students' legal guardians provided consent for participation in the study, corresponding to 614% participation. Among the participants, 31 were girls (574%) and 23 were boys (42.6%). In the urban school, there are 125 students in grades 5–8, of whom 116 students' legal guardians provided consent, representing a notably higher participation rate of 92.8% compared to the rural institution. Of these participants, 64 were girls (55.2%) and 52 were boys (44.8%).

Table 1. Age of students participating in the research by school

AGE	RURAL SCHOOL (PERSON) N=54	AGE DISTRIBUTION	CITY SCHOOL (PERSON) N=116	AGE DISTRIBUTION
9	0	0.0%	1	0.9%
10	6	11.1%	13	11.2%
11	18	33.3%	34	29.3%
12	9	16.7%	32	27.6%
13	14	25.9%	23	19.8%
14	7	13.0%	13	11.2%

Table 2. Distribution of the number of daily meals by school

NUMBER OF MEALS PER DAY	RURAL SCHOOL (PERSON) N=54	DISTRIBUTION OF ANSWERS	CITY SCHOOL (PERSON) N=116	DISTRIBUTION OF ANSWERS
Once	2	3.7%	1	0.9%
Twice	3	5.6%	5	4.3%
Three times	19	35.2%	36	31.0%
Four times	24	44.4%	55	47.4%
Five times	5	9.3%	18	15.5%
More than five times	1	1.9%	1	0.9%

The age distribution of students by school is presented in *Table 1*.

Among rural school respondents, the youngest participant was 10 years old and the oldest was 14 years old. In the urban school, the youngest participant was 9 years old and the oldest was 14 years old. In the rural school, 13 students (24.1%) were in 5th grade, 15 students (27.8%) in 6th grade, 12 students (22.2%) in 7th grade, and 14 students (25.9%) in 8th grade. In the urban school, 30 students (25.9%) were in 5th grade, 30 students (25.9%) in 6th grade, 28 students (24.1%) in 7th grade, and 28 students (24.1%) in 8th grade. When comparing grade distribution between the two institutions, no significant differences were observed, as students completed the questionnaire in similar proportions in both schools. The highest response rate was observed among 6th-grade students (45 students; 26.5% overall).

In the rural school, 0 students (0%) reported having diabetes mellitus, while 1 student (2%) reported hyperten-

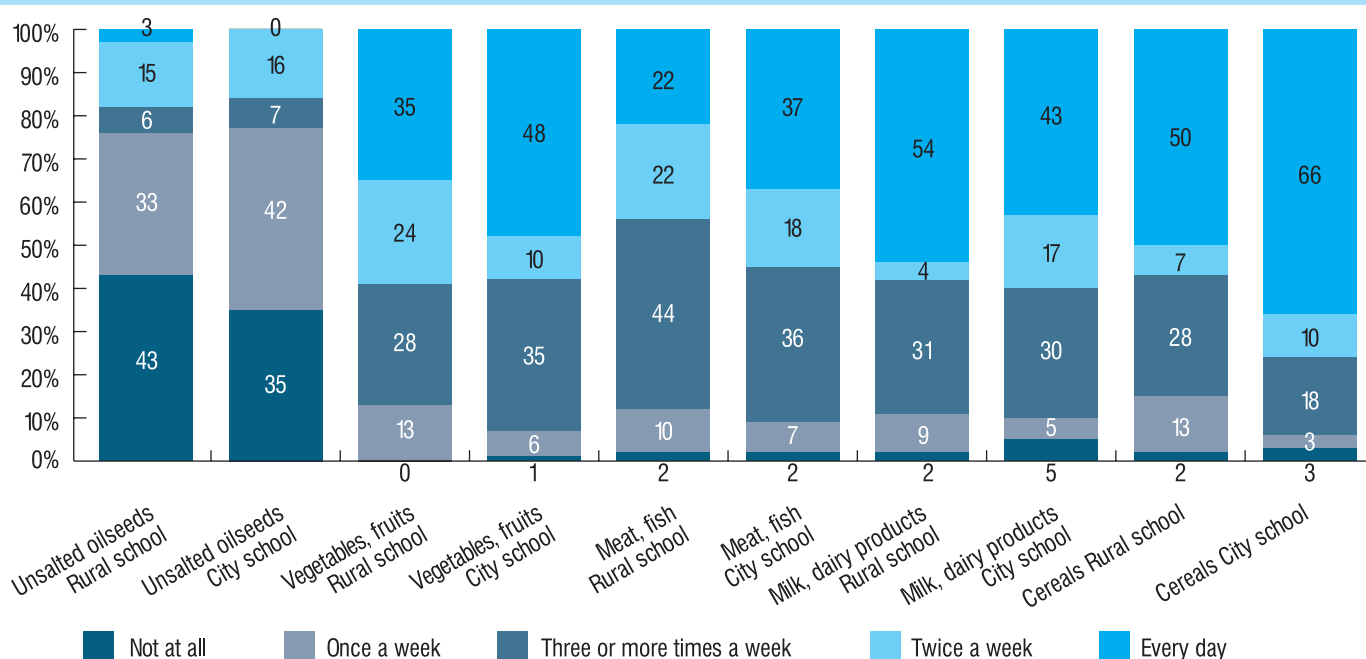
Table 3. Distribution of breakfast consumption habits by school

BREAKFAST CONSUMPTION HABITS	RURAL SCHOOL (PERSON) N=54	DISTRIBUTION OF ANSWERS	URBAN SCHOOL (PERSON) N=116	DISTRIBUTION OF ANSWERS
Yes, every day	26	48.1%	48	41.4%
Yes, only on weekends	6	11.1%	31	26.7%
Yes, only on school days	2	3.7%	5	4.3%
Sometimes	14	25.9%	19	16.4%
No	6	11.1%	13	11.2%

sion. In the urban school, 1 student (1%) reported diabetes mellitus.

The distribution of the number of meals per day is shown in *Table 2*, while breakfast consumption habits by school are presented in *Table 3*.

Figure 1. Weekly dietary habits among rural (n = 54) and urban (n = 116) school students, expressed in percentage distribution



The foods consumed for breakfast by school are presented in *Table 4*.

Based on the responses, students in the urban school tend to consume a more varied and nutritionally complete breakfast. Examples include: “cold cuts, bread, butter, vegetables, apple” and “scrambled chicken breast with ham, vegetables, whole grain bread”, which together represent a balanced breakfast composition. These meals typically contain protein, carbohydrates, fats, and dietary fibre. In addition, responses from both schools included pastries such as “cake, cocoa roll, brioche”, which are characterised by high carbohydrate and energy content but relatively low nutritional value.

Table 5 presents eating habits at school.

Regarding school eating habits, the majority of students reported consuming home-prepared sandwiches. Students from urban schools more frequently purchase meals from the school cafeteria. However, based on the responses, there are also students in both groups who do not consume any food during school hours.

The eating habits of students from rural and urban schools are illustrated in *Figure 1*.

The weekly consumption of unhealthy foods among students in rural and urban schools is shown in *Figure 2* (in percentages).

In terms of hydration, 92.2% of urban students reported daily water consumption, compared with 83.3% of rural students. Daily fluid intake data for both groups are shown in *Figure 3*.

Adequate quantity and quality of fluid intake is essential during childhood, as the human body is composed largely of water and water plays a key role in numerous physiological processes. The distribution of daily fluid consumption in both schools is shown in *Figure 4*.

Regular physical activity should play a central role in childhood, as this period is crucial for physical and mental development. The proportion of students engaging in sports outside of physical education classes was 81.5% (44 students) in the rural school and 75.9% (88 students) in the urban school. The weekly distribution of extra-curricular sports activity in both groups is presented in *Figures 5* and *6*. According to WHO recommendations, children should engage in at least 60 minutes of moderate-to-vigorous physical activity daily. The distribution of compliance with this recommendation is shown in *Figures 5* and *6*.

It is almost equally distributed in both schools: 43.3% in the urban school and 45.5% in the rural school.

The distribution of family activities performed together is shown in *Table 6*.

Based on the responses received, the most common shared family activity in both schools is gardening, reported by 42.6% of rural school students and 46.0% of urban school students.

The percentage distribution of leisure activities in rural and urban schools is presented in *Figure 7*.

Table 4. Foods consumed for breakfast by school

RURAL SCHOOL (PERSON) N = 54	URBAN SCHOOL (PERSON) N = 116
banana, apple, sandwich	scrambled eggs with toasted ham and bread
cereal with milk	milk bread
strawberry yogurt with muesli	brios
sandwich	a glass of kefir
cocoa, scone	cold cuts, bread, butter, vegetables, apple
cocoa roll	cereals
croissant with jam	on school days muesli, otherwise scrambled eggs, sausages
toast bread with tea	yogurt
scrambled eggs	sandwich
sausage with bread	natural yogurt with granola
milk porridge	cake
fried eggs	porridge or milk semolina
cake	bread with jam
empty croissant	hot sandwich or muesli
cottage cheese bun	bread with Nutella
milk bar	bacon, bread
toast bread	egg-fried bread
oatmeal, muesli, oat biscuits	toast with tuna cream
pizza slice	scrambled eggs with chicken breast and ham, vegetables, wholegrain bread
	buttered croissant, a glass of water
	cocoa rolls
	homemade cottage cheese spread, croissant
	hard-boiled egg, vegetables

Table 5. Eating habits at school

SCHOOL EATING HABITS	RURAL SCHOOL (PERSON) N = 54	DISTRI- BUTION OF AN- SWERS	URBAN SCHOOL (PERSON) N = 116	DISTRI- BUTION OF AN- SWERS
I don't eat at school	2	3.2%	4	2.3%
Home-prepared sandwich	44	69.8%	106	60.6%
Food bought in cafeteria or shop (e.g. pastries, sweets, etc.)	10	15.9%	39	22.3%
Home-prepared hot meal	0	0.0%	9	5.1%
Hot meal from the canteen	7	11.1%	17	9.7%
Ordered hot meal	0	0.0%	0	0.0%

Discussion, evaluation, hypothesis testing

I considered it important not to include questions regarding body weight, as this represents sensitive personal data. Body weight is often closely linked to self-esteem and body image, and for children in this age group it may contribute to the development of potential body image disturbances and psychological distress. For this reason, the assessment of students' body weight was excluded from the study; therefore, the results and conclusions are not fully comprehensive in this respect.

Like adults, children require five meals per day to ensure adequate energy and nutrient intake throughout the day (6). Based on the responses, a relatively high proportion of students consume three or four meals daily. When analysing the data from both schools, the most common pattern is four meals per day. A noticeable difference appears in the case of five daily meals, with a higher proportion of students in the urban school following this recommendation. A balanced breakfast is essential for maintaining adequate physical and mental performance. According to nutritional recommendations, a healthy breakfast should include fruits or vegetables, high-quality protein sources (e.g. milk, dairy products, lean meats, eggs), fluids, and whole-grain bread or cereals. Regular consumption of a balanced breakfast may reduce the risk of obesity and contribute to the prevention of elevated cholesterol levels and cardiovascular diseases (7). Comparing the responses from the two institutions, the results indicate that daily breakfast consumption is the most common pattern in both groups, although the over-

Table 6. Distribution of family activities performed together

FAMILY ACTIVITIES	RURAL SCHOOL (PERSON) N=54	DISTRIBUTION OF ANSWERS	URBAN SCHOOL (PERSON) N=116	DISTRIBUTION OF ANSWERS
Hiking, excursions	16	23.5%	8	6.3%
Joint sports (e.g. running, cycling, soccer, etc.)	14	20.6%	52	41.3%
Gardening (e.g. mowing lawn, cutting wood, etc.)	29	42.6%	58	46.0%
I don't do any of these activities with them	9	13.2%	8	6.3%

all proportion is not optimal. A difference was observed in the group consuming breakfast only on weekends, with a higher proportion among urban students. Based on the responses, students in the urban school consume a more varied and nutritionally complete breakfast. In addition, both groups reported the consumption of pastries such as "cake, cocoa roll, brioche", which are high in carbohydrates and energy but provide limited nutritional value, resulting in a rapid return of hunger. Although convenient and palatable, regular consumption of such foods for breakfast is not recommended (8).

Examining eating habits at school, the responses indicate that the majority of students prefer home-prepared sandwiches. Students in urban schools more frequently purchase food from the school cafeteria. However, it is also noteworthy that some students do not consume any

Figure 2. Weekly consumption of unhealthy foods among rural and urban school students, expressed in percentage distribution

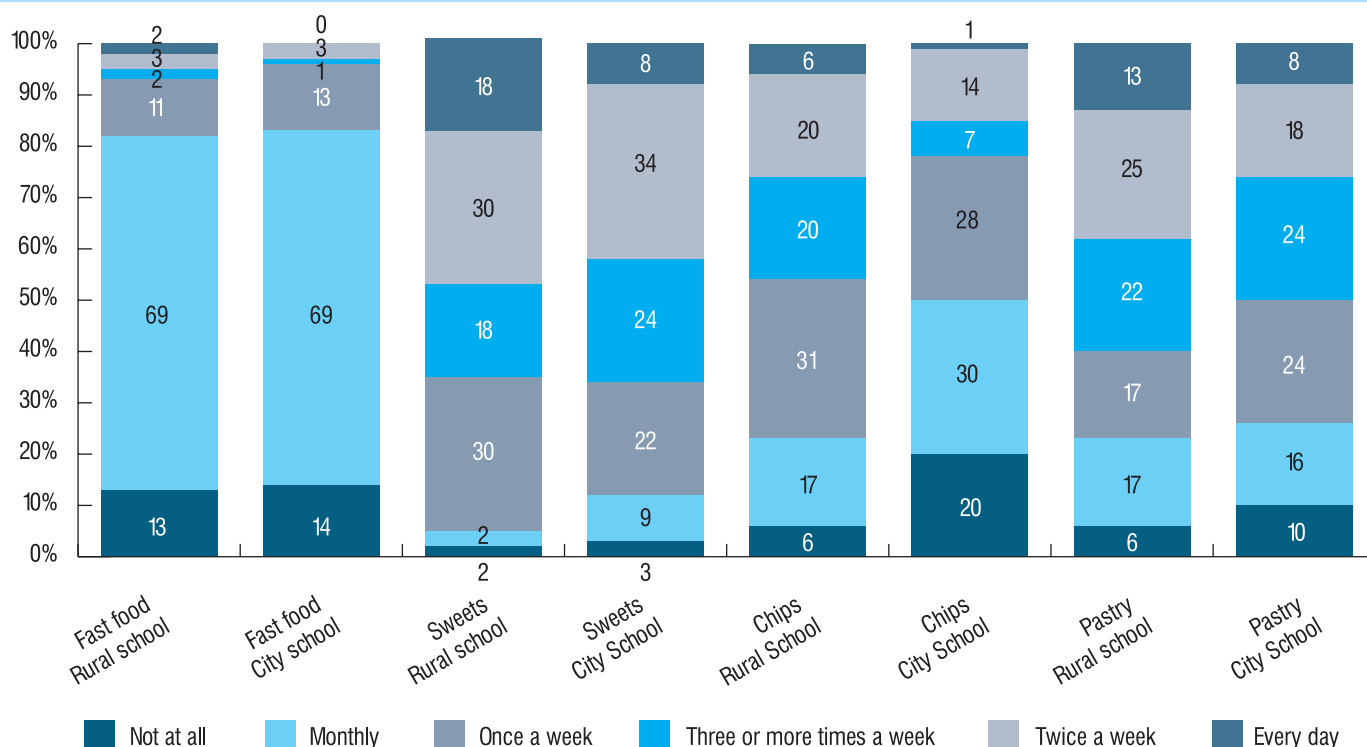
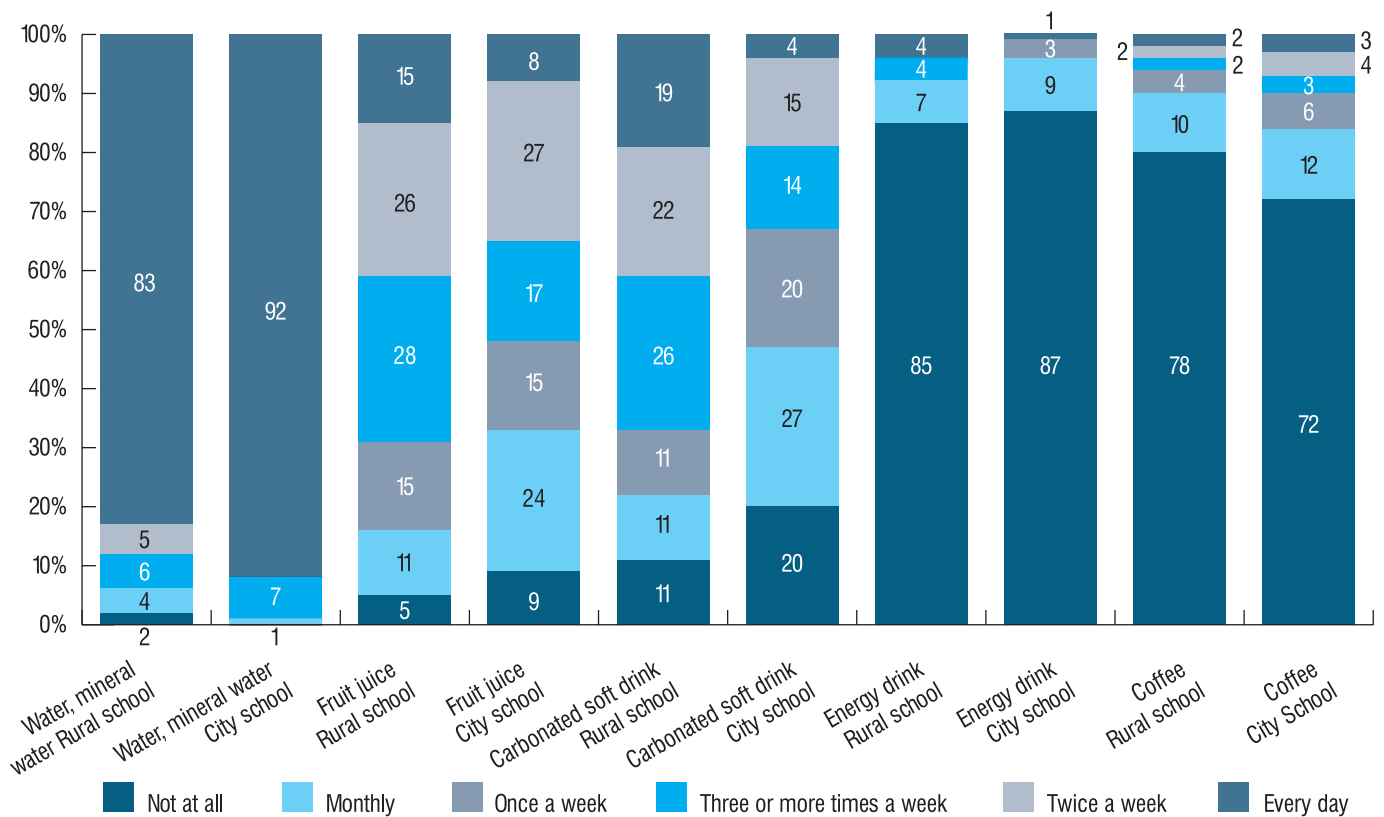
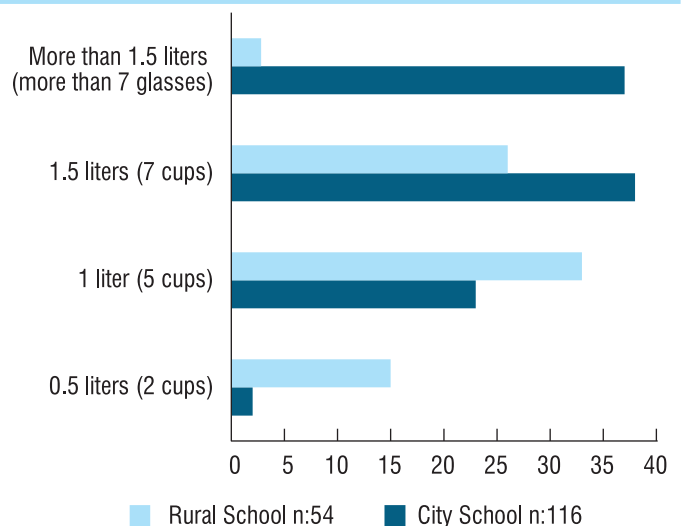


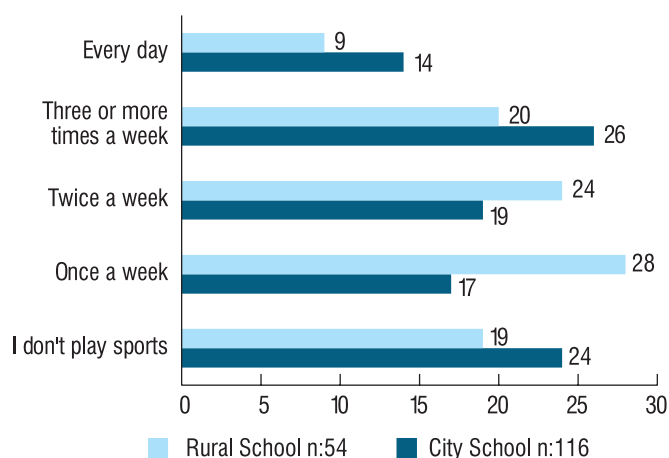
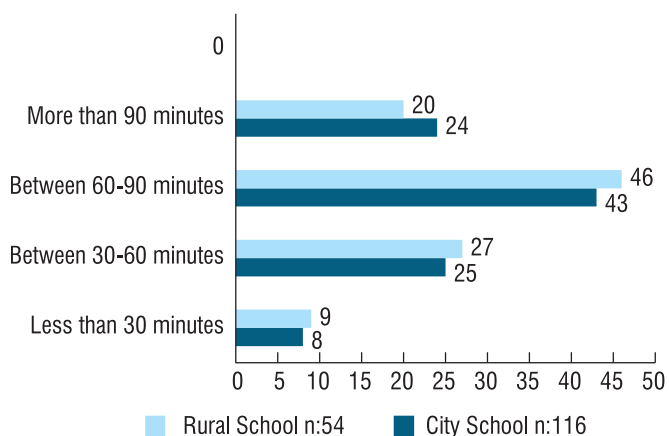
Figure 3. Daily fluid consumption among rural and urban school students, expressed in percentage distribution

food during school hours. A healthy and balanced diet is essential for optimal growth and development in children. Such a diet ensures adequate intake of essential nutrients in appropriate quantity and variety, which is crucial for both physical and mental development (9). Based on the analysis of eating habits, it can be stated that students attending urban institutions demonstrate healthier dietary patterns, as they consume most of the listed food groups on a daily basis, with the exception of unsalted oilseeds. In contrast, the daily consumption of milk and dairy products is higher among students in rural schools (53.7%) compared to urban schools (43.1%). An unbalanced or nutritionally inadequate diet may lead to insufficient nutrient intake, which can have serious consequences for children's health and academic performance. In addition, excessive energy and fat intake increases the long-term risk of overweight and obesity and may contribute to the development of chronic non-communicable diseases (9). Regarding unhealthy food consumption, students in rural schools tend to consume unhealthy foods more frequently. One of my initial hypotheses was that students in urban schools consume fast food more often; however, this was not confirmed by the data. Daily fast food consumption was reported only among rural school students (1.9%), while no urban students reported daily consumption. Fast food consumption three or more times per week was also slightly higher among rural students (1.9%) compared to urban students (0.9%). Another hypothesis – that students in urban schools consume more

Figure 4. Distribution of daily fluid intake in both schools (percentage)

sweets and crisps than those in rural schools – was also not supported by the results. According to the data, 5.6% of rural school students consume crisps daily, compared to 1.7% of urban school students. Furthermore, 20.4% of rural students consume crisps three or more times per week, whereas this proportion is 6.9% among urban students.

