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ORIGINAL PAPERR

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Assessment of the state of knowledge of bloodborne infections, occupational exposure and post-exposure prophylaxis and study of exposure to potentially infectious materials among students of selected medical faculties in Poland

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ABSTRACT

Introduction. Occupational exposure to potentially infectious material (PIM) is a serious problem for healthcare workers, including medical students.

Aim. We assessed the state of knowledge about occupational exposure and frequency of exposure among students of selected medical faculties in Poland.

Material and methods. Retrospective analysis with proprietary questionnaires.

Results. Only 34.5% from 753 respondents correctly indicated bloodborne pathogens and 9.3% PIM. There were 84 reports of exposure, mostly during intravenous injections. 10.4% students claimed probable occupational exposure which was not reported. Most common reason for not reporting was fear of negative supervisor reaction.

Conclusion. Student's knowledge of this matter is poor. Significant percentage of students has never participated in occupational exposure training. Occupational exposure was experienced by surprisingly large number of students. Students are afraid to report the incidents. Additional education would be useful in reducing exposure risk.

Keywords. knowledge, materials, occupational exposure, post-exposure prophylaxis, potentially infectious, students

Introduction

Since the first occupational infection by the human immunodeficiency virus (HIV) in 1984, occupational accidents involving biological material have been a prominent issue in public health.[1] Occupational exposure is defined as a contact of mucosa, conjunctiva or damaged skin with potentially infectious material (PIM), which occurred at work.[2] Due to the frequent

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contact with patient's body fluids and secretions, healthcare workers are particularly exposed to PIM. This issue concerns also medical students, who attend many procedures within the framework of academic course.[3] Not only blood is regarded as a PIM, the risk of infection occurs also in case of contact with other biological materials, such as: cerebrospinal fluid; pleural/peritoneal/pericardial fluid, amniotic fluid or any exudation containing blood. Despite the possibility of transmission over 20 pathogens with PIM, a particular role is attributed to hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV, due to serious health consequences and possible further spread.[4] It is estimated that the risk of infection after a contact with PIM is about 0.3% for HIV, varies from 0.5 to 3% for HCV and may reach 40% for HBV.[5] In the literature, there are limited polish studies concerning occupational exposure among medical students, having regard to the students' state of knowledge, exposure epidemiology or prevention methods.[6]

Aim

We have undertaken a study with purpose to assess the state of knowledge regarding occupational exposure and post-exposure prophylaxis (PEP) and to estimate the scale of a PIM exposure among students of selected medical faculties in Poland.

Material and methods

The subject of the study was to assess the state of knowledge regarding occupational exposure and post-exposure prophylaxis (PEP) and to estimate the scale of a PIM exposure among students of selected medical faculties in Poland. For this purpose, an anonymous survey consisting of 33 questions was constructed. Respondents were asked about: field of study, year of study, university, sex, age (5 questions), issues concerning occupational exposure and PEP (7 questions to assess respondents' state of knowledge), their own experience regarding occupational exposure and PEP (21 questions).

Addressees were students of medical faculties most at risk of occupational exposure, i.e. medicine, dentistry, nursing, midwifery and emergency medicine of all medical universities in Poland. The study was conducted in two ways - stationary in paper form given to all students before classes, mainly at the University of Rzeszow, and electronically - using social media and Google Forms. The invitation to participate was also sent via e-mail to the dean's offices of medical universities - in this way all students of the above-mentioned faculties in Poland had equal chances to participate. It was carried out throughout the country from February to March 2020.

The study was a non-interventional, anonymous, voluntary survey research. Every respondent agreed to participate in the study by starting to complete the questionnaire. Moreover, participation in it did not involve any financial gain or material benefits. All students' rights including the protection of sensitive data, were preserved and respected by the research team according to GCP and Declaration of Helsinki requirements. The study was approved by Institutional Review Board (Bioethics Committee of the Regional Medical Chamber in Rzeszow).

