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Occupational Exposures to Blood and Body Fluids (BBFS) among Health Care Workers and Medical Students in University of Gondar Hospital, Northwest of Ethiopia

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Methods: A cross sectional survey was conducted from September 6 to October 2, 2012, in University of Gondar hospital. Two hundred eighty five participants (including health professionals, janitors and medical students) were participated in the study. Stratified simple random sampling technique was used to select the participants. Data was collected through Self-administered questionnaire and interview using structured questionnaire.

Result: The overall lifetime and one year prevalence's of occupational exposure to BBF during the study period were 177(70.2%) and158 (62.9%), respectively. The exposure rate of BBFs in the last-one year was highest among interns 29(90.6%), followed by health professionals 100(63.3%) and least among housekeeping staffs 28(45.2%).

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Conclusion: BBFs exposure among HCWs was a widespread occupational hazard. Occupation, work experience and training were predictors for BBFs exposure. Altering the behavior of HCWs to apply Safety Precautions and an establishment of a surveillance system for registering, reporting and early management of occupational exposure are required.

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I. Introduction

Blood and body fluid (BBF) exposure to health care workers and the infectious complications associated with it, is a global issue (1, 2, 3).Each day thousands of healthcare workers (HCWs), around the world, suffer accidental occupational exposures during the course of their role of caring for patients. These injuries can result in a variety of serious and distressing consequences ranging from extreme anxiety to chronic illness and premature death for the individual involved (4, 5).

HCWs in developing countries are at serious risk of infection from blood-borne pathogens particularly hepatitis B virus (HBV), hepatitis C virus (HCV) and Human Immunodeficiency Virus (HIV) because of the high prevalence of such pathogens in many poorer regions of the world, especially they are endemic in sub-Saharan Africa (3,6).

In May 2007, the World Health Assembly endorsed the Global Plan of Action on Workers Health (GPA) for the period 2008-2017 with the aim to move from strategy to action and to provide new impetus for action by Member States. It calls on all countries to develop national plans and strategies for its implementation. There have been made countless interventions by employers and workers to attempt to make workplaces healthier, in many countries and many diverse settings (7, 8).

Ethiopia's Federal ministry of health (FMOH) has been leading reform in Hospitals throughout the country using EHRIG and IP is one of thematic area for the reform with aim of stopping the transmission of infectious agents is the only way to reduce the occurrence of Health care acquires infections (HCAIs) to ensure the safety of employees, patients and visitors (9).

Occupational hazards faced by healthcare personnel in University of Gondar hospital have received increasing attention but existing surveillance systems and HCWs responsiveness for Safety Precautions are inadequate to describe the scope and magnitude of occupational exposures to infectious agents that HCWs experience, the outcomes of these exposures and injuries, and the impact of preventive measures (10).

a) Study Setting

The study was conducted in University of Gondar Hospital; Gondar was one of the metropolitan cities of Ethiopia, founded in 1636 by Emperor Fasilades, 748 kms northwest from Addis Ababa.

b) Participants

Two hundred eighty five participants (including health professionals, janitors and medical students) of Gondar University Hospital were included in the study.

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c) *Study Population*

Sampled health professionals, janitors and medical students

i. *Inclusion and Exclusion Criteria*

Health Care Workers that are assigned for clinical services, academic staffs that had regular program for patient care and graduate bacth interns were included in the study.

Health Care Workers who were on leave (maternity, annual, sick, fieldwork) during the study period as well as HCWs who had not worked at least six months within the last one year , were excluded in this study.

d) *Sample size and sampling technique*

Sample size was calculated using a single population proportion. Considering 20.2% of one-year prevalence of at least one BBFs exposure in previous study in Ethiopia (13), a sample size of 285 was required with sampling error 5%, at a 5% c confidence level.

A stratified sampling technique was used to select the participants using lists of monthly payroll as a sampling framework and the number of participants selected from each stratum was determined by proportional to size.

e) *Study Variables*

Dependent:- Exposures of HCWs and medical students to blood and body fluids.

Independent:- Age, gender, marital status, religion, occupation, work experience in the area, uses of Personal Protective equipments, Infection Prevention trainings, educational status and working shift.

f) *Data collection procedures and quality assurance*

The data collection was done via self-administered questionnaire and interview using structured questionnaire. Self-administered question-naire was used for Health professionals and interns, and data from janitors was collected by interview using the structured questionnaire.