Adequate hydration plays an essential role in cognitive performance during school activities and learning pro-

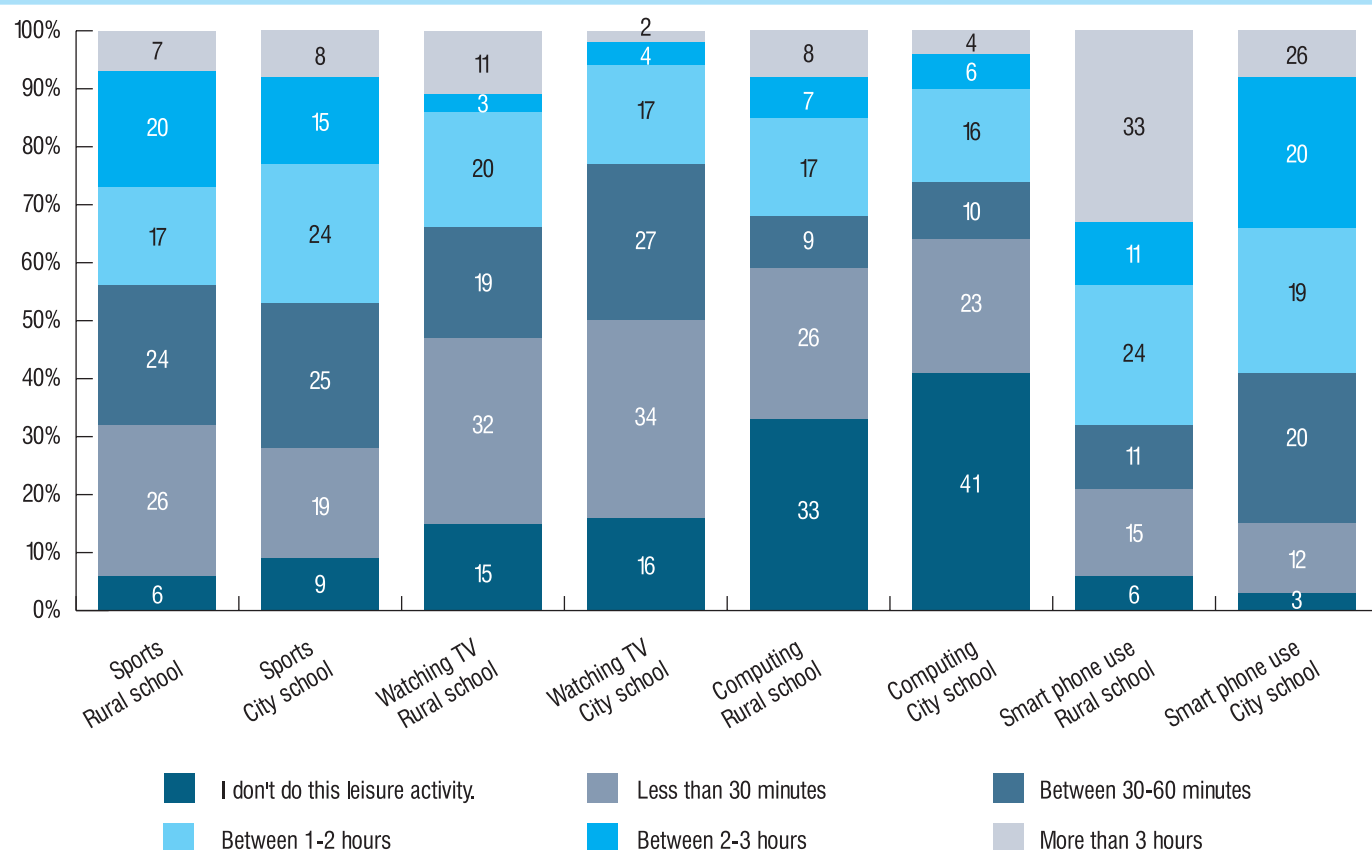
Figure 5. Weekly participation in sports activities outside of physical education classes in both schools (percentage distribution)**Figure 6. Time spent on sports in both schools (percentage distribution)**

cesses. Maintaining proper hydration status is important for ensuring optimal physiological functioning and may reduce the risk of headaches, fatigue, and concentration difficulties, thereby improving learning efficiency and effectiveness. It is also important to emphasise that the primary source of fluid intake should be water, as excessive consumption of sugar-sweetened beverages may contribute to the development of type 2 diabetes mellitus (10). Adequate quantity and quality of fluid intake are

particularly important during childhood, as the human body consists largely of water, which is involved in numerous essential physiological processes (10).

Regular physical activity should play a key role during childhood, as this life stage is critical for both physical and mental development. Regular exercise provides multiple health benefits for children (11).

In rural schools, a higher proportion of students engage in physical activity outside of physical education classes.

Figure 7. Distribution of leisure activities among rural and urban school students (percentage)

According to WHO recommendations, children should accumulate at least 60 minutes of moderate-to-vigorous physical activity daily (11). One of my hypotheses – that students in urban schools participate more frequently in extracurricular physical activity than students in rural schools – was confirmed. However, the recommended 60 minutes per day is not achieved in either group. The proportion of students meeting this recommendation is 43.3% in urban schools and 45.5% in rural schools, which remains insufficient, as it does not reach 50% in either institution. My final hypothesis – that students in rural schools spend less time using mobile phones in their free time – was also not confirmed. Based on the responses, 33.3% of rural school students spend more than three hours per day on their mobile phones, compared to 25.9% of urban school students.

Conclusions and recommendations

Health education should begin in childhood, which was also confirmed by both the literature review and the results of my own research. One of the fundamental components of a healthy lifestyle is appropriate nutrition, including balanced dietary habits. Based on the responses to the questionnaire, it can be concluded that the recommendation of five meals per day is only partially achieved among students in urban schools. Knowledge regarding the importance of a high-quality breakfast appears to be limited. Adequate nutrient and fluid intake was more consistently observed among urban students, while un-

healthy eating habits were more prevalent among students in rural schools. Regular physical activity is closely associated with the development and maintenance of a healthy body. Based on the results, daily physical activity is considered important among students in both schools. The schools provide an adequate level of physical education opportunities; however, urban students also participate in additional sports activities three or more times per week. This may be explained by the greater availability and diversity of sports opportunities in urban environments. Adequate rest and leisure behaviour are also essential components of a healthy lifestyle. However, based on the responses, sedentary activities – particularly mobile phone use – are increasingly dominant. On average, students reported spending more than three hours per day on their phones, which reduces the time available for active recreation, including sports.

In order to improve these outcomes and support prevention, I recommend increasing the frequency of health education sessions delivered by school health professionals in a clear and age-appropriate manner that draws attention to key risk factors. Greater emphasis should also be placed on school-organised health days or health weeks, particularly focusing on healthy nutrition and the importance of regular physical activity. The effectiveness of these programmes could be further enhanced through interactive and visually supported presentations, including practical and illustrative examples. It is also important to raise awareness among families regarding the key role of a healthy lifestyle. This could be promoted through joint school programmes, family-oriented events, and excursions.

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Interview on the characteristics and prevention options of obesity, high blood pressure, and diabetes mellitus in children and adolescents

Barbara Hegyi, Andrea Kovács

Family Care Methodology Department, Faculty of Health Sciences, Semmelweis University, Budapest

Corresponding author: Andrea Ildikó Kovács e-mail: kovacs.andrea197006@gmail.com

Abstract

The consequences of an unhealthy lifestyle, such as obesity and the numerous associated health problems, are already evident in childhood. Healthy nutrition and regular physical activity are considered to be of paramount importance in preventing these conditions. During our research, we examined the lifestyle habits of students living in two different agglomeration areas. Two research methods were applied. In our previous publication, we presented the results of a questionnaire-based survey. In the present study, we introduce the results of two in-depth interviews. This approach provided the opportunity to gain more detailed insights by involving one student from an urban area and one from a rural area. Based on the analysis of the responses obtained from the in-depth interviews, it was established that maintaining a healthy lifestyle is important for both students; however, its practical implementation appeared to be more feasible for the rural student.

Keywords: healthy lifestyle, childhood and adolescent obesity, prevention

Introduction

Childhood overweight and obesity are increasing public health concerns in Hungary. This trend is partly attributable to the low level of physical activity among children and the excessive time spent on sedentary activities, such as the use of smart devices. In addition, the consumption of vegetables and fruits among children remains low. Daily consumption of sweets and sugar-sweetened beverages occurs in approximately 30% of students, resulting in significant excess calorie intake (1). Inadequate nutrition and physical inactivity may lead to numerous physical and mental health problems, including hormonal imbalance, overweight, type 2 diabetes mellitus, chronic iron deficiency, reduced muscle strength and immune function, nervous system and di-

gestive disorders, dental caries, and behavioral and academic performance disorders (2).

Our research was conducted among students from two different agglomeration areas.

Research method

During our research, we examined the lifestyle habits of students living in two different agglomeration areas. Two research methods were applied. In our previous publication, we presented the results of the questionnaire-based survey. In order to provide a deeper understanding of the responses, we also conducted in-depth interviews with two students to analyze their lifestyle habits in greater detail. The participants' responses were analyzed and compared individually.

List of abbreviations

WHO: World Health Organization; **MDOSZ:** Hungarian Dietitians' National Association; **BMI:** Body Mass Index; **NEFI:** National Health Development Institute; **NEFI-GYI:** National Health Development Institute Children's Health Directorate; **COSI:** Childhood Obesity Surveillance Initiative; **NETFIT®:** National Unified Student Fitness Test

In-depth interviews

Parents were informed in advance about the in-depth interviews, and parental consent forms were prepared accordingly. Prior to conducting the interviews, the participants were also provided with detailed information about the purpose and process of the study. Each interview lasted approximately 30–40 minutes.

In-depth interview – Rural Elementary School and Kindergarten

One of the in-depth interviews on the topic of healthy lifestyle was conducted with a 12-year-old boy in the 6th grade of the Rural Elementary School and Kindergarten.

Eating habits

1. How important do you consider healthy eating on a scale from 1 to 10? If you consider it important, why is it important to you?

Healthy eating is important to me; I would rate it 9 out of 10. It is important because I do not want to become overweight, I want to look good, and I want to live a long life.

2. How many times do you eat a day?

At least four times, but sometimes five times a day.

3. Please describe your usual daily meals. When and where do you eat, and what do you usually consume?

- ♦ *Breakfast (at home, before school):*

Most often I eat a sandwich prepared by my mother. It usually contains bread, butter, chicken breast ham or liver spread, cheese, and cucumber. As a beverage, I drink homemade tea (green tea with sugar and lemon juice).

- ♦ *Mid-morning snack (at school):*

Similar to breakfast; sometimes I have a sandwich with fried meat, a banana as fruit, and a packaged snack (Dörmi cake). I usually drink homemade tea.

- ♦ *Lunch (at home after school):*

Among soups, my favorites are broth and goulash soup.

My favorite main courses include

- fried chicken breast with side dishes (rice, mashed potatoes, or occasionally French fries) and salad (cucumber salad or tomato salad)

- chicken stew with dumplings

- potato stew with meatballs

- grilled chicken breast with mixed salad

Beverages: apple juice, homemade tea.

- ♦ *Afternoon snack (at home):*

I usually eat yogurt, sponge cake, chocolate cereal balls with milk, or a dairy drink (e.g. Actimel).

- ♦ *Dinner (at home):*

If there are leftovers from lunch, I usually eat those. Otherwise, I eat hot sandwiches, scrambled eggs, or sausages. As beverages, I drink cocoa or milk.

During meals, do you only focus on eating food? Or do you also focus on other things, such as talking on the phone, playing games on the computer, or watching TV? Unfortunately, using a tablet or phone is almost essential at home, I watch various videos on them, but I don't do this elsewhere.

Does your family usually eat together, if so, how often?

On weekdays, I eat mainly in the morning and evening with my mother. On weekends, we eat the main meals with my family.

Do you eat breakfast every day? Do you prepare breakfast yourself or do you tell me what you want to eat?

Yes, I eat breakfast every day. When I get up, breakfast is ready, which my mother prepares.

How many times a day do you eat vegetables? If you don't, why not?

Every day, three times a day. I eat these vegetables: cucumbers, tomatoes, red onions, and bell peppers.

How many times a day do you eat fruit? If you don't, why not?

Twice a week, I only eat bananas.

When you snack, what do you usually snack on and how often do you do it?

Kinder chocolate, Dörmi Maci, Actimel, strawberry yogurt, Kinder Penguin milk bars, chips rarely – weekly

Have you ever had a lecture at school about the benefits of a healthy lifestyle?

Yes, as part of a natural history lesson.

Do you think it is true that a healthy lifestyle can reduce the risk of obesity and high blood pressure?

I consider a healthy lifestyle important, which can also prevent the risk of obesity and high blood pressure.

As part of a healthy diet, how important do you consider fluid consumption and hydration?

I consider it very important to consume the right amount of fluid. I usually drink about 2 liters of fluid per day, which consists of the following: apple juice, homemade tea, milk, cocoa, water rarely.

Physical exercise, relaxation

What types of physical activity are included in school classes and extracurricular options?

Physical education classes are held five times a week at school. In addition, I attend handball training, swimming sessions, and football practice three times a week outside of school.

What are physical education classes like at school? Are they difficult, tiring, varied? How much do you enjoy them?

My favorite subject is physical education. Classes usually include warm-up exercises, running, athletics, rope climbing, and high jump, and we often play sports games as well.

What would you change if you had the opportunity?

I would like to spend more time playing sports games.

What sports do you do outside of school, and how often?

I engage in physical activity on a daily basis. I attend mandatory football training three times a week at Szany SE as a member of the U13–14 team, and I go swimming once a week for one hour at Pápa Várkertfürdő. As a hobby, I also play football with friends, cycle, and ride a motorbike. My dream is to become a professional football player one day.

If you do sports outside of school, what motivates you?

I enjoy being active; it helps me relax and makes me feel free.

What leisure activities do you usually do with your family on weekends, depending on the season (e.g., walking, cycling)?

We usually go on trips to the forest, and sometimes we go cycling.

In-depth interview – City High School and Dormitory

My other in-depth interview subject was a 13-year-old girl in the 7th grade of the Urban High School and Dormitory.

Eating habits

How important do you consider healthy eating on a scale from 1 to 10? If important, why?

I rate it 8 because I want to be healthy.

How many times do you eat a day?

I eat 5 times a day.

Please describe your typical daily meals (what, when, and where you eat).

Breakfast (at home before school)

I usually eat cottage cheese dessert (Túró Rudi), Nutella toast, and drink water.

Mid-morning snack (at school)

Cheese scone, cocoa roll, a protein bar, and water.

Lunch (at home or at school)

My favorite is fried chicken breast with a side dish (I rarely eat rice; I prefer sweet potatoes or pasta).

Afternoon snack (at home)

Usually protein pudding/yogurt.

Dinner (at home)

Fried chicken breast with rice or sweet potatoes.

During meals, do you focus solely on eating, or do you also engage in other activities such as using your phone, playing on the computer, or watching television?

At home, I sometimes use my phone while eating, but this does not occur in public.

Is it customary for your family to eat meals together? If so, how often?

Yes, typically on weekends.

Do you eat breakfast every day? Do you prepare it yourself, or do you indicate what you would like to eat?

Yes, I eat breakfast every day, and I usually prepare it myself.

How many times a day do you eat vegetables? If not regularly, why?

I do not particularly like vegetables; I only eat baked potatoes.

How many times a day do you eat fruit? If not regularly, why?

Rarely. I prefer consuming fruit in the form of smoothies containing bananas and blueberries.

If you snack, what do you usually eat and how often?

I usually consume protein-rich chocolate several times a week. I rarely eat chips and only in moderation.

Have you ever attended a lecture at school about the benefits of a healthy lifestyle? If so, who delivered it?

I do not recall attending such a lecture.

Do you think that a healthy lifestyle can reduce the risk of obesity and high blood pressure?

Yes.

As part of a healthy diet, how important do you consider adequate fluid intake and hydration?

I consider it very important. I usually drink still water, rarely carbonated water, and consume approximately 2 liters per day.

Physical exercise, recreation

What types of physical activity are included in school classes and optional programs?

There are physical education classes five times a week at school. Optional activities include volleyball and basketball.

What are physical education classes like at school? Are they difficult, tiring, varied? How much do you enjoy them?

I enjoy physical education classes; they often include interesting team activities (e.g., dodgeball, “spider football”).

What would you change if you had the opportunity?

I would not change anything; I like it as it is.

What sports do you do outside of school, and how often?

Outside of school, I play badminton twice a week, which I started at the end of 5th grade. I have already participated in competitions, and in my most recent competition, I qualified for the National Student Olympics.

In addition, I go to the gym three times a week to train, primarily to build muscle strength to improve my performance in badminton.

If you participate in sports outside of school, what motivates you?

I enjoy sports; they help me relax and allow me to challenge my limits.

What leisure activities do you do with your family on weekends, depending on the season (e.g., walking, cycling)?

In winter, we usually go ice skating, while in spring and summer we play badminton, go cycling, or take walks.

Evaluation and comparison of in-depth interviews

Based on the responses to the first question, both students consider a healthy lifestyle important. The student attending the rural school rated its importance as 9, explaining that he does not want to become overweight and aims to live a long life. The student attending the urban school rated it as 8, stating that he wants to maintain good health. Both students believe that a healthy lifestyle contributes to the prevention of obesity and hypertension. In the rural school, the topic had already been addressed in an environmental education class; however, the urban student did not recall attending a similar lecture. Regarding the number of daily meals, both students reported eating approximately five times per day, which is consistent with general dietary recommendations. As part of our research, we examined the lifestyle habits of students living in two different agglomeration areas us-

ing two methods. The results of the questionnaire survey were presented in a previous publication, while the present section focuses on the analysis of the two in-depth interviews.

Analyzing their average daily diet based on the interview responses, the rural student consumes a more varied and balanced diet. He eats vegetables several times a day and consumes fruit approximately twice a week. In contrast, the urban student's diet is less varied and can be described as relatively monotonous. He rarely consumes vegetables, with potatoes being the only regular form, typically prepared in a fried form. Fruit intake is mainly in the form of smoothies. The rural student snacks more frequently and prefers sweets, whereas the urban student consumes protein bars and protein pudding, which is somewhat unusual for this age group. Excessive energy or fat intake may increase the long-term risk of overweight and obesity and can predispose individuals to chronic non-communicable diseases (3).

During meals, both students reported that they often engage in additional activities, such as using their phones, although this occurs less frequently in public settings.

The daily fluid intake of both students is adequate, at approximately two liters per day. However, beverage choices differ: the rural student prefers sweetened homemade tea and apple juice, while the urban student mainly drinks water. Adequate quantity and quality of fluid intake is essential in childhood, as the human body consists largely of water and it plays a key role in many physiological processes (4).

In both cases, family meals take place only on weekends. In the second part of the in-depth interview, questions focused on physical activity and leisure time. Both rural and urban students regularly engage in sports outside of mandatory physical education classes, and both have access to extracurricular sporting opportunities at school. They consider physical activity important, reporting that it makes them feel free and allows them to push their limits. In their free time, they also participate in activities such as cycling and hiking with their families. Regular physical activity provides numerous health benefits for children (5).

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Our Academic Pediatric Ancestors in the 19th and 20th Centuries Part I

György Harmat

Semmelweis University Faculty of Health Sciences, Hungarian Medical History Society

Corresponding author: e-mail: gyharmat1951@gmail.com

Abstract

The Hungarian Academy of Sciences celebrated the 200th anniversary of its founding in 2025. On this jubilee occasion, we would like to present the life and scientific work of our pediatrician academic colleagues. We will present the outstanding figures of the field in three parts. In the first part, the founders and famous representatives of the 19th century (János Bókay junior and Géza Petényi) will be introduced. In the second part, we will present the distinguished professors of the 20th century (Ödön Kerpel-Fronius, Pál Gegesi Kiss, Károly Méhes). In the third part, we will introduce contemporary pediatrician members of the Academy (Tivadar Tulassay, György Balla, István Seri).

Successful scientists who have made a lasting impact on both national and international scientific life are elected to the Hungarian Academy of Sciences.

Among Hungarian pediatricians, since the founding of the Academy, several renowned individuals – respected by the profession and society – have become members of this long-established institution.

First, *János Bókay Jr.* should be introduced as an academician, although his biography and work are well known within the historical record of pediatrics.

János Bókay Jr. (1858–1937) was one of the most prominent figures in Hungarian pediatrics. Following in his father's footsteps, he devoted his entire life to the treatment of sick children and the development of medical education.

He was the son of *János Bókay Senior.* (1822–1884) and *Judit Szabó* of *Szántó* (1831–1916). He completed his medical studies at the Faculty of Medicine of the Budapest University of Science and Technology, and was awarded his Doctor of Medicine degree in 1880. From 1883, he served as chief physician of the Stefania Children's Hospital. In 1885, he became a private docent of pediatrics; in 1892, an associate professor; and from 1907, a full professor at the Pázmány Péter University in Budapest.

During his tenure, pediatrics became a mandatory final examination subject in 1916.



From 1923, he was a corresponding member of the Hungarian Academy of Sciences.

He retired in 1929.

On April 11, 1896, the university professor of medicine *János Bókay* was granted nobility, a family coat of arms, and the noble surname "*Bókay*" by *Emperor Franz Joseph I* of Hungary.



Versatile scientist

Bókay described 6–7 cm high Bronze Age clay nursing vessels found in Hungary. He was also an active musician and composer. He wrote a study on the cause of *Mozart's* death and examined *Ludwig van Beethoven's* ear condition as well as the skulls of some of the world's greatest musicians. He served as chairman of the committee that coordinated the American child relief campaign in Hungary after World War I. He was a regular participant in international scientific congresses, and numerous scientific societies elected him as a corresponding or honorary member.

Our second Academic Pediatrician in chronological order:

His professional legacy is unparalleled (extraordinaire):

- ♦ In 1912, he published “A gyermekorvoslás tankönyve” (Textbook of Pediatrics), which was revised and republished in 1920 with co-authors *Zoltán Bókay* and *Ármin Flesch*. His textbook was used for decades and was also published in German.
- ♦ He introduced intubation therapy for diphtheria (throat diphtheria) in Hungary, followed by serum therapy.
- ♦ At international request, he clinically verified the efficacy of Behring's anti-diphtheria serum.
- ♦ He played a significant role in demonstrating the pathological relationship between herpes zoster (shingles) and varicella (chickenpox).
- ♦ He contributed to the clarification of the pathology of poliomyelitis (*Heine–Medin* disease, epidemic poliomyelitis).
- ♦ He made important contributions to the organization of hospital care for children.
- ♦ He played a key role in social child protection and infant welfare.
- ♦ He supported a new approach to the treatment of scarlet fever.
- ♦ In 1916, he succeeded in making pediatrics a mandatory elective subject in medical education, and from 1922 it became a mandatory final examination subject.

Géza Petényi

Géza Petényi was born as the son of carpenter *Pál Petényi* and *Júlia Roszál*. He completed his secondary education between 1900 and 1908 at the Hungarian Royal State High School in Budapest's VIII district. He was subsequently admitted to the Faculty of Medicine of the University of Budapest. Between 1911 and 1913, he worked on physico-chemical methodology at the Pathology Institute led by *Ferenc Tangl*. As a medical student, he participated in the activities of the Galilei Circle.