Table 1. Demographics of the study population (age, sex, university, year of study)

Study population n=753	N	%
Age mean ± SD, range (year)	22.2 ± 3.88, 19-58	
Sex:		
Male	124	16.5
Female	629	83.5
Field of study:		
Medicine	274	36.4
Nursing	196	26.0
Midwifery	166	22.0
Emergency Medicine	94	12.5
Dentistry	23	3.1
University:		
University of Rzeszow	398	52.9
Medical University of Lublin	68	9.0
Medical University of Lodz	47	6.2
Public Higher Medical Professional School in Opole	43	5.7
Medical University of Silesia	33	4.4
Medical University of Bialystok	33	4.4
University of Warmia and Mazury in Olsztyn	29	3.9
Wroclaw Medical University	16	2.1
Nicolaus Copernicus University, Collegium Medicum in Bydgoszcz	13	1.7
State School of Higher Vocational and Economic Education in Jaroslaw	13	1.7
Medical University of Warsaw	12	1.6
Jagiellonian University Medical College in Krakow	12	1.6
Poznan University of Medical Sciences	10	1.3
Medical University of Gdansk	6	0.8
University of Technology and Humanities in Radom	6	0.8
Others	14	1.9
Year of study:		
1st year of the Bachelor's programme/long-cycle Master's programme	162	21.5
2nd year of the Bachelor's programme/long-cycle of the Master's programme	172	22.8
3rd year of the Bachelor's programme/long-cycle of the Master's programme	173	23.0
4th year of long-cycle Master's programme/1st year of the Master's programme	120	15.9
5th year of long-cycle Master's programme/2nd year of the Master's programme	115	15.3
6th year of long-cycle Master's programme	11	1.5

Results

753 students took part in the study (437 in electronic form, 316 answers in paper form). Answers were obtained from a representative group for the population of medical students of several dozen of the largest universities in Poland. We included students of selected medical

faculties: medicine (n=274), dentistry (n=23), nursing (n=196), emergency medicine (n=94) and midwifery (n=166). The responses were obtained from medical students from all years of study – both undergraduate and graduate. The respondents were from 19 to 54 years old, 96.6% of them were in the age range 19-24. The average age was 22 years. The ratio of women to men was approximately 5:1 (Table 1).

Knowledge about post-exposure prophylaxis

According to the obtained data, 33% of students declare that they did not undergo any PEP training during their studies (Figure 1). Respondents were asked how they assessed their knowledge of what to do after exposure to PIM on a scale of 1 (no knowledge) to 5 (full knowledge). Most students rated their knowledge at 4 points (n = 278) and 3 points (n = 266). The average rating was 3.29 points.

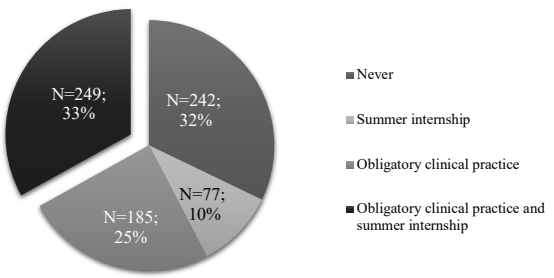

Fig. 1. Have you ever had training in post-exposure prophylaxis?

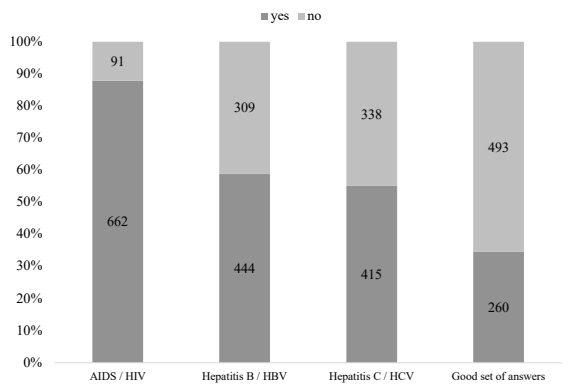

Fig. 2. What diseases associated with exposure to infectious material can you be exposed to in healthcare facilities? (AIDS - Acquired Immune Deficiency Syndrome, HIV - Human Immunodeficiency Virus, HBV – Hepatitis B Virus, HCV – Hepatitis C Virus)

The first open question asked to list diseases particularly vulnerable for medical students due to exposure to blood or body fluids. 34.5% of respondents indicated three viruses: HIV, HBV and HCV, 11.7% responded with "hepatitis" without specifying the type. Other responses that have often been mentioned include tuberculosis, human papillomavirus (HPV), Clostridium difficile or Staphylococcus aureus infection (Figure 2).

