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A cross sectional study on factors associated with risk perception of healthcare workers toward healthcare waste management in health care facilities of Gondar Town, Northwest Ethiopia

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Abstract

Some of the healthcare waste is potentially dangerous to human health and can contaminate the environment. Nonetheless, all types of healthcare wastes generated from healthcare facilities in many developing countries, including Ethiopia, are treated and managed equally like other ordinary general wastes. Therefore, the aim of this study was to assess the risk perceptions of healthcare workers towards healthcare waste in healthcare facilities of Gondar town. A cross sectional study was carried out in April and May 2011 to assess the risk perception of healthcare workers towards healthcare waste. A total of 260 healthcare workers were included using simple random sampling technique. A self administered questionnaire was used to collect data. Data were entered and analyzed using SPSS version 16. Mean score was used to assess the risk perception of healthcare workers. Of the respondents, only 156 (60%) had scored greater than or equal to the mean score value on the risk perceptions of healthcare workers towards improper healthcare waste management. Knowledge on healthcare waste types (AOR: 9.04; 95% CI: 1.03, 79.23) and diseases transmitted with healthcare waste (AOR: 2.28; 95% CI: 1.08, 4.81), and having a training (AOR: 1.87; 95% CI: 1.03, 3.40) on healthcare waste were significantly associated with risk perception of HCWs. None of the facilities had healthcare waste management guidelines. Only small proportion of the Healthcare workers had adequate risk perception on healthcare waste. Regular training on healthcare waste should be offered to improve the risk perceptions of healthcare workers and Health Care Facilities should have healthcare waste management plan and guidelines.

Key words

Medical waste disposal; risk assessment; cross-sectional studies

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Introduction

Healthcare wastes are of great importance due to its hazardous nature. As World Health Organization (WHO) indicated, some of healthcare wastes are considered the most hazardous and potentially dangerous to human health and pollute the environment.[1-4] Infectious wastes, particularly, have been responsible for most of the health problems reported in many findings that expose healthcare workers (HCWs), patients, clients and the community for blood borne pathogens unless proper care is taken on healthcare waste management.[1-3] In developing countries the risk perceptions of HCWs on healthcare wastes are much lower when it compared to developed countries. Moreover there is a paucity of credible evidence on this issue in Ethiopia. Therefore, this study was conducted to assess the risk perception of HCWs towards healthcare waste in healthcare facilities of Gondar town.

Many studies indicated that infectious healthcare waste can transmit more than 30 dangerous blood-borne pathogens, but those of primary significance to HCWs are hepatitis B, hepatitis C and Human immune deficiency virus (HIV).[1-3] WHO estimated that in 2000 injections with contaminated syringes caused 21 million hepatitis B, 2 million hepatitis C and 260,000 HIV infections.[5-7] In the preceding time, there has been an increase in public concern about the risks associated with healthcare wastes on a global basis and many efforts have been directed to raise awareness of HCWs about the risk associated with healthcare wastes, particularly, infectious wastes by different organizations.[8] Still the risk perceptions and the practicing of treating infectious wastes by HCWs who are working in developing countries are different when we compare to developed countries.[9,10] The findings from Nigeria, South Africa, Brazil and India indicated that HCWs had good risk perception on infectious wastes which are responsible for common specific diseases.[11-15]

In Ethiopia, nowadays, there is an increase in the number of healthcare facilities to address the basic healthcare needs of the society and to achieve the Millennium Development Goal (MDG). There is paucity of credible evidence on risk related with improperly managed healthcare wastes among HCWs which in turn if paramount to fill the gap by drawing appropriate strategy in order to prevent its consequence among themselves and the community as well as to reduce its impact on the environment. The findings may provide baseline data to design evidence-based interventions to reduce the risk related with healthcare waste among HCWs.

