



Occupational Exposure, Risk Perception and Access to Prophylaxis for HIV/AIDS Infection among Health Care Workers in Northern Nigeria

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Author's contribution

The only author performed the whole research work. Author OEA wrote the first draft of the paper. Author OEA read and approved the final manuscript.

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ABSTRACT

Introduction: This study was designed to describe occupational exposure, risk perception and access to prophylaxis for HIV/AIDS among the health care workers in Northern Nigeria.

Methods: This study is an analytical cross-sectional study. Multistage sampling technique was used to obtain a representative sample and a structured self-administered questionnaire was used to collect relevant information.

Results: A total of 421 health care workers were interviewed, 5.2% reported percutaneous exposure to HIV infected blood or body fluids in the workplace in the last 6 months. Predictors of risk perception were working in public facilities [OR=2.28, C.I=1.26-4.15], male gender [OR=3.42, C.I=1.59-7.36] and training on infection control [OR=1.94, C.I=1.13-3.34]. Significantly more males [OR=2.33, C.I=1.12-4.94], those in public facilities [OR=5.85, C.I=1.97-19.48], urban facilities [OR=24.99, C.I=3.67-491.82] and those in tertiary facilities [[OR=17.96, C.I=6.04-59.99] reported a greater access to prophylaxis medication.

Conclusion: The study concludes that male health care workers that are young, working in public facilities and have insufficient knowledge about HIV/AIDS have a high risk perception for HIV/AIDS while those in urban and public facilities especially tertiary facilities reported a ready access to prophylaxis medication. Uneven distribution of medication and other health care resources in Northern Nigeria and similar populations

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may contribute to increased casualty among the health care workers.

Keywords: HIV/AIDS infection; health care workers; occupational exposure; access to prophylaxis; risk perception; Northern Nigeria.

1. INTRODUCTION

The rapidly spreading HIV/AIDS epidemic has made a huge impact on the health care system in Nigeria. In addition to the increasing demand of services, there is a lack of HIV/AIDS-related training and health resources, and health care workers [HCW] are facing a growing risk of contracting HIV by means of contact with blood and other body fluids at work [1-2]. The risks for occupational transmission vary with the type and severity of exposure. Many health care workers are at an increased risk of per-cutaneous exposure and accidental needle stick injuries because of the environment in which they work. As a result, these workers are at risk of occupational acquisition of blood borne pathogens such as HIV, hepatitis B and C, and other diseases.

The annual estimated proportions of health-care workers (HCW) exposed to blood-borne pathogens globally were 2.6% for HCV, 5.9% for HBV, and 0.5% for HIV, corresponding to about 16,000 HCV infections and 66,000 HBV infections in HCW worldwide [3]. HIV seroprevalence surveys provide a way of indirectly assessing the risk of occupationally acquired HIV infection. In prospective studies of HCWs, the average risk of HIV transmission after a percutaneous exposure to HIV-infected blood was estimated to be approximately 0.3% and approximately 0.09% after a mucosal membrane exposure [4-7] and every year there are approximately 3 million percutaneous exposures among health care workers worldwide [8-10]. In the health care setting, blood-borne pathogen transmission occurs predominantly by percutaneous or mucosal exposure of workers to the blood or body fluids of infected patients. Occupational exposures that may result in HIV transmission include needlestick and other sharps injuries; direct inoculation of virus into cutaneous scratches, skin lesions, abrasions, or burns; and inoculation of virus onto mucosal surfaces of the eyes, nose, or mouth through accidental splashes. HIV does not spontaneously penetrate intact skin, and airborne transmission of these viruses does not occur [11-13]. Other seroprevalence studies similarly have shown low rates of HIV seropositivity among HCWs without non-occupational risk factors for HIV infection [14-18].

There is a paucity of research investigating occupational exposure experienced by health care workers in Northern Nigeria. Our study used quantitative methods to examine the real experiences of HCWs with occupational exposure. This study was designed to describe occupational exposure, risk perception and access to prophylaxis among the health care providers in Nasarawa state, Nigeria. The findings from this study will be beneficial in revealing opportunities available to improve safety of the health care workers in the health care system in Northern Nigeria and other low income countries.

2. MATERIALS AND METHODS

2.1 Study Design

This study is an analytical cross-sectional study. The information was collected from the health care providers working in Nasarawa State from January to February 2009.

