Kaweti and Abegaz *Annals of Occupational and Environmental Medicine* (2017) 29:39
DOI 10.1186/s40557-017-0188-6

Annals of Occupational and Environmental Medicine

RESEARCH ARTICLE Open Access

Magnitude of splash exposure and associated factors among health care workers in Hawassa referral and Adare District hospitals, January 2014

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Abstract

Background: Accidental splash exposure is one of the common occupational health related problem among health care workers. The problem is worse in developing countries in which the safety practice and protective devices do not properly used. However, little is known on the prevalence and associated factors for splash exposure. Therefore, the main objective of this study was to determine the prevalence of self reported splash exposure and factors that influence those exposures.

Methods: Institutional based cross sectional study was done from January 1 to 30, 2014 in Hawassa Referral and Adare District Hospitals. Physicians, nurses, laboratory technicians/ technologists, midwifes, health officers, cleaners, porters and laundry workers were involved in the study. Self administered questionnaires were used for those who can read and understand easily and interview was carried out for those who can't read and understand. Data was analyzed using SPSS version 16 and logistic regression was carried out to assess the association of selected independent variables with accidental splash exposure.

Results: The prevalence of one episode of splash exposure was 28%. There was twofold increased risk of blood and body fluids exposure among health care workers who have multiple responsibilities (AOR = 2.39, 95% CI: 1.27–4.49). Similarly, the risk of exposure was doubled among health care workers who washed linen in the institution (AOR = 2. 30, 95% CI: 1.37–3.84) and among those who work in delivery and operation room (AOR = 2.20, 95% CI: 1.10–4.40).

Conclusions: Splash exposure is common among health care workers in the study hospitals which warrantee occupational health and safety training.

Keywords: Splash exposure, Blood and body fluids exposure, Health care workers, Hawassa referral hospital, Adare District hospital

Background

Health care workers (HCWs) are at risk of many infections in health care set up [1]. Exposure to human blood and body fluids, placing them at risk of such blood born infections [2, 3]. Accidental splash of blood and other body fluids into eyes, nose or mouth of HCWs is a critical problem in health care settings [4].

Accidental exposure to BBFs is the unintended contact with blood and or body fluids mixed with blood, during a medical intervention [5]. HCWs are at increased risk of this exposure and acquiring infections including hepatitis virus and HIV because of direct chance of exposure they have to patients blood and other body fluids [5–10]. Blood borne pathogens can be transmitted through contact with eyes, nose and mouth or through broken skin [1, 3].

Worldwide, thousands of HCWs can be exposed to BBFs per day. As a result, the safety of health care work force and handling complications related to occupational

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exposure, is a global health concern [7, 11]. According to World health organization (WHO) estimates, 3 million HCWs face occupational exposure to blood born viruses each year (2 million to hepatitis B virus, 900,000 to hepatitis C virus, and 300,000 to HIV). More than 90% acquired in low income countries [12, 13]. This burden of high risk infectious diseases in developing countries makes the work condition critical for HCWs [14]. To minimize this threat, a series of procedures (standard precaution methods) are proposed to prevent occupational exposures and handle potentially infectious materials.

Splash or BBFs exposure may result in serious health risks like psychological distress, chronic diseases, and even death [15–18]. Other studies have also shown that occupational exposure to blood through mouth, nose or eyes is a serious health issue among HCWs in developing countries [9, 19]. This exposure is obviously more dangerous in those developing countries because, work related blood borne pathogens are more prevalent in low income countries of the world, specifically endemic in sub Saharan African countries [20]. There is relatively poor vaccination [21], limited knowledge and insufficient standard based practices [22] to aggravate the magnitude of the problem in developing countries.

In Ethiopia, there is a prompt expansion of health care facilities accommodating large numbers of HCWs. Previous studies in selected northern, southern and eastern parts of Ethiopia have shown the increased risk of occupational blood exposure [7].

Although there is a national guideline on infection prevention, little is known about the risk of exposure and preventive actions [7, 8, 23]. The provision of post exposure prophylaxis in Ethiopia is poor [24] and therefore the risk of developing HIV, HBV and HCV is high.

The purpose of this study was to estimate the magnitude of BBFs exposure and associated risk factors among HCWs in the study areas.