Methods and Materials

A cross sectional survey was employed to assess the risk perceptions of HCWs and associated factors towards improperly managed healthcare waste in Health Care Facilities (HCFs) of Gondar town, Northwest Ethiopia, from April to May 2011. A total of 624 full time employed HCWs, working in both governmental and private HCFs, were eligible to participate in this study. A single population proportion formula was used to calculate the sample size assuming 50% of the HCWs would have adequate risk perception, 95% level of confidence and 5% margin of error. The final sample size of this study was 263 including 10% none response rate. Reduction formula was used as total number of HCWs in Gondar town was less than 10,000 population. Selection of HCWs from each healthcare facility was done by stratified random allocation and their size was determined proportional to the total number of HCWs found in each governmental and private Healthcare Facility (HCF). Hence, 197 HCWs from two hospitals and 46 HCWs from three health centers and 20 HCWs from private clinics were included in the sample. Finally, sampling frame consisting of all HCWs in each HCF was obtained from each HCF administration offices and simple random sampling technique was used to select HCWs from each health institutions.

Self administered questionnaire was adapted from WHO recommendation assessment tool.[16-17] The questionnaire included questions on demographic characteristics, knowledge of HCWs on healthcare waste type, disease transmission with contact of infectious waste, and risk perception towards improperly managed healthcare wastes. There were 10 questions used to assess risk perceptions which were presented in a Likert scale level with responses of strongly agree, agree, I don't know, disagree, and

strongly disagree. A score of 5 was assigned for the answer "strongly agree" and a score of 1 for "strongly disagree". Hence, the total score for the attitude questions ranged from 10 to 50.

Risk perception was considered as workers' opinion towards the risk associated with improperly managed healthcare waste. Risk perception of respondent was measured by asking ten question with Likert's scale response ranging from 1 to 5 and the level is assessed by a HCW was considered having adequate perception when the respondent scored ≥ the mean of all attitude questions whereas inadequate perception when the respondent scored < the mean of all attitude questions. Knowledge of the respondent's on healthcare waste type, manuals and diseases transmitted with contact of infectious waste was measured based on the bloom's criteria.[17] Those respondents who scored ≥ 80% of knowledge questions were categorized as having "higher knowledge", those respondents who scored 60-79% of knowledge question were categorized as having "moderate knowledge" and respondents who scored ≤ 59% of knowledge questions were categorized as having "low knowledge".

The questionnaire was prepared originally in English and translated to Amharic (native language) and back to English by different language experts to ensure the accuracy of the questions. Training was given for data collectors and supervisors. Pre testing of questionnaire was made to assess the validity of the questions out of the study area. Spot-checks and review of the completed questionnaires were made daily by the principal investigator and supervisors to ensure completeness and consistency of the information collected.

The questionnaires were cleaned, coded and data were entered into Statistical Package for the Social Sciences (SPSS) version 16 software and analyzed. Descriptive statistics were computed. Bivariate and multivariate logistic regression analyses were used to identify predictor variables of risk perception of HCWs.

Ethical clearance was obtained from the ethical approval committee of University of Gondar. A formal letter was given to each HCFs and permission was secured at all levels. Participants were informed regarding the purpose of the study, benefits and harms of participation. After verbal consent was obtained from each participant, questionnaires were distributed to participants and filled in the presence of the data collector. Codes were given to participants instead of names to keep their responses confidential.

Result

A total of 260 HCWs participated in the study, with a response rate of 98.86%. There were no missed values. One hundred fifty three (58.8%) were males. The mean age of the respondents was 28 + 6.4 years. One hundred forty four (55.4%) of the study participants were nurse, 22.3% were working at medical ward and 41.5% had work experience of 1-5 years. One hundred ninety five (75%) of them were working at hospital (Table I).

Of the total respondents, 78 (30%), 99 (38%) and 83 (31.9%) had higher, moderate and lower knowledge on diseases transmission with healthcare waste, respectively. The majority (202, 77.7%) had low level of knowledge on the existence of manuals on healthcare waste, healthcare waste types, color coding containers for healthcare waste and the responsibility of healthcare waste segregation, respectively, while 45 (17.3%) and 13 (5%) had low, moderate and higher knowledge.

