AWARENESS OF HIV TRANSMISSION RISKS AND DETERMINANTS OF SEXUAL BEHAVIOUR: DESCRIPTIVE AND MULTIVARIATE ANALYSES AMONG GERMAN NURSING STUDENTS

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SUMMARY

Background and Aim: Nursing students play a crucial role in sexual health education. Evidence suggests, however, that nursing students had several gaps in their knowledge of HIV transmission. This study investigates how nursing students in Germany assess the potential risks of spreading HIV in defined situations and which factors influence the self-expressed sexual behaviour patterns of these students.

Methods: A standardized anonymous questionnaire was administered to a sample (N = 617) of nursing students in 2008 and 2013. The survey was conducted during lessons, resulting in a response rate of 100%.

Results: For 17.4% of the students, assistance with personal hygiene was associated with higher HIV transmission risk. Also, changing dirty linen (17.6%) and physical examination (14.1%) were also noted similarly risky. The average age of first sexual intercourse was 15.5 years and the number of lifetime sexual partners was 4.3. The higher the average number of lifetime sexual partners, the higher the likelihood to use condoms only sometimes or never (OR 1.11). Forty students reported an unintended pregnancy. The likelihood to be unintentionally pregnant was six times higher among students aged 25 years or older (OR 6.16).

Conclusions: The results clearly show that students overestimated HIV transmission risks in most of the situations encountered during health services provided by nurses, but overall sexual health behaviour indicated rather less risky behaviour. Nonetheless, the relatively high rate of unintended pregnancies is quite concerning. The findings underline the need for stronger integration of HIV and sexual education in the curricula of nursing schools in Germany.

Key words: nursing students, HIV transmission risks, sexual behaviour, contraception, HIV test

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INTRODUCTION

The increasing prevalence of HIV since 1990, coupled with longer life expectancy resulting from better treatment options with high antiretroviral drugs, have caused the infection to become a chronic disease. Compared to other countries and regions, Germany is in a very favourable situation regarding the HIV epidemic. At the end of 2012, about 80,000 people were affected by the infection, so the prevalence reached < 0.1%. Since 2000, the number of newly infected people has increased but has levelled off with about 3,000 new cases each year since 2007 (3,263 in 2013) (1, 2).

By providing care and treatment to affected people, nursing staff, and thereby especially nursing students, play an important role in the fight against infection with HIV/AIDS (3). The proceeding chronicity of the disease increases the probability of exposure to HIV/AIDS in daily work routine (4). Therefore, nursing students should be given sufficient knowledge and awareness about infection, potential risk factors, what does not constitute a transmission risk, and preventive measures. This knowledge ultimately serves to provide patients with appropriate information as well (5). Moreover, the awareness of healthy and preventive behaviour patterns not only enables better protection against HIV, but also allows the correct identification of clinical risk situations.

Furthermore, nursing staff plays a key role regarding sexual health education. They are the primary contacts who provide counselling to their patients on sexual health, sexual risk behaviour or prevention, and give information about transmission of sexual transmitted infections (STI) (6). The awareness of sexual risk behaviour allows nursing students to give effective and reliable counselling to their patients (7).

Previous research indicated that even 30 years after the appearance of the first HIV cases, knowledge gaps among nursing and health care students regarding symptoms, immunopathology and transmission risks are still present (4, 8). Research studies on nursing students mostly detected attitudes towards HIV/AIDS and

how to care for people with the disease (4, 5, 8–14). However, the studies inadequately assessed the awareness of potential HIV transmission risks.

Research about nurses or nursing students' sexual behaviour and potential influencing factors were rarely a subject of investigation. The studies from Lohrmann et al. and Suominen et al. could not detect any significant effect of background variables on sexual behaviour of nursing students (8, 15). In contrast, further research has found a significant association between age, gender and sexual behaviour (12, 16). It has been shown that younger students had sexual intercourse earlier than older students, but condom use was more widespread among students who had their first sexual encounter later (16, 17). All in all, research indicates that the prevalence of condom use among adolescents is still increasing (17–19), nevertheless, oral contraception remains the widely used method among European women (20).