Methods

Study design, settings, and participants

A cross sectional study was conducted in two public hospitals located in Hawassa city (i.e. Hawassa Referral and Adare District Hospitals). Hawassa City is found in Southern Ethiopia, about 275 km South of Addis Ababa. Hawassa University referral hospital had 350 functional beds for admitted patients and is expected to serve 10 to 12 million people of the southern region and surrounding oromia zones. Adare District hospital had 70 functional beds for admitted patients. Those HCWs who were on official leave during the study period were excluded.

Eligibility criteria

This study included all full time HCWs, working in both health facilities; who directly or indirectly involved in the day to day patient care. HCWs who were on any type of leave (i.e. maternity leave, annual leave, sick leave, study leave, etc) during the study period had been excluded from the study.

Data collection

Data collection tool was developed after reviewing different literatures. Finally, we adopted questionnaire from previous cross sectional study conducted in Dire Dawa administration council and Harari region, Ethiopia, 2010. After adoption, pretest was done on 20 HCWs at Shashemene Referral hospital. Confusing or misleading questions/concepts were modified after pre-test (Additional file 1).

All questionnaire items were translated to local language (Amharic) to test for clarity and consistency. Data collection process had undertaken by self-administered questionnaires and interview. Trained data collectors (One senior diploma nurse and one senior BSC laboratory professional) were assigned and completed data collection process. Data collection was conducted from January 1 to 30, 2014 during working day, on tea break and by appointment.

Before data collection, quality of data was assured by training data collectors. Filled questionnaires were checked on daily bases for completeness and clarity. Accuracy of data was checked timely, and data cleaning was made before analysis. Close supervision had made by principal investigator. Data collectors and supervisors reached study participants through getting permission

Predictors of exposure

Dependent variable was splash exposure. Outcome assessment was based on answers to the questions on the frequency of splash exposure the participants had experienced during their entire career and 1 year prior to the study. Potential risk factor was dichotomized into and coded by giving 0 to the group hypothesized as having a lower risk and 1 to the group hypothesized as having a higher risk.

The independent variables were selected by reviewing literatures (i.e. previous studies). They were age, gender, educational status; employment/qualification, department, personal protective practices, knowledge and attitude related questions.

Statistical analysis

Collected data was entered into epi data 3.1software and exported to SPSS version 16 for cleaning and analysis. Descriptive analysis was done to show the characteristics of different variables. Statistical significant associations between the outcome variable and different predictors

were examined using multivariate logistic regression model. *P*-value was set less than 0.05 to verify existence of association and odds ratios and 95% confidence interval were presented accordingly. The outcome variable for this analysis was dichotomized into at least one splash exposure during the entire career (coded 1) versus no such exposure (coded 0) (Additional file 2).

Results

Of the 526 questionnaires issued, 496 returned, giving a response rate of 94.3%. Out of the study respondents the majorities (67.5%) were females. Two hundred eighty five (57.46%) lies within age group of 25–34.The mean age of study respondents was 28.43 (SD= ±6.7) years. Regarding their educational status 178 (35.89%) were degree and above, 171 (34.48%) were diploma and the rest 147 (29.6%) were below diploma. Work departments were categorized in terms of their nature of work. Accordingly, all departments categorized into three: outpatient, inpatient and delivery/operation. Outpatient departments account 198 (39.9%), followed by inpatient 167 (33.7%) and delivery and operation room 90 (18.1%) (Table 1).

The prevalence of splash exposure was 28.4%. Of which the majority (21%) occurred 1 year prior to the study period and only 18% took anti-HIV infection prophylaxis.

Table 1 Socio demographic characteristics of respondents by sex, age, educational status and departments, Hawassa, Southern Ethiopia, 2014 (*N* = 496)

Variables		Hawassa Referral H (%)	Adare District H (%)	Total (%)
Sex	Male	128 (25.81)	33 (6.65)	161 (32.5)
	Female	274 (55.24)	61 (12.30)	335 (67.5)
Age	15–24	93 (18.75)	29 (5.85)	122 (24.6)
	25–34	230 (46.37)	55 (11.09)	285 (57.5)
	35–44	65 (13.10)	7 (1.43)	72 (14.5)
	>44	14 (2.82)	3 (0.6)	17 (3.4)
Educational status	Below diploma[a]	126 (25.4)	21 (4.23)	147 (29.6)
	Diploma[b]	125 (25.2)	46 (9.27)	171 (34.5)
	Degree and above[c]	151 (30.45)	27 (5.44)	178 (35.89)
Department	Outpatient department	152 (30.65)	46 (9.27)	198 (39.9)
	Inpatient department	147 (29.64)	20 (4.03)	167 (33.7)
	Delivery and operation room	73 (14.72)	17 (3.43)	90 (18.1)
	other@	30 (6.05)	11 (2.22)	41 (8.3)