On July 1, 1913, he was appointed assistant physician at the Fehérkereszt Children's Hospital. He graduated in 1914, although he did not receive his medical degree until February 1916. He later served as assistant physician there from 1918 to 1924.



International recognition

As an internationally recognized pediatrician, he served on the four-member editorial board of the journal *Jahrbuch für Kinderheilkunde*. The 38th meeting of the Deutsche Gesellschaft für Kinderheilkunde was organized in Budapest in his honor on the occasion of his 70th birthday. From the perspective of both international and Hungarian pediatrics, his greatest contribution lies in the fact that his work significantly helped establish pediatrics as a field encompassing internal medicine and surgical aspects of the neonatal period through adolescence.

He enlisted in July 1914 during general mobilization. On August 26, 1914, he was wounded and taken prisoner by Serbian forces, from which he returned home only at the end of 1915. From October 1916, he served on the Italian, Bukovina, Romanian, and again Italian fronts as an assistant physician and battalion physician. For his wartime service, he was awarded the Small Silver Medal of Valor, the Signum Laudis, and the Charles Cross.

From December 1, 1918 to September 1, 1924, he was assigned to the *Queen Zita* Institute and, in this capacity, also served at the Fehérkereszt Children's Hospital.

Between June 1920 and June 1924, he was employed by the University of Pécs as an unpaid teaching assistant.

In 1922, at the Erzsébet University of Pécs, he qualified as a private docent in pediatric diagnostics.

From September 1924, he served as chief physician of the First Department of Internal Medicine at the Fehérkereszt Children's Hospital, as well as head of the central laboratory and the internal medicine radiology institute. Between 1937 and 1945, he worked as chief physician and director.

The children's hospital was severely damaged by bombing during World War II. Despite operating in a ruined building, the institution was elevated to clinical status in 1946 as the Second Pediatric Department of the Faculty of Medicine of Pázmány Péter University, and Petényi was appointed director at that time.

He served as chief physician of the State Children's Hospital (1945–1946), professor at Pázmány Péter University and at the Budapest University of Medical Sciences, Second Department of Pediatrics (1946–1952), associate professor (1952–1965), and head of the department (from 1949).

In 1949 he was elected a corresponding member of the Hungarian Academy of Sciences, and, in 1960, a full member.

He served as chairman of the Health Sciences Committee of the Hungarian Academy of Sciences. He was chairman of the Judicial Medical Council (1949–1952), chairman of the Health Sciences Council (1952–1956), and later a member (1956–1965).

He also served as chairman of the Pediatrics Specialist Group of the Hungarian Academy of Sciences (MOTESZ) from 1960 to 1962.

His scientific work

He worked in the fields of infant and pediatric medicine, primarily focusing on rickets and childhood infectious diseases. He achieved significant internationally recognized results in the antibiotic treatment of child-



hood tuberculosis and other pulmonary diseases. He developed the principles of modern treatment for infant and childhood tuberculous meningitis and investigated diagnostic methods and surgical approaches for congenital heart defects.

His main works

F. m.: Über die Wirkung des Adrenalins auf den Blutzucker. *Biochemische Zeitschrift* h.n., 1921

Methodology of vitamin experiments on infants. *Orvosi Hetilap* 1924

Detection of the reserved vitamin amount and its significance in the human body. *Gyógyászat* 1926

Development of the measles virus. *Orvosi Hetilap* 1927

Pathology and general therapy of childhood eczema. *Therapia* 1934

On poliomyelitis. Budapest, 1934

Prophylaxis of rickets. *Therapia* 1935

On the "expert" and "scientific" work of Dr. Ferenc Orsós. *Orvosok Lapja* h.n., 1945

Development of tuberculosis therapy. MTA Department of Medicine Publications 1954

Géza Petényi was one of the most prominent figures in Hungarian pediatrics and was also a competitive chess player.

In the club competitions held at the Akadémia Street premises of the Budapest Chess Club – then the strongest club in the country – he placed sixth in 1910 and third in 1911. After that, however, he gave up serious competition and continued to play chess only as a hobby. At the same time, he was also a talented composer of chess problems, leaving a lasting impression in what is widely regarded as one of the most demanding fields of chess composition.

Following the German occupation of Hungary in March 1944, and especially during the Arrow Cross regime, *Petényi* saved the lives of dozens of Jewish children and adults. He did this by admitting them to his ward under the pretext of various illnesses and keeping them there for extended periods under false identities.

Other survivors who owed their lives to *Petényi* included Dr. *Makai* and his wife, whom he smuggled out of the Budapest ghetto; pianist *Pál Urbach*; surgeon *Alfréd Berndorfér*; *Magda Pető*, who later became a chemist in Budapest; *Lili Deményi*; *Ágnes Kenedy*; and others.

A deeply humane scientist, he advocated for Jewish patients as a medical professor and saved children and their parents by providing food, protective documents, and hiding places. For these actions, he was posthumously awarded the title Righteous Among the Nations on March 17, 1983, and a Tree of the Righteous was planted in his memory at Yad Vashem in Jerusalem.

His wife, *Irén Kollár*, was also a pediatrician.

Figure 5. His grave in the Farkasréti cemetery by Miklós Borsos (1965) (49. körönd-2-11/12). Artist: Miklós Borsos, 1965



Awards, recognitions

- ♦ Signum Laudis, with swords
- ♦ Small Cross of the Order of Merit of the Republic of Hungary (1948)
- ♦ Kossuth Award, 2nd class (1950)
- ♦ Order of Merit for Labor (1956, 1959)
- ♦ Excellent Doctor (1959)
- ♦ Semmelweis Medal (1964)
- ♦ Schöpf-Merei Ágost Memorial Medal (1968)

His memory

The *Petényi Géza* Foundation and the Hungarian Society of Pediatricians established a prize in his honor, with which publications by young doctors are rewarded.

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Turkish Archives of Pediatrics





History of the Hungarian Academy of Sciences

László Szabó

Heim Pál National Pediatric Institute, Budapest

Corresponding author: e-mail: szabo.laszlo.md@gmail.com

The Hungarian Academy of Sciences is Hungary's highest scientific public body. Its main tasks are to cultivate science, disseminate scientific results, and represent Hungarian science. Its fundamental importance lies in supporting Hungarian science, promoting exploratory research, and providing a credible, independent knowledge base for the development of the country and the nation. The Academy's logo is shown in *Figure 1*.

The Hungarian Academy of Sciences was founded 200 years ago.

The idea of establishing a Hungarian scientific society was first conceived by the Lutheran pastor and polymath *Mátyás Bél* in the second half of the eighteenth century. A few decades later, in 1781, *György Bessenyei* set forth a similar proposal in writing. The Committee on Science of the 1791 Diet included the establishment of a Hungarian academy of sciences, alongside military and fine arts academies, in its program. However, these plans ultimately failed to materialize during the first three decades of the reign of Francis I. In the authoritarian political environment of the period, intellectual initiatives remained largely unheeded until members of the social elite took up the cause. On November 3, 1825, during a session of the Diet in Bratislava, *Pál Nagy* of Felsőbüki, a leader of the opposition, sharply criticized those magnates whom he considered indifferent to the cause of national culture and the Hungarian language. In response, the young Count *István Széchenyi* (*Figure 2*), a Hungarian cavalry captain who was present in the assembly, made the following declaration: "Dear Estates and Orders! Although I am not one of the greatest men, I am a wealthy man; therefore, I offer my entire annual income for the advancement of my national language, provided that its administration and allocation for the intended purpose shall always remain under the authority of the Diet." (x) The reactions following his speech suggest that the foundation may have been the result of a coordinated effort involving several individuals. Following his example, *György Károlyi*, *György Andrássy*, *Ábrahám Vay*, and others made similar pledges one after another.

The first General Assembly of the Hungarian Society of Scholars was held on February 14, 1831. One of the

Figure 1. Logo of the Hungarian Academy of Sciences



Figure 2. Portrait of Count István Széchenyi



first achievements of the new institution was the standardization of Hungarian spelling and the codification of grammar. The Society published the first official Hungarian spelling regulations in 1832.

In 1840, the Hungarian Society of Scholars was renamed the Hungarian Academy of Sciences.

As Vice President of the Academy, *István Széchenyi* delivered an inaugural address on November 27, 1842. In his speech, he emphasized the cultivation of language, regarding the preservation and development of the Hungarian language as a matter of paramount importance.

Count *József Teleki*'s donation in 1826 of his valuable library of 30,000 volumes laid the foundation for the Academy Library. The Library of the Hungarian Academy of Sciences opened its doors in 1844. It is located at 1 Arany János Street, District V, Budapest. It is one of the

country's largest specialized scientific libraries. Its holdings comprise approximately two million items and include several special collections, such as the Manuscript and Rare Book Collection, the Oriental Collection, and the Microfilm Collection.

Figure 3. House of the Hungarian Academy of Sciences



The Society of Scholars soon became the principal organizer of Hungary's intellectual life. Its six departments – linguistics, philosophy, history, mathematics, law, and natural sciences – announced competitions in numerous disciplines, published scholarly works, and provided stipends to their members. Its journal, *Scientific Archive*, facilitated access to scientific findings from abroad. Small meetings provided a forum for the presentation of individual scientific achievements and new literary works, while from the mid-1840s onward, departmental meetings also served this purpose.

A significant number of the Academy's members were also public figures. During the 1840s, the government increasingly regarded the institution as an ally of the liberal reform opposition. This perception contributed to the severe restrictions imposed on the Academy's autonomy following the suppression of the Hungarian War of Independence of 1848–1849. The Academy's continued operation was made contingent upon the revision of its Statutes, a process completed in 1858 that strengthened government influence over the institution. The Academy's revival was signaled by *Baron Simon Sina's* donation of 80,000 forints at the end of the decade. Subsequently, a nationwide fundraising campaign was launched in 1860 to support the construction of the Academy's headquarters. An architectural design competition was announced in 1861, and the winning neo-Renaissance design was submitted by *Friedrich August Stüler*. Construction began in the spring of 1862 under the direction of *Miklós Ybl* and *Antal Szkalnitz-*

1. Table. Departments of the Hungarian Academy of Sciences

I.	Department of Language and Literature
II.	Department of Philosophy and History
II.	Department of Mathematical Sciences
IV.	Department of Agricultural Sciences
V.	Department of Medical Sciences
VI.	Department of Engineering Sciences
VII.	Department of Chemical Sciences
VIII.	Department of Biological Sciences
IX.	Department of Economics and Law
X.	Department of Earth Sciences
XI.	Department of Physical Sciences

ky. The building was inaugurated on December 11, 1865 (*Figure 3*).

The headquarters of the Hungarian Academy of Sciences is located at 9 Széchenyi István Square, District V, Budapest.

The meeting rooms, library, reading room, and art collection significantly enhanced the opportunities for scientific work.

The façade sculptures were created by *Emil Wolff*, while the bronze relief depicting the foundation was made by *Barnabás Holló*. The frescoes in the ceremonial hall are the work of *Károly Lotz*, and *Antal Ligeti's* landscape paintings adorn the small meeting room.

Since the 1870s, the Academy has served as the center of Hungary's scientific life.

Today, it comprises 11 scientific departments, of which eight are dedicated to the natural sciences and three to the social sciences (Departments I, II, and IX). The departments are listed in the 1. *table*.

The Hungarian Academy of Sciences currently fulfills the following main missions and tasks:

Today, the main missions and tasks of the Academy are the following:

The public body of the MTA comprises approximately ten thousand members who hold a scientific degree obtained or recognized in Hungary and who declare their intention to join the public body under the conditions specified in the Act on the Hungarian Academy of Sciences. The database has been under development since 1994 and is available both online and in printed form.

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Table 7. Positive effects of physical activity in children and adolescents

Positive effects of physical activity
Improved physical fitness (cardiorespiratory fitness and muscle strength)
Improved cardiometabolic health (blood pressure, lipid profile, glucose and insulin sensitivity)
Improved bone health
Improved cognitive function and school performance
Improved mental health (reduced symptoms of depression)
Reduced risk of obesity

Table 1. Conceptual changes in health over the past years (own editing) Source: Hidvégi (4)

AUTHOR	DATE	CONCEPTUAL CHANGES IN HEALTH
WHO	1946	Health is defined as a state of complete physical, mental, and social well-being.
WHO (Copenhagen)	1984	Individual and social conditions of existence and individual responsibility come to the forefront.
WHO (Ottawa)	1986	Includes individual knowledge, social factors, and the physical environment.
WHO (Adelaide)	1988	Improvement of population health status requires governmental-level action.
Seedhouse	1986	Health is interpreted at the individual level; being healthy means different things for different people, while basic conditions must be considered.
Antonovsky	1987	Human existence is characterised not by balance and health, but by loss of balance, disorder, and suffering.
Insel és Roth	2007	The question is not whether someone is healthy or ill, but where they are located on the health–disease continuum.

Table 2. Overweight or obesity according to BMI

BMI	
25 – 29.9	Overweight
30 – 34.99	Grade I obesity
35 – 39.99	Grade II obesity
≥ 40	Grade III (severe) obesity

Table 5. Recommended daily fluid intake (own compilation) Source: National Association of Hungarian Dietitians (36)

AGE	RECOMMENDED DAILY INTAKE	
	BOYS	GIRLS
2-3 years	1.3 liters	
4-8 years	1.8 liters	
9-13 years	2.1 liters	1.9 liters
14-18 years	2.5 liters	2 liters

Table 3. Symptoms indicating type 2 diabetes mellitus

overweight
weight gain
constant hunger, binge eating, cravings for sweets
weakness and increased fatigue
blurred vision, difficulty focusing
slow wound healing
darkening of the skin in the armpits and neck
frequent numbness of the extremities

Table 4. Most common symptoms of high blood pressure in childhood (30)

♦ developmental delay
♦ irritability
♦ headache, chest pain
♦ flushing and increased sweating
♦ dizziness
♦ nausea
♦ vision impairment
♦ frequent nosebleeds

Table 6. WHO recommendations for regular physical activity for children and adolescents aged 5-17 years (14)

Physical activity recommendations for children and adolescents aged 5-17
At least 60 minutes of moderate-to-vigorous physical activity daily, mainly aerobic
Vigorous-intensity aerobic activity and muscle- and bone-strengthening exercises at least 3 times per week
Limitation of sedentary behavior, especially screen time during leisure time

Figure 2. SMART PLATE® for children aged 6-17 Source: National Association of Hungarian Dietitians, 2018 (33) (OKOSTÁNYÉR® in Hungarian)

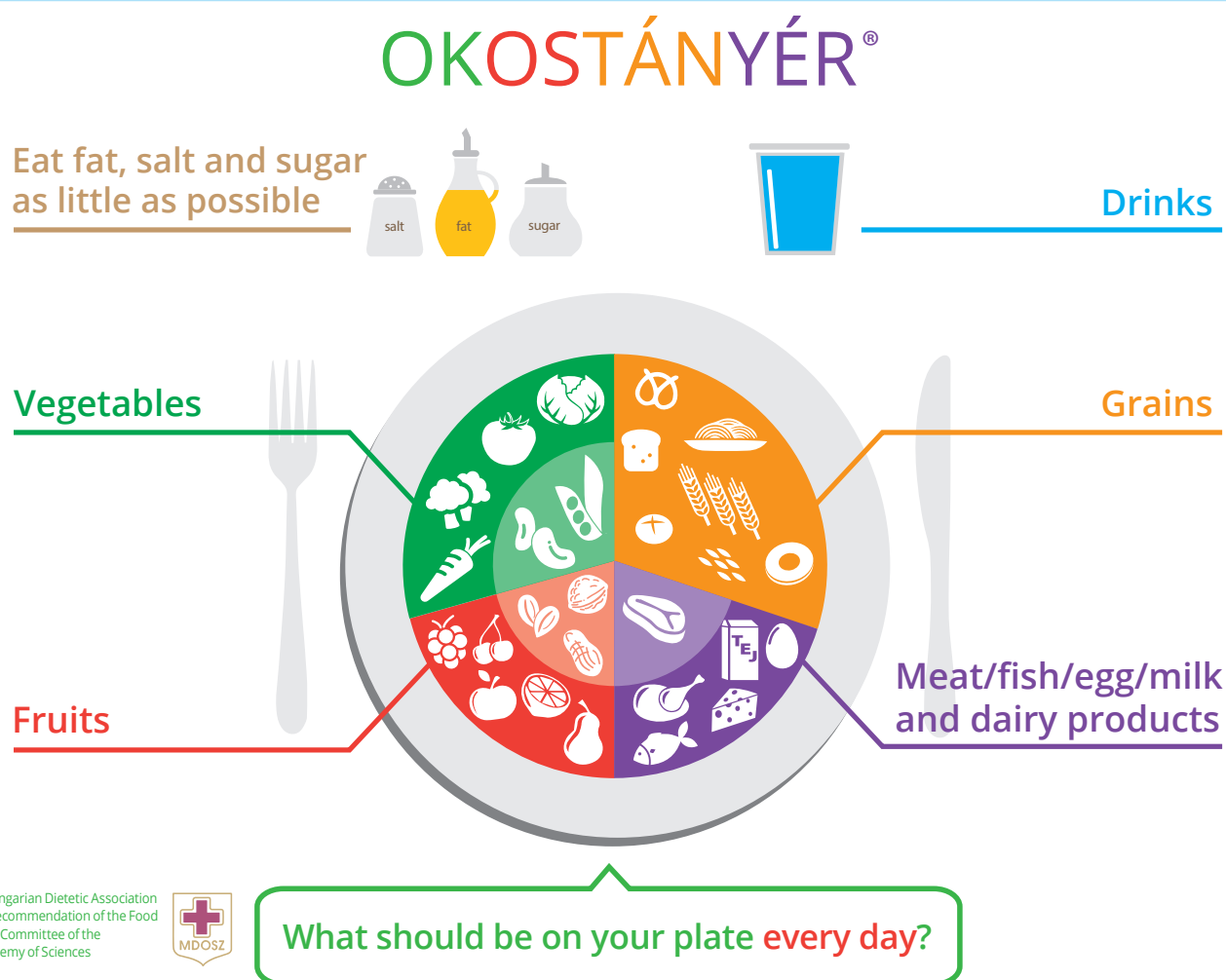
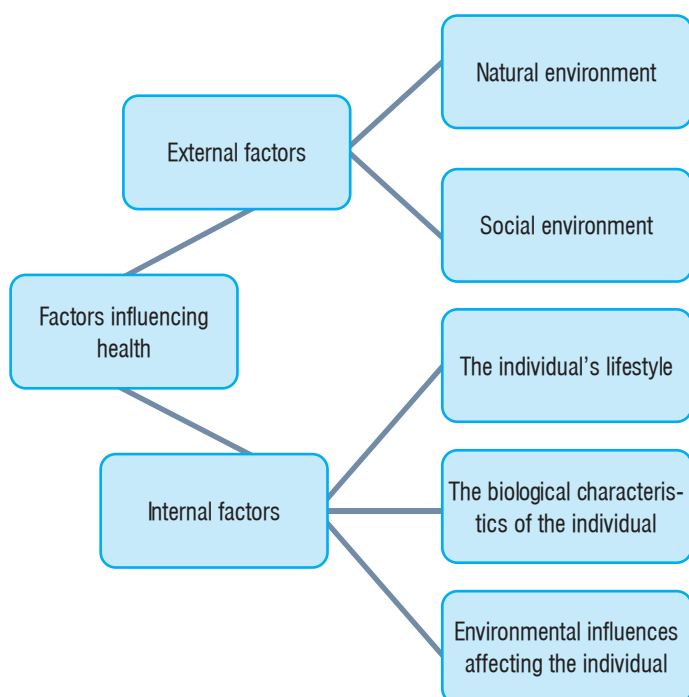


Figure 1. Factors influencing health (own editing)
Source: Hidvégi (4)





Is social media usage among children restricted?

László Szabó^{1,2,3}, Ivett Sófi², Andrea Szabó², Zoltán Ringwald³, Viktória Mátó⁴, Tímea Tóth⁵

¹ Doctoral School, Department of Health Sciences, Semmelweis University, Budapest

² Department of Family Care Methodology, Faculty of Health Sciences, Semmelweis University, Budapest

³ Heim Pál National Pediatric Institute, Budapest

⁴ Institute of Applied Health Sciences and Environmental Education, Gyula Juhász Faculty of Education, University of Szeged, Szeged

⁵ Department of Applied Psychology, Faculty of Health Sciences, Semmelweis University Budapest

Corresponding author: László Szabó szabo.laszlo.md@gmail.com

Abstract

Social media has become one of the most important platforms in daily life and a fundamental medium for socialization and information among school-aged children. A complete ban may be counterproductive; instead, emphasis should be placed on fostering critical thinking and digital literacy. Social media can play a positive role in building social relationships and providing online support. It also offers healthcare professionals an opportunity to access authentic information and to help counter health-related misinformation. Future research should therefore focus on developing and evaluating effective interventions that promote responsible online engagement, prevent problematic use, and preserve the benefits of online social support.

Keywords: social media, pediatrics, addiction, loneliness, education

Introduction

Social media has become one of the most influential platforms in daily life.

We define social media as any online tool that enables users to create and share content publicly or within virtual communities. These platforms (e.g., Twitter, Facebook) are generally characterized by relatively permissive content regulations, allowing users to express opinions more freely than in traditional print media. A complete ban on social media use is likely to be counterproductive; accordingly, the focus has shifted toward fostering critical thinking and digital literacy. In 2025, one of the most essential skills is the ability to critically evaluate online content and maintain a healthy balance between digital and offline activities (digital detox). Evidence from various restrictions affecting adolescents (e.g., smartphone bans, exclusion of transgender youth from sports participation, and book bans) suggests that such measures may have unintended negative consequences for mental health.

By 2025, social media may function as a “digital stethoscope” for physicians, providing insight into the health concerns and needs of the public while facilitating global professional collaboration. The principal challenge remains maintaining professional credibility in an environment where opinion can overshadow scientific evidence (1, 2).

Social media is no longer merely a communication channel for physicians but an increasingly important tool for continuous professional development, professional networking, and social responsibility. The digital presence of the medical community has substantially transformed the patient–physician relationship and the dissemination of medical knowledge.

1. Professional Development and Knowledge Sharing (Med-Ed)

A substantial portion of scientific discourse among physicians has shifted to digital platforms:

“Free Open Access Medical Education” (FOAMed): Physicians rapidly disseminate recent research findings and clinical case discussions through blogs, podcasts, and Twitter (X) threads.

Closed professional groups: Within private Facebook groups or specialized platforms (e.g., Doximity, Sermo), physicians can seek peer consultation – often anonymously – regarding complex diagnostic or therapeutic questions.

Conference amplification: During medical conferences, social media enables real-time dissemination of key messages and discussions to colleagues who are unable to attend in person.

2. Combating disinformation

In 2025, a central role of physicians on social media is the dissemination of reliable, evidence-based information:

“Medfluencers”: An increasing number of physicians engage as digital content creators (e.g., on TikTok or Instagram) to counter health-related misinformation, pseudoscientific claims, and false news in accessible language.

Prevention messaging: Physicians can communicate public health recommendations (e.g., screening programs, vaccination campaigns) directly to the public, circumventing delays associated with traditional media channels.

3. Professional Identity and Practice Management

A digital presence has become increasingly important, particularly for physicians in private practice:

Trust building: By 2025, patients routinely review online ratings and social media profiles before scheduling appointments.

Educational outreach: Publishing professional articles, educational videos, and evidence-based content allows physicians to demonstrate expertise while supporting practice growth.

4. Ethical and legal challenges

Physician engagement on social media is subject to strict regulatory frameworks, which are expected to become even more rigorous:

Patient data protection (GDPR/HIPAA): The sharing of identifiable patient information or images without explicit consent is strictly prohibited.