Because sexual behaviour like sexual orientation, initiation, practices or number of partners is directly linked to HIV transmission and prevention in terms of risk factors for HIV, preventive practices and knowledge (21), the purpose of this study was twofold: to examine how nursing students evaluate potential HIV transmission risks in defined, typical clinical as well as private situations; and to analyze determinants which influence the self-expressed sexual behaviour patterns of these students.

MATERIALS AND METHODS

An anonymous standardized self-administered questionnaire was used. The questionnaire has been applied in several studies mainly among medical students (22–25). The following sections were included in the questionnaire and further analyzed: socio-demographic data; assessment of HIV transmission risks in different clinical and non-clinical situations which was categorized using a 10-point analogue scale with endpoints 1 (very unlikely) to 10 (very likely); and sexual behaviour of the students.

Healthcare students in Germany study a three year vocational programme preceded by ten years of elementary and high school education.

The survey was conducted as part of series of lectures on health sciences, and has been approved by the school committee in 2008 and 2013 at the same nursing college associated with a regional hospital (1,735 beds) in Saxony, Germany. The two study groups, each consisting of all first- to third-year nursing students, were selected over two survey periods, thereby ensuring unique sample populations. The lack of significant differences in socio-demographic patterns allowed the two groups to be pooled together. The questionnaire was distributed and filled in during classes, resulting in a response rate of 100% (N = 617). The data collection was made in close cooperation with the college, so the students were motivated to participate. Of course, voluntary and anonymous participation was emphasized. The survey was non-clinical and had a non-invasive character with no registration of personal data, thus there was no potential risk for the participants. With these characteristics, the school committee as an ethical preliminary commission decided that it would not be necessary to consult an ethical committee. Nevertheless, all data were analyzed in compliance with the Helsinki Declaration (26).

Statistical Analysis

All items were first analyzed in a descriptive way. According to previous studies, assessment of HIV transmissions risks with ≥ 7 of the ten-point analogue scale were considered as relevant risk (22, 23). Chi-square test was applied to determine statistical differences between subgroups.

Multiple logistic regression was performed regarding condom use, oral contraception, unintended pregnancy, and undergoing HIV test to analyze potential factors associated with sexual behaviour. The ordinal items were dummy coded. Adjusted odds ratios (OR) and their corresponding 95% confidence intervals (CI) were calculated. As covariates, the socio-demographic items were used. In addition, the influences of the other items related to sexual behaviour were modelled. The level of significance was set at $\alpha < 0.05$. All analyses were conducted with SPSS package for Windows version 20.0.

RESULTS

Altogether, 617 nursing students and paediatric nursing students took part in the study. The majority were females (85.1%) aged from 19 to 21 years (46.2%). A 10th year secondary school education was the most common level of education (65.1%) followed by A-levels grade qualification with 32.9% (Table 1).

Table 1. *Demographic data (N = 617)*

Socio-demographics		**n**	**%**
Age	16–18 years	205	33.2
	19–21 years	285	46.2
	22–24 years	83	13.5
	> 24 years	44	7.1
Gender	Male	92	14.9
	Female	525	85.1
Educational level	9th grade	9	1.5
	10th grade	402	65.1
	A levels (12th grade)	203	32.9
	University degree	3	0.5

Assessment of HIV Transmission Risks

The nursing students had to assess the HIV transmission risks in daily working situations in eleven selected clinical situations, considering normal working conditions (Table 2). 94.8% of the students indicated using the same injection needle for several patients as the highest risk. The second most serious risk stated by 72.8% of participating students was placing an intravenous drip or performing an arterial puncture. A single blood transfusion was assessed to pose transmission risk by 56.7%, and multiple blood transfusion with 68.7% of respondents. One-fifth of the students estimated that changing dirty and defecated linen and providing assistance with personal hygiene are connected with a significant transmission risk. 14.1% responded that physical examination is linked to a higher risk of transmitting HIV or AIDS.

