

Risk Factors for HIV Transmission and HIV Testing Among Medical Students

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ABSTRACT Risky behavior in students is not infrequent. The prevalence of HIV in Ukraine is one of the highest in Europe. The aim of this study was to investigate risk factors of HIV transmission and prevalence of HIV testing in medical students from Ukraine. Medical students were invited to answer questions concerning individual risk factors of HIV transmission and HIV testing. Answers were received from 861 4th and 6th year students. Data from 20 received questionnaires was considered invalid and therefore excluded from further analysis. Answers from 841 students were analyzed. 36.94% had undergone HIV testing and only 14.84% were tested more than once. Unprotected vaginal sexual contacts with casual partners including forced contacts were reported by 27.23%. Intravenous drug use was reported by 1.66%. Male students reported higher prevalence of sex-related risky behavior and more frequent HIV testing. Professional injuries with exposed needles were reported by 29.13% of students. It is important to more actively popularize HIV testing in students, explain risk factors of HIV transmission, and to organize needlestick injury prevention and control program.

KEY WORDS: HIV, tests, risk factors, students

INTRODUCTION

The prevalence of HIV in Ukraine is one of the highest in Europe. There were 238 000 people living with HIV in Ukraine in 2017. The sexual mode of transmission is constantly increasing. In 2016, 61.6% of newly diagnosed patients were infected through heterosexual intercourse. Meanwhile, 21.8% were infected by intravenous drug use (1). Since 2010, new HIV infections have increased by 3% and AIDS-related deaths have decreased by 27% (2).

Risky behavior in students is not infrequent (3-7). Separation from family, loneliness (8), low sense of "health responsibility" (9), psychological and financial

problems, and generally poor QoL reported in university students (10) may exacerbate risky behavior. Romantic relationships at student age are more likely to include sexual intercourse (11). Medical and dentistry students may additionally have risk of occupational exposures to HIV-infected blood (12,13).

Meanwhile, prevalence of HIV testing in university students from different countries is relatively low (14-16). Further efforts are needed to achieve widespread acceptance of HIV testing among students. Having accurate data that reflects the reality of the youths' lives is crucial for efficient prevention planning (17).

The aim of this study was to investigate risk factors for HIV transmission and prevalence of HIV testing in medical students and further stimulation of HIV testing among them.

METHODS

Students from the 4th and 6th years of studies from the National Medical University (Kiev, Ukraine) were invited anonymously on a voluntary basis to answer blocks of questions concerning individual risk factors of HIV infection and HIV testing. The first block consisted of questions related to the risk of HIV transmission through blood: professional injuries with exposed needles during or after medical manipulations; occasional injuries by a needle discarded in a public place; blood transfusion; intravenous drug use; exposure to another person's blood; and sharing needles. The second block contained questions related to the risk of HIV transmission by sexual activity: unprotected vaginal sexual contacts with casual partners including forced contacts; anal sex; unprotected vaginal sexual contacts during periods; group sex; lifetime number of sexual partners; lifetime number of partners with ejaculation to oral cavity; and lifetime number of partners with unprotected vaginal intercourse. There was a separate question on personal history of HIV testing. Answers were received from 506 4th year and 90 6th year female students and 223 4th year and 42 6th

year male students. Data from 20 received questionnaires was considered invalid and therefore excluded from further analysis.

Ethical permission for the study was granted by the local research Ethics Committee. Fisher's exact test (two-sided) was used to analyze the significance of the association between the two kinds of classification. The results were considered significant if $P < 0.05$.

RESULTS

Data on frequency of professional injuries with exposed needles during or after medical manipulations, occasional injuries by a needle discarded in a public place, blood transfusion, intravenous drug use, exposure to another person's blood, sharing needles, unprotected vaginal sexual contacts with casual partners including forced contacts, anal sex, unprotected vaginal sexual contacts during periods, group sex, and HIV testing are presented in Table 1. Data on lifetime number of sexual partners, lifetime number of partners with ejaculation to the oral cavity and lifetime number of partners with unprotected vaginal intercourse are presented in Table 2.