Other@ = includes ENT, Dermatology, Dental unit, Oncology unit
[a]Have educational status with no certification on specific skill
[b]Trained on specific subject and certified with that specific skill, but with educational status of below bachelor of science/art
[c]Includes those who holds bachelor of science/, master of science/art, PhD, and above

Three predictors were found to be statistically significantly associated with blood and body fluids exposure. Multiple responsibilities/work overload/exposed HCWs to splash; (AOR 2.39, 95% CI: 1.27–4.49). As stated, there was significantly increased self reported risk of at least one episode of splash exposure among HCWs who had multiple responsibilities (i.e. head of department, focal person of case team etc.) compared to those who did not have such responsibilities. There was significantly higher risk of blood and body fluids splash to mouth, eyes or ears among HCWs who assigned at delivery and operation rooms compared to those who had assigned at outpatient departments; (AOR 2.20, 95% CI: 1.10–4.40). Hand washed soiled linen exposed HCWs to splash than their counter parts (AOR 2.30 95% CI: 1.37–3.84) (Table 2).

Statistically, there is no significant difference among study participants with regard to variation in sex, educational status, qualification, work experience, working more than 40 h/weeks, not always following standard procedures, not always using mask, goggle and head cover for procedures.

Discussion

Magnitude of BBFs exposure

In Ethiopia, data about BBFs exposure among HCWs are lacking. Hence the present study tried to provide the magnitude of splash exposure among HCWs and some possible risk factors observed in this group of people. In this study, there was high magnitude of the BBFs splash to mouth, eyes or ears. More than one fifth (21.2%) of HCWs experienced BBFs exposure 1 year prior to the study and more than a quarter (28.43%) of HCWs experienced at least one splash exposure during their entire carrier.

Splash exposure was significantly associated with working in Delivery and operation theatre, having multiple responsibilities (work overload) and manual washing of soiled linen.

Comparison with similar studies

Higher and lower prevalence rates were also detected as compared to similar study populations in different parts of the world. Prevalence of splash exposure, in this study, was higher compared to other studies conducted in United Arab emirate, Tanzania, and Iowa [18, 25, 26]. This higher prevalence is probably due to small sample size of this study, variation in the study areas and inclusion of non professional health care workers like cleaners, porters, sample transporters and laundry workers in this study. Non professional health care workers are less knowledgeable on risk of splash exposure and have greater chance to follow malpractice.

Table 2 Multivariate logistic regression analysis result for Splash exposure, Hawassa,Southern Ethiopia,2014 (n = 496)