In the next three multiple-choice closed questions including both correct and incorrect answers, 95.8% of students indicated percutaneous needlestick injury contaminated with blood as a situation requiring PEP, 89.4% marked conjunctival contact with potentially infectious material, 46.9% - superficial injury with needle considered as uncontaminated with blood, 13.5% - exposure of intact skin to PIM. 43.7% of respondents marked a set of answers: conjunctival contact with potentially infectious material and intradermal cut with a needle contaminated with blood (Figure 3).

The next multiple-choice closed question concerned activities that should be performed immediately after the exposure. 77.2% of students indicated rinsing a damaged skin thoroughly with water, 47.0% disinfection the skin with non-alcoholic agent, 37.2% disinfection with alcoholic agent, 11.8 % marked stopping the bleeding and 9.7% applying pressure on the wound. The set of answers including rinse damaged skin with plenty of water and disinfect the skin with an alcohol-free agent selected 30.1% of respondents (Figure 4).

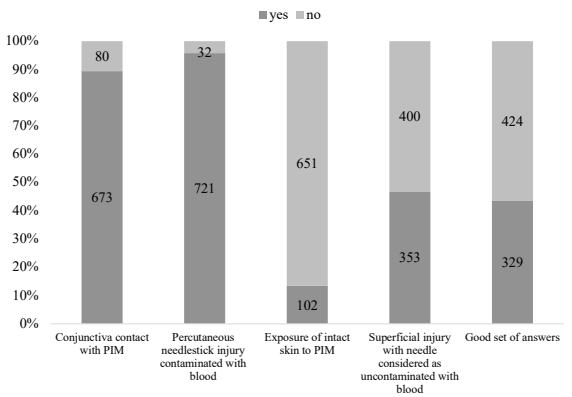

Fig. 3. What events require post-exposure prophylaxis? (PIM – potentially infectious materials)

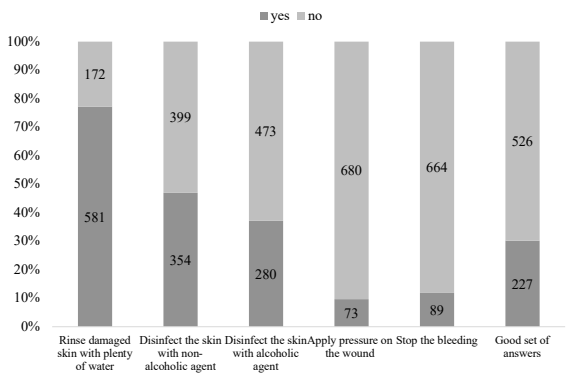

Fig. 4. What should you do after percutaneous injury with potentially contaminated needle?

When it comes to materials considered as PIM, 99.1% indicated blood, 82.2% marked semen, 74.4% faeces, 72.4% cerebrospinal fluid, 60.8% amniotic fluid, 16.1% sweat and 15.1% tears. (Figure 5).

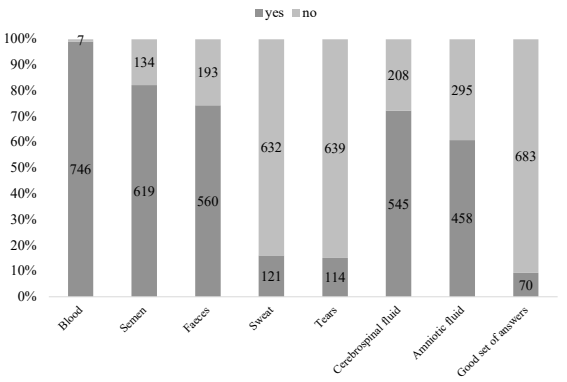

Fig. 5. What could be potentially infectious material?