Students who reported intravenous drug use (IDU) had blood transfusions more frequently ($P < 0.05$), used drugs intravenously more than once ($P < 0.01$),

Table 1. Data on frequency of professional injuries with exposed needles, occasional injuries by a needle discarded in a public place, blood transfusion, intravenous drug use, exposure to another person's blood, sharing needles, unprotected vaginal sexual contacts with casual partners including forced contacts, anal sex, unprotected vaginal sexual contacts during periods, group sex, and HIV testing

Characteristics	Total (n=841)		More than once	
	Students	Percentage (%)	Students	Percentage (%)
Professional injuries with exposed needles during or after medical manipulations	245	29.13	55	6.54
Occasional injuries by a needle discarded in a public place	50	5.95	10	1.19
Blood transfusion	35	4.16	9	1.07
Intravenous drug use	14	1.66	2	0.24
Exposure to another person's blood (on skin and/or mucosa)	653	77.65	403	47.92
Sharing needles	10	1.19	2	0.24
Unprotected vaginal sexual contact with casual partners (including forced contacts)	229	27.23	103	12.25
Anal sex	169	20.10	87	10.34
Unprotected vaginal sexual contact during periods	367	43.64	217	25.80
Group sex	42	4.99	11	1.31
HIV test (n=647)	239	36.94	96	14.84

Table 2. Data on lifetime number of sexual partners, lifetime number of partners with ejaculation to the oral cavity and lifetime number of partners with unprotected vaginal intercourse

Characteristics	0-1 partners		2-3 partners		4-10 partners		More than 10 partners	
	Students	%	Students	%	Students	%	Students	%
Lifetime number of sexual partners (all types of sexual contacts) (n=841)	308	36.62	262	31.15	209	24.85	62	7.37
Lifetime number of partners with ejaculation to the oral cavity (n=757)	583	77.01	136	17.97	33	4.36	5	0.66
Lifetime number of partners with unprotected vaginal intercourse (n=758)	450	59.37	231	30.47	67	8.84	10	1.32

shared needles ($P<0.001$), had anal ($P<0.01$) and group sex ($P<0.05$), had unprotected vaginal sexual contact with casual partners ($P<0.01$), and did it more than once ($P<0.001$). IDU students often had more than ten sexual partners ($P<0.01$) and unprotected vaginal intercourse with 4-10 partners ($P<0.05$). Frequency of HIV testing in IDU students did not differ from the general group of students.

Six out of ten students that reported sharing needles also reported IDU. Two of them shared needles more than once. One of them reported a single professional injury with an exposed needle during or after medical manipulations, three reported exposure to another person's blood (two persons more than once), one had more than one anal intercourse, and two had unprotected vaginal sexual contacts during periods more than once. Four of them reported 0-1 sexual partner and two others reported 2-3 sexual partners. Only one of them reported unprotected vaginal intercourse with 2-3 partners.

A significantly higher number of 4th year students reported exposure to another person's blood ($P<0.05$) and significantly more 4th year students had this experience more than once ($P<0.001$). A significantly higher number of 6th year students had 4-10 lifetime sexual partners ($P<0.05$) and a significantly higher number of them had unprotected vaginal intercourse with 2-3 partners ($P<0.01$). No other significant differences between 4th and 6th year students were found.

Several gender differences between male and female students were found (Table 3). Among those students who reported more than 10 sexual partners, male students had anal and group sex more often ($P=0.01$ for both), as well as higher frequency of having unprotected vaginal sex with 2-3 ($P=0.01$) and 4-10 ($P<0.05$) partners and higher prevalence of HIV testing ($P<0.05$). Female students who reported more

than 10 sexual partners more often had no oral sex with ejaculation to the oral cavity or had it with one partner ($P<0.05$).

Prevalence of unprotected vaginal sexual contacts with casual partners including forced sex in male and female students with different numbers of sexual partners is presented in Table 4.

Among those students who reported unprotected vaginal sexual contacts with casual partners 48.24% had never been tested for HIV. One male and one female student who reported unprotected vaginal sex with more than 10 partners had never been tested for HIV.

DISCUSSION

Unprotected vaginal sexual contacts with casual partners including forced sex were the most frequent risky behavior that may lead to HIV transmission in our respondents. Unprotected vaginal sexual contacts with casual partners were much more frequent in male students than in female students with 0-1 sexual partners. In contrast, it was more frequent in female students with higher number of sexual partners. Such experience was reported by 80% of female students with more than 10 sexual partners, more than half of female students with 4-10 partners, and by one third of female students with 2-3 partners. Almost half of students with such experience had never been tested for HIV. It is difficult to estimate exact risk of transmission because it depends on many different factors (18). Meanwhile, forced sex may be associated with higher traumatization and increased risk of HIV transmission (19).