Besides the clinical settings, the questionnaire contained seven private or non-clinical situations (Table 2). Unprotected sexual intercourse with a partner known for two years was assessed as half of the potential risk for contracting HIV (41.8%) as knowing the partner only for two weeks (89.1%). 39.1% of the students rated animal bites in the forest to be likely situation to get infected with HIV. One-fifth of the students assessed mosquito bites as relevant risk for transmission with HIV. Having unprotected sexual intercourse with a partner who is HIV positive was assessed as no relevant risk to acquire HIV by 3.7% of the nursing students.

By using chi²-tests, significant differences according to gender and level of formal schooling were found (Table 2). In contrast, no significant differences according to years of vocational training were identified in the sample.

Sexual Behaviour

6.6% of the participants have not yet had sexual intercourses. The average age for first sexual activities was 15.5 years (Ta-

Table 2. *Assessment of defined transmission situations*[1]

	n	%
Clinical situations		
Use the same injection needle for several patients[2]	584	94.8
Placing an intravenous drip	449	72.8
Performing an arterial puncture	449	72.8
Getting multiple blood transfusions	422	68.7
Changing wound dressings	413	67.2
Getting blood transfusion	349	56.7
Mouth-to-mouth ventilation	245	39.8
Changing infusion bottles	148	24.1
Changing dirty linen	107	17.6
Assistance with personal hygiene[6]	108	17.4
Physical examination	87	14.1
Private situations		
Unprotected sexual intercourse with a partner, who is HIV positive	593	96.3
Unprotected sexual intercourse with a partner, who is known for two weeks[3]	546	89.1
Unprotected sexual intercourse with a partner, who is known for two years[4, 7]	256	41.8
Animal bite in the forest	241	39.1
Mosquito bite	120	19.6
Kissing	73	11.9
To be coughed on[5]	75	12.2

[1]Assessment of HIV transmissions risks with ≥ 7 of the ten-staged analogue scale
[2]Significantly higher risk assessed by female students ($\chi^2 = 7{,}042$; $p = 0.008$)
[3]Significantly higher risk assessed by female students ($\chi^2 = 10{,}459$; $p = 0.001$)
[4]Significantly higher risk assessed by female students ($\chi^2 = 6{,}760$; $p = 0.009$)
[5]Significantly higher risk assessed by female students ($\chi^2 = 4{,}639$; $p = 0.031$)
[6]Significantly less risk assessed by 9th and 10th graders ($\chi^2 = 3{,}970$; $p = 0.046$)
[7]Significantly less risk assessed by 9th and 10th graders ($\chi^2 = 7{,}745$; $p = 0.005$)

Table 3. *Age of first sexual intercourse and number of sexual partners*

	Average	Standard deviation	Range
Age of first sexual intercourse (years)	15.5	± 1.62	10–21
Lifetime sexual partners (number)	4.3	± 4.74	0–40
Sexual partners last twelve months (number)	1.6	± 1.91	0–20