Two hundred fifty two (96.9%) of the HCWs did not have access to any guideline documents. One hundred thirty eight (53.1%) of HCWs did not take any training about healthcare waste management. The prevalence rate of needle stick and sharps injury in the preceding 12 months was 25% (65). Of this, 6 (9.6%) of the injuries occurred during handling of healthcare wastes. One hundred nine (49.1%) of respondents reported that there was no safety instruction at their work environment.

Risk perception of Respondents

All HCWs (100%) agreed that improperly managed healthcare wastes transmit infection to HCWs and 94.6% (246) to other hospital workers. Two hundred and fifty eight (99.2%) respondents reported that improperly managed healthcare waste may cause infections to patients. Of the total respondents, 98.8% and 85.8 % agreed that improper managed

Table I. Socio demographic characteristics of healthcare workers in Gondar town healthcare facilities, Ethiopia, May 2011

Variable		Total study subject	
		No (260)	Percent
Sex	Male	153	58.8
	Female	107	41.2
Age	20- 29	192	73.8
	30 -39	48	18.5
	40- 49	14	5.4
	≥50	6	2.3
Religion	Orthodox		
	Muslim	203	78.1
	Protestant	27	10.4
	Others	17	6.5
		13	5.0
Marital status	Single	152	58.5
	Married	99	38.1
	Separated	5	1.9
	Widowed	4	1.5
Job category	Health assistant	13	5.0
	Nurse	144	55.4
	Laboratory technologist	31	11.9
	Health officer	9	3.5
	Medical doctors	40	15.4
	Anaesthetist	12	4.6
	Other	11	4.2
Working section	OPD	49	18.8
	Medical	58	22.3
	Surgical	28	10.8
	Gynaecology	36	13.8
	Operation Room	23	8.8
	Paediatrics	34	13.1
	Lab room	22	8.5
	Others	10	3.8
Working experience in years	<1	64	24.6
	1-5	108	41.5
	>5	88	33.8
Monthly salary in Birr	300 – 1230	65	25
	1231 - 1600	68	26.2
	1601 - 2250	67	25.8
	2251 – 5465	60	23.1
Working health institution type	Hospital	195	75.0
	Health centre	45	17.3
	Clinics	20	7.7

healthcare waste could contaminate water and soil, respectively. Nearly half of HCWs (123, 47.3%) agreed that improper managed healthcare waste could cause cancer to the community. When the overall mean score on risk perception of respondents was computed, only 156 (60%) had scored at least the mean score value showing adequate risk perception whereas 104 (40%) had inadequate risk perception of HCWs on improperly managed healthcare waste on human health and the environment (Table II).

A total of 235 (97.7 %) respondents agreed that HIV/AIDS could be acquired through contact with infectious waste and the remaining 6 (2.3%) reported that they were not sure. Regarding infectious hepatitis B, 220 (84.6%) HCWs agreed that it could be transmitted through improperly managed infectious waste. Twenty eight (10.8%) respondents reported that they were not sure whereas 12 (4.6%) disagreed that the transmission of infectious hepatitis B can occur through infectious waste. One hundred fifty two (58.8%) respondents agreed that infectious hepatitis C could be transmitted by infectious waste. Twenty seven (10.0%) disagreed that improperly managed healthcare waste could transmit infectious hepatitis C and 81 respondents (31.2%) were not sure about the transmission (Table II).

Factors associated with risk perception

In the binary logistic regression analysis, sex, age, occupation, working experience, kind of health organization, salary of HCWs and injury during healthcare waste management were found to be non-associated with risk perception towards healthcare waste. But working department, training on healthcare waste, knowledge on healthcare waste type and knowledge on diseases transmission with healthcare waste showed statistically significant association with risk perceptions towards healthcare waste at p-value < 0.05.