Professional boundaries: Physicians must maintain appropriate professional distance while remaining approachable. Managing unsolicited “telemedicine” requests via private messages represents a significant source of professional and emotional strain.

5. Mental Health and Collegial Support

Given the high prevalence of burnout in the medical profession, social media plays a dual role:

Supportive communities: Online professional networks may reduce feelings of isolation by fostering collegial support during periods of stress or professional loss.

Adverse effects: Expectations of constant availability and exposure to hostile or aggressive online commentary may further increase psychological burden among physicians (1–3).

The role of social media in pediatrics by 2025 has become twofold: while it serves as an effective channel for disseminating reliable medical information, it also poses significant risks to the health and development of children and adolescents. The presence of pediatricians and healthcare institutions on platforms such as YouTube and Instagram can help counter health-related misinformation by providing parents with credible, evidence-based resources. Social media is also well suited for patient education and for the rapid, broad dissemination of preventive health messages (e.g., vaccination campaigns, healthy nutrition). In addition, online communities may offer children with chronic conditions and their families opportunities for peer connection and emotional support, potentially reducing feelings of isolation (3). At the same time, adolescent mental health indicators have worsened substantially in recent years. In the United Kingdom, the proportion of adolescents (10–24 years) with a probable mental health disorder increased from 10% to 25% between 2017 and 2022 (4).

According to a nationally representative survey of adolescents in the United States, mental health is among the most frequently searched health-related topics online. Ninety percent of individuals aged 13–19 years reported having at least one social media account, and more than half reported daily use exceeding 4 hours. Early and excessive social media use has been associated with sleep disturbances, substance use, cyberbullying, and eating disorders. The most commonly used platform was TikTok, followed by YouTube and Instagram. Notably, 6.3% of adolescents reported maintaining a social media account without their parents’ knowledge (5–9). A European study found that between 2012 and 2014, 42% of children aged 9–12 years had a Facebook account despite age restrictions limiting registration to individuals aged 13 years and older; in many cases, parents were aware of or had explicitly permitted account creation (10).

By 2025, social media has become a fundamental medium for socialization and information exchange in the lives of primary school-aged children. Although the official minimum registration age for most platforms is 13 years, a substantial proportion of Hungarian children are active users even in the lower grades of primary school. In Hungary, nearly half (46%) of children aged 7–16 years use social media daily; this proportion is 69% among

13–14-year-olds and increases to 82% among those aged 15–16 years. Consequently, parental supervision and structured digital literacy education have become critically important beginning in the early years of primary education (11).

Among primary school students, the most popular platform is TikTok, which is used not only for entertainment but increasingly as an informal search engine for information. YouTube remains a primary source of content consumption, particularly gaming-related and short-form videos. Instagram is more prevalent among older adolescents (12–14 years and above), serving as a platform for visual self-expression and peer interaction. Discord and Roblox occupy an intermediate position between social media and gaming platforms, functioning as digital “playgrounds” that facilitate peer communication and community building.

Notably, a large proportion of short-form video content on TikTok is both created and consumed by adolescents, blurring the traditional distinction between content creator and consumer – a contrast to more hierarchical platforms such as YouTube. This observation is consistent with prior research demonstrating that adolescents older than 13 years exhibit significantly higher rates of maintaining undisclosed or “secret” accounts (12, 13).

Adolescent-generated content accounted for approximately half of the analyzed videos, whereas content produced by therapists represented slightly less than half. Only a small proportion of videos were created by parents or other users. Educational videos produced by pediatricians, physicians, physical therapists, and nurses were of higher overall quality, more comprehensible, and contained less misinformation compared with those created by non-healthcare professionals (e.g., patients, caregivers, influencers) (2).

A recent study examining online fan communities reported that sexual and gender minority youth perceived web-based communities as contributing positively to identity development by providing a safe and anonymous environment for self-expression (14).

Emerging evidence supports a nuanced approach to regulating adolescent social media use that includes: (1) abandoning ineffective prohibitive measures, (2) acknowledging the potential benefits of social media engagement, and (3) fostering emotional regulation skills to promote self-regulation among adolescents (15). Such a shift is warranted given the limited effectiveness of strict bans, the documented benefits of online engagement, and the developmental importance of adaptive emotion regulation skills. A Hungarian study identified multiple associations among social comparison, perceived online social support, loneliness, self-esteem, and problematic social media use (16). Consistent with international findings documenting the increasing prevalence of early social media adoption, this study reported that 63.8% of adolescents younger than 13 years had an active social media account (10, 16).

By 2025, social media is no longer merely a leisure activity for high school students (14–18 years of age); it has become their primary arena for socialization, identity formation, and news consumption. At this developmental stage, digital and offline realities are deeply intertwined. Dominant platforms include TikTok and Instagram, which function as spaces for visual self-expression and the cultivation of idealized self-presentation. Adolescents construct and negotiate their digital identities within these environments. Discord serves as a semi-closed, real-time digital community space for peer groups, where learning, gaming, and social interaction often occur simultaneously. In contrast, platforms such as BeReal and Snapchat emphasize more immediate and less curated communication within smaller social circles. Beyond social interaction, these platforms increasingly function as information sources. Many high school students no longer rely primarily on Google or traditional news websites for information retrieval but instead turn to algorithm-driven content streams on TikTok for news, fashion trends, and academic advice. Adolescents are also increasingly seeking health-related information through social media, frequently bypassing traditional healthcare encounters. They value social media for perceived benefits such as overcoming social inhibition, fostering interpersonal relationships, maintaining long-distance connections, and enabling group interactions and shared experiences that may be more difficult to achieve through face-to-face communication alone (14).

Roles and patterns of social media use among children are summarized in the *Table*.

Gender differences in usage are consistently observed. By 2025, social media plays a distinct role among boys that differs substantially from patterns typically seen among girls. Whereas visual aesthetics and direct emotional connection often predominate among girls, boys’ usage more frequently centers on achievement, humor, gaming, and status signaling. Among high school-aged boys and young adult males, social media increasingly functions as a platform for status construction and peer recognition (17).

However, adolescent screen use is associated with a number of health problems, including psychological consequences such as anxiety and depression (18). Social media platforms may negatively influence health through several mechanisms, including targeted advertising and the positive portrayal of risky behaviors. Negative effects and risks on mental health: Excessive social media use is strongly associated with anxiety, depression, low self-esteem, and body image disorders. Physical consequences: Increased screen time often leads to sleep disturbances, decreased physical activity, and obesity. Research suggests that heavy use may impair attention, working memory, and impulse control in the developing brains of children. Experts often refer to “TikTok brain,” describing a shortened attention span

Table: Roles and areas in social media among children

ROLES AND AREAS		
IDENTITY SEARCH AND SELF-EVALUATION	High school years are characterized by personality development. Social media provides opportunities for experimentation but also places considerable pressure on adolescents.	FOMO (Fear of Missing Out): Fear of exclusion is particularly pronounced at this age, contributing to compulsive online presence.
		Social comparison: Continuous monitoring of metrics (e.g., likes, views) directly influences self-esteem and body image.
LEARNING AND CAREER GUIDANCE	Digital portfolio:	Many high school students consciously build a “personal brand” (e.g., on LinkedIn or Instagram) in preparation for university admission or employment.
	Learning communities:	Thematic Facebook groups and YouTube channels play a key role in examination preparation (e.g., matriculation exams, language certification).
SOCIAL AND POLITICAL ACTIVISM	High school students are highly active in social issues (e.g., climate action, education reform).	Social media serves as a primary tool for mobilization and expression, enabling adolescents to articulate generational concerns.
RISKS AND MENTAL HEALTH	Digital footprint:	Adolescents may underestimate the long-term professional consequences of impulsive online posts.
	Radicalization	Algorithm-driven content exposure may reinforce one-sided worldviews or increase susceptibility to misinformation.
	Sleep deprivation	“Doomscrolling” (prolonged, repetitive content consumption) contributes to chronic sleep deprivation and impaired academic performance.
STUDY MANAGEMENT AND COLLABORATION	Messenger and Discord	Primary platforms for class- and cohort-level communication, including sharing notes, exchanging exam materials, and coordinating group projects.
	YouTube and TikTok as educators	A substantial proportion of university students use video platforms to understand complex subjects (e.g., mathematics, coding, anatomy), often preferring them to traditional textbooks.
PROFESSIONAL SELF-IMAGE AND CAREER BUILDING	LinkedIn awareness	By 2025, university students increasingly develop professional profiles, build networks, and seek internships beginning in their first academic year.
	Professional portfolio	Instagram, Behance, or personal TikTok channels may function as digital résumés, particularly for students in creative or communication-related fields.
DOCUMENTING “BECOMING AN ADULT” AND ITS ANXIETIES	Aesthetic University Life (Studygram/StudyTok)	The stylized presentation of studying (e.g., curated notes, studying in cafés) can be motivating but may also create unrealistic expectations.
	Financial Awareness and “Side Hustle”	Many university students use platforms to identify secondary income opportunities (e.g., content creation, online sales) or to access financial and investment information.
MENTAL HEALTH AND “SOCIAL BURNOUT”	Academic FOMO	Constant exposure to peers’ achievements (e.g., scholarships, social events, career milestones) may increase impostor syndrome and anxiety.
	Mindfulness (Digital Detox)	By 2025, counter-movements have emerged, including the use of basic mobile phones (“dumb phones”) or app-blocking tools during examination periods to maintain focus.
COMMUNITY ACTIVITY AND NETWORKING	University organizations	Student governments (HÖK), dormitories, and sports clubs primarily communicate via Instagram and Facebook events.
	Getting to know each other	Dating and forming new friendships increasingly occur through digital platforms (e.g., Tinder, Bumble, or interaction via Instagram stories).

and reduced capacity for sustained, in-depth thinking due to rapid, high-intensity content consumption. Cyberbullying: Primary school-aged children are emotionally vulnerable; ostracism or bullying in group chats and comment sections can result in significant self-esteem problems (15, 19, 20).

Current evidence regarding the effectiveness of bans in improving adolescent mental health remains limited and inconclusive. Furthermore, peer support on these platforms appears to be mutually beneficial, as providing and

receiving online support can improve individual mental health and coping strategies (21). Leading pediatric experts have called for the development of guidelines and regulations governing pediatric content on social media to reduce misinformation (22). Since complete bans at this age are likely to be counterproductive, the focus has shifted to fostering critical thinking and digital literacy. The most important skills in 2025 are the ability to critically evaluate content and maintain a healthy online-of-line balance (digital detox).

Professional recommendations

By 2025, physicians and professional organizations (such as the American Academy of Pediatrics [AAP]) recommend no screen time (with the exception of video calls) for children younger than 18–24 months and no more than 1 hour per day for children aged 2–5 years. Families are encouraged to create a family media plan that designates screen-free times and locations (e.g., mealtimes, bedrooms). Parents should be present, actively monitor their child's online activities, and engage in ongoing discussions about the content being viewed (23).

The North American Society of Pediatric Gastroenterology, Hepatology, and Nutrition (NASPGHAN) has recently published a position paper advocating for the integration of social media into medical education and academic promotion frameworks (22).

Future research should focus on developing and evaluating effective interventions that promote responsible online engagement, aiming to prevent problematic social

media use while preserving the benefits of online social support. Further investigation is needed into the motivations underlying early adolescents' creation of undisclosed ("secret") social media accounts and whether such accounts are associated with problematic screen use or other addictive behaviors. Research should also prioritize improving the quality, credibility, and authenticity of digital health content while maintaining user engagement through creativity, self-expression, and relatability. Leveraging widely used social media platforms and community-engaged research approaches to disseminate evidence-based content may help bridge the translational research gap. Additionally, future studies should examine how adolescent-focused platforms such as TikTok and Instagram can be utilized to deliver evidence-based mental health information, resources, and coping strategies; strengthen social connectedness; reduce barriers to mental health service utilization (e.g., stigma); and counter mental health-related misinformation (24, 25).

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The Effects of Social Media and Influencers on Generation Z

Ivett Sófi¹, László Szabó^{1,2}, Adrienn Szabó¹, Zoltán Ringwald², Veronika Mátó³

¹Department of Family Care Methodology, Faculty of Health Sciences, Semmelweis University, Budapest, Hungary

²Heim Pál National Pediatric Institute, Budapest, Hungary

³Department of Health Sociology and Lifestyle, Juhász Gyula Faculty of Education, Institute of Applied Health Sciences and Environmental Education, University of Szeged, Szeged, Hungary

Corresponding author: Ivett Sófi, Semmelweis University, Faculty of Health Sciences, Department of Family Care Methodology, 1088 Budapest, Vas street 17, Hungary, e-mail: ivettsofi@gmail.com, ORCID: 0009-0008-6530-7747

Abstract

Social media plays a central role in Generation Z's daily lives, shaping communication, social interactions, and digital behaviors. This study aimed to examine social media usage patterns, the influence of online content creators, and smartphone attachment among young adults aged 18–29. A quantitative online survey was conducted with 150 participants using a questionnaire that included closed-ended items, a four-point Likert scale, short-answer questions, and one open-ended prompt regarding social media's benefits and drawbacks. The majority of respondents reported daily use of Instagram and TikTok (88%), followed by Snapchat (78.7%) and Facebook (72.7%). Influencers were most frequently followed on Instagram (59.3%) and YouTube (34%), primarily for interest and entertainment purposes. Daily social media use ranged from 1 to over 6 hours. Attitudes toward influencer advertising were mixed, with over half of participants expressing neutral or critical views. Social media was primarily used for communication, maintaining relationships, and information-seeking. Signs of strong smartphone attachment, digital addiction, and fear of missing out (FoMO) were also observed. These findings underscore the multifunctional role of social media in Generation Z's lives and highlight the need for conscious digital engagement, mental health promotion, and preventive programs addressing influencer marketing and digital addiction.

Keywords: *social media; Generation Z; digital communication; influencers; mental health; digital addiction*

Introduction

In recent years, the rise of digital technologies and social media has significantly transformed young people's daily communication, information-seeking habits, and social relationships, particularly among Generation Z (born 1995–2010). These platforms provide opportunities for entertainment, self-expression, and maintaining social connections, while simultaneously posing challenges and risks. Excessive social media use has been associated with sleep disturbances, body image concerns, emotional difficulties, and an increased risk of online harassment and cyberbullying (1, 2). Moreover, exposure to idealized self-images and constant social comparison on these platforms may negatively affect self-esteem and mental health (3). As Generation Z spends a substantial por-

tion of their lives in digital environments, social media platforms are particularly influential (4). A recent report by the McKinsey Health Institute (5) highlighted that, while social media offers benefits, it can also contribute to stress, anxiety, and social isolation. This study aims to examine social media usage patterns, digital addiction, and the influence of online content creators to better understand their impact on mental health and to promote more conscious digital behaviors.

Methods

A quantitative, survey-based design was employed to investigate social media usage patterns, influencer impact, and smartphone attachment among Generation Z. A to-

tal of 150 participants aged 18–29 were recruited online. Women comprised 60% and men 40% of the sample. Nearly half of participants resided in the capital (45%), while 19% lived in other cities, 19% in county-level towns, and 17% in villages or small towns. More than half (54%) were university students, 27.3% were employed, 30% both studied and worked, 0.7% were on parental leave, and 2.1% reported other statuses.

The questionnaire included closed-ended items, a four-point Likert scale (1 = “Completely true” to 4 = “Not true at all”), short-answer questions, and one open-ended question regarding social media’s advantages and disadvantages. Data were collected via Google Forms, allowing rapid and anonymous completion on computers or mobile devices, with automated data processing. The study was conducted in accordance with the Declaration of Helsinki, and participation was voluntary and anonymous.

Results

Figure 1 illustrates daily social media usage. Instagram and TikTok were used daily by 88% of respondents, followed by Snapchat (78.7%) and Facebook/Messenger (72.7%). Twitter/X, Tumblr, and Reddit were used daily by only 0.7% of participants. Figure 2 shows the platforms where participants follow influencers: 59.3% on Instagram, 34% on YouTube, and 28% on TikTok, while 32% did not follow any influencers. Motivations for following influencers (Figure 3) included interest (58%), entertainment (47.3%), and keeping up with trends (20.7%), with 38% not following any influencers. Time spent on social media is presented in Figure 4: 1 hour (5%), 2–3 hours (17%), 4 hours (22%), 5 hours (16.4%), 6 hours (10.6%), and more than 6 hours (12%). Opinions on influencer advertising (Figure 5) were mixed: 52% neutral, 23.3% investigated promoted products, 20% found influencer marketing off-putting, 4% irritating, and 0.7% were motivated to purchase advertised products. Social media usage purposes are shown in Figure 6: conversation (93%), maintaining connections (82.7%), entertainment (75.3%), information-seeking (68.7%), learning (46%), work (26.7%), and dating (16%). Table 1 presents attitudes toward smartphone use. For the statement, “I take my phone everywhere with me, even to the bathroom; I would feel uncomfortable if I missed something,” 18.7% responded “completely true,” 30.7% “rather true,” 26.7% “rather not true,” and 24% “not true at all.” For “I do not like being without my phone, even for a short time,” 16% answered “completely true,” 28.7% “rather true,” 26% “rather not true,” and 29.3% “not true at all.”

Fear of missing out (FoMO) was also assessed. Participants reported taking their smartphone everywhere as “rather true” (mean = 2.44) and not liking being without their phone as “rather not true” (mean = 2.31).

Figure 1: Distribution of daily social media usage among study participants (N=150)

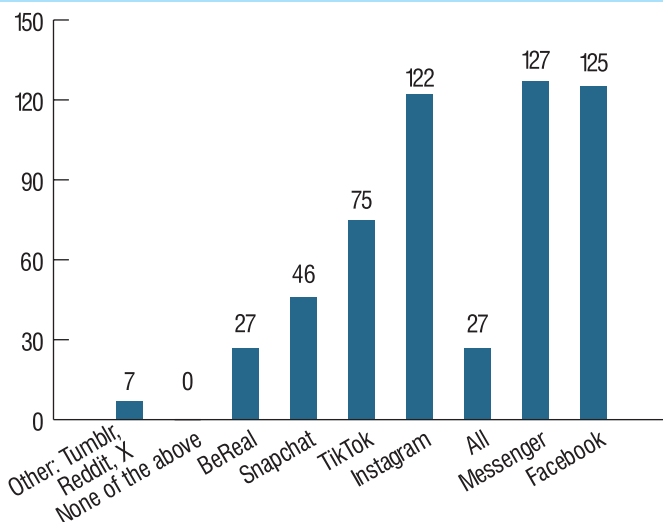


Figure 2: Distribution of participants' following of influencers by platform (N=150)

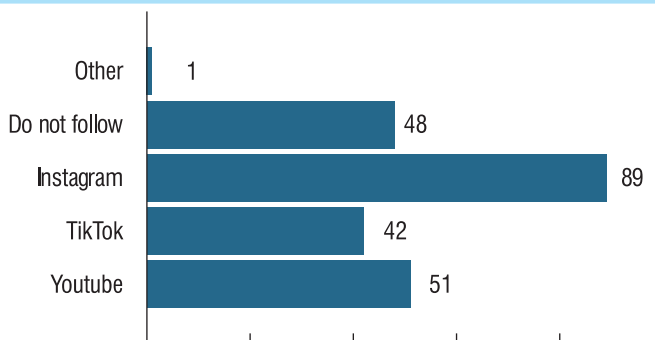
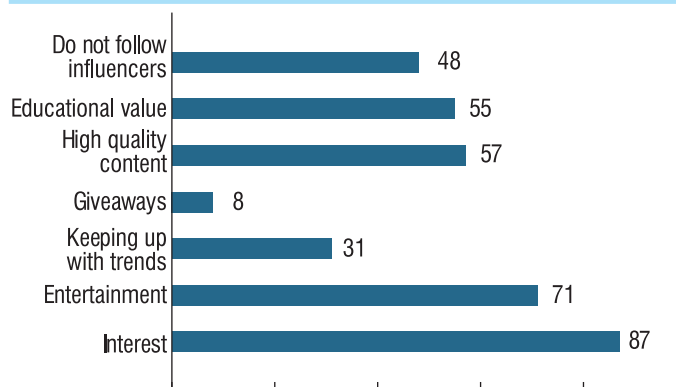


Figure 3: Distribution of individuals involved in the study based on interest (N=150)



Discussion

The results indicate high daily social media usage among this age group, consistent with recent international findings (5, 6). The dominance of Instagram and TikTok reflects rapid changes in the digital landscape and the growing

Table 1: Distribution of FoMO among respondents (N=150)

Statements	Not true at all Rather not true Rather true Completely true
I take my smartphone everywhere with me, even to the bathroom; I would feel uncomfortable if I missed something.	This statement is rather true (mean: 2.44).
I do not like being without my phone, even for a short time.	This statement is rather not true (mean: 2.31).

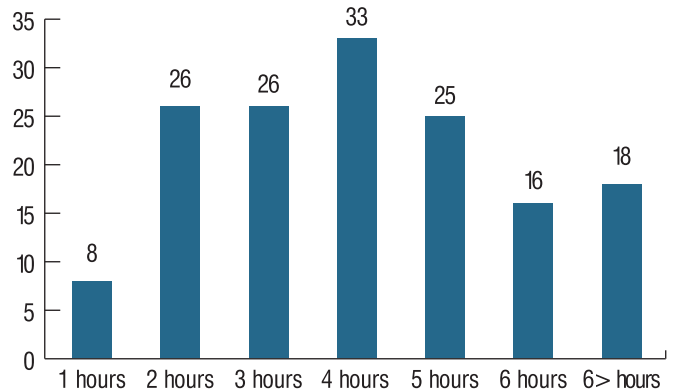
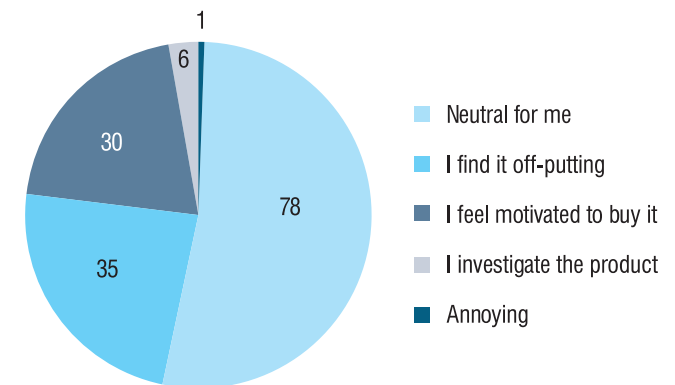
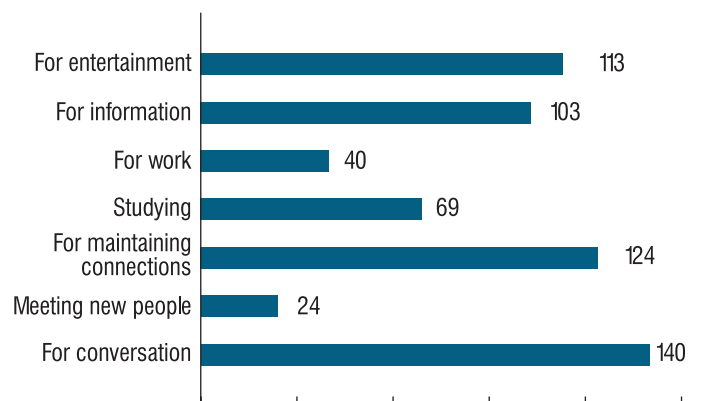
importance of visual content (7). Motivations for following influencers were primarily related to entertainment and trend-following, suggesting that influencers function as both cultural and social phenomena (6, 8). Mixed opinions on influencer advertising indicate increasing consumer critical awareness of digital marketing strategies (6, 9). Social media was mainly used for maintaining relationships and obtaining information, highlighting its multifunctional role as a social network (5, 10). Strong attachment to smartphones underscores concerns regarding digital addiction and fear of missing out (FoMO) (5, 11). Excessive use has been linked to higher anxiety and depression among Generation Z (3, 6). Additionally, issues such as digital self-harm and unauthorized sharing of images highlight digital safety and data protection concerns (5, 12). A decrease in sensitivity to likes and external validation may indicate positive digital well-being, consistent with recent studies on self-esteem and online behavior (5, 13–15).