Anal sex was reported by 20% of students, and only about 10% practiced it more than once. Unprotected anal intercourse is a risk factor for HIV

Table 3. Gender differences between male and female students

Characteristics	Male students (%) (n=255)	Female students (%) (n=586)	P
Professional injuries with exposed needles during or after medical manipulations	66 (25.87)	179 (30.55)	0.18
More than once	16 (6.27)	63 (10.75)	<0.05
Occasional injuries by a needle discarded in a public place	20 (7.84)	30 (5.12)	0.15
More than once	6 (2.35)	5 (0.85)	0.10
Blood transfusion	8 (3.14)	27 (4.61)	0.45
More than once	5 (1.96)	4 (0.68)	0.14
Intravenous drug use	5 (1.96)	9 (1.54)	0.77
More than once	1 (0.39)	1 (0.17)	0.51
Exposure to another person's blood (on skin and/or mucosa)	213 (83.53)	440 (75.09)	<0.01
More than once	134 (52.55)	269 (45.90)	0.08
Sharing needles	3 (1.18)	7 (1.19)	1.00
More than once	0	2 (0.34)	1.00
Unprotected vaginal sexual contact with casual partners (including forced contacts)	82 (32.16)	147 (25.09)	<0.05
More than once	46 (18.04)	57 (9.73)	<0.01
Anal sex	62 (24.31)	107 (18.26)	<0.05
More than once	37 (14.51)	50 (8.53)	<0.05
Unprotected vaginal sexual contact during periods	151 (59.22)	216 (36.86)	<0.001
More than once	88 (34.51)	129 (22.01)	<0.001
Group sex	27 (10.59)	15 (2.56)	<0.001
More than once	7 (2.75)	4 (0.68)	<0.05
HIV test	(n= 209) 95 (45.45)	(n=438) 144 (32.88)	<0.01
More than once	43 (20.57)	53 (12.10)	<0.01
Lifetime number of sexual partners (all types of sexual contacts)			
0-1	57 (22.35)	251 (42.83)	<0.001
2-3	69 (27.06)	193 (32.94)	0.11
4-10	88 (34.51)	121 (20.65)	<0.001
More than 10 partners	41 (16.08)	21 (3.58)	<0.001
Lifetime number of partners with ejaculation to the oral cavity	(n=233)	(n=524)	
0-1	142 (60.94)	441(84.16)	<0.001
2-3	62 (26.61)	74 (14.12)	<0.001
4-10	25 (10.73)	8 (1.53)	<0.001
More than 10 partners	4 (1.72)	1 (0.19)	<0.05
Lifetime number of partners with unprotected vaginal intercourse	(n=233)	(n=525)	
0-1	125 (53.65)	325 (61.90)	<0.05
2-3	72 (30.90)	159 (30.29)	0.62
4-10	30 (12.88)	37 (7.05)	<0.05
More than 10 partners	6 (2.58)	4 (0.76)	0.08

transmission, and it was previously reported that rates of condom use for heterosexual anal intercourse are lower than for vaginal sex (20). Published data on anal sex prevalence in students from different countries vary significantly (7,21,22).

In the present study group, sex was reported by almost 5% of students, and only 1% practiced it more

than once. Both anal and group sex were more frequent in male and IDU students. We can speculate that this may be partially explained by contacts with commercial sex workers. It was shown that presence of commercial sex increases the risk of HIV transmission (18). In the study by Buttram *et al.* (23), greater frequency of group sex was associated with buying



Table 4. Prevalence of unprotected vaginal sexual contacts with casual partners including forced sex in male and female students with different lifetime number of sexual partners

Unprotected vaginal sexual contact with casual partners (including forced contacts) in students with:	Male students (%)	Female students (%)	P
0-1 sexual partner	4 (7.02)	4 (1.59)	<0.05
2-3 sexual partners	11 (15.94)	59 (30.57)	<0.05
4-10 sexual partners	37 (42.05)	67 (55.37)	0.07
More than 10 sexual partners	30 (73.17)	17 (80.95)	0.55

sex, sex with an injection drug user, being high during sex, condomless vaginal sex, history of victimization, and incidence of sexually transmitted infection. Other studies have shown that HIV discordance among group sex events attendees is high, highlighting the potential transmission risk associated with group sex events (24). A low number of students reported oral sex with ejaculation to the oral cavity with more than one partner. Many more students had unprotected vaginal sex with more than one partner. Sexual contacts with more than 10 partners were uncommon. Almost 44% of our students reported unprotected vaginal sexual contacts during periods. More than 25% of students practiced it more than once. It is difficult to find data on exact risk of HIV transmission during this practice, but it was found that men who ever had sex with a woman while she was menstruating were twice as likely to be HIV positive (25).

