STUDENTS' KNOWLEDGE ABOUT HIV AND THEIR ATTITUDES TOWARDS PEOPLE LIVING WITH HIV/AIDS IN THE CZECH REPUBLIC: ANALYSIS OF THE SCHOOL ENVIRONMENT AND RECOMMENDATIONS FOR PREVENTION

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SUMMARY

Objectives: The main objective of the questionnaire survey conducted by the National Institute of Public Health in Prague was to determine the level of knowledge and attitudes and to identify changes since the previous survey in 2015. A secondary objective was to gather more detailed information on how HIV/AIDS topics are taught in schools, as reported by school prevention coordinators.

Methods: The questionnaire was distributed to 48 randomly selected educational institutions and the humanitarian organization MRIYA UA z.s. between October 2022 and January 2023. Data on 21 questions focusing on HIV/AIDS issues were collected anonymously from Czech and Ukrainian students. The survey included a representative sample of students from the 7th, 8th, and 9th grades in primary schools and multi-year grammar schools. Each institution received a questionnaire for the prevention coordinator, who answered 12 questions.

Results: A total of 3,011 students completed the questionnaire. The average score for HIV/AIDS knowledge was 13.5 points out of a maximum of 22 points. Students' knowledge gradually increased with higher grades: students from multi-year grammar schools scored an average of 15.9 points, while primary school students scored an average of 13.2 points. Czech students scored an average of 13.6 points, whereas Ukrainian students scored an average of 12.4 points; the 1.2-point difference was statistically significant ($p = 0.004$). Compared to the 2015 survey, there was a slight overall decline in adolescents' knowledge levels. Students' attitudes towards people living with HIV/AIDS positively correlated with their knowledge about HIV/AIDS: the better their knowledge, the more favourable their attitudes toward people living with HIV/AIDS. Students' main sources of information about HIV/AIDS were school (37.1%) and the Internet (36.6%). According to school prevention coordinators, 95.7% of the surveyed schools address the topic of HIV/AIDS, most commonly in biology or health education classes, dedicating an average of 8.7 instructional hours to the subject. The most frequent teaching method is video lessons, used by 87.2% of the surveyed schools. Schools expressed a preference for improving the quality of education by utilizing presentations with professionally approved content, with 74.5% of schools supporting this option.

Conclusions: The survey highlighted a gradual increase in HIV/AIDS knowledge with advancing school grades, a significant disparity in knowledge between Czech and Ukrainian students, and a slight overall decline in knowledge compared to 2015. The Internet and schools were the main information sources, though the role of schools declined significantly. It also underscored the need for enhanced educational programmes and continuous professional development for educators to improve health literacy and HIV/AIDS prevention among adolescents.

Key words: HIV, AIDS, prevention, knowledge, attitudes, primary prevention, education, stigma

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INTRODUCTION

HIV infection and AIDS remain significant public health issues in both developing and developed countries, necessitating constant attention. According to the World Health Organization (WHO), an estimated 39.0 million (33.1–45.7 million) people were living with HIV at the end of 2022, 1.3 million (1.0–1.7 million) people became newly infected in 2022, and 630,000 (480,000–880,000) people died from AIDS-related illnesses in 2022 (1) despite the existence of effective treatment for HIV/AIDS. UNAIDS data from 2021 indicate that every two minutes, an adolescent girl or young woman was newly infected with HIV, and the COVID-19 pandemic disrupted key HIV treatment and prevention services in many countries.

By the end of 2023, the surveillance system in the Czech Republic had recorded 4,619 HIV-positive individuals of Czech nationality and foreigners with a long-term stay, of whom 607 had already died, with 395 deaths occurring at the AIDS stage

and 212 from other causes (2). A total of 109 individuals were first diagnosed as HIV positive during adolescence (ages 10–19), with 31 diagnoses made in the last 10 years (2014–2023). The annual number of newly diagnosed HIV cases ranged from 208 to 292 between 2014 and 2023, with a total of 2,497 HIV-positive individuals diagnosed during this period in the Czech Republic. Additionally, from 2022 to 2023, 727 HIV-positive Ukrainian refugees fleeing the conflict and granted temporary protection status in the Czech Republic were recorded, 22 of whom were aged 10–19 years.

HIV infection is currently a treatable, but still incurable, disease that can be very effectively prevented through high health literacy, especially among the adolescent population. The issue of preventing this infection has gained urgency, particularly in connection with the war in Ukraine and the immigration of people of all age groups, including Ukrainian adolescents, to the Czech Republic. Increasing adolescents' knowledge about the HIV transmission routes and prevention is the key tool to reduce the number of new HIV infections. Effectively implemented educational programmes can demonstrably contribute to abstinence or delaying the initiation of sexual activity, reduce the frequency of unprotected sex, decrease the number of sexual partners, and increase the use of protective measures to prevent unwanted pregnancies and sexually transmitted infections (STI). Combination prevention programmes, which are evidence-based initiatives that use a mix of biomedical, behavioural, and structural interventions within communities, have a greater sustained impact (3).