Limitations

This study relied on self-reported data, which may be subject to bias. The sample was limited to Hungarian participants, potentially affecting generalizability. Due to the limited scope and sample size, only descriptive analyses were conducted. Future research should include larger and more diverse samples and employ mixed-method approaches to better explore causal mechanisms and cultural differences. Inferential statistics, such as correlations or regressions, could be used to examine relationships between social media use, influencer exposure, and mental well-being.

Conclusions

These findings provide insight into Generation Z's social media use and highlight the importance of promoting digital awareness and preventive programs to support mental and social well-being (5, 6). Educators and mental health professionals are encouraged to foster digital literacy and develop interventions that promote balanced social media use and critical engagement with influencer content.

Figure 4: Daily time spent on social media by young adults in the research sample (N=150)**Figure 5: Distribution of opinions on influencer advertising (N=150)****Figure 6: Distribution of social media usage by purpose (N=150)**

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Conflict of Interest

The authors declare no conflict of interest.

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Substance use during pregnancy, the role of social support, stigma, and environmental influences

Adrienn Szabó¹, Ildikó Nagyné Baji^{2,3}, Ivett Sófi¹, Zoltán Ringwald⁴, László Szabó^{1,4,5}

¹ Department of Family Care Methodology, Faculty of Health Sciences, Semmelweis University, Budapest

² Department of Applied Psychology, Faculty of Health Sciences, Semmelweis University, Budapest

³ Vadaskert Foundation, Budapest

⁴ Heim Pál National Pediatric Institute, Budapest

⁵ Doctoral School, Department of Health Sciences, Semmelweis University, Budapest

Corresponding Author: Adrienn Szabó; e-mail address: szaboadrienn567@gmail.com

Abstract

Purpose: This research examined substance use among Hungarian pregnant women, highlighting the importance of prevention and the role of the Sober Babies Association. Studies indicate a rising prevalence of substance use during pregnancy. The primary aim of this research was to expand understanding of the problem.

Methods: Five in-depth interviews were conducted with women who used substances during pregnancy. These interviews provided valuable insights into the underlying causes, personal experiences, and consequences of substance use during pregnancy.

Results: The Sober Babies Association supports pregnant women struggling with substance use and their families. The study highlights the positive role of social support, the impact of stigma, and the challenges arising from lack of support and feelings of marginalization within the healthcare system. By analyzing the experiences of both the participants and the association, this work emphasizes the importance of raising awareness, providing reassurance, and promoting specialized services among healthcare professionals.

Conclusions: The findings suggest that increasing the visibility and accessibility of supportive organizations like the Sober Babies Association can improve the well-being of pregnant women using substances. This research underscores the need for pregnancy care systems to adapt to the evolving needs of women, with greater attention to psychosocial support, prevention, and destigmatization.

Keywords: addiction, pregnancy, support, prevention, stigma, mothers

Introduction

Individuals may adopt maladaptive coping strategies, such as alcohol or drug use, to manage stress or emotional difficulties. For pregnant women, substance use presents particularly serious risks, as it can cause irreversible harm to the developing fetus. Addiction not only affects the individual but also has significant consequences for their families, including partners, children, and broader social networks.

Therefore, special attention and support are required when addressing substance use during pregnancy, with

family involvement being crucial. In Europe, the prevalence of substance use among pregnant women is notably high, and Hungary is no exception. The consumption of drugs and alcohol during pregnancy has been increasing, though reliable data are limited. Pregnant women often underreport illicit substance use due to fear of legal repercussions, social stigma, and potential negative consequences. In some cases, substance use is only identified when symptoms appear in the newborn (1).

The Sober Babies Association, established in Hungary in 2006 and providing low-threshold services since 2008,

aims to support substance-using pregnant women and their families.

This thesis explores the mental health, social circumstances, and specific needs of substance-using pregnant women in Hungary, alongside the services provided by the Sober Babies Association. It highlights the lack of social support, the harmful effects of substance-using environments, and the stigma experienced by women within the healthcare system. Furthermore, it examines how preventive measures, tailored care, and community support can be enhanced to better serve this vulnerable population.

As a gap-filling service, the Sober Babies Club in Budapest has developed anonymous support services for pregnant women, parents, and their children affected by substance use. The organization operates as a self-help group for parents who use drugs and actively participate in the care process.

Its work focuses not only on supporting the adult client but also on representing the interests of the fetus, newborn, infant, or young child, who are unable or only partially able to express their own needs. In 2008, the Sober Babies Club began a model program at its Józsefváros client center.

Addiction is a multifaceted condition affecting a large proportion of the population. It can be transmitted across generations, with high inheritance rates for various substances (2). The development of addiction is influenced by daily exposure to addictive stimuli, economic conditions, social environment, parental upbringing, personality, socialization, social status, and genetic predispositions (3). Attachment disturbances often precede substance use problems (4).

Materials and methods

Presentation of sampling and material description

Data were collected through interviews with mothers who had previously registered with the Sober Babies Association. Participants were former and current clients of the association who had received significant support during or after their pregnancies.

A total of five in-depth interviews were conducted with mothers who had used drugs – sometimes multiple substances simultaneously – during pregnancy. The first interview took place in 2020, and the remaining four were conducted in 2021, based on contact information provided by the association's leaders.

Interviews were conducted at the association, by phone, or via video call. Data were collected regarding the mothers' children's age at birth, details of their pregnancies, social circumstances, social support, substance use, attendance at prevention lectures, contact with health visitors (both school-based and local), and mental health prior to and during substance use.

The first interview was conducted online via video call, considering the pandemic and the participant's location, and lasted approximately 90 minutes. The second interview was conducted by phone following prior arrangement, while the remaining three were conducted in person at the association in a private room, allowing for more personal interaction. During my research stay, I also participated in group sessions with clients, which were highly family-like in atmosphere. This allowed me to observe firsthand the extensive work the Sober Babies Association undertakes daily to support pregnant women, mothers, and families in need.

Method

The case study method was applied. Based on the interviews, I sought to answer my research questions and confirm or potentially refute my hypotheses. For this topic, this method was considered most effective, as it allowed for a detailed and realistic understanding of participants' experiences. Data collection was therefore carried out through interviews, followed by analysis of the interview material.

Results

The Sober Babies Club primarily consisted of women in their twenties who were current or former drug users. The founders defined the operational principles of the community themselves, without adopting practices from other self-help groups (e.g., peer support or experiential support), as they had not previously attended such groups.

Two additional groups were also active: "Strength for Change", aimed at abused women, and the "Guardians Group", for grandparents or relatives raising children as guardians. Participants in "Strength for Change" learned to manage strong emotions, build trust, and develop self-esteem, while recognizing warning signs to reduce the likelihood of entering abusive relationships.

The club has conducted its programs in cooperation with the Hungarian Human Rights Foundation (MEJOK), which maintains its central office in Józsefváros, Budapest VIII district – an area considered a health and social crisis zone (5). The office provides legal aid and addiction services. The club seeks to mitigate individual, community, and societal harms caused by substance use, addressing social, economic, and health-related aspects of these issues (6).

Prior to the interviews, I spoke with the association's leaders, who provided information about the services generally available at the Sober Babies Association and the specific circumstances and opportunities during the pandemic. As the only organization in the country providing specialized addiction support for pregnant women, many women using psychoactive substances are referred to them.

Figure 1: Number of respondents who had a substance user in their immediate environment at the time they initiated substance use

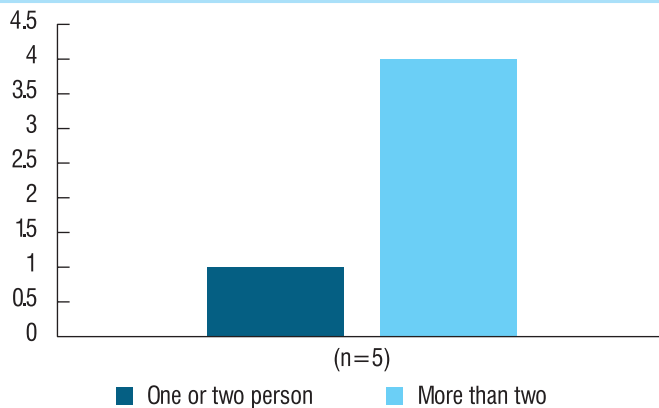
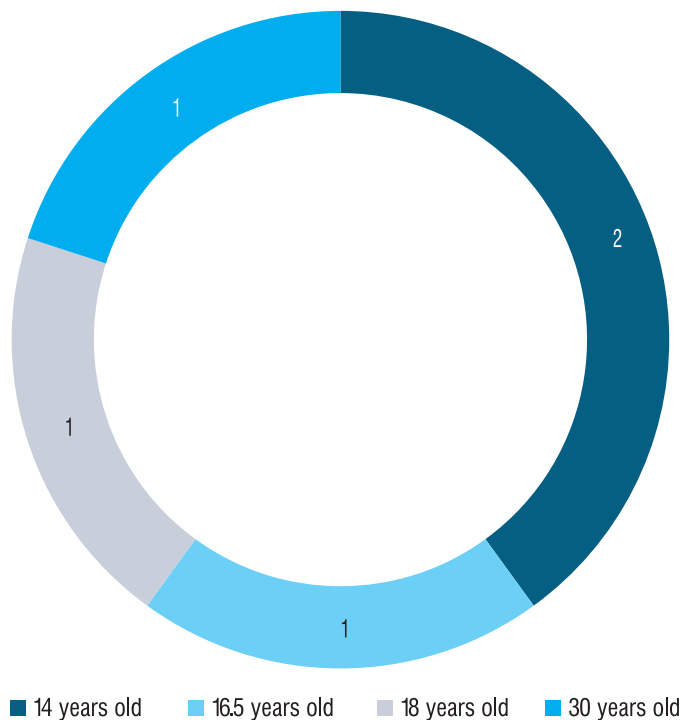


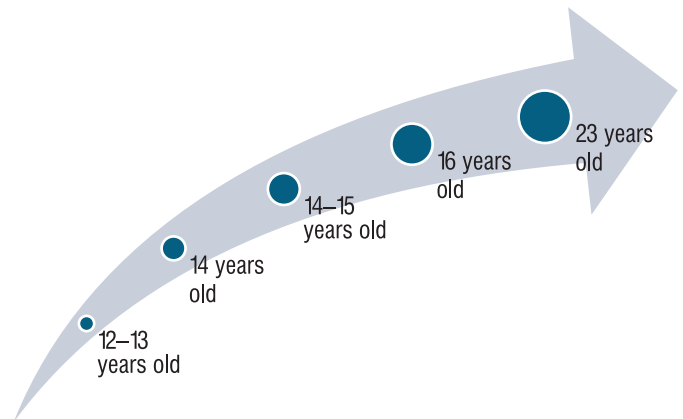
Figure 3: Age of the respondents when they began regular substance use (n = 5)



According to the association's leaders, during the interview period – from spring 2020 to February 2021 – there were few pregnant clients, as the pandemic significantly affected the lives of most of the club's target population. Following the easing of coronavirus restrictions, several services at the Sober Babies Association became available from June 1, 2020. During June, July, and August, activities included art therapy, social counseling, child psychology, behavioral therapy, and legal aid. These diverse programs aimed to promote creative engagement, social activity, and problem-solving skills.

During colder months, clients often had to find suitable accommodations outside Budapest, but crisis support re-

Figure 2: Age of the women at the time of their first substance use (n = 5)



mained available via online consultations and counseling. Pregnant women, parents, legal guardians, and children could access the association's services from anywhere in the country, including psychiatric treatment or homelessness support. Online consultation also facilitated initiation of healthcare, legal, or social services and connection to peer-support groups.

Family functioning is considered equally important as substance use itself, as parental drug use during conception, pregnancy, birth, or early childcare creates a critical situation. The leaders emphasized that building trust with each expectant mother and informing them of available resources is the most effective way to protect the health of unborn children. Their goal is to promote social equality for women and their children.

The "Alternative Prenatal and Family Care" program targets individuals affected by drug use, particularly pregnant women or parents caring for newborns and infants (7). Clients receive initial information about the program and access to self-help groups and anonymous professional counseling via the internet and printed materials. A distinctive feature is the "motivational voucher", which rewards clients for attending a set number of sessions with vouchers for essential goods such as diapers, clothing, and food. This support addresses the needs of clients living in poverty who may otherwise lack access to these items during pregnancy or after birth. Research interviews may also be integrated into these motivational sessions (8).

In connection with this program, the interviews revealed that all respondents had been exposed to substance use within their immediate environment at the time of initiation, most commonly through parents, step-parents, or peers, as illustrated in *Figure 1*. *Figure 1* shows how many of the respondents had a substance user in their immediate environment when they first initiated substance use.

Figure 2 presents the respondents' ages at the time of first substance use. The age of initiation ranged from early adolescence to young adulthood, with the majority starting between ages 12 and 16. Only one respondent began after age 18; she was 23 at the time.

Figure 3 shows the age at which respondents began regular substance use. Regular use generally developed later than initiation, though individual trajectories varied, ranging from 14 to 30 years. Overall, initiation most commonly occurred during early to mid-adolescence.

Figure 4 illustrates the availability of stable social support during pregnancy while using substances. All respondents reported having access to some form of social support during at least one pregnancy. In most cases, support came from the biological fathers of their children, while in some instances, close family members such as mothers or grandmothers provided assistance. However, the presence of stable support was not consistent across pregnancies; one respondent reported receiving no support during her last pregnancy.

Figure 5 depicts respondents' experiences of stigmatization within the healthcare system. Most participants reported at least one instance of stigmatizing behavior by healthcare professionals, whereas one respondent indicated that she had never experienced such treatment.

These findings underscore the diverse social backgrounds and healthcare experiences of the women in the study. Given this diversity, the Alternative Prenatal and Family Care program plays a particularly important role by providing a flexible, low-threshold form of support that addresses not only substance use but also the broader social and economic challenges faced by this population. By combining professional counseling, peer support, and material incentives, the program can help improve engagement with care among pregnant women and parents affected by substance use.

Clients often encounter fundamental communication challenges, struggling to express personal needs and problems. These difficulties can result in avoidance of care services or prenatal visits. A primary goal of the program is to assist clients in establishing professional relationships, articulating their needs, and communicating effectively with healthcare providers. Sharing accurate information about each case with the healthcare system throughout the care process improves communication between healthcare professionals and clients. Research suggests that structured, conscious descriptions of personal health status enhance the effectiveness of therapeutic relationships (9).

Since 2015, the Family Visiting Mobile Team, supported by the Ministry of Human Resources (EMMI), has operated primarily in Budapest, maintaining contact with individuals and families in crisis or experiencing addiction or mental health issues. Support is provided in hospitals, homes, and public spaces, with both professional and peer helpers involved.

Additionally, the Sober Babies Association runs a six-bed supported housing facility in the leaders' own home. This residential, independent-living program offers mothers and their children a safe environment, free of charge (with optional contributions). Many residents have histories of institutional care and high rates of abuse, yet all have demonstrated the capacity to live together harmoniously.

Figure 4: Number of respondents who had stable social support during pregnancy while using substances (n = 5)

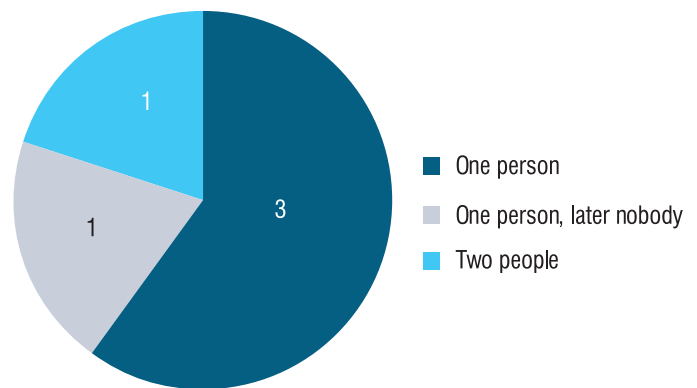
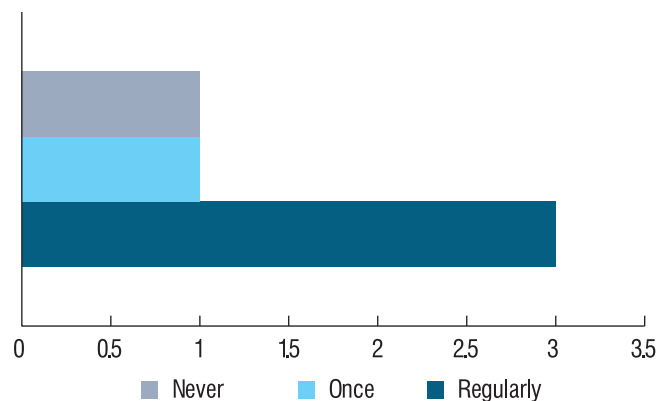


Figure 5: Number of respondents who experienced stigmatization from healthcare professionals within the healthcare system (n = 5)



Discussion

Women often describe their experiences in greater detail than men, frequently presenting fragmented narratives that require helpers to construct a coherent understanding. Previous literature indicates that most pregnant women who use drugs live in disadvantaged social conditions, lack knowledge of the risks associated with substance use during pregnancy, and often experience psychiatric disorders. Their lifestyle can negatively impact fetal development, with pregnancies frequently unplanned and sometimes inadequately monitored, increasing the likelihood of complications. Although drug use among pregnant women in Hungary is rising, reliable data remain limited, partly due to fear of stigma and legal repercussions. Obstetric care may also be hindered by healthcare professionals' reluctance or prejudices, a phenomenon documented even in developed Western countries (1, p. 10).

Early insecure attachment has been shown to predict later addictive behaviors, highlighting the complex interplay of biological, social, and psychological factors in addiction.

The “Preparing for Drug-Free Years” program is a five-session American training course available to any interested parent. It aims to teach conflict-resolution strategies, detection of key signs of drug use, and parenting guidance. Results from a well-designed randomized study involving 667 families showed that adolescents whose parents participated in the program used drugs less frequently during follow-up (10, 11).

The goal of comprehensive health promotion programs is to be effective across multiple settings, rather than restricted to a single context, supporting what could be described as full-spectrum health development projects. School-based prevention programs can reach a large proportion of young people and are relatively cost-effective. However, individuals who have left formal education are not reached by these programs, despite often representing a high-risk group for engaging in risky behaviors (11). Therefore, involving parents and foster parents in prevention efforts is essential, targeting the family as a whole (11). Evidence suggests that universal, family-based prevention programs can reduce substance abuse (10). Key factors include parenting skills, parent-child communication, interparental communication, parental substance use, support provided to the child, and the child’s stress tolerance.

The association’s services encompass prenatal care, counseling, coordination of addiction treatment, and legal assistance. Its approach prioritizes the well-being of the fetus or newborn, encouraging mothers to adopt substance-free behaviors while engaging families in supportive programs and community activities. These initiatives aim to reduce social isolation and foster integration into broader social and familial networks. Health visitors play a pivotal role in this process.

In Hungary, health visitors are specialized healthcare professionals who regularly visit pregnant women at home, monitor their physical and psychosocial well-being, and provide guidance on parenting and child development. They act as a bridge between families and the healthcare system, facilitating early identification and intervention when challenges arise.

Health visitors can be the first professionals to detect signs of substance use and provide tailored support for both the mother and her family. Their focus extends beyond physical health to include mental well-being, and they often serve as trusted intermediaries, promoting effective communication with other institutions and professionals.

The findings from the present qualitative interviews align with previous research emphasizing the influence of early social environments on the development of substance use. All interviewed women reported exposure to substance use within their immediate family or peer environment at the time of initiation, supporting the notion that early normalization of substance use increases vulnerability to later addiction. Moreover, the early age of first use reported by most respondents is consistent with literature identifying adolescence as a critical period for the emergence of risky behaviors.

The interviews further highlight the critical role of social support during pregnancy. Although all respondents reported access to some form of support at least during one pregnancy, this support was often unstable or situational. This finding reflects the fragmented social networks documented in the literature and may partly explain the challenges women face in maintaining substance-free behaviors during pregnancy. Consistent with previous studies, interactions with the healthcare system were frequently characterized by experiences of stigmatization, which can deter women from seeking timely prenatal care or addiction-related services.

Taken together, these qualitative findings underscore the importance of integrated, family-oriented, and nonjudgmental interventions. Programs that combine professional support, social network involvement, and practical assistance – such as incentive-based or low-threshold services – appear particularly effective in addressing the complex needs of pregnant women affected by substance use. These results also emphasize the pivotal role of frontline professionals, including health visitors, who often serve as the first point of contact and can facilitate early identification, trust-building, and coordinated care.

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Statements & Declarations

Dear Editors,

We, the authors, hereby submit our manuscript entitled “Substance Use during Pregnancy, the Role of Social Support, Stigma, and Environmental Influence” for consideration for first publication. We declare that the manuscript is original, that all authors are familiar with its content and agree with its submission. There are no conflicts of interest among the authors. For the purpose of publication in Hungarian Pediatrics, the authors waive the right to further publication. No financial support was received for the research or the preparation of this manuscript.

Budapest, 29 December 2025

*Adrienn Szabó
Ildikó Nagyné Baji dr.
Ivett Sőfi
Zoltán Ringwald dr.
László Szabó prof. dr.*

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Author Contributions

All authors contributed to the study conception and design. Data collection and analysis were performed

by Ildikó dr. Nagyné dr. Baji, and Adrienn Szabó. The first draft of the manuscript was written by Adrienn Szabó. All authors read and approved the final manuscript.

Consent to participate

Informed consent was obtained from all study participants.

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Preparedness of mothers with premature with preterm infants regarding discharge

Szonja Virág Schrödl, Katalin Eszter Müller

Family Care Methodology Department, Institute of Health Science, Semmelweis University, Budapest, Hungary

Corresponding author: Katalin Müller, e-mail: muller.katalin@semmelweis.hu

Abstract

Premature birth remains a major global public health concern. Mothers of preterm infants face particular challenges, especially after hospital discharge when they must independently care for their children. Maternal self-confidence is a crucial factor in infant development, strongly influences the experience of the maternal role, and plays an important role in the formation of the mother–child relationship.

The aim of our research was to find out what kind of information preterm mothers receive during their hospital stay regarding the care of their baby, and how confident they are in performing care activities in the period before returning home.

Our findings indicate that nearly half of the mothers did not receive adequate information during hospitalization. In most cases, education focused primarily on basic caregiving activities (e.g., feeding, diapering, safe holding). More advanced aspects of home care – such as medication administration, management of fever, and basic resuscitation knowledge – were addressed less frequently. A significant association was found between maternal confidence levels and the mode of information delivery. Mothers who were given hands-on instruction and the opportunity to independently practice caregiving reported higher levels of confidence. The quality and method of information transfer play a key role in strengthening maternal confidence.

Keywords: *preterm birth, preterm care, Home care*

Introduction

Premature birth remains a major global public health concern. The World Health Organization's 2022 recommendations on the care of preterm and low birth weight infants emphasize that maternal closeness and active involvement in care have positive effects on infants' physical health as well as their mental and emotional development (1).

