

Knowledge and practice of healthcare workers about standard precaution: Special emphasis on medical waste management in Ethiopia

Tadesse Alemayehu¹, Alemayehu Worku², Nega Assefa³

¹College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

²School of Public Health, Addis Ababa University, Addis Ababa, Ethiopia

³College of Health and Medical Sciences, Haramaya University, Harar, Ethiopia

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Abstract

Safe and proper healthcare waste management is becoming a challenge for many developing nations because of its complex nature in managing it, which includes: provision of basic sanitary equipments by health facilities, understanding the effects of healthcare waste by people handling it and acquiring of standard precautions by healthcare workers to protect themselves and others. This study has therefore assessed the knowledge and practices of standard precautions among healthcare workers with special emphasis to healthcare waste management in the eastern part of Ethiopia.

Institutional based cross-sectional study was made on 818 healthcare workers from 65 health facilities. Data were collected using a self administered questionnaire. The collected data were analyzed using IBM SPSS version 21 statistical software (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.). Variables were analyzed with a univariate, bivariate and multivariable analysis methods. Factors associated with the outcome variable were identified by Generalized Estimating Equation.

Out of the total respondents, 619 (78.8%) responded that they had heard about standard precautions. However, the overall knowledge about standard precaution was 54.6%. Variables such as recapping needles (adjusted odds ratio (AOR) = 0.62, 95% CI = 0.22-0.85, p-value = 0.012), taking training about hygiene education (AOR = 1.77, 95% CI = 1.14-2.77, p-value = 0.014) and safe injection (AOR = 2.17, 95% CI = 1.54-3.06, p-value < 0.001) were statistically associated with knowledge of standard precautions.

Corresponding Author

Tadesse Alemayehu, Haramaya University, College of Health and Medical Sciences, P.O.Box 1517, Harar, Ethiopia
E-mail: tadessewon@yahoo.com, tadessewon@hotmail.com

Knowledge of healthcare workers about standard precautions was low. Having in-service training could enhance the knowledge as well as the practice of healthcare workers about safety precautions.

Key words: Standard precaution, infection prevention and control, Healthcare waste, Medical waste, knowledge, healthcare workers, Ethiopia

Introduction

Healthcare waste management (HWM) includes activities from “cradle to grave”. In other words, it starts from generation to disposal. HWM requires a careful planning in each step, from generation, storage, collection, transfer, treatment to final disposal. Any mismanagement in one part of the process will affect the subsequent steps and maybe even the whole management process. Safe and proper healthcare waste management is becoming a challenge for many developing nations because of its complex nature in managing it which includes; provision of basic sanitary equipment by health facilities, understanding the effects of healthcare waste by people handling them and acquiring of standard precautions by healthcare workers (HCWs) to protect themselves and others.

Standard precautions are infection prevention and control measures that reduce the risk of transmission of blood borne and other pathogens through exposure to blood and body fluids among patients and HCWs. Compliance with these standard precautions has been shown to reduce the risk of exposure to blood and body fluids as well as injuries and related accidents.¹ In one study it has been pointed out that almost 50% of all injuries amongst HCWs could have been avoided if they followed strict standard precautions and safety boxes have been used for sharp materials.² There are however many instances when lack of compliance in basic standard precautions posed HCWs to significant health risks.³⁻⁵

The differences in knowledge of standard precautions may be influenced by the type of training HCWs are taking. Basic professional training gives HCWs an insight of understandings about the activities they will perform in their future career and particularly the safety precaution they should have to take in

order to protect themselves and others from acquiring infection. Among these trainings is one about Infection Prevention and Control (IPC). Every HCW practicing clinical activities is instructed about IPC during his/her basic professional training. It is not given as a main course but incorporated as a chapter(s) in a couple of courses. As a result, basic training doesn't totally equip them in all aspects of professional activities unless substantiated with short term in-service training to capitalize the knowledge and skill they have acquired before. Understanding the different categories and their potential health effects of wastes produced by healthcare institutions is a first step in prevention of infection arising from wastes. During assessing the knowledge of HCWs, a study in India showed that no single doctor knew about the various categories of bio-medical waste. Furthermore, only 50% of service providers had knowledge about universal aseptic precautions (UAP).⁶