The school environment provides an appropriate opportunity and means to reach a large number of young people before they begin their sexual lives (4). In accordance with the Education Act, the Ministry of Education, Youth and Sports of the Czech Republic issues the Framework Educational Programme for Basic Education (FEP BE) for the implementation of basic education, which is regularly revised and modernized in line with the dynamic developments and changes of the 21st century and in accordance with the government's Health 2030 strategy (5). The lower level of eight-year grammar schools, as well as the second level of primary schools, must include all cross-cutting topics from the FEP BE in their educational content (6). The basics of sex education, including protection against HIV/STIs, are further anchored in the document titled Recommendations of the Ministry of Education, Youth and Sports for the Implementation of Sex Education in Primary Schools (7). Activities to support the prevention of infection spread among young people are also included in the strategic document National Programme for HIV/AIDS in the Czech Republic for the period 2023–2027 (8), developed by the Ministry of Health (MoH) of the Czech Republic in cooperation with the National Institute of Public Health (NIPH). It classifies adolescents and young people as vulnerable population groups and lists them as a part of the general population at increased risk of HIV/AIDS to be targeted for education. In the Czech Republic, a wide range of activities aimed at preventing the spread of HIV infection among the adolescent population have long been implemented in cooperation with schools. Some of these activities are funded by the MoH's grants under the National Programme for HIV/AIDS.

The most widespread preventive education programme for adolescents and young people is the NIPH project titled "Game Against AIDS" (9, 10). Additionally, schools conduct thematic discussions and lectures with experts and people living with HIV/AIDS (PLWHA). Many websites provide important information to young people*, which are endorsed by the Manager of the National Programme for HIV/AIDS in the Czech Republic at NIPH. Other important resources include the websites of non-governmental organizations, particularly the Czech AIDS Help Society**, among many other specialized sources.

In 2015, the NIPH conducted a study mapping the state of knowledge and attitudes towards HIV/AIDS among adolescents, using a representative sample of schools across the Czech Republic. The results of this study serve as a basis for comparing developmental trends in health literacy among young people regarding HIV/AIDS prevention (11). As a follow-up to this study, the NIPH conducted a questionnaire survey on HIV/AIDS education, the results of which are presented here. The aim was to expand on the afore-mentioned study and identify shifts in knowledge and attitudes regarding HIV/AIDS over time within the same age groups. The research also included a questionnaire survey among school prevention coordinators, aiming to understand how HIV/AIDS education is delivered in schools and which teaching methods are considered optimal by teachers.

MATERIALS AND METHODS

Studied Sample

The target group of the survey consisted of students from the 7th to 9th grade of primary schools and students from the second to fourth year of multi-year grammar school. Schools were selected from all regions of the Czech Republic and were located in both small and large municipalities to ensure representativeness. Settlements with fewer than 10,000 inhabitants were classified as small, while those with 10,000 or more inhabitants were classified as large. The study involved 48 primary schools and multi-year grammar schools, as well as the registered humanitarian organization MRIYA UA z.s., where some students from Ukraine filled in the questionnaire. Additional information on teaching methods used for HIV/AIDS-related topics was obtained from school prevention coordinators, which mapped the inclusion of these topics in the curriculum.

Methods

The questionnaire of the current survey was based on the questionnaire of the 2015 study (11) and was modified according to the current research objectives by the NIPH in cooperation with the Public Health Institute Ústí nad Labem (PHI Ústí n. L.) and the Public Health Institute Ostrava (PHI Ostrava). The survey was conducted from October 2022 to January 2023. To assess students' knowledge and attitudes regarding HIV/AIDS, a questionnaire was developed that included only basic information about the

*https://tadyted.com/hiv-aids/ and https://www.prevencehiv.cz/
**https://www.aids-pomoc.cz/

respondents' gender, school, and age. Participation in the survey was voluntary and anonymous. The questionnaire consisted of 21 questions, some of which included sub-questions. The questionnaires were prepared in Czech and also in Ukrainian for students whose native language is Ukrainian.

Questions 1–13 assessed the students' knowledge and were closed-ended, with question 4 containing 10 short sub-questions, resulting in a total of 22 items in the questionnaire. Each question had only one correct answer, for which respondents received one point. The maximum knowledge score was 22 points. Questions 14–21 focused on students' attitudes towards PLWHA, information sources, and their own behaviour. Completing the questionnaire took approximately 15–20 minutes, depending on the grade level.

The second part of the survey targeted school prevention coordinators and how HIV/AIDS education was conducted at their schools. A questionnaire with 12 questions about HIV/AIDS education was created to collect information from school prevention coordinators. Each of the 48 schools received a questionnaire for the prevention coordinator, who answered the questions, with respondents allowed to select multiple options for some questions.

The administration and collection of questionnaires filled out by students were carried out by professional staff from the NIPH, the PHI Ústí n. L., the PHI Ostrava, and selected regional public health authorities (Regional Public Health Authority of the Hradec Králové Region and Regional Public Health Authority of the Olomouc Region), in cooperation with the school administrations and in the presence of a teacher. The completed questionnaires were subsequently digitized by the NIPH.

The survey was voluntary and anonymous, and therefore did not require approval from the Ethics Committee of the NIPH.

Statistical Analysis

The data were analysed using SPSS 24.0 software (SPSS Inc., Chicago, IL, USA). Since continuous variables did not meet the assumptions of normal distribution, non-parametric methods were used for testing. The chi-square test and Mann-Whitney U test were employed. P-values less than 0.05 were considered statistically significant.

