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What do Polish students know about HIV infections after 35 years of the first confirmed case?

Anna Bohdziewicz[1], Magdalena Goździalska[1], Tomasz Mikuła[2], Alicja Wiercińska-Drapało[2]

[1]Student's Science Society of the Department of Infectious and Tropical Diseases and Hepatology, Medical University of Warsaw, Poland
[2]Department of Infectious and Tropical Diseases and Hepatology, Medical University of Warsaw, Poland

Abstract

Introduction: Human immunodeficiency virus (HIV) causes progressive deterioration of immune system function, which leads to development of acquired immune deficiency syndrome (AIDS). During a period from 1993 to 2017, there was a growing number of HIV infections in Poland who become infected through sexual contacts. The main aim of the study was to evaluate the state of knowledge of Polish medical and non-medical universities students on HIV/AIDS prevention, routes of HIV transmission, and consequences of progressive weakening of immune system. Another purpose was to educate on the above-mentioned issues.

Material and methods: Students of various Polish universities received electronic questionnaires comprising 19 questions, with 16 closed (single-choice, true/false), 2 open, and 1 closed multiple-choice question. This anonymous questionnaire had been created for the present study.

Results: A total of 864 questionnaires were completed, with 28.9% done by medical university students and 71.1% by non-medical university students. Questions answered incorrectly by most of the respondents included those on life expectancy of HIV-positive individuals. Questions on HIV transmission via breastfeeding and difference in susceptibility to HIV infection in males and females also proved to be challenging.

Conclusions: The extent of knowledge on HIV transmission and HIV infection prevention among students at Polish universities is insufficient despite wide accessibility of reliable, accurate information. There is a need for more widespread propagation of HIV-related information, particularly on the relationship between HIV infection and life expectancy, breastfeeding by HIV-positive mothers, and gender-dependent difference in the risk of HIV infection.

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Introduction

The epidemiological situation of human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) in Poland had changed dramatically over the last 35 years. The first case of HIV infection in a Polish citizen was confirmed in 1985. Between the year 1985 (when HIV testing was firstly introduced) and December 31, 2019, a total of 25,544 Polish citizens and individuals of other

Address for correspondence: Anna Bohdziewicz, Student's Science Society of the Department of Infectious and Tropical Diseases and Hepatology, Medical University of Warsaw, Poland, e-mail: bohdziewicz99@gmail.com

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nationalities residing in Poland were diagnosed with HIV. There were 3,768 cases of AIDS and 1,429 AIDS-related deaths [1].

According to global statistics data from 2019, the total number of HIV-positive individuals all over the world was approximately 38 million. In 2019, there were 1.7 million newly reported infections [2]. The estimated number of new HIV infections in Europe in 2019 was 136,449 [3]. In order to limit new HIV infections globally, the United Nations AIDS (UNAIDS) program had set its 90-90-90 treatment target (meant to ensure that, by 2020, 90% of people living with HIV would know their HIV status, 90% of those would undergo antiretroviral therapy, and 90% of those would be treated and achieve viral suppression) [4].

In 2018, the highest numbers of new HIV cases were among men who have sex with men (MSM) as well as among sex workers and their partners [5]. The per-act HIV transmission risk for unprotected sexual exposures is approximately 0.08% for receptive penile–vaginal intercourse, 1.38% for receptive anal intercourse, and 0.11% for insertive anal intercourse. Infection via oral sex is biologically possible, but precise estimation is not possible since the risk per 10,000 exposures to an infected source is too low. Nonetheless, raising HIV awareness is very important from a global epidemiological perspective [6].

HIV infection prevention involves pre-exposure prophylaxis (PrEP), post-exposure prophylaxis (PEP), and prophylactic vaccination (currently unavailable). PrEP involves taking tenofovir and emtricitabine as part of either on-demand or long-term regimen. The effectiveness of PrEP in MSM population resulted in reducing the risk of HIV transmission in an experimental group by 44% versus control group. This percentage (44%) was the average for all study participants (both those who took drugs regularly and those who took it erratically or not at all) [7].

PEP involves taking antiretroviral drugs following HIV exposure, i.e., encountering infectious or possibly infectious material. PEP significantly reduces the risk of HIV infection; however, it is not 100% effective. Since the introduction of generic antiretroviral drugs into the Polish market, both PrEP and PEP have become cheaper and more accessible [7].