2.2 Study Area

Nasarawa state was created in 1st October, 1996 from the present Plateau state by the regime of late General Sanni Abacha, and has Lafia as its capital city. It covers a land area of approximately 27, 116.8 square kilometer. It comprises of 13 local government areas namely; Akwanga, Awe, Doma, Karu, Keana, Keffi, Kokona, Lafia, Nasarawa, Eggon, Obi, Toto and Wamba.

Nassarawa state is a multi-ethnic state. The major ethnic groups found in the state are; Eggon, Mada, Gwandara, Bassa, Alago, Rindre, Nyamkpa, Migilli, Koro, Kantana, Arum, Afo, Tiv, Hausa, Fulani and Kanuri. Three major religious groups are predominant in the state namely; Christianity, Islam, and Traditional worshipers. Nasarawa state is a predominantly a rural and agrarian state. Majority of the people reside in the rural areas while a few are found in the towns of Lafia, Keffi, Akwanga, Nasarawa and Karu. Therefore informal settlements with no direct access to health care facilities are common.

The state has two tertiary health institutions which are Specialist Hospital Lafia and Federal Medical Centre Keffi. There are thirteen General Hospitals and Comprehensive Health care centres cited in each local government area and several private clinics and public health centres scattered all over the state. Nasarawa state has a current HIV/AIDS prevalence rate of 10.0% [19], which was higher than most states in Nigeria. Similarly Lafia the state capital with HIV/AIDS prevalence of 19.0% [19] was ranked 5th in terms of HIV/AIDS prevalence.

2.3 Study Population

There were 1,680 health care workers as at december 2007. This comprised of 1357 in public/Government Health institutions and 323 registered health workers in Private Hospitals/Clinics throughout the state (Ministry of health (MOH), Nasarawa state). This is as shown in Table 1 below:

Table 1. List of registered health workers in Nassarawa State, Nigeria

Profession	Public	Private	Total
Medical Doctors	145 [83.8]	28 [16.2]	173 [100.0]
Nurse/Midwives	401 [78.6]	109 [21.4]	510 [100.0]
Pharmacists	44 [72.1]	17 [27.9]	61 [100.0]
Laboratory Scientists	45 [80.4]	11 [19.6]	56 [100.0]
Community Health Workers	230 [100.0]	0 [0.0]	230 [100.0]
Hospital Attendants	329 [74.4]	113 [25.6]	442 [100.0]
Technicians (Lab,Pharmacy etc)	129 [74.1]	45 [25.9]	174 [100.0]
Dental Personnel	23 [100.0]	0 [0.0]	23 [100.0]
Ophthalmetrists	2 [100.0]	0 [0.0]	2 [100.0]
Physiotheraphists	4 [100.0]	0 [0.0]	4 [100.0]
Radiographers	5 [100.0]	0 [0.0]	5 [100.0]
Total	1357 [80.8]	323 [19.2]	1680 [100.0]

2.4 Sample Size Determination

The total number of registered health care workers in both public and private health facilities representing aforementioned health professionals at December 2007 was 1680 (Nasarawa state ministry of health, Lafia, 2008) .The sample size used for this study was calculated with the formula (used when total study population is less than 10000):

$$Nf = n/1+(n)/(N)$$

Where; nf=the desired sample size when population is less than 10000.

N=the desired sample size when population is more than 10000.

N=the estimate of population size.

Hence if n is approximated to be 400 derived from the formular, $n=z^2 pq/d^2$, and N is 1680 then $nf=400/1+(400)/(1680) = 322$.

2.5 Sampling Technique

A Multistage sampling technique was used to obtain a representative sample of the health care workers in the state.

2.5.1 Stage 1: Selection of local government areas

The first stage was the grouping or categorization of the 2 tertiary, 13 secondary and 13 Comprehensive Model Primary health care facilities and 36 registered private hospitals in the 12 local government areas in the state. In order to obtain a representative sample, two local government areas was selected by random sampling technique.

2.5.2 Stage 2: Selection of facilities surveyed

A total of 12 health facilities were sampled. This comprises of 2 tertiary facilities, 2 general hospitals, 2 Comprehensive health facilities present in the local governments selected and 6 registered private health care centres. The 6 registered private health care centres were selected using simple random sampling (by balloting).