The absence of an enabling environment in the health institution, such as a lack of constant running water,⁷ a shortage of personal protective equipment (PPE),⁸ would lead to poor compliance with standard precautions.³

In recent years, HWM is becoming a crucial public health and environmental issue. This is because of the fact that improper management of healthcare waste poses great danger on the health of people working in the areas of healthcare institutions including HCWs. The compliance with regard to standard precautions among HCWs in eastern Ethiopia has not been assessed before. Therefore, assessing the level of knowledge and practices in relation to standard precautions of HCWs is vital for health authorities/managers in order to set measures to control adverse effects which might result from exposure to toxic materials in the wastes.

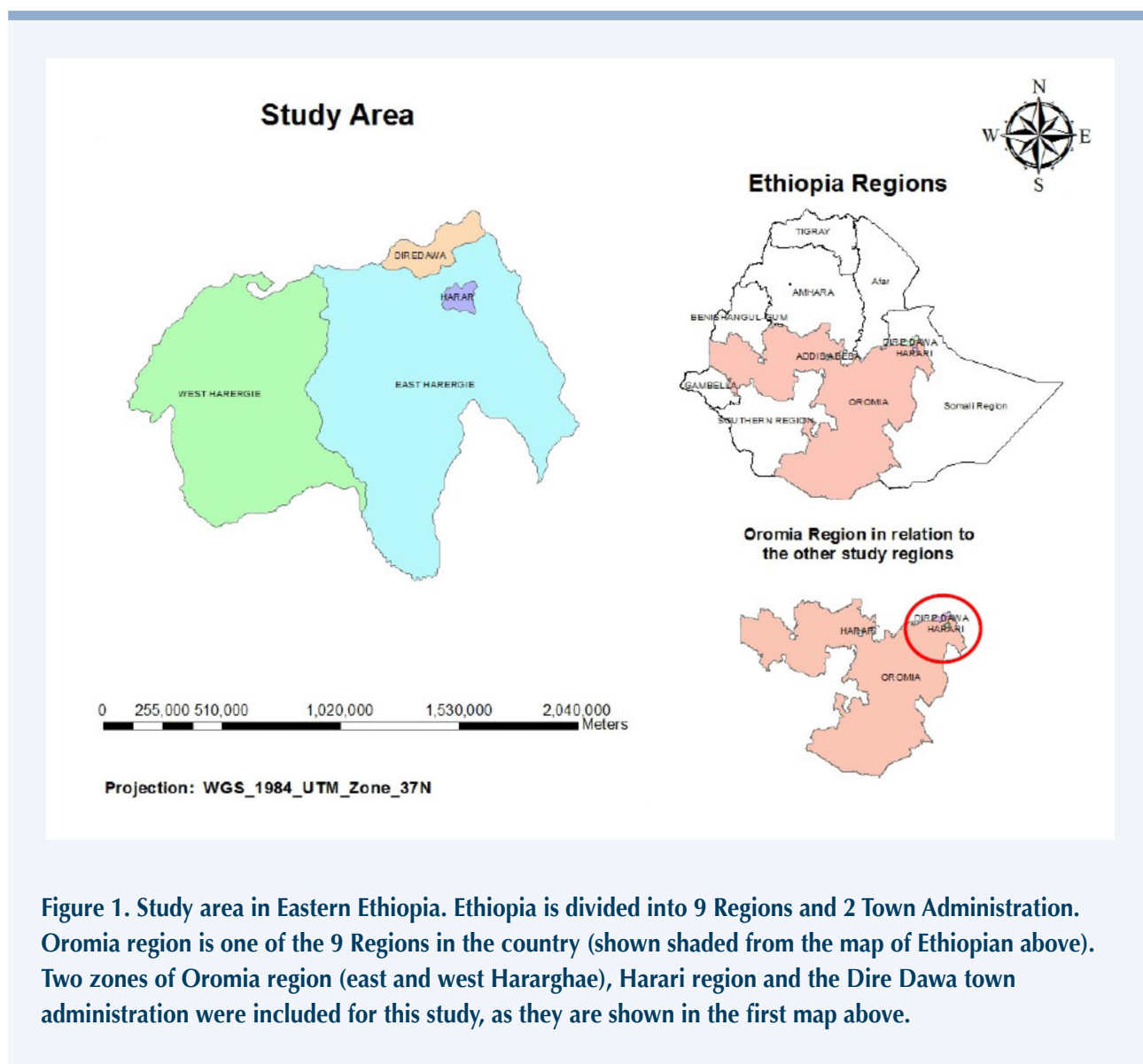
Methods and Materials

This cross sectional study was conducted in eastern Ethiopia (Figure 1) which includes Harari Region, Dire Dawa Administration, and east and west Hararghea zones, from August 2013 to February 2014. According to the data obtained from the respective health offices, there were a total of 195 public health facilities (hospitals and health centers) in the study area and the study was done in 65 (9 hospital and 56 health centers) of them.

For the selection of health centers, a two stage sampling was used. First, 30% (n=56) of the health centres were considered sufficient to assess health related issues as it was done elsewhere.^{9,10} Second, by probability proportional to population size sampling method, data were taken from 820 HCWs.

A self-administered questionnaire was used as data collection tool. It was prepared by adopting the questions from standard materials of WHO's Rapid Assessment Tool¹¹ and International Committee of the Red Cross.¹² The dependent variable was knowledge about standard precautions. Fourteen questions were asked to assess the level of knowledge of HCWs on standard precautions. Accordingly, the mean score was calculated for each and then for all questions. At the end, those who scored above the means score were considered as having good knowledge and those below the mean score as low knowledge.

The questionnaire was pretested in a health facility which was not part the main study but has a similar setup. Training was given for data collection facilitators and supervisors in order to make them aware about