RESULTS

Results of the Questionnaire Survey among Primary School and Multi-year Grammar School Students

A total of 3,011 students completed the questionnaire, of which 2,906 (96.5%) in Czech and 105 (3.5%) in Ukrainian. There were 1,479 boys and 1,395 girls, while 137 individuals did not specify their gender. Overall, 1,049 students (34.9%) were attending the 7th grade (or second year of grammar school), 966 students (32.1%) were in the 8th grade (or third year of grammar school), and 990 students were in the 9th grade (or fourth year of grammar school), with the remaining 6 students not specifying their grade level.

Students' Knowledge

In the area of knowledge, students could score between 0 and 22 points. All knowledge questions were answered by 2,532 students, while some responses were missing for the remaining questionnaires. The average score was 13.5 points, with a median of 14 points. Knowledge levels improved progressively with higher grades: in the seventh grade, the average score was 12.0 points (median 13 points), in the eighth grade it was 13.5 points (median 14 points), and in the ninth grade, it was 15.2 points (median 15 points), with the median score differing significantly ($p < 0.001$), as shown in Figure 1.

Students from smaller municipalities had statistically significantly lower scores by 0.6 points ($p < 0.001$) compared to students from larger municipalities. Statistically significant differences ($p < 0.001$) were also observed in knowledge between grammar school students and primary school students, with grammar school students scoring an average of 15.9 points and primary school students averaging 13.2 points, a difference of 2.7 points on average.

Furthermore, the level of knowledge between Czech and Ukrainian students was also statistically significantly different ($p = 0.004$). Czech students averaged 13.6 points, while Ukrainian students averaged 12.4 points, with Ukrainian students more frequently responding "don't know". Students' knowledge was not dependent on gender.

A detailed list of all knowledge-related questions, along with the proportions of correct and incorrect answers and the total number of responses, is presented in Table 1.

Students most frequently erred in identifying the appropriate time to undergo an HIV test following a risky situation, with only 13.0% answering correctly. A significant portion of students were unaware of what pre-exposure prophylaxis (PrEP) and post-exposure prophylaxis (PEP) entail, with only 24.4% and 31.6% answering correctly, respectively. Less than half (45.0%) of the students knew that hormonal contraception does not protect against HIV infection.

Conversely, 87.5% of the students knew that a healthy-looking person can be HIV positive. Additionally, 91.1% of the students were aware that HIV can be transmitted through unprotected sexual intercourse, 85.3% through blood, and 85.5% through shared needle use. Furthermore, 79.2% knew that HIV is not transmitted through handshakes, and 90.5% understood that it is not transmitted through hugging.

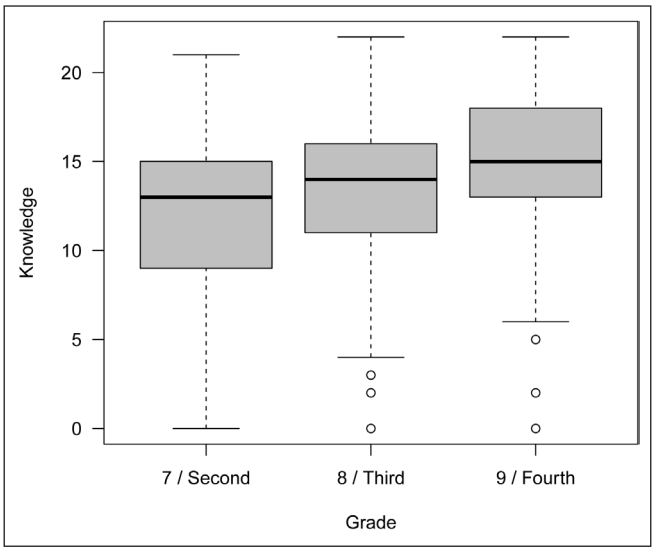

Fig. 1. *Knowledge score (0–22 points) in dependency to the respondent's grade at primary and multi-year grammar schools.*

Table 1. *Students' knowledge of HIV/AIDS according to correctly answered questions*

Question number	Question	Answer			Number of valid responses
		Correct	Incorrect	Don't know	
		%	%	%	N
1	What is HIV?	56.7	25.9	17.4	2,966
2	What is AIDS?	61.5	22.4	16.1	2,932
3	Can a person who looks healthy be HIV positive?	87.5	3.1	9.4	2,953
4.1	Can HIV be transmitted by unprotected sex?	91.1	2.4	6.5	2,995
4.2	Can HIV be transmitted by insect bites?	65.6	15.7	18.7	2,988
4.3	Can HIV be transmitted by shaking hands?	79.2	9.1	11.7	2,986
4.4	Can HIV be transmitted by sharing a toilet?	45.6	31.6	22.9	2,979
4.5	Can HIV be transmitted through blood?	85.3	4.4	10.3	2,995
4.6	Can HIV be transmitted by sharing needles?	85.5	4.6	9.9	2,997
4.7	Can HIV be transmitted by a casual kiss?	62.0	18.8	19.2	2,989
4.8	Can HIV be transmitted from an HIV-positive mother to her baby through the placenta?	55.0	11.2	33.8	2,968
4.9	Can HIV be transmitted by hugging?	90.5	2.3	7.2	2,997
4.10	Can HIV be transmitted by sharing a razor or a toothbrush?	36.9	39.3	23.8	2,975
5	Can mutual fidelity between partners reduce the risk of infection?	51.5	23.4	25.1	2,976
6	Can the risk of infection be reduced by using a condom every time a person has sex?	72.1	10.3	17.6	2,980
7	Can a person become infected with HIV during their first sexual encounter?	75.7	5.7	18.6	2,993
8	Does hormonal contraception protect against HIV infection?	45.0	13.2	41.8	2,973
9	Who can a person get HIV from?	77.0	11.9	11.1	2,949
10	How long after a risky situation should a person be tested for HIV to get a reliable result?	13.0	67.7	19.2	2,982
11	Is it possible to completely cure an HIV infection?	54.7	17.8	27.4	2,975
12	What is pre-exposure prophylaxis (PrEP)?	24.4	12.2	63.4	2,964
13	What is post-exposure prophylaxis (PEP)?	31.6	7.4	61.0	2,978