Quality of data was assured through intensive training for data collectors and supervisors, pre-testing the questionnaire on similar setting that was not included in the study, close supervision and assistance of data collectors, checking filled questionnaires on daily basis for completeness, clarity and accuracy of data. In addition data cleaning was also made before commencement of the analysis.

II. Data Processing and Analysis

Data was coded and entered into the SPSS version 20. Descriptive statistics was made using frequencies, tables, and figures and narrative explanations. Associations were examined using binary and multiple logistic regressions. P-value less than0.05 was taken as a cut-off point to say significant at 95% confidence level.

a) *Ethical Considerations*

Ethical approval was obtained from the Research and Ethics Review Committee at Bahir Dar University. Written consent was also obtained from Amhara-regional health Bureau and University of Gondar hospital to conduct the study. All the study participants were informed about the purpose of the study and finally verbal consent was obtained before data collection. The respondents had the right to refuse participation or terminate their involvement at any point during the study. Information provided by each respondent was kept confidential. Furthermore, report writing did not refer a specific respondent with identifiers.

III. Result

Out of the 285 selected HCWs and graduate batch interns, 252 responded giving response rate of 88.4%. Twelve incomplete questionnaires were discarded. Among the respondents, 127 (50.4%) were males. From the total participants 158 (62.7%) were health professionals, (24.6%) were housekeeping staffs, and 32 (12.7%) were graduated interns. Respondents age range from 19 to 54 years with a mean age of 29 years. Among participants in this study 113(44.5%) had less than two years of work experiences. HCWs who hand experiences two to four years were 62(24.6%) and only 45(17.7%) were five years and more experienced in their current position. Other demographic information is presented in Table 1.

The overall prevalence of lifetime and one-year prevalence of one occupational exposure to BBF at least once during the study period were 177(70.2%) and1587 (62.3%) respectively (Table 2). The exposure rate of BBFs in the last-one year was highest among interns 29(90.6%), followed by HP 100(63.3%) and least among housekeeping staffs 28(45.2%). Among exposed for NSI in the last twelve months, 50(61.0%) of them encountered once and 32 (39.0%) of faced two and more times.

Of those NSI exposed, 25 (30.5%) of respondents reported that the needle or sharp objects that cause the recent injury were visibly contaminated with blood prior to causing the injury, where as 38(46.3%) and 19(23.2%) were not contaminated and not sure respectively. Majority of the recent NSI, 58(70.7%) of were moderately penetrated skin while superficial skin scratch and deep punctures or wounds were 18(22.0%) and 6(2.7%) respectively. Hollow needles contributed to 45(54.9%) of the recent needle-stick injuries. Suture needles and other solid sharps contributed to 23 (28.0%) and glass and non-sharp safety devices causes 14 (17.1%) of the percutaneous exposures.

Of mucosal membranous exposure for blood and other body fluids in the last one-year, 46(34.3%) of

faced once, 60(44.8%) of two-three times and 28(20.9%) of four and more. Blood and blood product caused 86(64.2%) of splash exposures within the last one year. Body fluids and other body products like tissue accounts 32(23.9%) and 16(11.9%) respectively. Mucosal exposures to amniotic and vaginal fluid 28(43.1%), pleural and other organ fluid 19(29.2%), urine, saliva/sputum and stool 18 (27.7%) and were contributing factors to accidental exposure to body fluids. Of Mucosal exposed HCWs, 62(46.3%) faced small (<5cc) and 12(9.0) moderate (6-50cc) but 60(44.8%) did not know the amounts of BBF they faced. The most common exposed body parts were hand and finger 82(52.2%), followed by face, eye and mouth 43 (27.4%). Other less frequent sites were any two body parts at a time (e.g. hand and face) 19(12.1%) and leg and foot 13 (8.3%).

Overall, performing procedure for patients 78(52.2%) was the most hazardous procedure particularly among interns and staff health professionals. Disassembling, processing and cleaning used equipments 30(19.1%), phlebotomy, collecting and transporting blood sample 21 (13.4%) and assisting delivery 16(10.2%) were other hazardous procedures exposing the HCWs to potential infectious material in order of frequency. Major causes for occurrences BBFs exposure are presented in Figure 1.