The last question regarding the time when the post-exposure procedure should be implemented – 73.2% indicated the answer "no later than 24 hours", 17.7% "no later than 48 hours", 8.1% "no later than 72 hours" and 1.1% marked the answer "does not matter". (Figure 6).

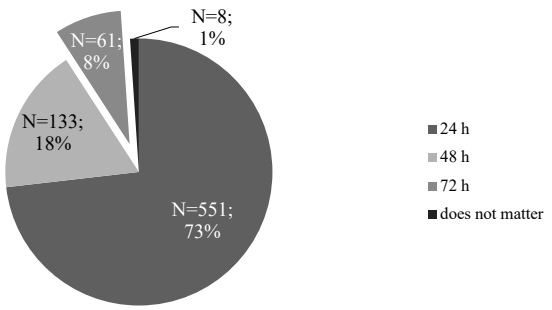

Fig. 6. How many hours should post-exposure prophylaxis begin?

For better illustration and comparing the subjective and objective students' knowledge about post-exposure procedures, a five-point scale (0-5 points) was used, according to which points were awarded for giving the correct answer (Table 2). The table presents also the objective and subjective knowledge depending of the year of study and field of study.

Occupational exposure

The second part of the survey concerned the frequency of occupational exposure among students and the course of proceedings after it occurred. Only students who declared that they had experienced the exposure participated in it. It turned out that 11.3% (n=85) of the respondents at least once experienced the occupational exposure, while 7.3% marked the answer "Probably yes". Exposures most often occurred during holiday internships (41.2%). The highest percentage of exposed respondents was found among dentistry students - 26.1% of all people from this faculty experienced exposure (Table 3). The data show that nearly 25% of exposed people have never participated in the PEP training.

Table 2. Comparison of subjective and objective knowledge assessment and objective knowledge depending on the year and field of study

Points	Subjective knowledge assessment		Objective knowledge assessment	
	N	%	N	%
1	34	5	19	2.5
2	113	15	54	7.2
3	226	35	158	21.0
4	278	37	403	53.5
5	62	8	119	15.8
Average score	3.29		3.73	

Year of study	Average subjective score	Average objective score	Faculty	Average subjective score	Average objective score
I	2.86	3.35	Medicine	3.31	3.97
II	3.37	3.71	Nursing	3.38	3.56
III	3.34	3.63	Midwifery	3.30	3.78
IV	3.52	4.06	Emergency Medicine	3.11	3.29
V	3.45	4.00	Dentistry	3.13	3.78
VI	3.64	4.73			

When it comes to the activities during which the exposure occurred, the most often there were various types of injections (intravenous, intramuscular, central), as well as blood collection – 64% in total. The second most frequently mentioned activity was surgery assistance – 11.8% of cases. The infectious material that students came into contact with most often was blood (91.8%). The incidents were most often reported to the academic teacher (35.3%), internship supervisor (18.8%) and chief of department or ward nurse (17.6%). The post-exposure procedure was initiated only in 67% of cases (n=57). The most common answers to the question about the reasons for lack of commence of post-exposure procedures were: 'no need' and 'the patient was considered healthy'.

All respondents were also asked if they had experienced the exposure but did not report it. As many as 76 people answered affirmatively (10.1%). To the question 'Were you/ would you be afraid to report an occupational exposure?' 85 respondents (11.2%) answered 'yes'. Among the reasons often mentioned were fear of the reaction of superiors, the need to incur costs, as well as the lack of time to undergo a long post-exposure procedure. 7.3% of respondents avoid carrying out invasive procedures for fear of exposure.