In multivariate analysis training on healthcare waste, knowledge on healthcare waste types and diseases transmitted with healthcare waste, remained significantly associated with risk perception towards healthcare waste. Working department lost its significance association with risk perception HCWs towards healthcare waste except in paediatrics ward (AOR: 9.01, 95% CI: 2.38, 34.10). The odds of adequate risk perception among HCWs in the Paediatrics Department was at least 2.38 times higher than the odds of adequate risk perception among HCWs in the Outpatient Department (OPD) (Table III).

In addition, the current study revealed that training on healthcare waste had a significant association with risk perception of HCWs towards healthcare waste. The odds of adequate risk perception on Health Care Wastes among HCWs who took training on healthcare waste was 1.87 times higher than the odds of risk perception on healthcare waste among those who didn't take training on healthcare waste (AOR: 1.87, 95% CI: 1.03, 3.40). HCWs with higher (AOR: 9.04, 95% CI: 1.03, 79.23) and moderate (AOR: 9.76, 95% CI: 3.13, 30.40) knowledge on healthcare waste type had significantly raised odds of adequate risk perception towards healthcare waste than HCWs who had low knowledge. Similarly, the odds of adequate risk perception among HCWs with higher (AOR: 2.28, 95% CI: 1.08,4.81) and moderate (AOR: 2.04, 95% CI: 1.02, 4.05) knowledge on diseases transmission due to healthcare waste were 2.28 and 2.04 times higher than the odds of risk perception among HCWs who had low knowledge on disease transmission with healthcare waste, respectively (Table III).

Discussion

It is known that WHO has prepared healthcare waste guideline manual to ensure safe healthcare waste management. Moreover, Quality and Standard Authority of Ethiopia (QSAE) in 2004 and Ministry of Health (MOH) in 1997 had prepared a working guideline which describes different types of healthcare waste and their risks.[18] In this study, the majority of the HCWs (96.9%) reported that they did not receive any guideline documents on healthcare waste management which was consistent with the study done in Ethiopia that indicated the guideline document was not available in anyone of the surveyed health facilities.[19] On the contrary, similar study among HCWs in South Africa 91% had reported that they had received guideline document.[20] This difference may be due to lack of regular supervision and lack of enforcement of standard practice by responsible body in our study area.

Table II. Risk perceptions of healthcare workers towards improperly managed healthcare wastes in Gondar town healthcare facilities, Ethiopia, May 2011.

Variable	Agree f* (%)	Not sure f (%)	Disagree f (%)
Improperly managed health care waste may cause infections among health workers	260 (100)	0	0
Improperly managed health care waste may cause infections among other hospital workers	246 (94.6)	5 (1.9)	9 (3.5)
Improperly managed health care waste may cause infections among patients	258 (99.2)	2 (0.8)	0
Improperly managed health care waste may contaminate water source	257 (98.8)	3 (1.2)	0
Improperly managed health care waste may contaminate soil	223 (85.8)	22 (8.5)	15 (5.8)
Improperly managed health care waste may cause cancer for the community	123 (47.3)	107 (41.2)	30 (11.5)
HIV/AIDS may be acquired through contact with infectious waste	235 (90.4)	19 (7.3)	6 (2.3)
Hepatitis B may be transmitted through health care waste	220 (84.6)	28 (10.8)	12 (4.6)
Hepatitis C may be transmitted through health care waste	153 (58.8)	81 (31.2)	26 (10.0)
Health care waste does not transmit any diseases/infections	0	0	260 (100)

* f= frequency

This study, only 20.8% of respondents reported that they knew about the existence of the WHO manual on healthcare waste. This result was inconsistent with the study done in South Africa in which about 46% of HCWs knew the existence of the WHO manual on healthcare waste. The finding on classification of healthcare waste by WHO in this study was known by 11.2% of the respondents and colour coding of waste bins was known correctly by 10.0% of HCWs. This finding was different from the study done on assessment of biomedical waste management in Ludhiana, India indicated that 95.8% HCWs knew classification of healthcare waste and colour coding system was known by 93.7%.[21,22] This difference might be due to the degree of emphasis of HCFs on healthcare waste management, on job training and the accessibility of healthcare waste management documents in the working environment.