Regarding the overall situation in which the recent exposures occurred, 49(31.2%) were occurred in the morning shift, while 40(25.5%) and 31 (19.7) occurred in the afternoon and in the night shifts respectively; but 37(23.6%) of them did not remember the shift that the exposure was happened.

IV. Discussion

Exposure to blood and potentially infectious body fluids has been recognized as a potential health hazard in HCWs (1, 4). In this study, 62.3% of the respondents were exposed to blood and contaminated body fluids at least once in the preceding year through NSI and splash .This was similar with studies in South Africa (62%) (11). There was a 32.5% of one year prevalence of needle sticks and sharps injuries identified in this study ,which was the same with previous study in Hawassa City(30.9%), but different from Harari Regional State and Dire Dawa Administrative Council (17.5%) and Addis Ababa (19%) (12-14). Although needle stick injuries are most common means of exposure for health care workers, blood borne pathogens can also be transmitted through contact with eyes, nose, and mouth or through broken skin (15, 16). The prevalence of one year splash exposure of BBFs was 53.2%, which was also different from Harari Regional State and Dire Dawa Administrative Council (20.2%) (12). This high prevalence of NSI and splash exposure in this study might be due to inclusion of medical students and housekeeping staffs which were not targeted in previous studies and might also be due to high work load on few professionals in the study area.

It has been reported that medical students experience the majority of needle-stick injuries in the world (3, 5). The results of this study showed that highest prevalence of percutaneous (68.8%) and mucosal (75%) exposure among medical students, which was almost comparable with other studies in South Africa (62%) and Uganda that reveal interns suffered more NSI than any occupational groups (17,18).

Eighty two percents of respondents had work experiences of less than five years. There was significant correlation between work experiences and the rate occupational exposure to BBFs. HCWs whose experience was two-four years were more exposed than HCWs who had experiences above four years (AOR=3.2,95% CI=1.4-7.5). Studies done in Iran showed that about 54% of the personnel with less than five years of working experience were exposed at least once during the previous year; however, this was 30.6% among the personnel with more than ten years of experience (19). Study in India identified that as experience was increasing, incidence of injury was decreasing (21). Moreover, HCWs in University of Gondar hospital have to deal with a high load of patients, this fact combined with urgency of some interventions and unavailability of PPEs might contributed to this high prevalence of BBFs among studied groups.

Healthcare workers have increased chance of acquiring blood borne pathogens through occupational exposure in developing countries due to a combination of increased risk and fewer safety precautions (3, 22). Most exposures are caused by a departure from standard precautions (23). One of the factors for occurrences of BBFs exposure in this finding was lacks of use of PPEs (39.5%), non-consistent use of PPEs was found to be associated with chance of sustaining NSI previous studies in Ethiopia (12,13,14,24). Wearing gloves may reduce (>50%) the volume of blood introduced through an injury (23). A major reason for not using all PPEs was inadequate supply (59.7%). Previous study of Ethiopia showed that Seventy-nine percent of HCWs reported that they did not wear any of the PPEs because of unavailability (24). Exacerbating the risk to health care workers in developing countries is a lack of gloves, gowns, masks, and goggles to protect them from contact with blood(3).

Needle-stick injuries to providers are usually attributable to the abrupt movement of patients during the procedure (25). Unexpected movement of patients during care was second major factor for BBFs exposures (23%); this was similar with report from West Africa (23%) (27). In previous studies in Ethiopia and abroad, needle recapping was major causes of NSI

(5,12-14,19), promisingly, it was of interest that needle recapping was not listed as a cause for accidental exposure in this study, suggesting adherence to the hospital's protocol and guidelines(9).

The risk of acquiring blood borne infections (BBI) from occupational exposures is dependent on the concentration of infectious virus in the implicated body fluid, the volume of infected material transferred, frequency of percutaneous, per mucosal exposure to blood or body fluid, device visibly contaminated with the source patient's blood, depth of injury, procedures involving a needle placed directly in the patient's vein or artery and type of needle involved (hollow needles contain more blood therefore there will be a higher risk of transmission) (3,26). In this survey, Hollow needles contributed to 55% of the needle-stick injuries which was the same with prior studies in Ethiopia and overseas (5, 6, 12-14, 19, 20, 24). Suture needles contributed to 28% of the percutaneous exposures, which was the same as South Africa (17).