Table 3. Occupational exposure

Have you ever experienced occupational exposure?	N	% of all students
No	613	81.4
Yes	85	11.3
Probably yes	55	7.3
Do you think that you have experienced occupational exposure but did not report it?		
No	677	89.9
Yes, once	57	7.6
Yes, several times	19	2.5
When the occupational exposure occurred?		% of exposed students (n=85)
During summer internship	35	41.2
During obligatory clinical practice	32	37.6
During extra activities e.g. on call	18	21.2
Field of study:		% of students in each field of study
Medicine	43	15.7
Nursing	10	5.1
Midwifery	20	12.0
Emergency Medicine	6	6.4
Dentistry	6	26.1
Year of study:		% of students in each year of study
1st year of the Bachelor's programme/long-cycle Master's programme	10	6.2
2nd year of the Bachelor's programme/ ong-cycle of the Master's programme	12	7.0
3rd year of the Bachelor's programme/long-cycle of the Master's programme	17	9.8
4th year of long-cycle Master's programme/1st year of the Master's programme	14	11.7
5th year of long-cycle Master's programme/2nd year of the Master's programme	30	26.1
6th year of long-cycle Master's programme	2	18.2

Primary prevention

The last part of the questionnaire focuses on exposure prophylaxis. Respondents were asked whether the academic teachers or superiors inform about the patient's potential infection - an affirmative answer was given by 73% (n=550). In open question about whether they decide to take extra precautions when dealing with HBV/ HCV/ HIV infected patient, most students (56.6%) do not apply additional security.

Moreover, our study checked how many students have been ever tested for HBV/ HCV/ HIV except for cases where PEP was initiated. The collected data shows that relatively large proportion of students had tested on their own, while a smaller percentage of tests was funded by universities. Very large percentage of students (over 50% in the case of HCV and HIV and over 40% in the case of HBV) who had run the tests was from the 1st and 2nd year of master's degree studies. It turned out that 43.4% of respondents (n=33), who believe they had exposure but did not report it, were tested for those three infections. The last question was to check what proportion of medical students decided to test the level of anti-HBs antibodies. A division into fields of studies was made, which showed that the percentage of students who checked the level of vaccine antibodies was similar for individual fields – only in the case of emergency medicine this percentage was much lower (Table 4).

Table 4. Primary prevention

How often do you have a contact with PIM?	N	% of all students
Everyday	68	9.0
Couple times a week	260	34.6
Couple times a month	186	24.7
Couple times a year	162	21.5
Less	37	4.9
Never	40	5.3
What additional measures do you use in contact with an HIV/HBV/HCV-infected patient?		
Gloves	115	15.3
Double-gloving or triple-gloving	67	8.9
Greater caution	62	8.2
Other (masks, glasses, protective clothing)	84	11.2
None	426	56.6
Have you been tested for HIV/HBV/HCV (not as part of PEP)?		
No	443	58.8
Yes, HBV – funded by the university	71	9.4
Yes, HBV – on my own	175	23.2
Yes, HCV – funded by the university	34	4.5
Yes, HCV – on my own	113	15.0
Yes, HIV – funded by the university	24	3.2
Yes, HIV – on my own	115	15.3
Students tested for HIV/HBV/HCV by fields		% of all students in a given field
Medicine	113	41.2
Nursing	77	39.1
Midwifery	68	41.0
Emergency Medicine	45	47.9
Dentistry	9	39.1
Have you ever checked level of post-vaccination anti-HBs antibodies?		% of all students
Yes	195	26.0
No	558	74.0
Students who checked level of post-vaccination anti-HBs antibodies by fields		% of all students in a given field
Medicine	58	21.2
Nursing	34	17.3
Midwifery	39	23.5
Emergency Medicine	7	7.4
Dentistry	5	21.7

Discussion

Medical students are a group particularly at risk of accidental exposure to infectious material because they do not have adequate experience, but they are willing to

learn new, invasive procedures – they are also required to prepare for their future profession. Students of medicine, nursing, midwifery, dentistry and emergency medicine are particularly vulnerable, because they relatively often have contact with PIM while taking part in invasive medical procedures. To date, no scientific studies have been published regarding the scale of occupational exposure among young adepts of medical faculties in Poland. There are also few publications regarding this issue in other countries. Most commonly these are studies on a very small group of students or students are included as a smaller proportion of all health care workers of a given centre. Therefore, the risk of occupational exposure among medical students is often underestimated and its scale is unknown due to the lack of official data on the number of reported incidents.