the study objective, how to clarify if respondents ask questions, and in general how to facilitate data collection by self administered questionnaire method.

During data analysis, first descriptive statistics were carried out to see the nature of the collected data. Then both bivariate and multi-variable analysis were carried out. The knowledge of HCWs was assessed by calculating a composite scale. Different factors (e.g. age, years of services, availability and utilization of protective devices, level of basic and in-service trainings, etc.) known to have influence on the knowledge of HCWs towards maintaining safety practices were identified and tested to see their influence by a bivariate analysis. Lastly, the generalized estimations equation (GEE) model was used in order to identify factors associated with the occurrence of knowledge concerning standard precautions. GEE was basically used to control the clustering effects of the health facilities as each of them were considered as one cluster.

Result

Socio-demographic characteristics

Out of the total respondents, 456 (56.2%) were male and almost half (51.1%) of them were from the hospitals. Educational level records showed that majority, 513 (63.3%) were only trained at diploma level and 498 (61.3%) of them were nurses. Age distribution data also showed that more than three-fourth (76.5%) of the professionals were in the age group between 20-29 years. Similarly, the majority, 602 (82.4%), of the professionals had been in service for 1 to 9 years with a median of 4 years (Table I).

Health facility related information

Respondents were asked about their knowledge regarding the health facility they are working. The types of waste produced was one of those questions asked and out of the total 817 HCWs who responded to this question, only 542 (66.3%) have replied they knew the production of infectious wastes in their premises. The utilization of safety box is common as 762 (96.8%) replied they are using it in the facility they are working at. Recapping of used-needles are practiced by 165 (20.9%) of 789 respondents. While 84.4% reported that they have taken training about institutional hygiene, only 36.3% took training about

safe injection practices. Hand washing practices are considered to be low as only 486 (63.3%) reported there is water with soap for hand washing purpose (Table II).