From a midwifery perspective, supporting families, pregnant women, and children requiring increased levels of care is a fundamental responsibility. This is particularly relevant for preterm infants and their families. National regulations governing regional midwifery care also place special emphasis on the provision of enhanced support for this population (2). Preterm infants and their families require specialized and individualized care.

A study conducted in Szeged, Hungary, provides guidance on the provision of information to mothers following preterm birth, including the nature, quality, and

quantity of information delivered. The study examined maternal perceptions of care and analyzed differences between groups categorized by gestational age and birth weight (3).

Premature birth is a significant issue worldwide, including in Hungary. Statistical data underscore the magnitude of the problem. According to a longitudinal study examining trends between 2010 and 2020, approximately 134 million infants were born preterm in 2020. On average, preterm births account for 9% of live births globally, with the highest rates reported in South Asia (13%) in 2020. The majority of preterm births occur in less developed and economically disadvantaged regions (4).

From a parental perspective, preterm birth represents a highly stressful life event and constitutes a risk factor for mental health problems, including depression and anxiety disorders. The risk is associated with gestational age at birth; the earlier the infant is born, the greater the likelihood of subsequent parental psychological distress (5).

Creating a calm and low-stress environment in neonatal care units is essential. Efforts should also be made to promote adequate pain management. Close physical and emotional contact with caregivers serves the child's best interests, facilitating calming, pain relief, a sense of security, and recovery (6).

The challenges of caring for a preterm infant are particularly evident in the elevated levels of stress and anxiety experienced by mothers following premature birth. Anxiety may further increase after discharge, when mothers lose the continuous professional support available in the hospital setting (7). During a short period, mothers must acquire substantial new knowledge and independently apply it in the care of their infant, which can contribute to heightened anxiety (8, 9). In many cases, mothers voluntarily isolate themselves with their infant out of concern about exposure to infections brought by visitors. This isolation may lead to loneliness and the weakening or loss of social relationships (10).

Research subject, material, method

The aim of our study was to assess the information received by mothers of preterm infants in Hungary regarding infant care and to evaluate their self-confidence related to caregiving. We examined the form in which mothers received information prior to their infant's discharge and gathered data on their perceptions of the adequacy and quality of the information provided.

A questionnaire-based method was used to assess maternal self-confidence in caring for a preterm infant, as well as the quality of information received. We developed a self-designed, online questionnaire based on a review of recent literature. The instrument included single-choice, multiple-choice, closed-ended, and open-ended questions. Participation was voluntary and anonymous. The questionnaire was created using Google Forms. Maternal self-confidence was measured for each caregiving activity using a 5-point Likert scale

(5 = felt completely confident; 1 = did not feel confident at all).

We distributed the questionnaire via social media platforms and thematic online groups. These groups primarily consisted of peer-support communities and self-help groups for parents of preterm infants. The National Association for Premature Babies also shared the questionnaire within their closed online groups. Consequently, the study population included mothers of preterm infants born in Hungary who were members of online support communities related to prematurity. Descriptive statistical methods were applied to analyze the sample. Associations were examined using inferential statistical tests, including Likert scale analysis, independent samples t-tests, ANOVA with post hoc analysis, and chi-square tests. Statistical analyses were performed using the free online version of GraphPad QuickCalcs and IBM SPSS Statistics version 25.

Results

A total of 530 mothers completed the questionnaire. Of the total sample, 22.5% (n = 119) delivered before 28 weeks of gestation, 37.9% (n = 201) delivered between 28 and 32 weeks, and 39.6% (n = 210) delivered between 33 and 37 weeks of gestation. Altogether, 544 preterm infants were born to the 530 participating mothers, including 25 sets of twins and one set of triplets. Details regarding the level of neonatal care, length of hospital stay, and birth order within the family are presented in *Table 1*.

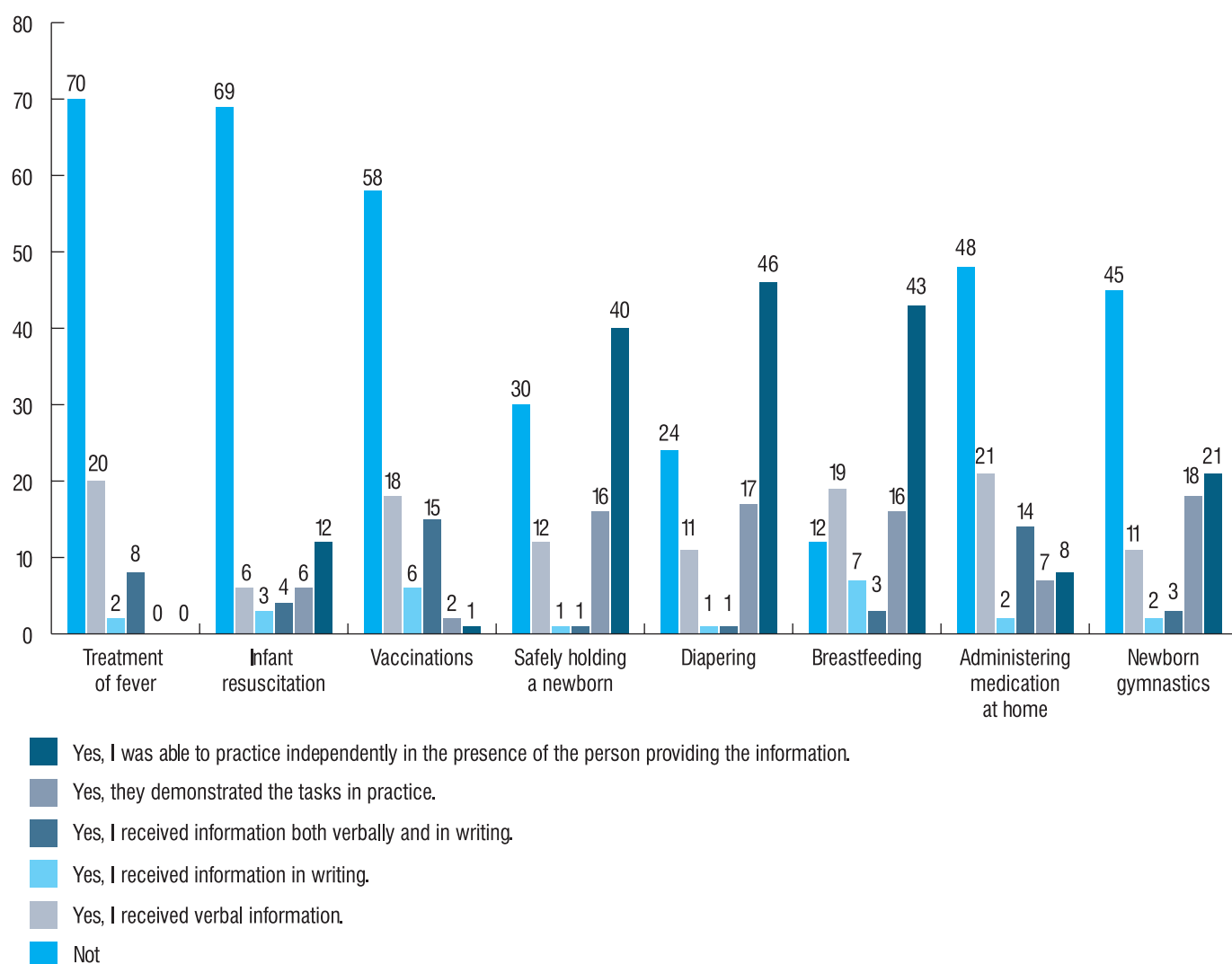
Of the 544 infants, 213 were diagnosed with at least one secondary condition. The most common complication was intraventricular hemorrhage (36.6%, n = 78). Bronchopulmonary dysplasia was reported in 65 cases (30.5%), and retinopathy of prematurity in 47 cases (22.1%).

Mothers most frequently reported receiving information about breastfeeding/feeding, diapering, and safe holding/positioning of the newborn. These data are presented in *Figure 1*.

Table 1: Data on the children of the mothers examined: gestational age, place of birth, number of children born into the family, time spent in hospital

GESTATIONAL AGE	LOCATION	BEFORE 28 WEEKS OF GESTATION	BETWEEN 28-32 WEEKS OF GESTATION	BETWEEN 33-37 WEEKS OF GESTATION	N
Place of birth	Budapest	55 (25.3%)	87 (40.1%)	75 (34.6%)	217
	County seat	50 (20.7%)	91 (37.6%)	101 (41.7%)	242
	Other city	14 (19.7%)	23 (32.4%)	34 (47.9%)	71
Child	First-born	74 (22.4%)	127 (38.5%)	129 (39.1%)	330
	Secondborn	27 (22.5%)	45 (37.5%)	48 (40%)	120
	third or more born	9 (20.5%)	17 (38.6%)	18 (40.9%)	44
Time spent in hospital	Less than 2 weeks	2 (2%)	5 (5.1%)	91 (92.9%)	98
	Less than 1 month	1 (0.6%)	71 (39%)	110 (60.4%)	182
	Several months	116 (46.4%)	125 (50%)	9 (3.6%)	250

Figure 1: Characterization of mothers' information regarding fever, infant resuscitation, vaccinations, safe holding/holding, diapering, breastfeeding, home medication administration, and exercise.



The highest level of information provision – defined as the opportunity for the mother to practice caregiving tasks independently under professional supervision – was most reported for diapering (46%, $n = 244$), breastfeeding/feeding (43.4%, $n = 230$), and safe holding/positioning of the preterm infant (41.5%, $n = 220$). A detailed breakdown by gestational age group is shown in *Figure 2*. In these areas, nearly half of the mothers received the most comprehensive form of instruction. In contrast, mothers were least likely to have the opportunity to practice administering medication at home (7.9%, $n = 42$), performing cardiopulmonary resuscitation (CPR) on a preterm infant (12.3%, $n = 65$), and conducting developmental exercises with their child (20.6%, $n = 109$). The caregiving activities most frequently demonstrated in practice by healthcare professionals were bathing and skin care (18.3%, $n = 97$), developmental exercises (17.7%, $n = 94$), and diapering (17.4%, $n = 92$). The least frequently demonstrated activity was the administration of medication at home (7.4%, $n = 39$).

Considering all forms of information provision combined, written information alone was the least frequently used method (1.7%, $n = 93$). The second most common method was providing mothers with the opportunity to practice tasks under supervision (21.8%, $n = 1160$).

Regarding breastfeeding/feeding, 146 mothers (27.5%) reported feeling completely confident, 142 (26.8%) mostly confident, and 115 (21.7%) moderately confident. Fifty-nine mothers (11.1%) reported feeling less confident, while 68 (12.8%) stated that they felt very uncertain about breastfeeding/feeding their child.

Regarding bathing and skin care, 33.3% of mothers ($n = 176$) reported feeling completely confident, 24.5% ($n = 130$) mostly confident, and 21.1% ($n = 112$) moderately confident. In contrast, 9.4% ($n = 50$) felt less confident, and 11.7% ($n = 62$) reported feeling completely unsure.

In the case of diapering, the majority of mothers (67.4%, $n = 357$) felt completely confident performing this task. A further 104 mothers (19.6%) selected level 4 (mostly

confident), 40 (7.5%) selected level 3 (moderately confident), 17 (3.2%) selected level 2 (less confident), and 12 (2.3%) selected level 1 (not at all confident).

Nearly half of the mothers (48.7%, $n = 258$) reported being completely confident in safely holding their newborn, while 23.8% ($n = 126$) were mostly confident. Additionally, 14.7% ($n = 78$) felt moderately confident, 7% ($n = 37$) less confident, and 5.8% ($n = 31$) not at all confident.

Regarding putting the baby to sleep, 166 mothers (31.3%) considered themselves completely confident, 140 (26.4%) mostly confident, and 127 (24%) moderately confident. Fifty-six mothers (10.6%) reported feeling less confident, and 41 (7.7%) were not at all confident.

With respect to developmental exercises, only 19% of mothers ($n = 102$) reported feeling completely confident. A further 21.3% ($n = 113$) were mostly confident, 20.6% ($n = 109$) moderately confident, 13.6% ($n = 72$) less confident, and 25.3% ($n = 134$) reported feeling very unsure about their knowledge in this area.

Regarding their level of knowledge about vaccinations, 19.8% of mothers ($n = 105$) reported being completely confident, 17.5% ($n = 93$) mostly confident, and 23.4% ($n = 124$) rated their knowledge as average. In contrast, 13.2% ($n = 70$) felt rather unsure, and 26% ($n = 138$) were completely unsure.

Only a small proportion of mothers (64%, $n = 34$) reported feeling completely confident about neonatal resuscitation. Fifty-five mothers (10.4%) considered themselves mostly confident, 89 (16.8%) rated their knowledge as average, and 65 (12.3%) felt rather uncertain. More than half of the respondents (54.2%, $n = 287$) stated that they were very uncertain about this topic. The questionnaire allowed respondents to indicate what additional information they would like to receive regarding each care activity. In total, 7,727 responses were submitted by 530 mothers across the 10 specified care areas; the percentage distribution is shown in Figure 3. Regarding developmental exercises, most mothers ($n = 312$) were interested in learning which exercise methods (e.g., Dévény method, Katona method) are recommended in specific cases. This was followed by interest in the effects of baby massage on premature infants ($n = 292$) and information about which specialists to consult regarding physiotherapy ($n = 295$).

Concerning safe holding of the newborn, nearly half of the mothers (48.7%, $n = 258$) reported being completely satisfied with the information received. In relation to vaccinations, mothers most frequently expressed interest in optional (non-mandatory) vaccines ($n = 279$), how to recognize allergic reactions following vaccination ($n = 237$), and what to do in the case of a missed vaccination ($n = 193$).

Regarding febrile conditions, mothers most commonly wanted to know in which situations immediate hospital care is necessary ($n = 391$), which medications can be administered in case of fever in a newborn ($n = 302$), and where to seek medical help when fever occurs ($n = 191$).

In relation to diapering, mothers considered it important to receive information about normal stool and urine characteristics and the expected frequency of bowel move-

Figure 2: Percentage of mothers who attempted supervised care activities by gestational age of newborn

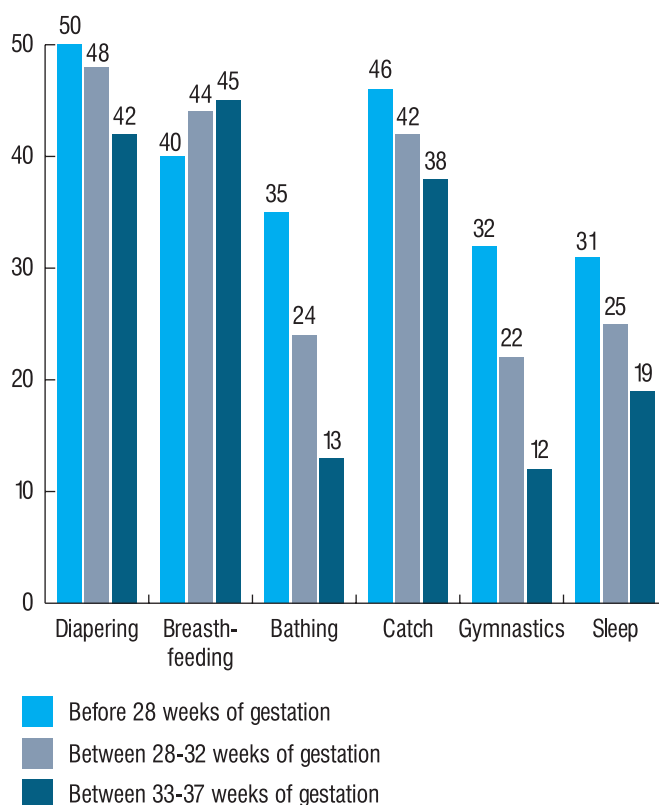
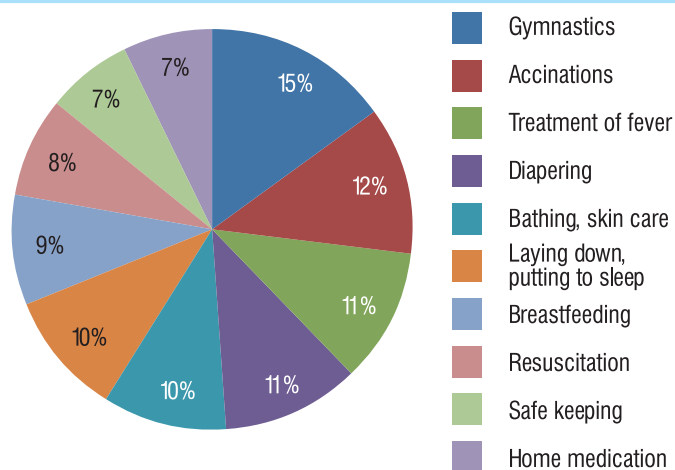


Figure 3: Percentage distribution of care areas indicated by mothers about which they would like to receive more information



ments. In the area of bathing, 242 mothers wished to receive guidance on selecting appropriate bath and body care products, while 222 were interested in the benefits of skin care creams for premature infants. Additionally, 178 mothers sought information on the frequency and optimal timing of bathing, and 106 respondents requested further details about preparing for bathing.

Regarding laying the baby down and putting the infant to sleep, mothers expressed a need for more informa-

tion about creating an appropriate sleep environment ($n = 193$), the role and importance of using a baby nest ($n = 189$), and the correct use of a home apnea monitor ($n = 173$).

In the area of breastfeeding/feeding, mothers were most interested in how to ensure optimal nutrition in the absence of breast milk ($n = 253$). They also wished to receive more guidance from hospital staff on breastfeeding positions ($n = 169$), proper breast milk expression techniques ($n = 149$), and the use of breastfeeding aids ($n = 129$).

With regard to resuscitation, mothers considered it most important to know how to perform resuscitation correctly if necessary ($n = 380$) and to be able to recognize precisely when resuscitation should be initiated ($n = 257$).

Concerning safe handling of the infant, the main areas in which mothers reported deficiencies included turning the baby appropriately ($n = 285$), proper head support ($n = 140$), and safely lifting the infant in and out of the crib ($n = 131$).

Regarding home medication administration, mothers expressed a desire for more information on recognizing possible allergic reactions ($n = 204$) and understanding potential medication side effects ($n = 136$).

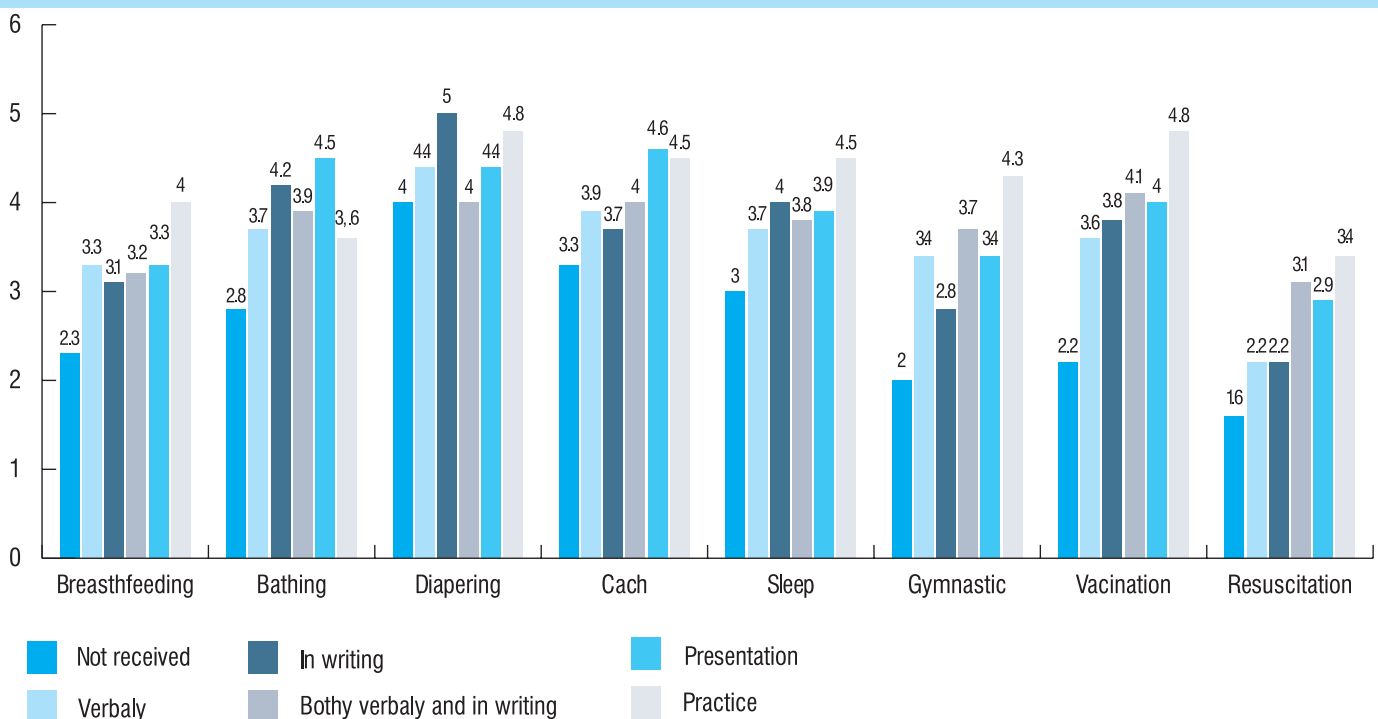
Relationship between gestational age and the type of information received

Among the three gestational age groups, parents of infants born between 33 and 37 weeks received the least information across nearly all examined care activities.

With the exception of breastfeeding, the most comprehensive information was provided to mothers of infants born before the 28th week of gestation. In terms of hands-on practice of care activities, mothers of infants born before 28 weeks had the most opportunities to practice independently under professional supervision, whereas mothers of infants born between 33 and 37 weeks had the fewest opportunities.

A statistically significant difference between the gestational groups was found in everyday care activities related to bathing, which was most frequently practiced under supervision among parents of infants born before 28 weeks ($p < 0.001$). Significant differences were also observed in non-routine care activities, including vaccinations, medication administration, resuscitation, and developmental exercises. Independent practice of home medication administration under professional supervision was reported by 16% ($n = 19$) of mothers of infants born before 28 weeks, 8.5% ($n = 17$) of those whose infants were born between 28 and 32 weeks, and 2.9% ($n = 6$) of those whose infants were born between 33 and 37 weeks ($p < 0.001$). A similar trend was observed in the areas of developmental exercise ($p < 0.001$) and resuscitation training ($p < 0.001$). Independent practice of developmental exercises under supervision was reported by 31.9% ($n = 38$) of mothers of infants born before 28 weeks, 22% ($n = 44$) of those born between 28 and 32 weeks, and 12.9% ($n = 27$) of those born between 33 and 37 weeks. Regarding cardiopulmonary resuscitation (CPR), 22.7% ($n = 27$) of mothers of infants born before 28 weeks, 12.4% ($n = 25$) of mothers of infants born between 28 and 32 weeks, and

Figure 4: Mothers' confidence level in caring activities as a function of the information received, according to a Likert scale from 1 to 5. 1 is the weakest and 5 is the best



only 6.2% ($n = 13$) of mothers of infants born between 33 and 37 weeks had the opportunity to practice CPR.

We also examined the relationship between the form of information provided and mothers' confidence levels, measured on a Likert scale. The results demonstrated a significant association between the type of information received and maternal confidence (*Figure 4*).