Our study revealed that at the root of the problem of occupational exposure and PEP may be poor students' knowledge. As many as 30% of respondents stated that they have never had training in post-exposure prophylaxis, despite carrying out the same study program throughout Poland. It revealed that a large proportion of students do not know how to behave in contact with infectious material and what to include to PIM. In the part of the survey containing questions about knowledge about occupational exposure and post-exposure prophylaxis, students confirmed their subjective poor assessment of own knowledge. In an open question referring to diseases related to occupational exposure, only slightly more than 30% of respondents correctly listed hepatitis B, hepatitis C and HIV infection, and another 10.8% mentioned HIV/ AIDS and 'hepatitis'. Students mentioned also incorrect answers such as tuberculosis, human papillomavirus (HPV), *Clostridium difficile* or *Staphylococcus aureus* infection. Respondents also had a problem determining the situations that require the implementation of PEP. Although about 90% correctly marked conjunctival contact with potentially infectious material and percutaneous needle injury with contaminated blood as incidents requiring PEP, many students also marked a superficial injury with a needle deemed uncontaminated and, surprisingly, exposure of intact skin to potentially infectious material (respectively 46.9% and 13.5%). To sum up, only 43.7% of respondents selected the correct set of answers (conjunctival contact with potentially infectious material and intradermal cut with a needle contaminated with blood). In terms of potentially infectious materials, students' knowledge was very poor. Only 9.3% of respondents correctly marked all the answers! - blood, semen, cerebrospinal fluid and amniotic fluid. Interestingly, 7 respondents concluded that blood is not a PIM. It turned out that less than 75% respondents know that cerebrospinal fluid and amniotic fluid (including 77.6% of midwifery students who have frequent contact with amniotic fluid) may also be responsible for occupational exposure. Faeces proved to be particularly problematic, because almost 75% of the students considered them to be PIM. It should be emphasized that, according to the Occupational Safety and Health Administration (OSHA), faeces are not potentially infectious material in themselves – they become PIM only when contaminated with blood.[7] In terms of PEP implementation time, only 8.1% of the students correctly indicated the answer 'no later than within 72 hours. The PEP procedure is not known to all students - only every third respondent knows how to proceed after exposure to PIM. It is worth noting that more or less equal number of students would disinfect the wound with an alcoholic and non-alcoholic agent. According to WHO guidelines, immediately after exposure to the infectious material, the place should be rinsed thoroughly with water and disinfected with a non-alcohol or soap-containing disinfectant, and in the case of conjunctiva – rinsed several times with running water or saline.[8] It is very important not to use strong solutions (alcohol, iodine) and not to squeeze the wound area, as this may result in additional irritation and increased penetration of microorganisms into the tissues. Also, the blood flowing out should not be stopped, as the free outflow of blood may limit the entry of pathogens.[9] In summary, the knowledge status of students can be described as moderate (average score 3.73 points on a scale of 0 to 5). However, analysing individual questions the knowledge of the respondents is very poor – just like in other foreign publications on knowledge in the field of occupational exposure and PEP.[10,11] Our study shows that awareness and knowledge generally increase with the year of study, which was confirmed by a higher percentage of correct answers and the highest score among students of 6th year (3.35 points on the first year compared to 3.73 points on the last year). This is related to the gradual acquisition of knowledge during clinical classes and the role of observation and modelling on teachers. When it comes to field of the study, medicine students achieve the best score (3.97 points) and the worst result was obtained by emergency medicine students (3.29).

Students subjectively assessed their knowledge at the beginning of the questionnaire at 3.29 on a scale of 0 to 5, which can be described as moderate, and thus according to the actual state of their knowledge. It is very important issue because high self-esteem combined with low actual knowledge can be a risk. In such situations, students could opt out of further PEP training and would potentially pose a threat as medical personnel.