Table 4. *Determinants of condom use and oral contraception*

Condom use (n = 527; R^2 = 11.2%)				
Determinants	**Reference**		**OR**	**CI 95%**
Age	16–18 years	19–21 years	0.90	0.56–1.47
		22–24 years	0.92	0.47–1.80
		> 24 years	0.52	0.20–1.37
Gender	female	male	1.07	0.59–1.96
Educational level	9th or 10th grade	A-levels or university degree	1.04	0.66–1.64
Oral contraception	yes	no	0.95	0.57–1.60
Unintended pregnancies	no	yes	0.76	0.34–1.68
Other methods for contraception	yes	no	1.44	0.91–2.29
Number of lifetime sexual partners			1.11***	1.06–1.17
Age at first sexual intercourse			0.88	0.76–1.01
Fellatio	no	yes	1.00	0.51–1.98
Cunnilingus	no	yes	0.98	0.51–1.89
Anal intercourse	no	yes	1.27	0.76–2.12
Oral contraception (n = 527; R^2 = 14.9%)				
Determinants	**Reference**		**OR**	**CI 95%**
Age	16–18 years	19–21 years	1.66	0.94–2.92
		22–24 years	0.83	0.41–1.68
		> 24 years	0.81	0.34–1.98
Gender	female	male	0.66	0.35–1.24
Educational level	9th or 10th grade	A-levels or university degree	0.88	0.53–1.46
Condom use	occasionally or never	always	0.93	0.56–1.55
Unintended pregnancies	no	yes	0.31**	0.15–0.67
Other methods for contraception	yes	no	2.93***	1.85–4.63
Number of lifetime sexual partners			0.97	0.92–1.03
Age at first sexual intercourse			0.93	0.80–1.09
Fellatio	no	yes	2.26*	1.07–4.79
Cunnilingus	no	yes	0.83	0.40–1.73
Anal intercourse	no	yes	0.91	0.50–1.67

Levels of significance: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

ble 3). The mean number of lifetime sex partners and partners within the last twelve months was reported to be 4.3 and 1.6, respectively.

Fellatio and cunnilingus were practiced by 4.2% and 4.8% of the students only once, whereas 41.2% and 41.6% of respondents reported occasional, and 23.5% and 22.0% regular practicing. Oral intercourse was never practiced by one-third of the students (fellatio: 31.1%, cunnilingus: 31.6%). More than two-third never practiced anal intercourse (68.8%), whereas 14.2% only once, 15.2% occasionally, and 1.8% performed it regularly.

During sexual intercourse with a new partner, 69.9% of the students always used condom, whereas 22.2% of the students used it occasionally and 7.9% never used it. The results of logistic regressions indicated that the likelihood to use condom only occasionally or never increased with the number of sexual partners ($p < 0.001$; Table 4). More males than females, those with higher education level, those at a younger age at the time of their first sexual intercourse and those using other methods for contraception could describe occasional or no use of condoms during sexual intercourse with a new partner as a risk factor, but these results were not significant.

Altogether, 75.1% of the participants reported using oral contraception. The likelihood to use oral contraception decreased among students who were unintentionally pregnant ($p < 0.002$) and increased when no other methods for contraception were used ($p < 0.001$; Table 4). In total, about 27.6% of the students reported using other methods of contraception.

Forty participants (6.6%) reported having at least one unintended pregnancy (themselves or their female partner). No significant effects could be found regarding educational level, gender, condom use, using other methods for contraception, and sexual practices. In relation to the age reference group, it was six times more likely to be unintentionally pregnant for the age group of 25 years and older ($p = 0.006$; Table 5). The more sexual partners the students had, the more unwanted pregnancies were reported ($p = 0.019$). Those who had their first sexual intercourse at an older age were 32% less likely to have an unintended pregnancy ($p = 0.005$). However, the chance for