2.5.3 Stage 3: Selection of study participants

Proportional sampling technique was used to obtain a representative sample of the health care workers in the state. Equal numbers of respondents (112 health care workers) were allocated to tertiary, secondary, PHC (mostly primary health care delivery), and Private (mostly primary health care delivery) hospitals respectively. The ratio of doctors to nurses in each hospital was used as the sampling scheme, and hospital laboratory scientists and pharmacists were over-sampled to allow for their adequate representation in the analysis.

A total of 421 randomly selected Health care workers participated in the self-administered survey between January and february, 2009, with less than 5% refusal rate.

2.6 Research Instrument

The instrument or tool used in this study was a self administered questionnaire. The questionnaire was structured into three sections, namely: Bio-data (demographic Characteristics); Risk perception (assessed variables such as total number of events and rate of occupational exposure events) and Post exposure access to HIV/AIDS prophylaxis (assessed variables such as availability of drugs in the facility, access to specialist for prescription etc).

Single multiple response choice questions were asked to determine risk perception: "Do you think you can be infected with HIV from your daily duty".

Occupational exposure was determined by asking: Have you had needle stick injury or infected blood touches or splash on your skin cuts or wounds in the last 6months?

A checklist assessing availability of medication and other resources was also used to assess facilities visited.

2.7 Data Collection

Data were collected from three different local government areas in a Nasarawa state. Participants consisted of service providers who were currently working at the health care facilities in the area. The questionnaire was pre-tested in Nov 2008 on 45 respondents who were randomly selected health care workers. All the necessary adjustments and corrections were made in the question sequence. Most of the questions except a few were close-ended. Pre-coding was done to allow for easy data capturing.

Data collection was carried out by the investigator and a research assistant who possessed senior secondary school certificate. The assistant was trained by the investigator on the research methodology and data collection procedure before the commencement of the research. At each selected health facility, the investigator explained to subjects the reasons for the study and its voluntary nature and sought for their cooperation before the distribution of questionnaires. An incentive of two ballpoints (blue and red in colour) was given to each participant.

2.8 Ethical Consideration

Ethical approval was sort from the Ethics and Research Committee of the Nasarawa state Ministry of Health, evidence of which was an approval letter. It would be note worthy to state that although the specialist hospital Lafia and the federal medical centre Keffi had their own ethical and Research Committee; their management consented on presentation of the approval letter of the state Ministry of Health.

A consent information sheet/form including information on confidentiality was designed which was used in seeking informed consent from health care facilities and individual respondents after explaining thoroughly the purpose, objectives, procedure and methodology of the study to them. Respondents were informed that they were free to withdraw from the research at any point if they so wished. All survey data were collected anonymously. Individual informed consent was obtained prior to administration of the survey.

2.9 Data Analysis

The data was entered into SPSS statistical software version 15. Frequencies were generated for detection of errors (data editing). To describe patient characteristics, we calculated proportions. For categorical variables, we compared proportions using chi-square tests and, when appropriate, Fisher's exact test. Chi-square was used to determine association between categorical variables and a p value of less than 0.05 was considered significant. Data was presented in tabular form.

A logistic regression model was produced with risk perception and access to prophylaxis as outcome variable to identify associated factors. All explanatory variables that were

associated with the outcome variable in bivariate analyses, variables with a P-value of ≤ 0.05 were included in the logistic models.

3. RESULTS

3.1 Sociodemographic Characteristics

A total of 12 health facilities were sampled. This comprise of 2 tertiary facilities, 2 general hospital, 2 Comprehensive health facilities and 6 registered private health care centres were selected. Sixty-seven percent of the facilities surveyed reported not having antiretroviral medications in their facility. Moreover, the availability of other medications and dietary supplements was limited, and protective materials and other supplies and utilities were not always available.

A total of 421 health workers were interviewed, 284 [67.5%] were males and 137 [32.5%] were females. Majority [77.2%] of the participants were aged 20-39yrs and only 1[0.25%] and 2 [0.5%] were less than 20years and greater than 60 years respectively. The mean age of the health workers studied was 34.09 SD=8.1yrs and the mean year of experience at work was 8.24, SD=7.53 years. Among the health workers, 47.0% have been working for 5yrs or less, 26.4% for 6-10yrs, 11.4% for 11-15yrs and 15.2% for more than 15yrs and above. Three hundred and three [72.0%] were married and 116 [27.6%] were singles, only 2 [0.5] were widower. Precisely 309 [73.4%] were selected from government hospital and 112 [26.6%] from private health facilities. 52 [12.4%] were medical doctors, 78 [18.5%] were nurses. 54 [12.8%] were laboratory scientists, 53 [12.6%] were pharmacists, 57 [13.5%] were community health workers, 74 [17.6%] were hospital orderlies and 53 [12.6%] were from other professions in the hospital. The socio-demographic characteristics of the participants are summarized in Table 2.