Comparison of Survey Results from 2015 and 2022–2023

The comparison of student knowledge regarding HIV/AIDS from the 2015 and 2022–2023 studies is detailed in Table 2. The question about pre-exposure prophylaxis was newly added to the 2022–2023 survey, and therefore question 12 is not included in Table 2.

When comparing students' current knowledge with the 2015 survey, there was a statistically significant decline in the percentage of correct answers for most knowledge questions. The most substantial decline was observed for question 8, regarding whether hormonal contraception protects against HIV infection, with a decrease of more than 20 percentage points (20.1 p.p.). Another significant drop was in question 5, which asked if fidelity between partners can reduce the risk of infection, showing a decrease of 17.1 percentage points.

Conversely, there was an increase in knowledge levels for question 9, which asked from whom a person can contract HIV, and question 13, which asked what post-exposure prophylaxis is, with increases of 15.6 and 17.0 percentage points, respectively.

Students' Attitudes towards People Living with HIV/AIDS

Attitudes towards PLWHA were assessed using two questions based on the Global AIDS Monitoring Methodology (12). In response to the question, "Would you buy fresh vegetables from a shopkeeper or vendor if you knew that this person had HIV?" less than one-third of students – 29.4% (873 students) answered yes, 48.9% (1,451 students) answered no, and 21.8% (646 students) were unsure. In 2015, 31.0% of students responded positively to this question.

For the question, "Do you think that children living with HIV should be able to attend school with children who are HIV negative?" approximately half of the students – 50.2% (1,494 students) answered yes, 27.6% (821 students) answered no, and 22.2% (660 students) were unsure. In 2015, more than half of the respondents (52.2%) answered positively to this question.

Therefore, when compared to the 2015 survey, there was a slight decline in the positive attitudes of students towards PLWHA. The attitudes of students towards PLWHA positively correlated with their knowledge about HIV/AIDS. The better the students' knowledge, the more positive their attitudes were towards PLWHA.

Table 2. *Comparison of students' knowledge of HIV/AIDS from the 2022–2023 and 2015 studies*

Question number	Study (percentage of correct answers)		p-value
	2022–2023 (%)	2015 (%)	
1	56.7	70.0	< 0.001
2	61.5	66.7	< 0.001
3	87.5	90.5	0.002
4.1	91.1	97.3	< 0.001
4.2	65.6	69.9	0.003
4.3	79.2	88.1	< 0.001
4.4	45.6	51.6	< 0.001
4.5	85.3	93.3	< 0.001
4.6	85.5	92.1	< 0.001
4.7	62.0	67.1	0.001
4.8	55.0	69.9	< 0.001
4.9	90.5	95.0	< 0.001
5	51.5	68.6	< 0.001
6	72.1	83.2	< 0.001
7	75.7	82.4	< 0.001
8	45.0	65.1	< 0.001
9	77.0	61.4	< 0.001
10	13.0	11.3	0.102
11	54.7	66.0	< 0.001
13	31.6	14.6	< 0.001

The relationship between respondents' knowledge and their attitudes towards PLWHA is illustrated by the mosaic plot in Figure 2.

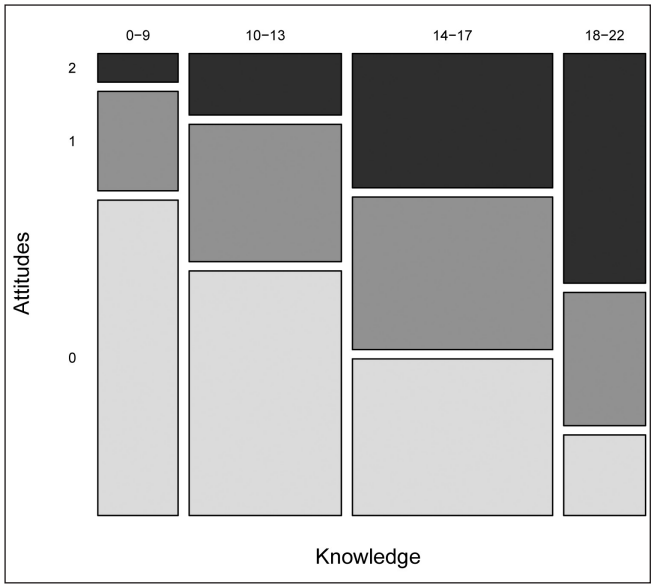

Fig. 2. *A mosaic plot of respondent's attitudes towards PLWHA (0–2, where 0 represents the least friendly attitudes towards PLWHA) in dependency on knowledge score (0–22 points for questions on knowledge).*