The results of our study indicate that more than 1 in 10 students experienced professional exposure. The result cannot be compared with other studies, because, so far, no studies have been published exclusively concerning students of various medical faculties and exposure to infectious material among them, both in Poland and in other countries. However, considering much rarer students' contact with PIM in comparison to regular

healthcare workers, we can conclude that this is a large percentage of them. This is worrying, because the problem of occupational exposure among students is not addressed worldwide, while concerning so many young people. The percentage of respondents who experienced such an event increases with the year of study as the number of incidents accumulates throughout the entire duration of study. Regarding fields of study, our study revealed that the largest percentage of occupational exposure concerns dental students - up to a quarter of them experienced an incident. The problem of exposure to potentially infectious material in dental students is widely discussed in the professional literature. Due to the specific and difficult technical conditions during invasive procedures and the actual performing of them by less experienced students of the last years of study only supervised by academic teachers, professional exposure occurs very often. According to published studies, percentage of dental students who have experienced exposure to biological material during their study period ranges from 19.1% to even 80.0%.[12-16] Surprisingly, in our study the smallest percentage of events concerned nursing and emergency medicine students. These data differ from those usually published, according to which nursing and emergency medicine students are most vulnerable to occupational exposure due to frequent contact with potentially infectious materials while performing invasive procedures.[12,17] We are not able to explain this fact unlike this is the result of the growing knowledge about occupational exposure in recent years and the resulting greater attention and caution when performing invasive procedures. Following this way of thinking, a high percentage of occupational exposure among medicine students may result from sporadic participation in invasive procedures and little experience in this field. This is confirmed by the fact that almost half of the incidents took place during holiday practices.

It should be emphasized that 10% of respondents admitted that they had experienced the occupational exposure but did not report it – a quarter of it repeatedly. This shows the problem of low reporting starting during studies, but fully developed among healthcare professionals. Available publications show that up to 80% of occupational exposures are not reported.[17-19] Fortunately, the results in our study are much lower. According to the limited data, reporting in Poland oscillates around 45-70%, including only about 20% of employees who report professional exposure each time. The most common reasons for concealing such incidents include lack of time, too much formalities, recognition of such events as a normal element of work, and no obligation to report exposure.[20-22]

Similarly to available publications, most of the exposures concerned needlestick injuries.[13,18,23,24] It is worth reminding here about replacing the needle cover after use (usually completely unnecessary action) so often causes needle injuries and possible bloodborne infection.[17,25,26] According to OSHA, recapping needles is generally incorrect.[27] In our study almost all incidents related to blood exposure, occurred in surgical and ob-gyn wards, what is undoubtedly connected with the number of invasive procedures performed. The same conclusions were obtained in other publications on student exposures.[28] As for PEP, the procedure was implemented only in 60% of cases. In the remaining cases, the patients were subjectively considered healthy and uninfected. It is worrying that one respondent after reporting the exposure was laughed at and ignored and three other students indicated that they had not informed anyone about the incident. Such situations may lead to further unreported exposures in the future and to possible infection eventually. Among the respondents only one person reported the presence of a disease related to occupational exposure, without indicating which one.

Statements of respondents about the reason for not reporting incidents are just as contentious. Most (almost 50 students) admitted that they would be afraid to report occupational exposure due to the negative assessment from the academic teacher and other students. Nervousness, mocking, shouting, evaluation as incompetent, inattentive, too fearful were also indicated. Similar results can be found in available publications.[17] Such situations are completely inappropriate and should be eliminated from the healthcare environment. According to the principle 'a good rescuer is a living rescuer', healthcare workers should mind own health as well as their colleagues including young medical adepts. Atmosphere of safety and trust should be created, and students should be assured that professional exposure can happen to any employee, even those most experienced and skilled. Other reasons for not reporting were a lot of formalities, confusion and too much time spent on the entire post-exposure procedure. Attention was also paid to several responses regarding the costs of PEP and possible treatment. Pursuant to the law in force in Poland, in the case of occupational exposure financing of post-exposure proceedings is the responsibility of the employer or the commissioning entity.[29] The results show that some of the respondents are not familiar with the applicable regulations for healthcare professionals (including medical students). It is dangerous because in the event of an exposure a student may not report it with unreasonable fear of incurring costs – and expose self to falling ill. It is therefore important to educate students about their rights and obligations to increase their sense of safety and minimize the phenomenon of low reporting of such incidents. Almost every tenth respondent indicated avoiding invasive procedures for fear of potential infection. Higher percentage of affirmative answers occurred in the group of people who have already experienced occupational exposure, which shows how traumatic this event is and how much it affects the further learning process and professional work.