Table 5. *Determinants of unintended pregnancies and undergoing HIV-testing*

Unintended pregnancies (n = 527; R^2 = 21.9%)				
Determinants	**Reference**		**OR**	**CI 95%**
Age	16–18 years	19–21 years	1.90	0.70–5.15
		22–24 years	2.57	0.78–8.43
		> 24 years	6.16**	1.70–22.40
Gender	female	male	1.06	0.39–2.85
Educational level	9th or 10th grade	A-levels or university degree	0.86	0.39–1.91
Condom use	occasionally or never	always	1.37	0.61–3.09
Oral contraception	yes	no	3.08**	1.42–6.69
Other methods for contraception	yes	no	0.68	0.32–1.47
Number of lifetime sexual partners			1.08*	1.01–1.14
Age at first sexual intercourse			0.68**	0.52–0.89
Fellatio	no	yes	1.14	0.26–5.03
Cunnilingus	no	yes	2.91	0.70–12.10
Anal intercourse	no	yes	0.59	0.23–1.52
HIV-testing (n = 412[a]; R^2 = 15.2%)				
Determinants	**Reference**		**OR**	**CI 95%**
Age	16–18 years	19–21 years	2.20*	1.18–4.10
		22–24 years	3.50**	1.51–8.07
		> 24 years	5.52***	1.94–15.72
Gender	female	male	1.42	0.67–3.03
Educational level	9th or 10th grade	A-levels or university degree	0.60	0.33–1.10
Condom use	occasionally or never	always	0.87	0.50–1.50
Oral contraception	yes	no	1.71	0.98–2.99
Number of lifetime sexual partners			1.08**	1.02–1.15
Fellatio	no	yes	1.19	0.48–2.91
Cunnilingus	no	yes	0.64	0.28–1.50
Anal intercourse	no	yes	0.77	0.36–1.64

[a]Number of cases was less than in the other models because of excluding students, who underwent HIV test during blood donation.
Levels of significance: *p ≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

such a pregnancy increased by 2.82 times if the pill was not used (p = 0.004).

58.1% reported never undergoing an HIV test, while 26.1% of the nursing students underwent testing before a blood donation. Having undergone more than one HIV test without donating blood was reported by 4.6% of the students. With higher age, the probability to get tested for HIV increased (p = 0.001, p = 0.013; Tab. 5). The more sexual lifetime partners the participants reported, the more HIV testing was done (p = 0.009).

DISCUSSION

This survey included all nursing students from a large nursing college at different times (2008 and 2013), each group with a response rate of 100% because the survey was carried out during classes. Even though the study was carried out in only one nursing college in Germany, due to the outstanding response rate along with the nursing college super regional student body cooperation, the results may be generalized. The gender imbalance was due to gender-specific occupational choices. Furthermore, this study questionnaire piloted in earlier studies has been used successfully multiple times. Accordingly, the comparability to previous research was possible (22–25).

On the other hand the study is not without limitations. The study design did not allow to draw any conclusions about causal relationships of the results. Further longitudinal research should be therefore done to detect potential developments in a study population. Also, the questions about sexual behaviour and habits dealing with very private matters were therefore very sensitive. The possibility of social desirability bias could be also suspected here (15).

The most effective way to prevent HIV transmission is relevant knowledge about infection risk factors and means of transmission (5). The findings point to the problem that the nursing students investigated had several noticeable gaps in their knowledge about HIV infection risks in defined clinical and non-clinical situations. About 20% of the students reported assistance with personal hygiene and changing dirty linen as relevant risks for contracting HIV, although in these situations and in other daily

contact, transmission is very unlikely. These results correspond with those from Askarian et al. (5). Likewise, the overestimation of HIV infection risks was found in the situation of physical examination of patients, which is analogous to findings in a study of Namibian health care students (23). Overestimations in daily contacts were similarly shown in studies of German (8) and British (12) nurses and nursing students. Getting a single blood transfusion was assessed by about 60% of the participants as a relevant risk for transmission of HIV infection although the residual risk of contracting during a blood transfusion is scientifically estimated at 1 to 4.3 million (27). However, these results are consistent with findings among nurses in Great Britain (9).

The analysis of data from non-clinical settings also showed considerable high overestimations as well, although HIV transmission in some of these situations is extremely unlikely. One-fifth of the students assessed mosquito bites and another two-fifths stated that animal bites are relevant risks for contracting HIV, which is similar to findings of Akinsanya and Rouse (9). Unprotected sexual intercourse with a partner who is known for two years was assessed as half of the risk of HIV transmission than unprotected sexual intercourse with a partner who is known only for two weeks. This seems to imply that a longer partnership suggested a monogamous lifestyle. However, previous research showed that sexual contacts with multiple partners also existed in stable partnerships (28). Especially alarming was the assessment of unprotected sexual intercourse with an HIV-positive partner, where around 4% of the students reported this as a low risk activity.