Information Sources

When asked "Do you think you have enough information about HIV and AIDS?" nearly 60% of students responded "definitely not" or "probably not" (1,789 students, 59.9%), while 868 students (29.1%) answered "definitely yes" or "probably yes", and 328 students (11.0%) answered "don't know". Compared to the 2015 survey, the proportion of students who believe they do not have enough information increased from 41.6% to 59.9%.

HIV/AIDS was most commonly discussed at school just once (1,158 students, 39.0%), while 425 students (14.3%) reported more than once, and 1,390 students (46.8%) reported that the topic had not been discussed at all. A total of 145 students mentioned specific names of primary prevention programmes they participated in, with the most frequently mentioned being "Game against AIDS" (21 students) and "Be HIV-negative, Protect Your Life" (20 students).

More than a third of students (1,073 students, 37.1%) stated that their main source of information about HIV/AIDS was school. The Internet was cited by 1,058 students (36.6%). Family (439 students, 15.2%), other sources (203 students, 7.0%), and friends (120 students, 4.1%) were further mentioned.

Students' Behaviour

In response to the question, "Do you think you are being safe so that you don't get HIV?" more than two-thirds (2,036 students, 69.0%) answered "yes". The answer "no" was chosen by 122 (4.1%) students, and "don't know" was selected by 791 (26.8%) students. Compared to the 2015 survey, there was a decrease in the "yes" response from 75.2% to 69.0%, while the "don't know" responses increased from 19.4% to 26.8%.

For the question "What do you prefer for protection against HIV?" students could choose multiple options. The most frequently cited method was using condoms, chosen by 2,566 students (85.9%), followed by not using intravenous drugs, mentioned by 2,177 students (72.9%). Other responses and their percentage distribution are shown in Figure 3.

Results of the Questionnaire Survey among School Prevention Coordinators

School prevention coordinators from 47 schools completed the questionnaire on the implementation of HIV/AIDS education. One school did not submit the questionnaire. Nearly all schools (95.7%) reported that they include HIV/AIDS and other STIs in their mandatory curriculum, with only two schools (4.3%) not covering this topic. Continuous education on this subject is provided to only 27.7% of teachers.

The topic of HIV/AIDS is most frequently incorporated into biology classes, as indicated by prevention coordinators from 42 schools (89.4%). Thirty-four schools (72.3%) included it in health education, 18 schools (38.3%) in civics, and 11 schools (23.4%) in other subjects such as Czech, family education, English, and chemistry. The total time spent by schools on HIV/AIDS and other STIs averages 8.7 instructional hours.

Additionally, the majority of schools (97.9%) integrate the topic of HIV/AIDS into cross-curricular themes, most commonly into personal and social education (44 schools, 93.6%) and multicultural education (15 schools, 31.9%). Less frequently, schools

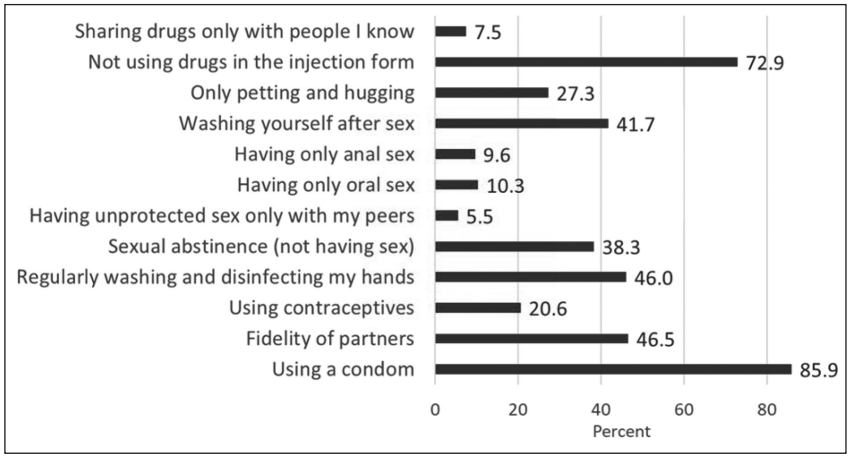

Fig. 3. *Percentage representation of the responses to the question "What is your preference for protection against HIV infection?"*

addressed HIV/AIDS within media education (23.4%), education for thinking in European and global contexts (14.9%), education for democratic citizenship (14.9%), environmental education (6.4%), and other unspecified areas (4.3%).

Educators most commonly used video lessons and short videos (41 schools, 87.2%), brochures and leaflets (33 schools, 70.2%), and posters (18 schools, 38.3%) as teaching materials. Five schools (10.6%) used demonstrative teaching models, while 11 schools (23.4%) reported using other materials such as textbooks, educational games, and the Internet.