Another alarming issue are reports of professional injuries with exposed needles during or after medical manipulations in almost 30% of respondents. The incidence of needlestick injuries is significantly higher than reported through passive surveillance, ranging from 14 to 839 needlestick injuries per 1,000 health care workers per year. The economic cost of managing these injuries is also high, ranging from 51 to 3766 US dollars in 2002. This amount excludes the cost of treating the long-term complications of needlestick injuries, such as HIV and hepatitis B and C infections (26). Occupational exposures to HIV continue to occur, presenting a real risk of HIV infection. Widespread adoption of standard universal precaution guidelines, post-exposure prophylaxis, and HIV testing are important for reduction of occupational HIV transmission (27). Policy, practice, and training need to address new devices engineered to prevent sharps injuries, sharps disposal containers, and prophylaxis after percutaneous injury (28). Some of our students work as nurses during their free time in order to gain professional experience and have an additional source of money. We can speculate that they have higher risk of occupational needlestick injuries. Health care employers should evaluate the imple-

mentation of needlestick injury prevention devices with the participation of employees who will use such devices and, where appropriate, introduce such devices accompanied by the necessary education and training as part of a comprehensive sharps injury prevention and control program (29). The prevalence of professional injuries with exposed needles during or after medical manipulations in our students was comparable with data from other studies (12,13).

Almost 78% of students in our study reported exposure to another person's blood and almost half had more than one such episode. Very low risk of HIV transmission may occur in case of preexisted injury of the skin or mucosa. Continuous intravenous drug use was reported by 0.24% of students. Meanwhile, 1.66% had a single episode of intravenous drug use. Risky behavior of this subgroup of students is not limited to drug use. IDU students had high prevalence of other risk factors: sharing needles, anal and group sex, and unprotected vaginal sexual contacts with casual partners. They also had a higher number of sexual partners. The reason for sharing needles by 6 other students who did not reported intravenous drug use remained unknown. In contrast with IDU students, they reported a low number of sexual partners and no unprotected vaginal sex with casual partners.

Less than 5% of students reported blood transfusions. Despite the high prevalence of HIV in donated blood (30,31), the risk for transfusion-transmitted HIV infection has been almost eliminated in Ukraine. However, some HIV-infected individuals in Ukraine were infected by blood transfusion (32). Therefore, blood transfusion in Ukraine should be considered an extremely low risk factor for HIV transmission but still may be a reason for a HIV test. The risk may depend on the year when blood transfusion was performed. Almost 6% of our students reported occasional injuries by a needle discarded in a public place and more than 1% reported more than one incident. It is extremely unlikely that HIV infection would occur following an injury from a needle discarded in a public place. However, if the incident involved a needle and syringe with fresh blood and if some of the blood was

injected, infection is theoretically possible and prophylaxis is indicated (33).

Less than 40% of students had ever been tested for HIV. A significant number of students who had never been tested reported risky behavior. It is important to determine reasons why some students did not want to be tested. Despite relatively low prevalence of HIV testing in our students, it is comparable with data from other countries. In the study from US between 2011 and 2013, an average of 33% of young adults had ever been tested for HIV (34). 58.1% of German nursing school students reported never undergoing an HIV test (21). Data on HIV testing in university students significantly varies between countries: from 27% of Thai students (14) to 51% of South African (15) and 65.2% of Nigerian students (16).

Male students in our study reported higher prevalence of sex-related risky behavior but also more frequent HIV-testing. Despite 6th year students reporting a higher number of sexual partners, there was no difference in HIV testing.

CONCLUSIONS

The prevalence of unprotected vaginal sexual contacts with casual partners and professional injuries with exposed needles during or after medical manipulations was quite high. Meanwhile, prevalence of HIV testing in our respondents was lower than 40% and only about 15% were tested more than once. Free and anonymous HIV testing is now widely available in Ukraine. It is important more actively popularize HIV testing in students, explain risk factors of HIV transmission, and to organize needlestick injury prevention and control program.

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