The findings indicated several knowledge gaps referring to ways HIV can or cannot be transmitted. One possible explanation of these worrying results may be ascribed to young people, especially adolescents between 16–20 years of age perceiving HIV/AIDS as more dangerous than the general population (29). Other research detected that most of the students acquired their knowledge not from their training but rather from the mass media (11).

Therefore, it is recommended that topics like HIV or AIDS, transmission risks and appropriate care of infected patients should be emphasized during nursing training (4). This might help to improve adequate care for HIV patients. Lohrmann et al. (8) and Suominen et al. (14) have shown that education, experiences in providing care for people with HIV, or knowing someone who is HIV positive influences knowledge levels.

With regard to their age, students are the most at-risk group for HIV infection or other sexually transmitted infections because frequent changes of sexual partners or spontaneous (unprotected) sexual contacts in this age cohort were more common than in other age groups (18, 19, 29).

In general, the analyses showed regular health-conscious behaviour related to nursing students' sexual activity. The main focus of this reasearch was to identify important factors affecting nursing students' sexual behaviour. The study did not detect any significant influence related to educational level and gender, comparable to other studies (15). With an average number of nearly 1–2 sexual partners within the last twelve months, the findings were similar to other research on nursing students (16). Having their first sexual intercourse at a mean age of 15.5 was comparable with results of other studies (16). On the other hand, a review about sexual health in Europe pointed out that young people aged 16–20 years reported that they had their first intercourse at the age of 16.5 (30), but as noted in the study, there has been a progressive decrease.

92% of the participants always or at least occasionally use condoms during sexual activities with a new partner. When compared to a survey among 16–20 years olds, the results were substantially higher (19). Nevertheless, it should be mentioned that sporadic use of contraception, especially condoms, increases the risk not only for unintended pregnancies, but also for HIV or other STI (20). As the number of lifetime sexual partners increased, the probability of either only occasional or rare use of condoms also increased, which was consistent with a survey about youth sexuality (19). A possible explanation might be that with increasing sexual experience, oral contraception will be the preferred contraception method (17, 19). As noted by other authors, students who had their first sexual experience at an older age were more cautious, as reflected by their safer practices (12, 14). The results showed that these students used condoms more often than younger ones.

A high number of students used oral contraception, which was associated with their higher age. Siegel et al. stated that oral contraception was perceived as a method for overall risk reduction but it was worth mentioning that this option only helped to prevent unintended pregnancies. The risk of contracting STI did not decrease (31).

Quite worrying results were that 40 students reported unintended pregnancies, which indicate that knowledge gaps related to contraception use are still present. Amongst other aspects, age was related to a higher probability for unwanted pregnancies. Older students were more at-risk for unintentional pregnancies, which can be explained by a higher number of lifetime opportunities. The same explanatory approach might be stated for undergoing HIV testing, which was also influenced by factors like age of students and a number of their lifetime sexual partners. Altogether, HIV testing was not very common among nursing students in this study, nonetheless, it was more frequent than found in other studies (16).

CONCLUSION

In conclusion the results of the assessment of HIV transmission risks identified strong overestimations in most of the defined situations. This indicates knowledge gaps among the students investigated. With regard to sexual health behaviour, it can be stated that nursing students in general did not show risky sexual behaviour in terms of condom use, first sexual experiences and number of sexual partners. Nevertheless, further education relating to awareness of the fact that oral contraception only protects against unintended pregnancies, not against HIV and STI, is necessary. All in all, the findings underline the need to enhance efforts to increase education on HIV, transmission risks, dealing with HIV patients, and sexual education during nursing training. This would help to improve adequate care for HIV patients and awareness of nursing students' own sexual health as well.

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Conflict of Interests

None declared

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