The most common options for improving the quality of HIV/AIDS education were a ready-made presentation for teaching with professionally approved content (35 schools, 74.5%), a discussion with a doctor (25 schools, 53.2%), and training seminars for teachers (23 schools, 48.9%).

DISCUSSION

The positive impact of educational programmes focused on sexual education, HIV/AIDS prevention, and other STIs on the behaviour of adolescents and young people is confirmed by a comprehensive meta-analysis summarizing the results of 83 studies conducted in various countries worldwide. The results of this meta-analysis demonstrate the positive influence of educational programmes in this area on the behaviour of adolescent populations (13), as well as a meta-analysis of 67 studies, which demonstrated the effect of interventions on reducing the incidence of STIs, increasing condom use, limiting or delaying penetrative sex, and enhancing negotiation skills for safer sex (14). Education itself is unlikely to affect the decision of intervened adolescents to delay the onset of sexual activity, but the frequency of condom use is demonstrably higher among educated youth than among those without this education (15).

School education in the field of HIV/AIDS is associated with a later age at first sexual intercourse, fewer sexual partners, and a lower likelihood of forced sexual intercourse. Ideally, HIV/AIDS education in schools should begin before puberty or, at the latest, before the first sexual intercourse (16).

A discrepancy seems to exist between the statements, with 46.8% of students stating that HIV/AIDS issues were not covered in school, contrary to prevention coordinators' claims that 95.7% of schools address HIV/AIDS as part of compulsory education. However, this curriculum is typically introduced in higher grades, most commonly during the 8th year (seconds), which also correlates with higher levels of knowledge among older students. A comparison between the current study and a study conducted in 2015 (11) suggests a strengthening role of the Internet as the main source of information on HIV/AIDS among adolescents, increasing from 33.0% in 2015 to 36.6%, and a decrease in the role of families from 17.2% to 15.2%. The most significant finding is a substantial decline in the school's role as the main source of information, from 50.8% in 2015 to the current 37.1%. This trend necessitates a reversal through support for the creation of special programmes respecting the latest expert recommendations on this issue and motivating teachers in all types of schools to use them, as well as their ongoing education in this area.

These results clearly confirm the importance of educational programmes that include practical demonstrations and training in condom use, along with information on contraception methods, as exemplified by the most widespread educational project in the Czech Republic, the "Game Against AIDS" project (9, 10). Gamification can be a useful approach to sexual education, utilizing various games, including modern technological applications appealing to the adolescent generation. Active participation of pupils and students also develops critical thinking skills, enhances self-confidence, and increases motivation for learning (17). Curricula for 21st-century education must always include both the content of education and achievable outcomes and practical experiences that students will acquire in school according to a certain curriculum, drawing from both current scientifically supported information and the past (18). A formal education system with broad access to young people should play a central role in education for HIV/AIDS prevention. Effective school programmes for HIV/AIDS prevention education must focus on teacher training, partnerships, and appropriate teaching methods, they should also include a list of recommended resources to help teachers in the HIV/AIDS field obtain current data, appropriate teaching aid, and sample assessment questionnaires. It is essential to emphasize professionally trained and actively involved educators, partnerships with open communication, the use of unconventional and innovative teaching methods, support for skills-based education, and monitoring and evaluating the effectiveness of education (19).

A study by Polish authors from the late 1990s mapping the information sources of students aged 15–17 identified television (53%) and magazines (45%) as the main sources of information on AIDS, with a third of students citing school as an information source. Between 1990 and 1998, there was a decrease in the proportion of students who wanted to obtain information through the media, and an increase in the number of adolescents who stated a preference for "personal" sources of information (family, school, healthcare professionals). Absence of HIV/AIDS education was reported by 58% of students in 1990, decreasing to 38% in 1994, with 92% of students expressing interest in more information about AIDS (20). The irreplaceable role of schools in increasing health literacy is demonstrated by a study conducted in the Moravian-Silesian Region, where students attended an educational lecture and participated in a group game with interactive elements called "Playfully about STIs". Using an anonymous paired questionnaire (input/output), the shift in students' knowledge levels was evaluated, which improved on average by 15.5%, with the highest effectiveness observed in the 13–14 age group, where improvement reached 17.9% (21).

Our conclusions regarding significant differences in the level of knowledge of adolescents in HIV/AIDS prevention in the Czech Republic with respect to the type of school attended are confirmed by a study focused on comparing the knowledge level of high school students and vocational school students. The results clearly demonstrate significantly higher levels of knowledge among high school students compared to vocational youth and simultaneously significantly higher levels of knowledge among girls compared to boys (22). However, these findings for the Czech Republic do not correspond to the results of eleven studies conducted in school settings among adolescents and young people in low- and middle-income countries (23). In 9 out of 11 studies, boys scored higher in knowledge about HIV transmission and prevention, and gender-based disparities were found between knowledge, risk perception, and HIV prevalence among youth, leading the authors to speculate that social and cultural contexts cause girls in low- and middle-income countries to be at high risk of HIV infection. According to UNESCO, effective educational programmes for school-age youth in sexual health and STI prevention should include a wider range of topics, including STI prevention, sexual orientation, gender roles, adolescent pregnancies, etc. However, the content of education remains within the competence of EU member states, and there are significant differences in methods, content, and scope of education in this area among EU countries (24).