Of the mucosal exposures within the last 12 months, blood and bloody products were involved in 64% of exposure. NaSH showed that blood and blood product involved in almost 79% of all reported splash exposures and it was 86% study in Iran (19, 20).

Study in India explored that exposure was inversely related to training, a sizeable number of those trained were subsequently exposed (21). In this study satisfactory training, but not training by itself, was highly associated with preventions of BBFs exposures. HCWs who was satisfied with trainings given was less likely exposed for BBFs than none trained and unsatisfied one (AOR=0.501, 95% CI=0.23-0.91).

a) Strength and Limitations of the Study

Including both health professionals and non health professionals like janitors/cleaners to asses occupational exposure to BBF could be taken as the strength of the study but not screening of viral infections like HIV and hepatitis for exposed HCWs and since the study was based on self report about previous one year and life time occupational exposure to BBF the result might be affected by recall bias.

V. Conclusion

Injuries from sharp objects and BBFs splash exposure among HCWs were a widespread occupational hazard in University of Gondar hospital and higher previous studies in Ethiopia. Occupation, work experience and satisfactory training were factors for occurrences occupational exposure. This study showed that medical students were more exposed to BBFs than health professionals and housekeeping staffs.

This loss of a wage-earning health care worker can be devastating to the financial security of the worker's family. The loss of HCWs can also have a disproportionate effect on the fragile health care infrastructure of Ethiopia, where trained health professionals are scarce in relation to the overall populations they serve.

VI. Recommendations

1. Initial effort is supposed to be focused on altering the behavior of HCWs to follow standard operating procedures during patient care and consistent availability of PPEs.
2. The ways of infection prevention training supposed to be revised and participant centered because the results of this study showed that satisfactory training, but not training by itself, has impacts on prevention of blood and body fluid exposures to healthcare workers.
3. Attending physicians and senior HCP must be made responsible for ensuring that students are capable of performing procedures safely before expecting them to do so without supervision. It is responsibility of medical educators to provide a safe learning environment for students before they face the risks of direct patient care.

VII. Acknowledgements

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Table 1 : Socio-demographic variables of healthcare workers and medical students in University of Gondar Hospital, 2012

Demographic Variables	Frequency(N=252)	(%)
Age of respondent		
19-24 years	106	42.1
25-34 years	118	46.8
35 and above	28	11.1
Marital status		
Single	161	63.9
Married	83	32.9
Divorced & widowed	8	3.2
Religion		
Orthodox	215	85.3
Muslim	18	7.1
Other Christians	19	7.5
Educational status		
Intern	32	12.7
12/10 not completed	5	2.0
12/10 completed	41	16.3
Diploma	56	22.2
1st degree and above	118	46.8

Table 2 : Prevalence's of blood and body fluid exposure to healthcare workers and medical students in University of Gondar hospital, Sep. 2012

Exposure	NSI N (%)	BBF splash N (%)	Total Exposure rate N (%)
Life time			
Health prof.	66(41)	108(68)	117(74)
Intern	22(69)	25(78)	29(91)
Housekeep	14(23)	23(37)	31(50)
Total	104(41)	156(62)	177(70)
Last 12 months			
Health prof.	49(31)	89(56)	100(63)
Intern	22(69)	25(78)	29(91)
Housekeep.	11(18)	21(34)	28(45)
Total	82(33)	134(53)	157(62)

Table 3 : Multivariate logistic regression results of blood and body fluids exposure within the previous one year in University of Gondar hospital, Sep.2012

Variable	Exposed (n=157)	Not Exposed (n=95)	AOR (95% CI)	P-Value
Occupation				
Intern	29(19)	3(3)	**9.4(1.8-49.9)***	0.009
Health Prof.	100(64)	58(61)	1.2(0.37-3.69)	0.799
Housekeep.	28(18)	34(36)	1	
Experience in years				
< two years	86(55)	59(62)	0.94(0.5-2)	0.863
2-4years	47(30)	15(16)	**3.2(1.4-7.5)***	0.008
Above four years	24(15)	21(22)	1	
IP training				
Satisfactory	49(31)	42(44)	**0.5(0.3-0.9)***	0.023
Not satisfactory	108(69)	53(56)	1	

Figure 1 : Major factors for occupational exposure to blood and body fluids among healthcare workers and medical students in University of Gondar hospital, Sep.2012