3.2 Previous Occupational Exposure and Testing in the Last 6 Months

Five point two percent [5.2%] of the health care providers reported percutaneous exposure to HIV/AIDS infected blood or body fluids in the workplace in the last 6 months. However 56.5% of the health care providers interviewed had ever tested for HIV. Among these 197 [46.8%] presented for Voluntary counselling and testing (VCT), 22 [5.2%] were tested as a result of work place accident and exposure to blood products and other body fluids, 12 [2.9%] were due to blood donation and 7 [1.7%] were due to social reasons such as marriage, employment, insurance requirement etc. The health care providers mostly at risk were the nurse/midwives [9.0%] and Hospital orderlies 8.1%, followed by community health workers 5.3%. Others were medical doctors 3.8% and other workers 3.8%, the least exposed being laboratory scientists 1.9% and the pharmacists 1.9%. This was however not statistically significantly different [p=0.37]. This is as shown in Table 2 below.

Table 2. Access to post exposure prophylaxis/risk perception and socio-demographic characteristics

	Total No [%]	% who believe that they are at risk of infection	Unadjusted odds ratio	% who had access to medication	Unadjusted odds ratio
Age					
20-30 yrs	172 [40.9]	152 [88.4]	5.53 [1.77-17.20]	17 [9.9]	0.19 [0.06-0.61]
31-40 yrs	165 [39.2]	127 [77.0]	2.43 [0.82-7.13]	29 [17.6]	0.37 [0.12-1.13]
41-50yrs	65 [15.4]	50 [76.9]	2.42 [0.72-8.12]	6 [9.2]	0.17 [0.04-0.71]
>50 yrs	19 [4.5]	11 [57.9]	1.00	7 [36.8]	1.00
Total	421 [100.0]	340 [80.8]		59 [14.0]	
Sex					
Male	284 [67.5]	229 [80.6]	0.98 [0.56-1.69]	48 [16.9]	2.33 [1.12-4.94]
Female	137 [32.5]	111 [81.0]	1.00	11 [8.0]	1.00
Profession					
Medical Doctor	52 [12.4]	42 [80.8]	0.64 [0.20-2.04]	11 [21.2]	1.15 [0.40-3.33]
Nurse/Midwives	78 [18.5]	73 [93.6]	2.22 [0.59-8.67]	9 [11.5]	0.56 [0.19-1.65]
Pharmacists	53 [12.6]	37 [69.8]	0.35 [0.12-1.04]	11 [20.8]	1.13 [0.39-3.24]
Laboratory Scientists	54 [12.8]	54 [100.0]	0.00	18 [33.3]	2.15 [0.81-5.77]
Community Health workers	57 [13.5]	42 [73.7]	0.43 [0.14-1.26]	0 [0.0]	0.00 [0.00-0.42]
Hospital Orderlies	74 [17.6]	46 [62.2]	0.25 [0.09-0.68]	0 [0.0]	0.00 [0.00-0.32]
Others	53 [12.6]	46 [86.8]	1.00	10 [18.9]	1.00
Years of Work Experience					
0-5 yrs	198 [47.0]	175 [88.4]	4.81 [1.91-12.10]	26 [13.1]	0.52 [0.19-1.47]
6-10 yrs	111 [26.4]	84 [75.7]	1.96 [0.78-4.94]	16 [14.4]	0.58 [0.19-1.76]
11-15 yrs	48 [11.4]	35 [72.9]	1.70 [0.58-4.98]	7 [14.6]	0.59 [0.16-2.15]
16-20 yrs	33 [7.8]	27 [81.8]	2.84 [0.80-10.45]	3 [9.1]	0.34 [0.06-1.71]
>20yrs	31 [7.4]	19 [61.3]	1.00	7 [22.6]	1.00