Knowledge regarding standard precautions

We have used 14 questions to assess the level of knowledge of HCWs about standard precautions. When asking respondents a general question about standard precautions, 619 (78.8%) reported that they have heard about standard precautions. Only 287 (36.6%) were aware of any legislation applicable to the HWM in the country and about 544 (70.6%) of the respondents knew the presence of national policy on safe injection (Table III). The overall knowledge score about standard precaution of the respondents was 54.6%.

Practice regarding standard precaution

The practice of health professionals toward maintaining standard precaution on infection prevention was assessed by asking them a number of questions. For instance, 596 (78.8%) responded that they wash their hands with water and soap after removing gloves. At the same time, they were asked whether they undergo health checkups after exposure to sharp objects and blood and body fluids in the work place. The response to this question showed that 354 (45.8%) replied yes. Out of these who undergo medical check-ups, only 31 (15%) revealed their result was positive. However, all of them refrained to mention what specific health problems they were told to have. On the other hand, the number of HCWs that wear protective devices when there is a possibility of exposure to blood and body fluids varied; 622 (82.4%) wear disposable gloves, 267 (35.2%) face shield, 308 (40.7%) protective eyewear and 377 (50.5%) outer garments. At the same time, the number of HCWs who were trained about safety issues before beginning the current work was 274 (36%) (Table IV), and those who took any type of vaccination at work were only 250 (32.9%). On further questioning about which vaccines they have taken, almost half, 179 (52%), have taken tetanus toxoid while only 118 (36.1%) have reported they took hepatitis B. At the end while asked whether they think their job contains some risks, 604 (77.4%) responded yes.

Table I. Socio-demographic characteristics of healthcare workers in in the eastern part of Ethiopia

| | Number | Percentage |
|---------------------------------|--------|------------|
| Types of health facility | | |
| Hospital | 418 | 51.1 |
| Health Center | 400 | 48.9 |
| Region | | |
| Harari | 192 | 23.5 |
| East Hararghae | 263 | 32.2 |
| West Hararghae | 149 | 18.2 |
| Dire Dawa | 214 | 26.2 |
| Sex | | |
| Male | 456 | 56.2 |
| Female | 356 | 43.8 |
| Educational status | | |
| Certificate | 2 | 0.2 |
| Diploma | 513 | 63.3 |
| First Degree | 278 | 34.3 |
| Second Degree | 13 | 1.6 |
| Others | 5 | 0.6 |
| Professional category | | |
| Medical Doctor | 20 | 2.5 |
| Health Officer | 85 | 10.5 |
| Nurse | 498 | 61.3 |
| Midwifery | 90 | 11.1 |
| Laboratory technicians | 99 | 12.2 |
| Anesthesia | 2 | 0.2 |
| Others | 18 | 2.2 |
| Age | | |
| 20 - 29 | 543 | 76.5 |
| 30 - 39 | 106 | 14.9 |
| 40 - 49 | 39 | 5.5 |
| 50 - 60 | 22 | 3.1 |
| Years in service | | |
| 1 - 9 | 602 | 82.4 |
| 10 - 19 | 80 | 10.9 |
| 20 - 29 | 31 | 4.2 |
| 30 - 39 | 18 | 2.5 |

Table II. Health facility related information for HCWs in the eastern part of Ethiopia