Discussion

Most participants in the study gave birth between 33 and 37 weeks of gestation, while the smallest proportion delivered before 28 weeks. In cases of threatened preterm birth, well-established protocols are implemented, such as transferring the mother to an obstetric unit equipped with a perinatal intensive care (PIC) unit. This approach not only aims to prevent preterm delivery but also ensures that, if birth occurs, the infant is delivered in a setting best suited to provide appropriate neonatal care (6). Some infants – primarily those born after 33 weeks of gestation – required less than two weeks of hospitalization; however, the majority required several months of hospital care. This likely reflects the immaturity, low birth weight, and comorbid conditions frequently associated with prematurity (11).

The findings of this research clearly demonstrate the type and quality of information provided to mothers of preterm infants during their hospital stay. In several important areas of care – such as correct resuscitation techniques and information regarding vaccinations and fever management – more than half of the mothers reported receiving no information at all. In contrast, in the areas of breastfeeding/feeding, diapering, and safe handling of the infant, more than half of the mothers were able to practice these activities under professional supervision. The WHO guideline on preterm care emphasizes the importance of supporting and involving mothers in breastfeeding/feeding, as this has a positive impact on infant development and health outcomes and may reduce the length of hospital stay (1). According to the present findings, this recommendation appears to be well integrated into Hungarian preterm care practices. Diapering and safe handling are fundamental caregiving activities and are therefore strongly emphasized in hospital education. Similar results were reported in the Szeged study, where mothers also received the most comprehensive information regarding breastfeeding/feeding and diapering (3). In the present study, maternal confidence levels reflected the effectiveness of hands-on demonstration and supervised practice. The more opportunities mothers had to practice a specific care activity independently under supervision, the more confident they felt performing it. This association was not observed to the same extent with other forms of information delivery. Mothers reported the highest level of confidence in diapering and the greatest uncertainty regarding the correct performance of resuscitation.

Regarding the form of information provided, the findings indicate that a considerable proportion of mothers did not receive any information during their hospital stay. The second most common form of information transfer was practical demonstration, during which tasks were shown, and mothers were given the opportunity to practice them under professional supervision. As the study covered the entire country, regional differences and variations in institutional protocols may explain these discrepancies. This assumption is supported by the study conducted in Szeged, where mothers received uniform information in all examined circumstances. In that case, however, the research was limited to mothers treated within a single institution (3).

We also asked mothers which care activities they would have liked to receive more information about. The results suggest that differences between care areas were minimal; overall, mothers expressed a desire for more comprehensive information across all domains during their hospital stay. The most frequently highlighted topics were exercise, management of febrile conditions, and vaccinations. This may be explained by the fact that the care of premature infants represents a specialized field that is less comparable to the care of full-term newborns (7).

More than half of the mothers indicated that they would have welcomed additional information about infant exercise, including the benefits of baby massage, different physiotherapy methods, and their specific indications. Regarding fever management, mothers wished to know which medications could be safely administered and when immediate hospital care was necessary. Concerning vaccinations, the majority were particularly interested in optional vaccines, their benefits, and their relevance for premature infants. These topics may be especially salient because mothers of premature infants often place heightened emphasis on protecting their child's health. Following premature birth and prolonged hospitalization, mothers may become overprotective and experience persistent worrying regarding their child's physical well-being (5), which can increase their need for detailed information.

The study also examined whether infants developed illnesses during hospitalization or required medication. Fewer than half of the infants had a diagnosed condition requiring medical treatment. The most common complications were cerebral hemorrhage, bronchopulmonary dysplasia, and retinopathy of prematurity, consistent with the most frequently reported prematurity-related conditions in international literature (11). Infants often received vitamin and mineral supplementation as part of their care, including in many cases those without major complications. In accordance with World Health Organization recommendations, iron supplementation was commonly administered to prevent anemia. High-dose vitamin D, folic acid, and caffeine therapy were also frequently reported. These interventions are known to support the development and stabilization of premature infants (1).

Nearly half of mothers did not receive adequate information on infant care during hospitalization, with education largely limited to basic caregiving activities. Higher-quality information – particularly opportunities for supervised independent practice – was associated with significantly greater maternal confidence at discharge. Mothers

of more premature infants and those with longer hospital stays received more comprehensive education and reported higher confidence levels. Maternal confidence was not influenced by infant health status or multiple births, underscoring that the quality of information provision is the primary determinant of preparedness for home care.

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Disabled Child in the Family: Care for Hearing-Impaired Children

Regina Ramóna Soós, Judit Kormos-Tasi

Family Care Methodology Department, Institute of Health Science, Semmelweis University, Budapest, Hungary

Corresponding author: Judit Kormos-Tasi, e-mail: judtasi@gmail.com, kormos-tasi.judit@semmelweis.hu

Abstract

Hearing loss and deafness affect millions of people worldwide. Universal newborn hearing screening within the first month of life is essential to ensure early detection and timely intervention. Child healthcare services play a crucial role not only in prenatal care but also in monitoring children's development and identifying potential abnormalities at an early stage.

In this study, semi-structured interviews were conducted with a regional health visitor working in a rural area, a deaf educator, and hearing parents raising a hearing-impaired child. The research aimed to explore the experiences and perspectives of both professionals and parents regarding the care and support available for hearing-impaired children.

The findings indicate that participants would have required more comprehensive information and clearer guidance about available services, specialist care pathways, and support systems. Many parents reported a lack of psychological support and insufficient information about where such services could be accessed. In several cases, no such services were available in their area of residence. Health visitors play a key role in early detection through screening examinations and are responsible for reporting abnormalities and informing families. Following referral, it is the responsibility of specialized professionals to ensure appropriate and coordinated care.

The results highlight the importance of improved interprofessional cooperation, accessible psychological support, and clearer communication pathways to better support families of hearing-impaired children.

Keywords: *hearing loss, hearing impaired children, Health visitor care, Health visitor screening test, interprofessional cooperation*

Introduction

According to the World Health Organization (WHO), disability includes sensory impairments such as hearing loss. Globally, approximately 34 million children require intervention for hearing loss (1–3). In the United States, more than 48 million people are affected by hearing loss, and nearly one-fifth of the population meets the WHO criteria for hearing impairment (4). Among American children, approximately 14.9% are affected by hearing loss or deafness (5).

According to data from the Hungarian Central Statistical Office (KSH), in 2023 there were 1432 hard-of-hearing and 193 deaf children living in Hungary. These numbers have remained relatively stable in recent years. This stability may be explained by the fact that a significant proportion of childhood hearing impairment is of genetic origin, while the incidence of hearing loss due to acquired causes remains comparatively lower (6).

Newborn hearing screening (NHS) plays a crucial role during the first month of life in facilitating early hearing detection and intervention (EHDI) in cases of signifi-

ABBREVIATIONS

ADHD: Attention Deficit Hyperactivity Disease; **ASD:** Autism spectrum disorder; **CI:** Cochlear implant; **DHH:** Deaf or hard of hearing; **EHDI:** Early hearing recognition and intervention; **JCIH:** Joint Committee on Infant Hearing Screening; **CSO:** Central Statistical Office; **NHS:** Neonatal hearing screening; **PCHI:** Permanent childhood hearing loss; **SINOSZ:** Siketek és Nagyothallók Országos Szövetségének, National Association of the Deaf and Hard of Hearing (in Hungarian)

cant and permanent hearing impairment. The primary aim of EHDI programs is to ensure timely identification and intervention for deaf and hard-of-hearing (DHH) children. Early intervention minimizes the negative impact of hearing loss and maximizes auditory stimulation during critical periods of neural development. Since early auditory input forms the foundation for optimal speech and language acquisition in the first year of life, EHDI significantly contributes to the development of language competence and literacy among DHH children (7, 8).

Although early diagnosis and intervention have reduced some of the disadvantages associated with hearing loss, families of affected children continue to face substantial challenges. Up to 40% of children with hearing impairment experience additional cognitive or neuromotor difficulties, further complicating their developmental trajectory (9, 10).

The identification and care of children who do not develop typically has become an increasingly important component of child health services. One of the primary responsibilities of healthcare professionals is the early detection of developmental deviations, including hearing impairment through NHS.

Child health care encompasses not only prenatal services but also the continuous monitoring of children's physical, cognitive, and psychosocial development. In Hungary, child health services are regulated by Decree 49/2004 (V. 21.) of the Ministry of Health and Family Welfare on regional child health care. Developmental monitoring through structured screening programs constitutes a fundamental task within this system (11).

Through hearing screening and the assessment of early speech and language development, professionals are able to identify hearing impairment at an early stage.

The care of children with hearing impairment is delivered through interprofessional teamwork. Public health nurses (health visitors), pediatricians, audiologists, deaf educators, and other specialists collaborate to ensure comprehensive care tailored to the child's individual needs.

Beyond providing medical and developmental information, a crucial component of care involves empowering parents. Professionals play an essential role in reinforcing parents' commitment to early intervention and long-term developmental support, emphasizing that sustained engagement can significantly improve the child's future opportunities. For many families, the diagnosis of hearing impairment is experienced as a profound loss, requiring emotional support and assistance in processing grief. Therefore, psychosocial support for parents is an integral part of comprehensive care.

During intrauterine development, the fetus is capable of receiving and processing external stimuli (12). The auditory system begins to develop as early as the sixth week of gestation and continues maturing until approximately the twentieth week. By this stage, the fetus is able to perceive environmental sounds, and by 23–24 weeks of gestation, it can respond to auditory stimuli (13). Intact

hearing plays a crucial role in early development. It supports the formation of attachment, facilitates orientation within the environment, and provides a sense of security from infancy. Through speech and various auditory stimuli, the child gradually learns to anticipate events and interpret environmental cues. These processes not only promote speech and language development but also contribute to nervous system maturation and the richness of emotional development (14).

In low- and middle-income countries, hearing loss often receives limited attention due to competing public health priorities such as widespread poverty, constrained healthcare resources, and a high burden of infectious and chronic diseases. A major challenge is the insufficient availability of specialized knowledge, trained professionals, and service capacity to provide adequate care for children with hearing impairment (15–17). Furthermore, social beliefs, stigma, and misconceptions surrounding hearing loss may hinder early detection and intervention, thereby impeding the achievement of the goals established by the Joint Committee on Infant Hearing (JCIH) (15, 18).

Materials and Methods

During the research, semi-structured interviews were conducted with one regional health visitor working in a rural area and one deaf educator. In addition to these professionals, hearing parents raising hearing-impaired children were also included in the study.

Barbara Botos, an employee of the National Association of the Deaf and Hard of Hearing (SINOSZ), assisted in contacting parents. I participated as a volunteer at the children's camp (Vidám7) organized by SINOSZ, where I met Ms. Botos. Through her support, I was able to establish contact with parents. On the closing day of the camp, during a joint parent–child program, I met several parents who later agreed to participate in the interviews. The main inclusion criterion for parents was that they had normal hearing and were raising a hearing-impaired child who was either attending primary school, about to start primary school in September, or had already received specialized care. Five parents participated in the study, including four mothers and one father. Four of the five parents had enrolled their children in a specialized school for the hearing impaired, while one parent chose mainstream education, where integrated schooling was available.

Semi-structured interviews were conducted to explore the experiences and perspectives of professionals and parents.

The semi-structured interview format allowed for the exploration of individual life trajectories, personal experiences, and everyday challenges faced by both professionals and parents. This method provided participants with the opportunity to express their own perspectives in

depth. Through the analysis of specific cases, it became possible to identify potential barriers in care pathways, as well as common patterns across different life stories. These insights may help professionals recognize critical points in service provision and identify areas where additional support is needed.

The in-depth interviews were conducted anonymously to facilitate open and honest sharing of experiences. The interviews took place in a calm and private setting, allowing for a deeper exploration of the topic. Audio recordings were made with the prior informed consent of the participants, who were informed in advance about the purpose of the recording.

Results

In-depth interview with a deaf educator

The specialist has been working at her current institution since 2020. Since that year, she has served as the head of the kindergarten member institution while also leading a kindergarten group that includes two children with hearing impairment, seven children with autism spectrum disorder, and typically developing children in an integrated setting.

In the development of deaf and hard-of-hearing (DHH) children, the special education teacher applies several therapeutic methods. These include breathing exercises, articulation exercises, lip and tongue motor exercises, auditory training, sound differentiation, and the practice of correct pronunciation of vowels and consonants. The children in this group do not use sign language, as they are part of a non-signing group and are able to understand spoken communication adequately.

According to the specialist, small group size is a key factor in successful development: “The most important thing for children with special needs is the small number. There are two children now for whom I can say that integration could be attempted, but in terms of socialization, I think that in a class of 28–30 students, they would initially be marginalized. Therefore, a gradual approach may be necessary: starting in a special school, then moving toward partial integration, and after 1–2 years, possibly finding their place in a fully integrated school.”

It was emphasized that the appropriate type of schooling must be determined individually for each child.

The kindergarten operates with a structured daily routine similar to mainstream institutions. Children, regardless of their impairment, are expected to follow this routine. However, an additional feature of this institution is the high level of specialized development services. Each group includes a group leader and a special education teacher, and complex special educational development is provided.

The specialist reported that hearing-impaired children integrate well into the group activities. They participate

in singing, reciting rhymes, and morning circle activities, and their comprehension and expressive abilities show continuous improvement. She noted, however, that the children in question do not have severe hearing impairments. As they attend an integrated kindergarten, their developmental opportunities and future prospects are considered more favorable.

The specialists maintain daily contact with the families, which enables close cooperation. Consultation hours are less rigid than in many other institutions; therefore, if questions or problems arise, professionals are available to parents almost at any time. Parents frequently take advantage of this opportunity.

As the specialist explained: “They are used to this opportunity; they are cooperative. I see in this group that there is a need for parents to come together more often, to discuss problems with each other, to support one another, and to exchange experiences. I plan to organize such a meeting again this school year to bring parents together to talk, because they can share many valuable things with each other.” The specialist also highlighted an ongoing concern: children often arrive for developmental intervention later than would be optimal. He reported having no contact with child welfare services. During the interview, he repeatedly returned to a central question: where does the process break down, and why do children fail to receive timely care?

“Where is the process slipping? Perhaps there are not enough child welfare workers, so they cannot perform their tasks with sufficient quality. There seems to be some deficiency in the regulatory system; some link in the chain is missing.”

Interview with a local health worker

The health visitor has been working in her current position for three years. She has not previously cared for a child born with another type of disability. She is currently responsible for a two-year-old child with hearing impairment. According to her, one of the greatest obstacles to adequate care is geographical distance, as the specialized centers available to these children are located 100–130 kilometers away.

She has been caring for the family since the prenatal period. The child’s hearing impairment was anticipated, as the mother is also hearing-impaired. Prenatal care was provided with the assistance of a sign language interpreter. Communication between the health visitor and the mother is often facilitated by the grandmother, who has normal hearing and can assist when a sign language interpreter is unavailable. The health visitor also noted that there is a shortage of sign language interpreters in the country. Currently, the child has been prescribed one hour of complex special education development per week; however, even this single hour is difficult to access regularly. During the interview, the health visitor emphasized that, in addition to professional support, parental

attitude plays a significant role in determining the child's developmental progress and opportunities for early intervention.

In-depth interview with the affected parents.

The primary focus of the interview questions was to explore the children's medical and developmental history, their current situation, the personal experiences of the parents, and the role of the health visitor in the care process.

None of the five parents reported having a hearing-impaired family member in either the immediate or extended family to their knowledge; therefore, their child's hearing impairment came as unexpected news. This is a crucial point, as they were unable to rely on prior family experience or guidance regarding where to seek professional support.

As the parent described: "As soon as we knew the diagnosis, we started looking into what could be done. He did not respond to the hearing aid. An acquaintance mentioned the possibility of cochlear implant (CI) surgery. So we took him to Szeged and contacted a deaf educator. He received a CI at 14 months of age."

In most cases, the diagnosis was established only after numerous examinations. This delay resulted in the loss of valuable time, thereby significantly affecting the sensitive period of speech and language development. Although the children were examined by various specialists, a common experience among parents was that, despite receiving a diagnosis, they were not provided with adequate guidance regarding further steps or available services. Another significant concern raised by parents was that suspicion of hearing impairment often emerged only several years later. In some cases, even when parents expressed concerns early on, appropriate and timely diagnostic procedures were not initiated, resulting in delayed intervention.

Four of the five parents reported that, prior to the identification of hearing impairment, their children had been diagnosed by different professionals with attention deficit hyperactivity disorder (ADHD) or autism spectrum disorder (ASD). These diagnoses were later reconsidered, as the children's unusual or seemingly inappropriate behaviors were ultimately attributed to communication difficulties. Their limited ability to understand and interact with their environment often led to frustration, reduced attention, and behaviors that mimicked neurodevelopmental disorders.

One parent reported that her child did indeed have ADHD; however, she observed significant improvement in symptoms after the hearing impairment was identified and appropriate assistive devices and developmental interventions were introduced.

Four of the respondents specifically chose to enroll their child in a school for the hearing impaired, as they believed that such institutions would provide the most suitable foundation for their child's development. One of the five children is still in kindergarten and is scheduled to start

school in September at the same institution. One parent, however, opted to send their child to the local primary school, reasoning that the cochlear implant (CI) significantly improved their child's hearing, enabling successful participation in an integrated educational environment. Notably, this primary school also employs a deaf teacher, ensuring that the child can access all necessary developmental support on site.

Parents expressed overall satisfaction with the professionals working in both schools and kindergartens. However, they highlighted the persistent shortage of specialized personnel in schools for the hearing impaired, which often limits the scope and intensity of developmental support that can be offered. In Hungary, the number of schools dedicated specifically to the education of hearing-impaired children is very limited, placing an additional burden on families. For example, one parent opted for a boarding school solution, necessitating weekly travel of more than 160 km and limiting family contact to only two and a half days per week. Although this arrangement is stressful for the entire family, it was considered necessary to ensure adequate development opportunities for the child.

The study also explored how parents experienced their child's hearing impairment. It is essential to emphasize the psychological state of parents, as the provision of appropriate support and information is critical to enabling them to create an environment that fosters the child's optimal development. A common theme among parents was the experience of self-blame and guilt. Many reported a sense of relief following the diagnosis; however, this was often accompanied by intensified feelings of responsibility and guilt. Nevertheless, the diagnosis served as both a starting point for targeted intervention and a means for parents to process their grief, providing a clearer framework for supporting their child.

The parent shared: "We had a period of grief, which was much more difficult for my husband. I see that it is harder for men to process the fact that their child is not perfect... Even today, I often have to remind myself not to compare my child to anyone. Perhaps I would have this struggle even if he were not hearing-impaired. My husband and I attended therapy frequently, which helped us immensely. Our child initiated a very deep process of self-discovery, which ultimately saved our marriage. It was a profound lesson. I now pay more attention to what we have received. This is the only way to approach it."

The wider social environment also plays a significant role in how parents experience their child's hearing impairment. Some parents report misunderstanding or criticism from relatives or the broader community, while others benefit from acceptance, support, and practical help from family members.

From a professional perspective, it is important to clarify the role of child health nurses. Their primary responsibility is to identify deviations in screening tests and provide initial information. Once a potential issue is signaled, it

becomes the responsibility of specialized professionals to provide targeted care. Child health nurses act as critical indicators in the early detection process, ensuring that deviations are recognized and monitored. Additionally, they play an essential role in observing and supporting the child's developmental progress.

The accompanying *table* summarizes common patterns among the families interviewed and provides guidance on the typical duration from early recognition of hearing loss signs to formal diagnosis. It also highlights the relationship between this timeline and the children's current developmental status, including speech and language outcomes.

Discussion

Permanent childhood hearing impairment (PCHI) is the most common sensory pathology present at birth, with an incidence of approximately 0.5–1.5 per 1000 newborns (19). A systematic review and meta-analysis reported a combined prevalence of 9% for autism spectrum disorder (ASD) among deaf and hard-of-hearing (DHH) populations. Children with severe hearing impairment are more likely to receive a comorbid ASD diagnosis than those with milder hearing loss (20, 21).

Early detection and diagnosis are crucial, as they facilitate the child's potential to attend integrated educational settings and, if appropriate and medically feasible, to receive a cochlear implant (CI).

Typically developing DHH children often display intact eye contact, joint attention, and pointing; therefore, it is important to screen for atypical development of these social-communication skills in this population. Studies

indicate that DHH children with ASD show fewer and lower-quality facial expressions compared to typically developing DHH children (22, 23).

The Joint Committee on Infant Hearing (JCIH) recommends that all newborns undergo hearing screening within the first month of life, with a confirmed diagnosis by three months of age, and that treatment and interventions begin by six months of age (24).

Screening performed by health visitors can serve as an early indicator of hearing loss, helping children access specialized care promptly. Effective care, however, requires a multidisciplinary team approach, where health visitors collaborate closely with allied professionals to ensure timely and appropriate interventions.

In addition to the work of health visitors, interprofessional collaboration is a cornerstone of child care (25). Early diagnosis and intervention are critical steps in proactive care for children with hearing impairment, as there is a sensitive period for auditory brain development and language acquisition. Recent evidence suggests that comprehensive intervention services initiated by six months of age can enable many children with sensorineural hearing loss to achieve language skills comparable to their hearing peers. The presence of deafness in the family affects all aspects of family life. Understanding this impact is essential to involve all elements of the family system in early intervention. Current models of early intervention for DHH children emphasize parental self-efficacy and active involvement (26, 27). Parents of infants identified through universal newborn hearing screening (UNHS) programs require educational support shortly after confirmation, as well as opportunities to connect with other families facing similar challenges (28, 29).

Table: Summary of the results of primary research (in-depth interviews with parents)"

AGE	13 YEARS, GIRL	9 YEARS, BOY	6 YEARS, BOY	10 YEARS, GIRL	9 YEARS, BOY
Age when hearing impairment was suspected?	<1 year	~1 year	Newborn	Newborn	Around 2 years old
Age at diagnosis	5.5 years	8 years	2 years	<1 year	4 years
What is the degree of hearing impairment?	Severe	Medium level	Severe (J:75-80dB, B:70dB)	Deaf	Medium level
Type of school	School for the hearing impaired	School for the hearing impaired	Kindergarten for the hearing impaired	Integrated	School for the hearing impaired
Distance to school	> 100 km	> 100 km	>50 km	Same city	> 150 km
Was the child care worker able to help?	Not	Not helpful, not informed	Yes, but progress stalled	No help was needed	Yes, but progress stalled
Parent's view on developmental support	Not sufficient	Sufficient	Sufficient	Sufficient	Sufficient
Speech development	Say a few words	He didn't speak until he was 6.5 years old, now he says a few words	He is late, he is currently speaking, but not clearly	She was late, but she is speaking well now	He was late, he says a few words
Assistive devices	Hearing aid	Hearing aid	Hearing aid (considering cochlear implant)	Cochlear implant	Hearing aid

In my research, participants reported that they would have appreciated more information and guidance on where to seek professional care. They also expressed a need for psychological support, which was either unavailable or not communicated in their area of residence. PCHI has a substantial psychological impact on both affected children and their families. It can result in language and communication delays, lower academic and professional achievement, and increased risk of mental health difficulties (24).

Various studies have demonstrated the impact of stress on parents raising deaf or hard-of-hearing (DHH) children, both in terms of practical caregiving and emotional involvement. However, variables such as poorer socioemotional functioning and the child's language skills appear to be more closely associated with higher parental stress than the degree of hearing impairment itself (30–32).

Parents of children with special educational needs frequently report experiences of anxiety, depression, loneliness, and hopelessness. Stressors identified in the literature include difficulties in accepting and adapting to the child's disability, limited or absent information about the child's condition, financial demands for medical equipment and care, time-management conflicts, and poor access to appropriate services that could alleviate caregiving burdens (33). Elevated parental stress can negatively affect parent–child interactions, contributing to more controlling and less responsive parenting behaviors, as well as inadequate language input. Therefore, assessing parental stress is essential to ensure the effectiveness of early interventions (34).