3.3 Risk Perception due to Occupational Exposure

Nineteen point two percent [19.2%] of all participants believe that they are not at risk of being infected with HIV/AIDS as a result of occupational exposure. The lower age-group less than 30 yrs had a statistically significantly higher risk perception than the older workers [OR=5.53, C.I=1.77-17.20]. Those in public hospitals believe that they have a higher risk of being infected than those in private hospitals [OR=1.98, C.I=1.15-3.41], years of experience less than 5yrs OR=4.81, C.I=1.91-12.10] and the Nurses/Midwives [OR=2.22, C.I=0.59-8.67] believe that they had a higher risk of being infected when compared to other health care workers. Only 6.9% of respondents had access to sources of knowledge such as library and journal articles, internet facilities at work etc. Significantly those who had training on infection control believe that they had a higher risk of being infected [OR=1.94, C.I=1.13-3.34]. Risk perception was not significantly associated with facility type [OR=1.54, C.I=0.87-2.72], rural /urban location of facility [OR=0.84, C.I=0.46-1.53] and gender [OR=0.98, C.I=0.56-1.69]. This is as shown in Table 3 below.

3.4 Access to Medication

Only 14.0% of the health care providers reported access to post-exposure prophylaxis in case of accident. Significantly more males [OR=2.33, C.I=1.12-4.94], those in public facilities [OR=5.85, C.I=1.97-19.48], urban facilities [OR=24.99, C.I=3.67-491.82] and those in tertiary facilities [OR=17.96, C.I=6.04-59.99] had a greater access to medication. Among the various providers, the laboratory scientists [OR=2.15, C.I=0.81-5.77] reported the best access. Those who had recent training on infection control reported a better access to medication than those who had not been trained [OR=8.18, C.I=2.40-33.47].

3.5 Predictors of Risk Perception and Access to Prophylaxis

In the multiple logistic regression models, two variables were found to be independently associated with Risk perception and Access to prophylaxis respectively. Predictors of risk perception were working in public facilities [OR=2.28, C.I=1.26-4.15], male gender [OR=3.42, C.I=1.59-7.36] and training on infection control [OR=1.94, C.I=1.13-3.34]. Significantly more males [OR=2.33, C.I=1.12-4.94], those in public facilities [OR=5.85, C.I=1.97-19.48], urban facilities [OR=24.99, C.I=3.67-491.82] and those in tertiary facilities [OR=17.96, C.I=6.04-59.99] reported a greater access to prophylaxis medication. This is shown in Table 4.

4. DISCUSSION

The study shows that 5.2% of the health care providers reported exposure or accident in the workplace in the last 6 months. Several retrospective studies and surveys have shown higher rates ranging between 12%-87.4% of blood contact among HCWs in different patient care settings [20-24] very few of these studies have actually been specific for HIV infected blood and blood products. The low rate reported in this study might have been due to low level of uptake of VCT in the study area despite high prevalence of HIV/AIDS infection. This is also supported by the fact that only 46.8% of the health care workers had ever tested for HIV. This study implies that the Nigerian health system should scale up VCT uptake in order to ascertain and prevent HIV/AIDS infection due to occupational exposure.

Table 3. Access to PEP/risk perception and workplace characteristics

	Total No [%]	% who believe that they are at risk of infection	Unadjusted Odds Ratio for Risk Perception	% who had Access to PEP	Unadjusted Odds Ratio for Access to Medication
Type of Practice					
Public	309 [73.4]	259 [83.8]	1.98 [1.15-3.41]	55 [17.8]	5.85 [1.97-19.48]
Private	112 [26.6]	81 [72.3]	1.00	4 [3.6]	1.00
Location of facility					
Rural	110 [26.1]	91 [82.7]	0.84 [0.46-1.53]	1 [0.9]	24.99 [3.67-491.82]
Urban	311 [73.9]	249 [80.1]	1.00	58 [18.6]	1.00
Type of facility					
Tertiary	179 [42.5]	150 [83.8]	1.54 [0.87-2.72]	55 [30.7]	17.96 [6.04-59.99]
Secondary	76 [18.1]	62 [81.6]	1.31 [0.63-2.76]	0 [0.0]	0.00 [0.00-3.36]
Primary	166 [39.4]	128 [77.1]	1.00	4 [2.4]	1.00
PEP Related Training in last 2yrs					
Yes	307 [73.1]	257 [83.7]	1.94 [1.13-3.34]	56 [18.2]	8.18 [2.40-33.47]
No	113 [26.9]	82 [72.6]	1.00	3 [2.7]	1.00