| | Number | Percentage |
|--|--------|------------|
| Knowledge about the type of waste generated (n= 817)* | | |
| Infectious | 542 | 66.3 |
| Chemical/pharmaceutical | 200 | 24.5 |
| Sharps | 499 | 61.1 |
| General | 377 | 46.1 |
| Others | 70 | 8.6 |
| Do you use safety box? ** (n= 787) | | |
| Yes | 762 | 96.8 |
| No | 25 | 3.2 |
| Do you have adequate supply of safety box (n = 791) | | |
| Yes | 745 | 94.2 |
| No | 46 | 5.8 |
| Receiving needles and syringes with safety box (n = 780) | | |
| Yes | 626 | 80.3 |
| No | 120 | 15.4 |
| I don't know | 34 | 4.4 |
| Are you recapping used-needles? (n = 789) | | |
| Yes | 165 | 20.9 |
| No | 624 | 79.1 |
| Training about the importance of hospital/health center hygiene (n = 762) | | |
| Yes | 643 | 84.4 |
| No | 119 | 15.6 |
| Training on safe injection practices (n = 796) | | |
| Yes | 289 | 36.3 |
| No | 495 | 62.2 |
| I don't remember | 12 | 1.5 |
| Period of last training (n = 322) | | |
| <1 year | 110 | 34.2 |
| 2 years ago | 96 | 29.8 |
| 2-5 years | 75 | 23.3 |
| Before 5 years | 41 | 12.7 |
| Disposal method for used needles and syringe (n = 801)* | | |
| Burning | 240 | 30 |
| Incinerator | 522 | 65.2 |
| Burying | 41 | 5.1 |
| Other methods | 25 | 3.1 |
| Is there running water with soap for hand washing inside the health facility? (n = 764) | | |
| Yes | 486 | 63.6 |
| No | 278 | 36.4 |

* percentages do not add up to 100% due to repeated responses

** these are boxes used for storing sharp wastes which are made of cardboard which should be destroyed or burned along with the sharps during disposal.

Table III. Knowledge regarding standard precaution for HCWs in the eastern part of Ethiopia

| Knowledge | | Frequency | Percentages |
|--|---------------|------------------|--------------------|
| Have you ever heard of Standard Precaution? | Yes | 619 | 78.8 |
| | No | 167 | 21.2 |
| Is there a national guideline on safe injection? | Yes | 544 | 70.6 |
| | No | 102 | 13.2 |
| | I do not know | 125 | 16.2 |
| Do you adhere to the policy of one needle-one- syringe for one injection? | Yes | 715 | 90.3 |
| | No | 50 | 6.3 |
| | I do not know | 27 | 3.4 |
| Are you aware of any legislation applicable to the healthcare waste management in the country? | Yes | 287 | 36.6 |
| | No | 347 | 44.2 |
| | I do not know | 151 | 19.2 |
| Is waste management activities included in your job descriptions? | Yes | 486 | 61.4 |
| | No | 192 | 24.3 |
| | I am not sure | 113 | 14.3 |
| Should waste be segregated into different categories? | Yes | 562 | 72.2 |
| | No | 143 | 18.4 |
| | I do not know | 73 | 9.4 |
| Spreading of bacteria in hospitals occurs via the hands of personnel. | True | 600 | 75.9 |
| | False | 190 | 24.1 |
| Healthcare associated infections are caused by bacteria brought into the hospital by hospital workers. | True | 419 | 53.7 |
| | False | 361 | 46.3 |
| Hand jewelry makes good hand hygiene impossible. | True | 571 | 73.2 |
| | False | 209 | 26.8 |
| Gloves reduce the contamination of the hands, but do not prevent it completely. | True | 580 | 73.1 |
| | False | 213 | 26.9 |
| Most healthcare personnel have ever experienced needlestick injury, because of unsafe handling of sharps. | True | 551 | 73.0 |
| | False | 204 | 27.0 |
| All blood and body fluids from patients are infectious | Yes | 525 | 68.4 |
| | No | 243 | 31.6 |
| | Do not know | 67 | 8.6 |
| Is it difficult to make injections safe? | Yes | 109 | 14.1 |
| | No | 644 | 83.4 |
| | I do not know | 19 | 2.5 |