Notably, the U = U (undetectable viral load = untransmittable HIV) message has been promoted in recent years as a part of international campaign to raise awareness of the benefits of antiretroviral therapy combination (cART). The main objective of the initiative is to educate people about the fact that regular use of cART helps achieving undetectable viral loads (HIV-RNA < 20 copies/ml). Such low viral load values preclude the transmission of HIV infection through sexual contacts, which means that HIV-positive individuals may engage in condomless sex, and their uninfected partners do not have to use pre-exposure prophylaxis. These conclusions are based on data collected as a part of PARTNER studies, which analyzed various types of sexual contacts (oral, vaginal, anal), presence of ejaculation, and sexual partners' roles (insertive vs. receptive) [8].

For many years, there have been many attempts to develop a vaccine that would prevent HIV infections. Promising findings from ASCENT study have been recently presented at the 10th International AIDS Society (IAS) conference in Mexico. The ASCENT study evaluated safety and tolerance of a novel vaccine and assessed response in anti-Env antibody levels. The research team expects the final results by the year 2023 [9, 10].

Social attitude to HIV and AIDS is shaped by general awareness of risk factors, preventive measures, and routes of infection. Despite several educational initiatives conducted in many countries, there was a spread of false information about HIV infections and AIDS, causing stigmatization of affected individuals [11].

In 2005 and 2015, there were two papers published based on studies evaluating the extent of HIV/AIDS-related knowledge of Polish citizens. First study was performed among 3,200 respondents aged from 15 to 49 years from November 30 to December 15, 2005. The aim of this study was to analyze multiple aspects of respondents' family and sex lives. Second study, conducted 10 years later by Huk-Wieliczuk, evaluated the extent of HIV/AIDS-related knowledge in female cosmetology students aged 19-21 years [12, 13].

The main aim of the current study was to assess the level of knowledge of students of Polish medical and non-medical universities on HIV-AIDS prevention, routes of HIV transmission, and consequences of progressive weakening of the immune system. Another purpose of the study was to educate the respondents on the above-mentioned issues.

Material and methods

The study was conducted in April 2019 among students of Polish (medical and non-medical) universities. The method employed in the study was an exploratory survey based on an original questionnaire that was created for the purpose of this study. The survey was not sponsored. Ethical approval was not needed, because the questionnaire did not include personal information of the participants. All the students were informed about the aim of our study and provided informed consent for participation.

Questionnaires were distributed electronically and included 19 questions, with 16 closed (single-select, true/false) questions, 2 open questions, and 1 closed multiple-choice question. The first two questions were on the respondent's sex and type of university (medical or non-medical), and the remaining questions examined the extent of the respondents' knowledge. The collected data were analyzed statistically with Microsoft Excel for Windows 10.

Results

There was a total of 864 respondents, of whom, 70.3% were females. Most of the respondents (71.1%) were students at non-medical universities, and the others represented

Table 1. Closed questions from the questionnaire (possible answer choices: 'Yes', 'No', and 'I do not know')

No.	Question	Yes	No	I do not know
1.	Is AIDS caused by HIV?	88.7%	6.9%	4.7%
2.	Is a woman more likely to get HIV infection from a HIV-positive man than a man from an HIV-positive woman?	37.5%	42.6%	19.9%
3.	Can HIV be transmitted through anal sex?	88.8%	4.2%	7.0%
4.	Can HIV be transmitted through oral sex?	72.7%	18.2%	9.0%
5.	Can an HIV-positive mother infect her infant through breastfeeding?	46.7%	33.6%	19.7%
6.	Can an HIV-positive woman who knows her HIV status, remains under specialist care, and takes anti-HIV drugs give birth to an HIV-negative baby?	78.9%	8.1%	13.0%
7.	Do condoms reduce the risk of HIV transmission?	97.6%	1.0%	1.4%
8.	Is there a vaccine that protects against HIV infection?	5.7%	82.8%	11.5%
9.	Can an HIV-positive person be cured and achieve complete elimination of HIV from their body by using antiretroviral therapy?	13.6%	79.3%	7.0%
10.	Is life-expectancy of HIV-positive individuals significantly shorter than that of HIV-negative individuals?	49.3%	43.4%	7.3%