Shepherd et al. point out that interventions in HIV and other STI prevention must be part of a whole-school approach to promoting sexual health, and young people will benefit from being involved as equal participants in designing and implementing interventions, but teacher-led interventions are cheaper than peer-led interventions due to less frequent retraining needs (25).

Authors of an extensive systematic review synthesized current global evidence on barriers and factors hindering effective HIV prevention among youth, concluding that most barriers to interventions targeting young people are related to implementation strategy factors, along with barriers between facilitators and intervention recipients, emphasizing the need for multi-level and combined approaches to barrier removal and facilitation of intervention success (26). In the context of the Czech Republic, consideration must also be given to the role of prevention coordinators in schools, their expertise, and particularly their individual abilities to communicate with young people about such a sensitive topic as sexual education, as the WHO strongly emphasizes that quality education must include comprehensive learning about all cognitive, emotional, social, interactive, and physical aspects of human sexuality (27). Currently, there are a variety of recommendations regarding effective biomedical, behavioural, and structural approaches aimed at addressing HIV prevention needs among adolescents, including oral PrEP, male circumcision, rapid HIV testing, and numerous behavioural structural interventions (28).

A limitation of this study is the low number of Ukrainian students involved in the study compared to the sample of Czech students. Furthermore, not all students completed all the information in the questionnaire which affected the number of valid responses for each question. Similar surveys would need to be conducted repeatedly to assess the trends in student knowledge and attitudes.

CONCLUSIONS

The results of the survey conducted among a sample of 3,011 young people revealed that the knowledge of students regarding HIV/AIDS in the second level of primary schools and multi-year grammar school gradually increases. Adolescents from smaller municipalities have significantly lower knowledge compared to their peers from cities and larger towns, and higher knowledge was also demonstrated among students of multi-year grammar schools compared to primary school students. Significant differences in the knowledge scores achieved were also identified between Czech and Ukrainian students. When compared with the results of the survey from 2015, consistency was found in the increase of knowledge among students in higher grades and in identifying the difference in knowledge levels between primary school students and grammar school students. However, current survey revealed a difference in the level of knowledge among students based on the size of their place of residence, which was not identified in the 2015 survey. In the current study, the main sources of information for adolescents regarding HIV/AIDS were the Internet and school, with the role of schools significantly declined compared to the previous survey. Supporting the role of schools in increasing health literacy in HIV/STI prevention is necessary through the development of special programmes for schools and the ongoing education of teachers and other experts in this field. The conducted survey is fully in line with the recommended and approved activities of the National Programme for Addressing the Issue of HIV/AIDS in the Czech Republic for the period 2023–2027 (8).

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Conflicts of Interest
None declared