Table IV. Practices regarding standard precaution for HCWs in the eastern part of Ethiopia

| Questions | Frequency | Percentage |
|---|-----------|------------|
| Have you undergone health check-ups in the workplace? | | |
| Yes | 354 | 45.8 |
| No | 419 | 54.2 |
| If medical check-up, what was the result? | | |
| Positive | 31 | 15.0 |
| Negative | 172 | 83.1 |
| I did not get my status | 3 | 1.4 |
| No answer | 1 | 0.5 |
| Do you clean your hands with water and soap or waterless hand rubs after removing disposable gloves? | | |
| Yes | 596 | 78.8 |
| No | 160 | 21.2 |
| Do you wear protective eyewear whenever there is a possibility of splashes of blood or other bodily fluids? | | |
| Yes | 308 | 40.7 |
| No | 449 | 59.3 |
| Do you wear disposable gloves whenever there is a possibility of exposure to blood or other body fluids? | | |
| Yes | 622 | 82.4 |
| No | 133 | 17.6 |
| Do you wear a disposable outer garment that is resistant to blood and bodily fluids whenever there is a possibility of soiling your clothes? | | |
| Yes | 377 | 50.5 |
| No | 370 | 49.5 |
| Have you taken training before you start your work? | | |
| Yes | 274 | 36 |
| No | 488 | 64 |
| Did you take vaccination? | | |
| Yes | 250 | 32.9 |
| No | 511 | 67.1 |

Factors associated with knowledge of standard precautions

After running the multivariable analysis, recapping needles, taking training on hygiene education and safe injection have shown statistically significant association with knowledge about standard precautions. The odds of having good knowledge for those who reported recapping needles was 38% less than those who didn't recap needles (AOR = 0.62, 95% CI = 0.22-

0.85, p-value = 0.012). HCWs who took training on hygiene education increase the odds of having good knowledge by 1.8 times than those who didn't take such training (AOR = 1.77, 95% CI = 1.14-2.77, p-value = 0.014). At the same time, for those who took training on safe injection, the odds of having good knowledge increases by 1.5 times compared with those who didn't take training on safe injection (AOR = 2.17, 95% CI = 1.54-3.06, p-value < 0.001) (Table V).

Table V. Factors associated with knowledge of standard precaution for HCWs in the eastern part of Ethiopia

| Factors | | Knowledge of SP | | OR | 95% confidence Interval | | P- value |
|-----------------------------------|-----|-----------------|-----|------|-------------------------|------|----------|
| | | High | Low | | | | |
| Recapping needles | Yes | 73 | 92 | 0.62 | 0.22 | 0.85 | 0.012 |
| | No | 359 | 265 | 1 | | | |
| Hygiene instruction | Yes | 374 | 269 | 1.77 | 1.14 | 2.77 | 0.014 |
| | No | 47 | 72 | 1 | | | |
| Training on safe injection | Yes | 191 | 98 | 2.17 | 1.54 | 3.06 | <0.001 |
| | No | 243 | 252 | 1 | | | |
| Hand washing | Yes | 338 | 258 | 1.16 | 0.78 | 1.73 | 0.47 |
| | No | 75 | 95 | 1 | | | |
| Wearing eye protection | Yes | 179 | 129 | 1.11 | 0.82 | 1.52 | 0.49 |
| | No | 236 | 213 | 1 | | | |
| Wearing glove | Yes | 354 | 268 | 1.26 | 0.79 | 1.99 | 0.33 |
| | No | 63 | 70 | 1 | | | |
| Wearing outer garment | Yes | 218 | 159 | 1.23 | 0.88 | 1.7 | 0.33 |
| | No | 186 | 184 | 1 | | | |
| Take vaccination | Yes | 149 | 101 | 1.04 | 0.71 | 1.52 | 0.85 |
| | No | 270 | 241 | 1 | | | |
| Work related risks | Yes | 339 | 265 | 0.97 | 0.56 | 1.67 | 0.91 |
| | No | 82 | 68 | 1 | | | |

Discussion

In this study the level of knowledge of standard precautions was found to be 54.5%. Factors associated with knowledge of standard precautions are recapping needles, training about hygiene education and safe injection practices.