Variables		Splash exposure		Crude OR (95% CI)	Adjusted OR (95%)
		Yes	No		
		N (%)	N (%)		
Sex	Male	61 (37.9)	100 (62.1)	1.94 (1.30–2.92)**	1.28 (0.70–2.35)
	Female	80 (23.9)	255 (76.1)	1	1
Educational status	Below Diploma	34 (23.1)	113 (76.9)	0.58 (0.35–0.95)*	1.75 (0.52–5.88)
	Diploma	46 (26.9)	125 (73.1)	0.71 (0.45–1.12)	1.15 (0.56–2.34)
	Degree and above	61 (34.3)	117 (65.7)	1	1
Qualification	Nurse and midwife	61 (28.8)	151 (71.2)	1	1
	Physicians	27 (49.1)	28 (50.9)	2.39 (1.30–4.38)**	1.67 (0.60–4.74)
	Laboratory professionals	4 (10.3)	35 (89.7)	0.28 (0.10–0.83)*	0.46 (0.12–1.80)
	Laundry staff and porters	19 (19)	81 (81)	1.05 (0.57–1.93)	0.69 (0.23–2.10)
	cleaners	19 (29.7)	45 (70.3)	0.58 (0.33–1.04)***	0.45 (0.12–1.60)
	Others	11 (42.3)	15 (57.7)	1.82 (0.79–4.18)	1.31 (0.46–3.79)
Department	Outpatient Department	39 (19.7)	159 (80.3)	1	1
	Inpatient Department	50 (29.9)	117 (70.1)	1.74 (1.08–2.62)*	1.24 (0.64–2.40)
	Delivery and operation services	42 (46.7)	48 (53.3)	3.57 (2.07–6.14)***	2.20 (1.10–4.40)*
	Others	10 (24.4)	31 (75.6)	1.32 (0.59–2.91)	0.94 (0.35–2.51)
Manual wash of linen?	Yes	63 (36.8)	108 (63.2)	1.85 (1.24–2.76)**	2.30 (1.37–3.84)**
	No	78 (24)	247 (76)	1	1
Additional responsibility	Yes	44 (47.3)	49 (52.7)	2.83 (1.78–4.52)***	2.39 (1.27–4.49)*
	No	97 (24.1)	306 (75.9)	1	1
Work experience	< 2 years	85 (30.6)	193 (69.4)	0.87 (0.41–1.87)	0.96 (0.36–2.59)
	2–4 years	39 (22.9)	131 (77.1)	1.04 (0.69–1.56)	1.12 (0.67–1.87)
	>4 years	17 (35.4)	31 (64.6)	1	1
Work >40 h/week	Yes	129 (31.2)	284 (68.8)	2.69 (1.41–5.13)**	1.75 (0.84–3.66)
	No	12 (14.5)	71 (85.5)	1	1
Always follow std. procedure	Yes	60 (25.1)	179 (74.9)	1	1
	No	81 (31.5)	176 (68.5)	1.37 (0.93–2.04)	1.27 (0.76–2.11)
Always wear mask for procedure	Yes	65 (37.8)	107 (62.2)	1	1
	No	47 (17.8)	217 (82.2)	0.36 (0.23–0.55)***	0.62 (0.31–1.26)
Always wear goggle for procedure	Yes	27 (46.6)	31 (53.4)	1	1
	No	85 (22.5)	293 (77.5)	0.33 (0.19–0.59)***	0.60 (0.30–1.24)
Always wear head cover for procedure	Yes	51 (38.6)	81 (61.4)	1	1
	No	61 (20.1)	243 (79.9)	0.40 (0.25–0.63)***	0.87 (0.43–1.75)

*$p < 0.05$, **$p < 0.01$, and ***$p < 0.001$

One hundred forty one (28.43%) HCWs reported BBFs splash to their mouth, eyes or ears throughout their entire carrier, which is lower than a study reports in United States of America emergency medical hospital (56.1%) [27], Kenya rift valley provincial hospital (51%) [3], Serbia (59%) [28], Palestine (51.7%) [10], University of Gondar (70.2%) [29] and Debre Berhan (56.6%) [30], Amhara region, north Ethiopia and Jimma Zone (68.5%) [2], Oromia region, south west Ethiopia. This lower exposure was probably due to better intervention strategies designed and implemented at national level since 2010 [31]. For instance, Ethiopian hospital reform implementation Guideline was finalized in 2010 and widely implemented then after.

One year self reported splash exposure was 21.2%, which is almost similar to report from eastern Ethiopia

(20.2%) [7], but three times lower than study conducted in University of Gondar, Northwest Ethiopia (62.3%) [29], This discrepancy might be due to the fact that graduate batch medical students (interns) who have direct and frequent contact with patients, were included in Gondar study. Sample size, sampling techniques and variation in study area may also contribute for the differences.

Four hundred thirteen (83.3%) HCWs reported dissatisfaction by the provision of infection prevention and control materials. HCWs in sub Saharan Africa are dissatisfied with their job, overworked and underpaid and less protected [20, 32]. Lack of infection prevention materials seriously affect prevention efforts and put patients, visitors and HCWs at greater risk of infection and contributes to the dissatisfaction of HCWs with their work environment.

Three factors increased risk of splash exposure. First, risk of splash exposure had increased in delivery/operation theatre than in outpatient departments. This is consistent with report from six Hospitals in Tigray [33] in which working in delivery and gynecological departments were increased risk of splash exposure. The using practice of personal protective equipment may aggravate the problem. In this study, Health care workers who did not always use personal protective equipments were more in delivery/operation room (13.3%) than in outpatient departments (8.6%).

Second, there was a twofold increased risk of splash exposure among HCWs who had additional responsibilities in the institution compared to those who had no such additional responsibilities. Even though there is limitation of study findings specific to splash exposure on additional responsibilities, working long hours was also a significant predictor of the risk of blood and body fluid exposure [34]. This is most probably due to shortage of time to strictly follow recommended procedures of exposure reduction strategies. Working excessive hours can result in stress and emotional and physical exhaustion, which are likely to increase the chance of human error and contribute to a tendency towards risky behaviors such as poor compliance with the standard precautions in general. One study revealed that excess work load contributed for more than half (64.6%) of splash exposure [7].