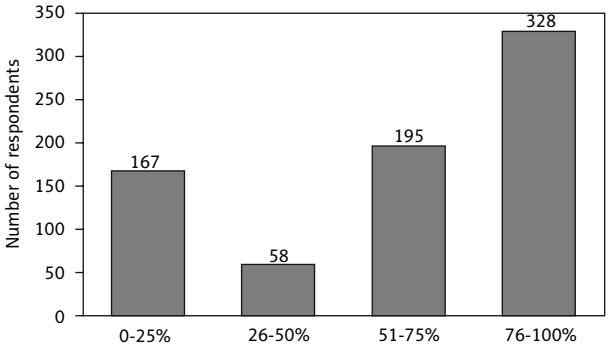

Figure 1. Respondent-estimated risk of HIV transmission during one-time unprotected heterosexual contact with HIV-positive partner

medical universities. The maximum possible score was 13 points from 14 true/false questions. Due to concerns of some participants about the question about life expectancy of HIV-positive individuals, which according to their opinions could be not precise, we decided not to include it in the final results. This score (13 points) was achieved by 21 respondents. The mean score for the study population was 7 points., with the score of 8 points achieved by the largest number of respondents (n = 165). The middle score achieved by medical students was 10 points, whereas the middle score achieved by non-medical students was 8 points.

Our questionnaire contained 4 closed multiple-choice questions, in which the respondents were to select the best answer out of several specific scenarios (Table 1). There were also 2 open questions to answer individually by entering an estimate in a designated box. The final question included an option of both selecting an answer from a list and entering own response.

1. The extent of knowledge on the number of HIV-positive individuals residing in Poland: How many HIV-positive people live in Poland?

Over 51% of the respondents stated correctly that in Poland, there were approximately 25,000 HIV-infected individuals. Approximately 39% believed this number to be approximately 6 times higher at 125,000, whereas 9.6% assumed that an approximate number of HIV-infected Polish residents was 5,000.

2. The extent of knowledge on the main route of HIV transmission in Poland: What is the main route of HIV transmission in Poland?

A total of 339 participants (39%) presented an opinion that heterosexual contacts were the main route of HIV transmission in Poland. The correct answer, which was the homosexual route, was provided by 19.3% of the respondents.

3. Respondent awareness of pre-exposure prophylaxis of HIV infection: Do you know what pre-exposure prophylaxis (PrEP) is?

Our study showed that 31% of the respondents admitted not knowing what pre-exposure prophylaxis (PrEP) was, and as many as 36.7% believed that it involves 'the use of a condom during sexual intercourse with an HIV-positive partner'. The proportion of the respondents who selected the correct answer, which was 'using an appropriate regimen of anti-HIV medication before a condomless sexual intercourse', was slightly above 30%.

4. Respondents' awareness of post-exposure prophylaxis of HIV infection: Do you know what post-exposure prophylaxis (PEP) is?

Most of the students (64.8%) selected the correct answer, which was 'taking anti-HIV medication after sexual exposure to HIV', and 2.1% of the respondents selected 'I don't know'. Over 7% of the evaluated students claimed that PEP meant 'practicing genital hygiene after sexual exposure to HIV'.

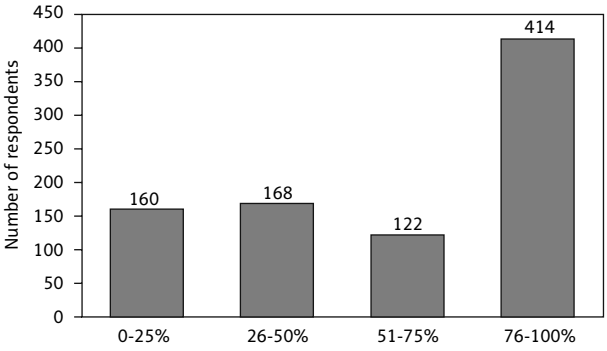

Figure 2. Respondent-estimated risk of HIV transmission during one-time unprotected homosexual contact with HIV-positive partner

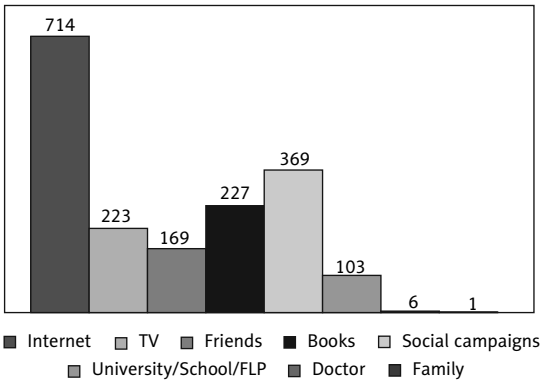

Figure 3. Sources of respondents' knowledge on HIV/AIDS FLE (family life education)

5. Respondent-estimated risk of contracting HIV infection through a one-time unprotected heterosexual/ homosexual contact with HIV-positive partner: In your opinion, what is the risk of HIV infection through a one-time unprotected heterosexual/ homosexual contact with HIV-positive partner?