In this study, more than 99% of HCWs agreed that improperly managed healthcare wastes could transmit infection for HCWs and patients. This result was consistent with the study done in South Africa in which most of HCWs (98.5%) agreed that improper management of healthcare waste could lead to the transmission of infections among HCWs and patients.[20] Similarly, the awareness of HCWs done in Ludhiana (92.1% - 98.0%) was consistent with this finding but it differs from the results done in Srinagar, India (86%) which was lower than the results of the current study.[21,22] This difference may be due to the time gap of the study.

In this study, the majority of participants (90.4%) agreed and only 2.3% of respondents disagreed that HIV/AIDS could be acquired through contact with infectious waste. This finding was higher than the study done in South Africa in 2009 that indicated 82% of the participants agreed and 13% disagreed that HIV/AIDS can be acquired through contact with infectious waste.[20] Again, this difference might be due to the time gap of the study, the current prevalence of HIV/AIDS and the promotion of HIV/AIDS to prevention and control using different methods to avert the current prevalence of HIV/AIDS.

Table III. Adjusted logistic regression analysis for potential factors associated with risk perception of healthcare workers towards healthcare waste in Gondar town healthcare facilities, Ethiopia, May 2011.

		Risk perception		Adjusted OR (95% CI)
Variables	**Categories**	**Good**	**Poor**	
Sex	Male	97	56	
	Female	59	48	
Age group	20-29	121	71	
	30-39	26	22	
	40- 49	7	7	
	≥ 50	2	4	
Job category	Health assistant	8	5	1.00
	Nurse	77	67	1.75 (0.43, 7.22)
	Lab. technologist	25	6	4.38 (0.82, 23.53)
	Health officer	3	6	0.72 (0.09, 5.66)
	Medical doctor	31	9	**5.49 (1.12, 26.90)***
	Anaesthesia	3	9	0.43 (0.05, 3.56)
	others****	9	2	5.87 (0.70, 48.97)
Working experience in years	<1	42	22	
	1-5	61	47	
	>5	53	35	
Kind of healthcare organization	Hospital	123	72	
	Health centre	25	20	
	Clinic	8	12	
Monthly salary in birr	≤1230	41	24	
	1231-1600	36	32	
	1601-2250	40	27	
	2251-5465	39	21	
Working department	OPD	17	32	1.00
	Medical ward	33	25	
	Surgical dept.	17	11	
	Maternity ward	22	14	
	Operation Room	8	15	
	Paediatrics ward	28	6	9.01 (2.38, 34.10)**
	Laboratory room	18	4	
	Others	6	4	
Ever had training on HCW	No	71	67	1.00
	Yes	85	37	**1.87 (1.03, 3.40)***
Knowledge on HCW	poor	103	99	1.00
	moderate	41	4	9.76 (3.13, 30.40)***
	higher	12	1	**9.04 (1.03, 79.23)***
knowledge on disease transmission	poor	34	49	1.00
	moderate	66	33	**2.04 (1.02, 4.05)***
	higher	56	22	**2.28 (1.08, 4.81)***
Injury due to HCW	No	142	93	
	Yes	14	11	

HCW= Health Care Waste, ***P ≤ 0.05, ** p ≤ 0.01,***p ≤ 0.001**

Regarding on awareness of Hepatitis B transmission through improper management of healthcare waste in this study, it was revealed that 84.6% of HCWs agreed that it could be transmitted. Ten percent of the respondents reported that they were not sure, whereas 14.6% of respondents disagreed about the transmission of infectious hepatitis B through contact of infectious waste. This result was consistent with the finding done in South Africa; the majority of the participants (88%) agreed that Hepatitis B might be acquired through contact with infectious waste.[20]