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REFERENCES

1. World Health Organization. HIV and AIDS [Internet]. Geneva: WHO; 2023 [cited 2024 May 15]. Available from: https://www.who.int/news-room/fact-sheets/detail/hiv-aids?gclid=Cj0KCQiAv8SsBhC7ARIsALIkVT2p6pdZJ0ct7cB8pZ0D2z4JWYUrdYBty01ONlQf7hUyX6AKe357I-m8aAvFoEALw_wcB.
2. National Institute of Public Health. [Graphs of trends in the development and incidence of HIV-AIDS in the Czech Republic in 2023] [Internet]. Prague: NIPH; 2024 [cited 2024 Apr 27]. Available from: https://szu.cz/publikace-szu/data/vyskyt-a-sireni-hiv-aids/. Czech.
3. World Health Organization. Global HIV Programme [Internet]. Geneva: WHO; 2024 [cited 2024 May 7]. Available from: https://www.who.int/teams/global-hiv-hepatitis-and-stis-programmes/hiv-programme.
4. UNAIDS. International technical guidance on sexuality education. An evidence-informed approach [Internet]. Geneva: UNAIDS; 2018 [cited 2024 May 3]. Available from: https://www.unaids.org/en/resources/documents/2018/international-technical-guidance-on-sexuality-education.
5. Ministry of Education, Youth and Sports of the Czech Republic. [Major revisions to the primary curriculum framework] [Internet]. Prague: MEYS; 2023 [cited 2024 Apr 25]. Available from: https://velke-revize-zv.rvp.cz/. Czech.
6. Ministry of Education, Youth and Sports of the Czech Republic. [Framework curriculum for primary education] [Internet]. Prague: MEYS; 2023 [cited 2024 May 18]. Available from: https://www.edu.cz/rvp-ramcove-vzdelavaci-programy/ramcovy-vzdelavacici-program-pro-zakladni-vzdelavani-rvp-zv/. Czech.
7. Ministry of Education, Youth and Sports of the Czech Republic. [Recommendations of the Ministry of Education, Youth and Sports for the implementation of sex education in primary schools] [Internet]. Prague: MEYS; 2010 [cited 2024 Feb 11]. Available from: https://www.msmt.cz/vzdelavani/zakladni-vzdelavani/doporuceni-msmt-k-realizaci-sexualni-vychovy-v-zakladnich. Czech.
8. [National Programme on HIV/AIDS in the Czech Republic for the period 2023-2027] [Internet]. Prague: Ministry of Health of the Czech Republic; 2023 [cited 2024 Jan 22]. Available from: https://www.mzcr.cz/narodni-program-reseni-problematiky-hiv-aids-v-ceske-republice-na-obdobi-2023-2027/. Czech.
9. National Institute of Public Health. [Game against AIDS] [Internet]. Prague: NIPH; 2024 [cited 2024 May 7]. Available from: https://www.prevencehiv.cz/nase-sluzby/hrou-proti-aids/. Czech.
10. Kubátová A, Stupka J, Jedlička J, Mruškovičová L, Mravčík V, Průchová E, et al. [Game against AIDS: manual]. Prague: National Institute of Public Health; 2022. Czech.
11. Mičulková V, Fialová A, Kovačić T, Hamplová L, Veselý D, Hulínský P. What do Czech adolescents know about HIV? Cent Eur J Public Health. 2018;26(2):149-53.
12. Global AIDS monitoring 2024 [Internet]. Geneva: UNAIDS; 2023 [cited 2024 May 3]. Available from: https://www.unaids.org/sites/default/files/media_asset/global-aids-monitoring_en.pdf.
13. Kirby DB, Laris BA, Rolleri LA. Sex and HIV education programs: their impact on sexual behaviors of young people throughout the world. J Adolesc Health. 2007 Mar;40(3):206-17.
14. Johnson BT, Scott-Sheldon LAJ, Huedo-Medina TB, Carey MP. Interventions to reduce sexual risk for human immunodeficiency virus in adolescents: a meta-analysis of trials, 1985-2008. Arch Pediatr Adolesc Med. 2011;165(1):77-84.
15. Oringanje C, Meremikwu MM, Eko H, Esu E, Meremikwu A, Ehiri JE. Interventions for preventing unintended pregnancies among adolescents. Cochrane Database Syst Rev. 2009 Oct 7;(4):CD005215. doi: 10.1002/14651858.CD005215.pub2. Update in: Cochrane Database Syst Rev. 2016 Feb 03;2:CD005215. doi:10.1002/14651858.CD005215.pub3.
16. Ma ZQ, Fisher MA, Kuller LH. School-based HIV/AIDS education is associated with reduced risky sexual behaviors and better grades with gender and race/ethnicity differences. Health Educ Res. 2014 Apr;29(2):330-9.
17. Haruna H, Hu X, Chu SKW, Mellecker RR, Gabriel G, Ndekao PS. Improving sexual health education programs for adolescent students through game-based learning and gamification. Int J Environ Res Public Health. 2018; Sep 17;15(9):2027. doi: 10.3390/ijerph15092027.
18. Acedo C, Hughes C. Principles for learning and competences in the 21st-century curriculum. Prospects. 2014;44(4):503-25.
19. Schenker II, Nyirenda JM. Preventing HIV/AIDS in schools [Internet]. Brussels: International Acadamy of Education; 2002 [cited 2024 Jun 25]. Available from: https://healtheducationresources.unesco.org/sites/default/files/resources/prac09e.pdf.
20. Woynarowska B, Szymanska MM, Mazur J. Sources of information about HIV/AIDS, educational needs of adolescents with this respect and participation of school in fulfilling these needs. Problemy HIV i AIDS. 2000;6(1):25-9. Polish.
21. Macounová P, Tomášková H, Šnajdrová A, Stanovská M, Polochová M, Tomášek I, et al. Education of adolescents in the prevention of HIV/AIDS in the Czech Republic. Int J Environ Res Public Health. 2021 Jun 7;18(11):6148. doi: 10.3390/ijerph18116148.
22. Sekera JC, Preis J, Pazdiora P. Health literacy on HIV infection among adolescents in the Czech Republic: a case study of two Czech cities Plzeň and České Budějovice. Epidemiol Mikrobiol Imunol. 2020 Winter;69(4):182-8.
23. Chory A, Gillette E, Callen G, Wachira J, Sam-Agudu NA, Bond K, et al. Gender differences in HIV knowledge among adolescents and young people in low-and middle-income countries: a systematic review. Front Reprod Health. 2023 Jun 26;5:1154395. doi: 10.3389/frph.2023.1154395.
24. Picken N. Sexuality education across the European Union: an overview. Luxembourg: European Union; 2020.
25. Shepherd J, Kavanagh J, Picot J, Cooper K, Harden A, E Barnett-Page E, et al. The effectiveness and cost-effectiveness of behavioural interventions for the prevention of sexually transmitted infections in young people aged 13-19: a systematic review and economic evaluation. Health Technol Assess. 2010;14(7).
26. Mbengo F, Adama E, Towell-Barnard A, Bhana A, Zgambo M. Barriers and facilitators to HIV prevention interventions for reducing risky sexual behavior among youth worldwide: a systematic review. BMC Infect Dis. 2022 Aug 8;22(1):679. doi: 10.1186/s12879-022-07649-z.
27. WHO Regional Office for Europe and BZgA. Standards for sexuality education in Europe: a framework for policy makers, educational and health authorities and specialists [Internet]. Cologne: BZgA; 2010 [cited 2024 June 25]; Available from: https://www.icmec.org/wp-content/uploads/2016/06/WHOStandards-for-Sexuality-Ed-in-Europe.pdf.
28. Hosek S, Pettifor A. HIV prevention interventions for adolescents. Curr HIV/AIDS Rep. 2019 Feb;16(1):120-8.

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