The respondents were asked to enter the risk (percentage value) of contracting HIV infection during a single, unprotected heterosexual or homosexual contact with HIV-positive partner (Figures 1 and 2).

6. Sources of knowledge about HIV/AIDS: Where do you get your information about HIV/AIDS? (Figure 3).

Discussion

There are few papers reporting on the level of awareness regarding HIV/AIDS transmission and prevention among university students in Poland. The most up-to-date Polish survey-based study results on this topic were published by Huk-Wieliczuk *et al*. in 2015. This research was conducted among 118 female students of cosmetology at Department of Physical Education and Sports in Biała Podlaska. One of the questions of the survey was whether HIV infection could be completely cured, and 77.1% of respondents stated that there was no effective HIV infection therapy that would lead to complete viral eradication [13]. A similar question in our study was answered similarly by 79.5% of the respondents, which indicates a sustained high level of awareness on this issue. In an American study by Andrew *et al*., 81.0% of students' stated that HIV-infection/AIDS was incurable, which shows comparable levels of awareness on this issue among American and Polish students [14].

The observed increase in the rates of correct responses by Polish students may be associated with simpler access to reliable Internet-based sources of information on HIV infection. Our study respondents indicated the Internet as the primary source of knowledge, followed by social campaigns and books. The mention of social campaigns is particularly noteworthy, since such campaigns are becoming increasingly more popular due to a growing students' involvement in raising HIV/AIDS awareness among adolescents and adults. The main source of knowledge on HIV/AIDS reported by cosmetology students had been doctors (63.6%), followed by academic teachers (52.5%), and media (44.9%). This illustrates a significant shift in main sources of knowledge on HIV/AIDS in Poland over the last 4 years [13]. The fact that the Internet has become an increasingly common source of information may be partly associated with a greater degree of anonymity and possibility of finding quick answers to critical issues.

Despite the increasingly easy access to sources offering accurate information, 6.9% of the respondents in the present study negated the relationship between HIV and AIDS, and 4.7% of the participants did not know whether such a relationship exists. This demonstrated that the level of awareness of as many as 11.6% of the students regarding HIV and AIDS and their relationship is inadequate. This finding seems to be extremely important, as it indicates that raising people's awareness about HIV and AIDS should begin with placing an emphasis on the relationship between the two.

Andrew et al. conducted a study among 400 students at the Jackson State University, and assessed the level of their awareness of routes of HIV transmission. A total of 71.3% of students believed that the use of condoms completely prevented HIV transmission during sexual intercourse [14]. Our study in Polish students showed that 97.6% of the respondents believed that the use of condoms significantly reduces the risk of HIV infection, which indicates that the level of awareness on this topic among Polish university students is satisfactory. We would like to emphasize that it is difficult to compare this aspect of our Polish study findings and American study conclusions, as Polish students were asked if condoms reduce the risk of HIV transmission, whereas American students were asked whether consistent use of condoms could prevent HIV infection.

One important aspect of our analysis was the possibility of vertical HIV transmission. Santos *et al*. analyzed a total of 591 students from a Brazilian medical university, and 39.0% of them responded that breastfeeding was not a route

of HIV transmission. A similar question in our study was answered in the same way by 33.7% of the respondents, which indicates similar levels of awareness on this topic among Polish and Brazilian students [15]. These findings show an urgent need of educating students on this issue. The level of their awareness of this route of HIV transmission is unsatisfactory. Therefore, providing adolescents with more comprehensive information on this particular question seems necessary. We would like to emphasize the importance of our findings and, as with the issue of the relationship between HIV and AIDS, strive hard to ensure that the public receives information about vertical HIV transmission. Interestingly, a vast majority of the respondents in our study showed that they were aware of the possibility of an HIV-positive mother under specialized care to give birth to a healthy baby. Awareness of this possibility may have been due to recommendations issued by experts from the Polish Society of Gynecologists and Obstetricians. These recommendations, which are publicly available, include a treatment recommended for HIV-positive mothers during pregnancy and following childbirth. In the period of 1985-2016, there were approximately 220 cases of vertical HIV transmission reported in Poland. Prevention of vertical HIV transmission has been implemented in Poland since 1994, which allows us to progressively minimize the risk of perinatal HIV transmission [16].