Factors contributing to parental stress in families of DHH children include age at diagnosis, degree of hearing loss, language ability, mode of communication (spoken or signed), child behavior problems, perceived social support, cochlear implantation (CI), and additional disabilities that are associated with poorer language skills or higher rates of behavioral challenges. Conversely, other studies have reported no increase in stress levels among parents of DHH children (30, 35–37).

Dammeyer et al. (35) suggested that it is not the hearing loss itself but the characteristics of the child – such as additional disabilities and behavioral, emotional, or social difficulties – that influence parental stress negatively. Similarly, *Fitzpatrick et al.* (36) found that parents of children with early-onset mild bilateral hearing loss who were otherwise developmentally typical did not experience higher stress compared to parents of children with normal hearing (35–37).

Interestingly, the decision to pursue cochlear implantation has been associated with reduced parental stress, possibly due to observed improvements in the child or the perception that parents have taken all possible steps to support their child. *Horsch et al.* (38) reported that parents of children with hearing loss who underwent CI experienced stress levels similar to parents of children without hearing impairment. In contrast, *Spahn et al.* (39) found higher parental stress among parents of children with CIs compared with those using hearing aids, particularly during the period surrounding implantation. Based on the interviews with parents, it is evident that they face a very challenging situation, as there is often no deaf educator available near their place of residence to provide specialized care for their child. Consequently, their daily lives are burdened with extensive travel and logistical challenges.

Overall, the care of hearing-impaired children is a multifaceted task, made significantly more difficult by the shortage of qualified professionals. Close cooperation among the professionals involved in the child's care is crucial, as it facilitates early identification of hearing impairment and the timely initiation of developmental interventions.

In addition to professional support, parents bear a substantial responsibility. They must consistently guide their child's development while recognizing that progress is gradual, and the outcomes of these efforts may only become apparent over time. The literature highlights the benefits of an appropriate habilitation environment and emphasizes that a family-centered approach yields better results, as the family represents the child's natural environment for growth and learning (40).

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Peripheral Intravenous Extravasation: Current Strategies for Prevention and Management

Review of the literature and proposal for management algorithm

Márió Mikóczi

Heim Pál National Pediatric Institute, Department of Surgery, Traumatology and Reconstructive Surgery

Corresponding author: Márió Mikóczi – Heim Pál National Pediatric Institute, Department of Surgery, Traumatology and Reconstructive Surgery, 1089 Budapest, Üllői road 86., Hungary. E-mail: drmikoczimario@gmail.com ORCID ID: 0000-0002-6402-0639

Abstract

Peripheral intravenous extravasation (PIVE) is a common complication of intravenous therapy in pediatric and neonatal populations. Incidence rates vary by age and clinical setting, with neonates and intensive care patients at highest risk. While most cases are mild, severe extravasations can result in tissue necrosis, compartment syndrome, and permanent functional impairment. Early recognition, prevention, and standardized management protocols are essential to minimize complications. This review summarizes current evidence on PIVE incidence, risk factors, preventive strategies, and therapeutic interventions, including conservative, minimally invasive, and surgical approaches. Despite the availability of international guidelines, no unified protocol currently exists; this work aims to support the development and implementation of standardized national management strategies for pediatric PIVE.

Keywords (MeSH): *Extravasation of Diagnostic and Therapeutic Materials, Veins, Child, Algorithms*

Introduction

According to the international literature, 70–90% of hospitalized patients receive intravenous catheter therapy. This includes both short-term peripheral and long-term central venous access. On general hospital wards, peripheral venous access is the most common form. In intensive care and surgical units, venous access is, from a practical standpoint, nearly universal (~100%). In infants and neonates, cannula use is also very high due to the frequent need for infusion therapy (1, 2).

Studies indicate that approximately 30–50% of patients develop some form of peripheral venous complication, including Peripheral Intravenous Extravasation (PIVE), defined as the leakage of intravenously administered fluid from a peripheral vein into the surrounding tissues (3, 4). Consequently, every second or third peripheral catheter is

removed earlier than planned because of a local complication. The incidence of severe complications (infection, compartment syndrome, necrosis, thrombosis) is fortunately low (<1%); however, their management significantly prolongs hospital stay and may lead to permanent limb damage (5, 6). The treatment of severe complications typically requires a multidisciplinary approach (7, 8).

The incidence of intravenous extravasation injuries in children shows considerable variability in the literature, influenced by patient age, clinical setting, and diagnostic criteria applied (1, 2, 4). In general, on pediatric wards, reported PIVE events range from 0.1% to 6%, with the vast majority of cases being mild (5, 9). In pediatric intensive care units, the incidence increases to 2–5%, reflecting more complex and prolonged infusion therapies (5, 10). Neonates are particularly vulnerable; reported incidence rates in neonatal intensive care units range from 10% to

Table 1: Risk factors for severe PIVE complications

RISK FACTOR	DETAILS
Properties of the infused substance	High osmolarity, extreme pH, chemotherapeutic agents, and vesicant drugs increase risk (18, 19).
Improper venous access/insertion site	Small veins, proximity to joints, damaged or previously irradiated limbs. Extravasation can also occur if an intraosseous needle becomes dislodged (3, 5).
Patient's general condition	Age (infants, young children, elderly), atherosclerosis, diabetes mellitus, venous or lymphatic edema, prior radiation, prior chemotherapy, multi-polytrauma, severe burns (3–5, 10).
Infusion parameters	High infusion rate, large volume, absence of pressure-sensing devices, prolonged infusion duration, poorly secured veins, poorly visible or inaccessible insertion sites (8, 12, 17).

40% (4, 11). Across the entire pediatric population, the weighted average incidence is approximately 1–3%, while the proportion of complications resulting in significant tissue damage remains below 0.5% (2, 5). Thus, the highest incidence of extravasation injuries occurs in neonates, with a gradually decreasing risk in infants and young children (1–10%), and declining to below 1% in school-aged children and adolescents (1, 4, 12).

Discussion

Prevention and diagnosis of PIVE and complications

International literature emphasizes the importance of monitoring, early recognition, and standardized prevention and management protocols during pediatric and neonatal infusion therapy (3, 8, 13, 14). Prevention is of paramount importance. Education of healthcare personnel (nurses, physicians) as well as the parents of hospitalized children, is essential. The use of pressure-sensitive infusion pumps or specialized optical sensors may further support early detection (17). The majority of complications associated with peripheral intravenous catheters are preventable (8, 12). Several well-known risk factors increase the likelihood of severe complications (*Table 1*). Key preventive measures include atraumatic catheter insertion, appropriate vein selection, ultrasound-guided catheterization when necessary, administration of irritant solutions (e.g., hyperosmolar, chemotherapeutic, or high-calcium solutions) via central rather than peripheral lines, and continuous monitoring, maintenance, and timely replacement of catheters (3, 4, 10–14). Extravasation can be particularly dangerous when irritant (“vesicant”) substances leak into the surrounding tissue, potentially leading from local edema and pain to extensive tissue necrosis, injury to vessels, nerves, tendons, and joints, and ultimately permanent functional loss (3, 4). The use of standardized protocols and appropriately equipped devices reduces complications and improves the quality of patient care (3, 6, 8, 15–17).

Table 2: List of medications based on risk profile

LOW RISK	MEDIUM RISK	HIGH RISK
Amoxicillin/clavulanate	Acetazolamide	Aciclovir
Amphotericin B (liposomal)	Allopurinol	Alprostadil
Ampicillin	Amikacin	Aminophylline
Benzylpenicillin	Aminophylline	Amiodarone
Blood products	Amphotericin B (conventional)	Arginine HCl
Cefazolin, Cefotaxime, Ceftazidime	Ciprofloxacin	Calcium salts (CaCl ₂)
Ceftriaxone, Cefuroxime	Diazepam	Chemotherapeutics
Clindamycin	Erythromycin	Caffeine citrate
Fentanyl	Ganciclovir	Doxycycline
Furosemide	Glucose (dextrose) 10–12.5%	Epoprostenol
Glucose (dextrose) <10%	KCl < 40 mmol/L	Esmolol
Gentamicin	Lorazepam	Foscarnet
Heparin	Mannitol < 15%	Glucose (dextrose) > 12.5%
Hydromorphone	Midazolam	KCl ≥ 40 mmol/L
Imipenem/Cilastatin	Morphine	Mannitol ≥ 15%
Iron infusion	Nafcillin	Methylene blue
IVIG	Ondansetron	NaHCO ₃ ≥ 3%
Magnesium sulfate (bolus)	Parenteral nutrition ≤ 950 mOsm/L	NaCl ≥ 3%
Meropenem	Phenobarbital	Na-valproate
Methylprednisolone	Propofol	Nitroprusside
NaCl 0.9%, 0.45%	Propylene glycol-containing drugs	Parenteral nutrition ≥ 950 mOsm/L
Pentamidine	Radiological contrast (non-ionic)	Phenytoin
Phenytoin	Sulfamethoxazole/Trimethoprim	Promethazine
Piperacillin-tazobactam	Thiopental-Na	Radiological contrast media – ionic (e.g., Magnevist, MultiHance)
Ringer lactate	Vancomycin	Vasopressors (Dopamine, Dobutamine, Adrenaline, Noradrenaline, Milrinone, Phenylephrine, etc.)
Sulbactam		
Tobramycin		

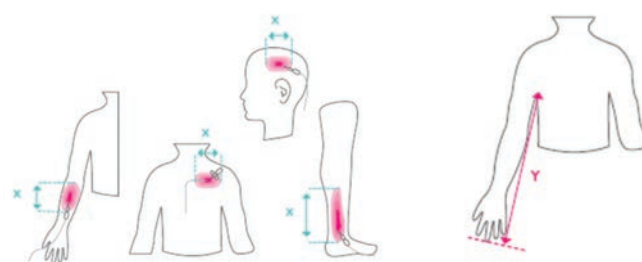
Note: This table is not exhaustive. If a drug is not listed and there is uncertainty regarding its PIVE risk, consultation with the institutional pharmacist is recommended. Any drug extravasation (even of normal saline) can potentially cause severe tissue injury, ischemia, or compartment syndrome (18, 21–24).

Infusion fluids, solutions, and medications can be classified into three main categories based on their tissue-damaging potential in PIVE: low (green), medium (yellow), and high (red) risk (16, 18–20) (*Table 2*). Early recognition of PIVE is crucial, as accurate staging and assessment of injury severity are essential to guide further management. (*Table 3 and 4*).

Complex clinical situations: Consider the potential for compartment syndrome and the local effects of the extravasated substance (7, 15, 28). Assessment of PIVE stages is often subjective and requires clinical experience. At the same time, it is the responsibility of the initial observer to evaluate the potential severity of the PIVE-related com-

Table 3: Major PIVE complications

COMPLICATION	DESCRIPTION
Tissue edema, pain, erythema	Early signs of extravasation include redness, swelling, pain, and sometimes burning or tingling around the catheter site. (These symptoms may mimic inflammatory or infectious processes.) (1–3, 5).
Blistering of the skin	If the infused fluid is irritant, hyperosmolar, or vesicant, blisters, skin peeling, and burn-like phenomena may develop (18, 19).
Tissue necrosis	In more severe cases, tissues (skin, subcutaneous tissue, and possibly muscles and tendons) may undergo necrosis due to toxic or irritant substances (6, 7, 15).
Nerve, tendon, joint involvement – functional impairment	Extravasation may extend to deeper structures, including nerves, tendons, and joints, resulting in persistent sensory loss, pain, or restricted mobility (6, 16, 25).
Compartment syndrome, vascular compromise	Large-volume interstitial infusion or progressive swelling may lead to tissue compartment pressure increase, causing vascular compromise or compartment syndrome (15, 26–28).
Infection, delayed wound healing	Tissue damage increases the risk of infection and slows healing; septic skin or tissue loss may occur (21, 22, 25).
Permanent scarring, cosmetic changes	After necrosis, pathological scar tissue may form, and skin changes or discoloration may persist, potentially causing functional and/or aesthetic problems (29–33).

Figure 1: Extravasation percentage

Maximum diameter of swelling (X)
 Length of upper limb from axilla to longest fingertip (Y)
 $\text{Extravasation \%} = X/Y \times 100$

plication and to request additional assistance to ensure optimal patient management when necessary. Measurement of the percentage of extravasation provides an objective tool that is widely used internationally [3, 7, 17] (Figure 1.). If extravasation is $\geq 30\%$, minimally invasive or surgical intervention should be considered (7, 15, 18).

Management of PIVE complications

In addition to prevention, early and adequate management of established complications is equally critical. Proper treatment may save a limb and preserve its function and integrity, preventing tissue necrosis and soft tissue defects (6, 7, 15, 21). Over recent decades, efforts have been made to develop uniform, clearly defined, and easily understandable recommendations for the management of peripheral extravasation injuries during intravenous therapy (Table 5 and 6.). The following treatment algorithm is based on current literature recommendations (3, 7, 15, 16, 18, 21, 30). Standardization of extravasation emergency kits on hospital wards can facilitate timely management.

Table 4. Stages of PIVE

STAGE	CLINICAL FEATURES	SKIN/TISSUE CHANGES	PAIN / SENSORY DISTURBANCE	CAPILLARY REFILL TIME (CRT)
0 – normal	Infusion flows freely, no swelling or skin color change	None	None	Normal (<2 s)
1 – mild infiltration/extravasation	Mild swelling, slight erythema, tautness, catheter more difficult to flush	Mild edema at puncture site, redness, intact skin	Mild discomfort	Normal or slightly delayed (≤ 3 s)
2 – moderate extravasation	Swelling, erythema, infusion slow or stopped	Moderate edema above and below catheter site, erythema, possible mottling	Moderate pain, burning sensation	Slowed (3–4 s)
3 – severe extravasation	Extensive swelling, cool to touch, grayish or livid skin	Moderate to extensive edema, blistering, taut and cool skin, erythema or pallor	Severe pain, burning-throbbing	Significantly delayed (>4 s), compromised peripheral circulation
4 – necrosis	Tissue necrosis, ulceration, skin and muscle damage, sensory loss	Significant swelling, ulceration, necrosis, peeling, deep tissue involvement	Initially severe pain, later sensory loss	CRT often unmeasurable

Table 5. General actions by stage

STAGE	ACTIONS
0	Regular monitoring, documentation, and preventive measures.
1	Stop infusion, remove the catheter, elevate the limb, apply cold/warm compress depending on infused substance, document the event. (Symptoms at this stage may mimic inflammatory or infectious processes.)
2	Stop the infusion, provide analgesia, elevate the limb, observe the PIVE site for 24–48 h, consult a specialist (do not remove the cannula until consultation), document the event (photo recommended).
3	Stop the infusion, leave the catheter in place, provide analgesia, elevate the limb, consult a specialist, administer an antidote (if available), closely monitor, document the event (photo recommended).
4	Stop the infusion, leave the catheter in place, provide analgesia, elevate the limb, consult a specialist, administer an antidote (if available), perform immediate surgical intervention, initiate wound care, consider second-look surgery if needed, consult plastic surgery, document the event (photo recommended)

Note: All PIVEs involving vasoactive agents are automatically classified as stage 4 (25, 29, 30).

The mnemonic “SLAP” guides immediate actions:

- ♦ Stop – stop the infusion
- ♦ Leave – leave the catheter/cannula in place
- ♦ Aspirate – aspirate the extravasated fluid (and any residual drug from cannula)
- ♦ Plan – plan next steps: call for assistance, administer analgesics, assess the PIVE event, prepare necessary equipment, document (symptoms, limb perfusion, catheter site and time, drug type, volume, infusion rate and duration; mark and photograph the affected area), inform the parents (7, 15, 18).

Conservative treatment

- ♦ Discontinue the infusion, request specialist consultation if needed (e.g., surgeon, traumatologist, etc.), leave the cannula in place until consultation;
- ♦ Elevate and immobilize the limb;
- ♦ Consider analgesia (NSAIDs);
- ♦ Apply warm or cold compress depending on the substance involved:
 - Warm: promotes blood flow and absorption,
 - Cold: reduces inflammation; avoid in cases of vasoconstrictor extravasation as this may worsen ischemia.
- ♦ Topical treatments: nitroglycerin, silver sulfadiazine, dimethyl sulfoxide, corticosteroids (30–32).

Minimally invasive treatment

- ♦ Aspiration: removal of extravasated fluid through the existing catheter or by inserting a new catheter into the puncture tract. (These procedures may require sedation and analgesia.)

Table 6. Treatment guidance based on extravasation percentage and substance risk group

EXTRAVASATION % & RISK GROUP	ACTIONS
All vasoactive agents (red group)	Immediate treatment, consult a specialist, administer phentolamine antidote, do not apply cold compress.
≥30% red group	Review within 30 minutes. Consultation, analgesia, documentation. Prepare for washout procedure, which should be performed as soon as possible. Notify plastic/local surgery team if the procedure may need to be performed in the operating theatre. Consider treatment with hyaluronidase.
<30% red group	Review within 30 minutes. Consultation, analgesia, documentation. Hourly observation and reassessment of the injury for 48 hours. Notify plastic/relevant surgical team within hours Washout procedure only required if progressing towards ≥30% swelling or evidence of impending tissue ischemia (above). Consider treatment with hyaluronidase.
≥30% yellow or green group	Review within 30 minutes. Hourly observation and reassessment of the injury for 48 hours. Invasive treatment is generally not required. Consultation, analgesia, documentation. A washout procedure is indicated if there is impending tissue ischemia or if swelling exceeds 60%. Discuss with plastic/relevant surgical team if worsening, to determine whether intervention is needed. Consider treatment with hyaluronidase.
<30% yellow or green group	Non-urgent review. Observe and reassess the injury every 4 hours for 24 hours. Treatment is typically not required unless there are signs of progressive ischemia or increasing swelling. A washout procedure is indicated if there is impending tissue ischemia.

- ♦ Hyaluronidase injection: facilitates diffusion of the extravasated substance (33–36)
 - Administer within 1 hour for optimal effectiveness
 - Adult dose: 150 units (IU)
 - Pediatric dose: <1 year: 15 units in 1 mL saline per injection site; >1 year: total dose of 150 units, similar to adult dosing (dose based on affected area rather than body weight)
 - Technique: inject at 5–10 points around affected area, total volume 1–2 mL saline
- ♦ Phentolamine local injection: for vasoactive substances (α -adrenergic antagonist) (37)

- Administer immediately (within 1 hour)
- Adult dose: 5–10 mg subcutaneously or intradermally around the affected area
- Pediatric dose: 0.1–0.2 mg/kg around the affected area; inject slowly in small volumes to minimize tissue stress
- ♦ Other antidotes. Specific agents have limited published evidence: sodium thiosulfate (mechlorethamine), dimethyl sulfoxide (anthracyclines, mitomycin C, platinum compounds), dexrazoxane (anthracyclines) in PIVE (18, 36). In cases of chemotherapy extravasation, hyaluronidase may also be used to increase tissue permeability (38–43).

Invasive treatment

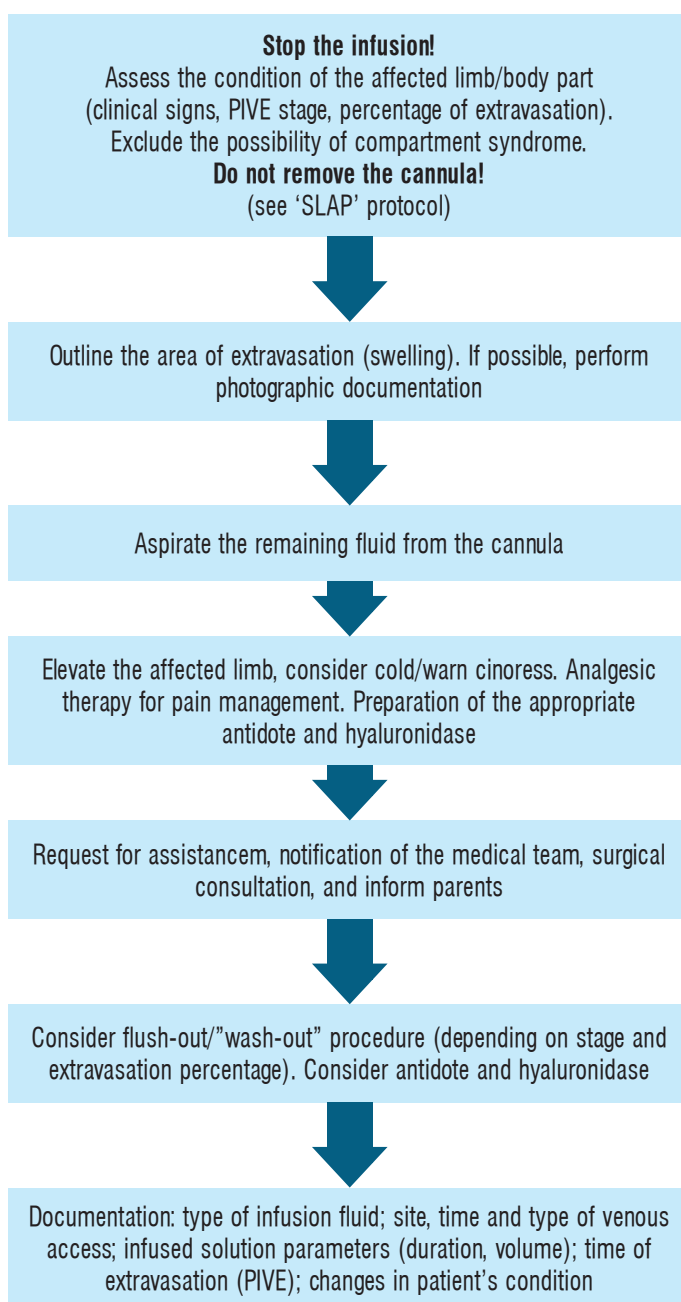
- ♦ Saline flush-out/washout ± liposuction (7, 15, 16, 18, 30, 42)
 - Small incisions or punctures at the affected area, followed by subcutaneous saline lavage
 - Hyaluronidase may be administered prior to lavage
 - Optional liposuction
 - Antibiotic prophylaxis may be considered in immunocompromised patients
- ♦ Surgery (fasciotomy, debridement, necrectomy, skin grafts, other tissue reconstruction)
 - Acute, delayed, and late phases: management of acute complications, delayed second-look procedures for additional necrotic tissue removal and reconstruction; and subsequent functional and aesthetic reconstruction
 - Timing should be individualized; however, in compartment syndrome, immediate intervention within 4–6 hours is critical to prevent irreversible ischemic injury (15, 28, 43).
 - All surgical specialties should be familiar with the potential acute minimally invasive and invasive management options.

The early management flowchart for PIVE events is seen in *Figure 2*.

Conclusion

Peripheral intravenous extravasation represents a common and potentially serious complication in pediatric patients. Although severe tissue injury is uncommon, early recognition, consistent monitoring, and timely, standardized management are essential to prevent long-term functional and cosmetic sequelae. Implementation of uniform prevention and treatment protocols, together with staff education and appropriate technological support, can significantly reduce the incidence and severity of PIVE. In Hungary, the absence of a national guideline underscores the need to establish standardized protocols to optimize pediatric patient safety and quality of care.

Figure 2: Early management flowchart for PIVE events



Statement and declaration

The author declares no relevant financial or non-financial conflicts of interest.

Ethical Considerations

As this study is based on previously published data and does not involve human or animal subjects, formal ethics approval was not required. However, the work is consistent with the Declaration of Helsinki (2013 revision) and emphasizes the ethical obligation to ensure patient safety through standardized, evidence-based care.

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