In this study, 58.8% of participants agreed that infectious hepatitis C could be transmitted with contact of infectious waste. However, 31.2% and 10.0% of the respondents were not sure and didn't agree the transmission of hepatitis C with contact of infectious waste, respectively. This result was two times higher than the study done in Ethiopia by Making Medical Injection Safer USAID, hepatitis C virus was mentioned by only 28% of HCWs.[7] However, this result was lower than the study done in South Africa; 76% of HCWs agreed that contact with infectious waste could lead to acquired hepatitis C infection.[20] This discrepancy might be due to the extent of infection occurrence in the study area, frequency of on job training, the availability of safety instruction and the accessibility of healthcare waste document.

In this study, 53.1% of the HCWs did not take any training on healthcare waste management. This finding was incomparable with a study done in India in which most HCWs were in accordance with the prescribed rules and standards of the hospital.[21] This could be due to the budget allocation of HCFs, the accessibility of healthcare waste document and on job training. This finding was in agreement with study done in Hawassa city of Ethiopia and in Nigeria.[23,24]

Different studies in different setting reported that the risk perception on healthcare waste was different across health professionals. A study done in India showed that Nurses have better risk perception than other HCWs.[21] However, in other studies medical doctors were better in having theoretical knowledge.[22] In this study, results on risk perception showed that, medical doctors had better risk perception than other health professionals. This difference might be due to education background, training, and commitment of healthcare staffs.

Studies done in developing and developed countries showed that training on healthcare waste had an impact on the risk perception of HCWs.[21-25] This study also indicated that the odds of adequate risk perception among HCWs who had taken training on healthcare waste management was 1.78 times higher than the odds of adequate risk perception on healthcare waste among HCWs who did not received any training (AOR: 1.87, 95% CI: 1.03, 3.40).

Most study findings from different scholars reported that knowledge on healthcare waste type and diseases transmission with the contact of infectious waste had an influence on the risk perception of HCWs.[22-25] Similarly, this study claimed that the odds of adequate risk perception among HCWs who had higher and moderate knowledge on healthcare waste type were 9.04 (95% CI: 1.03, 79.23) and 9.76 (95% CI: 3.13, 30.40) times higher than the odds of adequate risk perception among HCWs who had low knowledge on healthcare waste type, respectively. Moreover, this result indicated that the odds of adequate risk perception among HCWs who had higher and moderate knowledge on diseases transmission with contact of infectious wastes were 2.28 (95% CI: 1.08, 4.81) and 2.04 (95% CI: (1.02, 4.05) times higher than the odds of adequate risk perception on healthcare waste among HCWS who had low knowledge on diseases transmitted with contact of infectious wastes.

Limitation of the study

There might be loss in information when the risk perception of respondents operationally changed into dichotomous variable for the purpose of identifying predictor variables associated with risk perception.

Conclusion and recommendation

Only 60% of the HCWs had adequate risk perception that improperly managed healthcare wastes could transmit infection to HCWs and patients. This is due to the fact that the majority (96.9%) of the HCWs did not receive any guideline documents on healthcare waste management, only small proportion (20.8%) of respondents reported that they knew about the existence of the WHO manual on healthcare waste

and nearly half (53.1%) of the HCWs did not take any training on healthcare waste management.

Training on healthcare waste management, higher and moderate knowledge on healthcare waste type and higher and moderate knowledge on diseases transmission with contact of infectious wastes were significant predictors of risk perception on improperly managed healthcare wastes.

Frequent training on risk associated with healthcare waste should be given to HCWs to raise awareness and HCFs should have healthcare waste management plan and guideline. To this end, both the Zonal and District Health Offices of the HCFs, the regional and National Health Offices could take the lead for the availability of Guidelines and provision of Training on improperly managed health care wastes and the associated risks.

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