HCWs who have heard of standard precautions were 78.8%. This finding was similar to a study in Jamaica¹³ but higher than a finding from Egypt¹⁴ and Iran.¹⁵ However, the overall knowledge score about standard precautions was only 54.5%. This level of knowledge was lower than findings from Nigeria,¹⁶ Indonesia¹⁷ and Jamaica.¹³ This difference could be due to HCW factors in terms of experiences, years of service and types of training provided. Safety issues and standard precautions are acquired through basic professional trainings. It is however best acquired through practice,

exchanges from colleagues and in-service training. A health facility with huge number of junior staff (in this study, 82.4% of the respondents have less than 9 years of service) could easily be equipped with HCWs having better knowledge and good practices though in-service training.

National laws and regulations including standard precautions on safe clinical practices aim at reducing morbidity and mortality associated with such unsafe practices. In this study however, only 70.6% knew about the presence of a national guideline for safe injection. At the same time, those who are adhering to one-needle-one-syringe policy were 90.3% and some HCWs are using multi-dose vial between patients. This policy was highly recommended by international bodies such as WHO since 1999.¹⁸ Only 36.6% knew about national legislation applicable to HWM. This finding was lower than a study in Nigeria¹⁹ but

higher than a study done in Cameroon.²⁰ The low level of knowledge about the existence of these documents could be because they are shelved for long period and they are not displayed so that HCWs might not be aware of them.²¹

One of the most basic and simple actions, but a very critical measure, to prevent and reduce transmission of infection is proper hand washing.^{7,22} In this study, though hand washing was one of the factors associated with knowledge of standard precaution, only 78.8% of the respondents washed their hands after removing gloves. This was higher than a studies from Nigeria¹⁶ and Indonesia.¹⁷ HCWs are expected to have high compliance with hand hygiene after performing clinical practices. However, in situations such as those in our study setting, HCWs often do not have regular access to essential resources, such as constant supply of running water, soap or other detergents and hand drying materials.²³

In this study, 82.4% of the respondents reported wearing disposable gloves whenever there is a possibility of exposure to blood and body fluids. This finding was higher than a study from Nigeria where 70.1% usually wear gloves before handling patients or patients' care products.¹⁶ Those who wear face shields were 35.2% and 50.5% used disposable outer garment to avoid soiling of clothes. Other researchers also found similar findings elsewhere.^{16,24} Due to the unavailability of personal protective devices utilization of face shield and disposable outer garments is rare.^{9,21,24,25}

The level of knowledge on some aspects of common practices was found to be poor. For example, many HCWs believed that needles should be recapped²³ and in this study recapping of used needles was practiced by 20.9% respondents. This finding was lower than a study done in Afghanistan (51.4%)²⁶ but higher than finding from Bangladesh (17%).⁶ This gap of information poses health threats to HCWs as recapping is a main cause of needle-stick injuries and consequently increased risk of contracting blood-borne diseases.²⁷

Limitation of the Study

While the current study contributes important information likely to aid in the design of relevant policies and to guide future research and programmatic efforts relevant to safe injection practices in Ethiopia or elsewhere, it must be considered in light of some limitations. Data presented in our analyses were based on only those HCWs from public health facilities and do not include those working in the private facilities. This may limit the generalizability of our results to the general HCWs in the region.

The authors are aware of the limitation of self-administered questionnaire. Taking this into account, we made the questionnaire as simple as possible and all the jargon used in the questionnaire was carefully selected (those that are known by all HCWs involved in this study). At the same time, we recruited data collection facilitators (who were university instructors) who were always available for possible clarification of vague issues on the questionnaire. Study participants were clearly told they can seek assistance whenever there was any difficulty. On top of that the questionnaire was pretested and those vague questions, phrases, words, etc were replaced with clearer ones that could be understood by all the different categories of health professionals.

Conclusion and Recommendations

The overall self-rated knowledge level was generally low. Knowledge of HCWs on the availability of important policies, legislations and guidelines which are important for enhancing good practices and maintaining the safety of workers was not adequately high. At the same time, HCWs' practice in terms of utilizing personal protective equipment was low. There is therefore a need to increase the awareness of these workers through in-service training which may subsequently improve their skill for good practices.

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