Third, HCWs who washed soiled linen in the institute had faced significantly increased risk of splash exposure compared to HCWs who never washed soiled linen in the institute. According to world health organization (WHO) as well as Ethiopian Hospitals Reform Implementation Guide Line Standards, laundry is the recommended place to wash soiled linen and laundry machine need to carry out such activities [31]. So, existence of manual linen washing practice in study areas contributed for splash exposure of staff.

About 18% of exposed HCWs started Post exposure prophylaxis (PEP). This result was almost similar to study conducted in Iran [35] and Tanzania [9], but about four times less than study conducted in Gondar, north west of Ethiopia [24].

Study limitations

We recognized some limitations in our study. Information on exposure was sought for the preceding 12 and more months and therefore there was a possibility of recall bias among HCWs. There was also a probability of information bias as those who had got splash exposure might have been more eager to participate in the study.

Validity of the study

We had not recognized any selection bias as all HCWs were involved in the study. So, we think that our results are likely to reflect quite well what was happening among HCWs. The questionnaire was answered anonymously, so that the participants could answer with no fear of being linked to their response, and this may promoted the accuracy of the response. We were able to collect information on several potential risk factors and assess their relative contribution to the risk while adjusting for the other factors.

Conclusion

This study identified a high rate of splash exposure among health care workers in Hawassa referral and Adare district hospitals. Work department, work overload (additional responsibilities) and manual washing of soiled linen were the identified risk factors for the occurrence of splash exposure. This study suggests that BBFs or splash exposure could be considerably reduced by organizing adequate training on this specific area of concern. Future research should investigate what type of training is most effective. In addition, it is better to give attention in reducing work overloads and in providing adequate training for gynecological room, operation theatres and delivery room workers. It is better to wash soiled linen by laundry machine rather than hand washing.

Additional files

Additional file 1: Questionnaire. Amharic Version of the questionnaire is developed for this study from the standardized english version to meet the local need. Both english and amharic versions are attached. (ZIP 70 kb)

Additional file 2: SPSS Data. The original SPSS data is attached. (SAV 98 kb)

Abbreviations

AOR: Adjusted odds ratio; BBFs: Blood and body fluids; CI: Confidence interval; HBV: Hepatitis B virus; HCV: Hepatitis C virus;; HCW: Health care workers; HIV: Human immunodeficiency virus; OR: Odds ratio; SD: Standard deviation; WHO: World Health Organization

Acknowledgements
The authors express their gratitude to the participants in the study. We thank Hawassa University Referral and Adare District hospitals top management for giving us permission to carry out the study in the hospitals. We also want to forward special thank to Hawassa University College of medicine and health sciences for funding the research that allowed us to complete the whole study. We would like to thank Mr. Gemachu Amaya and Mr. Deribe Aschalew for assisting us in the acquisition of data and Mr. Ayalew Asthetikie for his valuable comments in the analysis.

Funding
Hawassa University College of Medicine and Health Sciences had funded the research thesis. But, the college had no role in the design of the study and collection, analysis and interpretation of data and in the development of the manuscript.

Availability of data and materials
The data sets analyzed during the current study is available from the corresponding author on reasonable request. Supporting materials are attached with the manuscript.

Authors' contributions
GK developed proposal, conducted study, analyzed the data and completed the first draft of the manuscript. TA participated from the initial point of proposal development, in the conduct of the research and in the first draft of the manuscript as primary advisor of this article. Both authors read and approved the final manuscript and its revision.

Ethics approval and consent to participate
Ethical clearance was obtained from institutional review boards (IRB) of both Hawassa University College of medicine and Health sciences and Addis Continental Institute of public Health. Written consent was obtained from Hawassa referral and Adare district hospitals. All study participants were informed about the importance of the study and finally verbal consent was obtained before data collection. Participants had the right to refuse participation or terminate their involvement at any point during the study. Information obtained from each respondent was kept confidential. Any section of report writing did not refer to a specific respondent.

Consent for publication
Written informed consent was obtained from participants prior to their involvement in the study. There is no individual detail, images or video in our study.

Competing interests
The authors declare that there is no any financial and non financial competing interest regarding this specific manuscript. The research was funded by Hawassa University college of Medicine and Health Sciences with no financial interest. Until now, no application for patents to any organization and we haven't received any reimbursement, fees and salary.

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Received: 20 December 2016 Accepted: 4 August 2017
Published online: 25 August 2017

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