Extremely interesting findings were also reported by Alhasawii *et al*., who assessed HIV/AIDS knowledge and awareness among senior high-school students in Kuwait. The study involved an anonymous completion of specially designed questionnaire by 346 students (192 males and 154 females). The results of analysis demonstrated that 93.9% of respondents were aware of the risk of HIV infection through unprotected sexual contact. Over 50% of participants were able to name at least one way of preventing HIV infection [17]. Nonetheless, it is difficult to compare HIV prevention knowledge in Kuwaiti and Polish students because in our study, the respondents were presented with a list of HIV prevention methods and asked to estimate their effectiveness.

In the current study, out of all the respondents, 32.3% understood the nature of PrEP, and 64.8% knew what PEP was and how to use it. These findings demonstrated unsatisfactory level of awareness on this issue among Polish students, and indicated another important gap in HIV/AIDS-related education that needs to be addressed.

Our questionnaire asked the students about the existence of a vaccine preventing HIV infection, and 82.8% of the respondents answered correctly that such a vaccine was currently not existing.

In our questionnaire, we included a question about life expectancy of HIV-positive individuals to assess the opinions of the evaluated students. A total of 49.3% of the respondents claimed that HIV-positive patients had a shorter life-expectancy than that of non-infected individuals, with a comparable proportion of 43.4% of the participants believing this was not correct, and 7.3% of the respondents admitting that they did not know. These findings indicate that more extensive education on this issue should be considered. Available databases, including Cochrane, Medline, and PubMed, contain no papers addressing the level of public knowledge on this topic. According to the 2017 meta-analysis by Teeraananchai *et al*., the mean life expectancy of HIV-positive patients have greatly improved following cART initiation, approaching that of HIV-negative individuals [18]. Kaiser Permanente researchers also reported that, since 1996, life expectancy of HIV-positive individuals under appropriate treatment had significantly increased. In 1996, life expectancy of a 20-year-old HIV-positive person was 39 years and, by 2011, it had increased to approximately 70 years [19].

There have been several studies analyzing the level of knowledge on the number of HIV-positive individuals in Poland and the scale of it. We decided to ask students about this issue and received a large proportion of incorrect answers, with the respondents demonstrating their belief that this was a big problem in Poland. As many as 39% of respondents claimed that the number of HIV-infected individuals living in Poland was approximately 6 times greater than it actually was. We suspect that selecting this answer may have been due to the students' intuitively choosing the largest of the values listed in the questionnaire.

Our questionnaire also included a question on the percentage risk of HIV infection during a one-time unprotected heterosexual or homosexual contact with an HIV-positive partner. According to the respondents, the risk was high in both scenarios. The risk of HIV transmission was estimated in the range of 76-100% for a heterosexual and homosexual intercourse by nearly 40% and nearly 48% of respondents, respectively. The respondent-estimated risk and the actual risk of HIV transmission differed considerably. The reason behind this discrepancy is difficult to determine; however, such a considerable overestimation may be due to fear of the infection.

Over the last few years, there have been few studies analyzing students' awareness of HIV-related issues both in Poland and around the world. The findings of the present survey indicate the need to conduct further analyses of this kind, and to propagate accurate information on HIV/AIDS. In addition, our study showed that the students were willing to discuss and learn more on HIV/AIDS-related issues, which was confirmed by the large number of individuals who responded to our appeal to participate in this study.

Conclusions

Even though it has been nearly 35 years since the first confirmed case of HIV infection in Poland and there are publicly available reliable sources of information, the extent of knowledge on HIV transmission and HIV infection prevention among Polish medical and non-medical students is unsatisfactory. The issues that need to be particularly addressed in educating the public on HIV and AIDS include the relationship between HIV and AIDS, breastfeeding by HIV-positive mothers, the actual risk of HIV transmission through sexual contacts, the nature and principles of PrEP

and PEP, and the effect of HIV infection on life expectancy. We believe that more widespread and open discussions on these issues are warranted.

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Conflict of interest

The authors declare no conflict of interest.

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