Table 4. Predictors of risk perception and access to prophylaxis

	Adjusted odds ratio for risk perception	Adjusted odds ratio for access to prophylaxis
Age		
<30yrs	5.96 [0.91-39.24]	
>30yrs	1.00	
Sex		
Male		3.42 [1.59-7.36]
Female		1.00
Type of Practice		
Public	2.28 [1.26-4.15]	2.42 [0.95-6.12]
Private	1.00	1.00
Years of Job experience		
<5yrs	1.34 [0.93-1.93]	
>5yrs	311 [73.9]	
Profession		
Nurse/Midwives	2.80 [0.77-10.27]	
Others	1.00	
PEP Related Training in last 2yrs		
Yes	0.00008 [undefined]	0.000016 [undefined]
No	1.00	1.00
Location of facilities		
Urban		0.81 [0.40-1.65]
Rural		1.00
Type of facility		
Tertiary		0.85 [0.32-2.25]
Secondary		0.64 [0.24-1.73]
Primary		1.00

This study suggests that the lack of medication for prophylaxis and other materials needed to treat and prevent the spread of HIV and the high risk perception of being infected among the health workers may contribute to discriminatory behaviour towards people living with HIV/AIDS [PLWHs]. This has been reported by previous studies [25-26]. Many of the facilities in this study did not even have sufficient medication, dietary supplements, protective materials and other supplies and utilities. The professionals in low income countries lack adequate protection thus leading to the fear of contracting HIV/AIDS [27-29]. In order to do their jobs safely and effectively, health professionals must be provided with adequate supplies of essential protective materials. Further, the lack of basic medications hampers the ability of health professionals to provide appropriate treatment. Without these materials, it is unlikely that education of health professionals and implementation of anti-discrimination policies alone will have the desired impact on practice.

However only 56.5% of the health care providers interviewed had ever tested for HIV with less than half [46.8%] presenting for VCT. This may be due to fear of being identified as an HIV/AIDS victim. Lack of resources also results in differential treatment practices that may contribute to stigmatization of PLWH. Moreover, only 14.0% of the health care providers reported access to post-exposure prophylaxis with significantly more males and those in public, urban and tertiary facilities having a greater access to medication. This shows an uneven distribution in health care resources towards the more advantageous health care workers. It is likely that in other low-resource contexts, the absence of medications needed

to treat HIV/AIDS-related illnesses, a lack of materials needed for protection of health personnel, and insufficient knowledge of health personnel about HIV/AIDS may contribute to increased causality among the health care workers. The role of these factors should be investigated and addressed in order to reduce infection with HIV/AIDS among these workers and improve work efficiency in health care services.

Significantly those who had training on infection control had a more positive attitude towards occupational exposure to HIV/AIDS. Furthermore the most at risk professionals (the nurses, the hospital orderlies and the community health workers) had the least access to medication. The vast majority of professionals expressed an interest in additional information and suggested education as a way to address access to post exposure prophylaxis by their colleagues. An immediate investment to ensure the education of all existing clinical staff about HIV/AIDS, including modes of transmission, universal precautions, and the rights of PLWH would likely reduce the number of casualty among the health care workers and may improve quality of service delivery by these workers. This assertion is supported by previous studies that demonstrate the effect of HIV/AIDS education of nurses and other health workers on their attitudes and behaviour towards patients who are HIV-positive in Nigeria and elsewhere [30-32]. These studies also suggest that education about scientific matters is not likely to be sufficient to achieve change in practice and that educational programs may also need to address attitudes and cultural beliefs, and access to medication.

The study concludes that male health care workers that are young, working in public facilities and have insufficient knowledge about HIV/AIDS have a high risk perception for HIV/AIDS while those in urban and public facilities especially tertiary facilities reported a ready access to prophylaxis medication. Uneven distribution of medication and other health care resources in Northern Nigeria and other low resource populations may contribute to increased casualty among the health care workers.

Given the cross-sectional nature of the results, interpretation of study results is restricted. Future research with a longitudinal approach would be valuable. Our analyses identified significant relations, but their relative strengths were often weak. A major limitation is that our research investigated occupational exposure retrospectively; this may be faced with recall bias. However, our study findings might represent the actual situation since we dealt with professionals and such experience of occupational exposure in times of pandemic of the HIV/AIDS disease may be very difficult to forget. It would be interesting to conduct a follow-up study to gain insight into whether and how disease state could emerge from these occupational exposures.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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