More than half of the students do not use any additional protective measures when the patient has confirmed HIV/HCV/HBV infection. Other respondents pointed to putting on gloves (even double or triple), masks, special protective clothing and greater caution. Obviously, the use of masks, glasses, protective clothing is indicated for the prevention of contact with PIM, however the use of double and triple gloves can be controversial. This results in significant stiffening of the material and less comfort of work, which can lead to less precise movements and increase the risk of an exposure incident. According to WHO recommendations, double gloves should be used only when participating in longer surgical procedures (>30 minutes), especially orthopaedic ones, and in case of expected contact with large amounts of blood or other body fluids.[30] Numerous publications indicate that double gloves usually provide greater safety than a single layer.[31] Additional exercises and getting used to working in a double layer will not affect the effectiveness of manual work and will allow to maintain greater safety.

Almost 75% of respondents confirmed that in the case of performing an invasive procedure in a patient with confirmed HIV/ HBV/ HCV infection, they were informed about it by the academic teacher before conducting the procedure. It is very important because it allows student to use additional protective measures and leads to increased vigilance and greater precision in performing the procedure.[32,33]

About 75% of respondents have never checked their own anti-HBs vaccine antibodies. The minimum protective level of antibodies is generally considered as 10 IU/L. In Poland there are no recommendations for routine determination of antibody levels after vaccination, but it is measured in employees of some healthcare facilities. There are also no legal regulations for people of the medical profession who have not obtained a protective level of antibodies. The literature suggests the usefulness of performing such tests in healthcare workers, as well as among medical students, because the very fact of being vaccinated against HBV in childhood may not show actual immunization.[34] Slightly more than half of the surveyed students reported that they had carried out their own tests for HBV/HCV or HIV infection, while at the university's expense – 17% (not under PEP). The largest percentage of tests performed for these viruses was present among emergency medicine students (47%). It turns out that a very large percentage of tested students are from second-degree studies - more than 50% in the case of HCV and HIV and more than 40% in the case of HBV. Midwifery, nursing and emergency medicine students often take up work after completing their undergraduate studies, so it is possible that they did tests when undertaking work in healthcare facilities.

Conclusions

Medical students are particularly vulnerable to occupational exposure to potentially infectious material due to frequent performance or assistance in invasive procedures and not fully developed precision and fluency in their performance. It is therefore important to have knowledge of occupational exposure and post-exposure prophylaxis. The results collected in this study point to insufficient emphasis placed on these issues during studies, which results in unsatisfactory knowledge of the studied population. It seems that deficiencies in theoretical knowledge, as well as a small awareness of the right to implement post-exposure prophylaxis, cause fear of reporting occupational exposures among students. In addition, fear of negative evaluation by the academic teacher, ridicule, or too much commotion associated with submitting the exposure incident may be the reasons for inadequate reporting. The analysis of the data revealed that in the studied population 11% of students have experienced occupational exposure. Despite the fact that the time of exposure was not correlated with the year of study, it is worth emphasizing that training in post-exposure prophylaxis should be mandatory at the beginning of studies because most students take part in invasive procedures on first year clinical practice or holiday internships after 1st year of study. The training could be repeated on the third or fourth year, when great part of bachelor graduated take their first job.

Therefore, it is important to build an atmosphere of safety and trust and to properly educate students in this matter – submitting exposures and implementing prophylaxis can protect against the occurrence of a serious chronic disease.

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