Research Article

Practices of Healthcare Workers regarding Infection Prevention in Bale Zone Hospitals, Southeast Ethiopia

Demisu Zenbaba,1 Biniyam Sahiledengle,2 and Daniel Bogale2

1Department of Environmental Health, Madda Walabu University Goba Referral Hospital, Bale Goba, Ethiopia
2Department of Public Health, Madda Walabu University Goba Referral Hospital, Bale Goba, Ethiopia

Correspondence should be addressed to Demisu Zenbaba; zdemisu@gmail.com

Received 17 April 2019; Revised 2 January 2020; Accepted 14 January 2020; Published 1 February 2020

Academic Editor: Carol J. Burns

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Introduction. In Ethiopia, infection prevention to protect patients, healthcare workers, and visitors from healthcare-acquired infections is one of a number of nationwide transformational initiatives to ensure the provision of quality healthcare services. The aim of this research was to assess the practice of healthcare workers regarding infection prevention and its associated factors in Bale zone Hospitals. Methods. A cross-sectional study targeted 402 healthcare workers using simple random sampling to learn about their practices related to infection prevention. Data were collected in interviews using pretested, structured questionnaires. Returned questionnaires were checked for completeness and then data were entered into a database and analyzed using SPSS Version 20. Adjusted odd ratio (AOR) with a 95% confidence interval was calculated to determine the strength of association, and variables with a p value <0.05 in the final model were considered as statistically significant. Results. Three hundred ninety-four healthcare workers participated in the study. Of these; 145 (36.8%, 95% CI 32, 42%) of them were found to have self-reported good infection prevention practice. Good knowledge towards infection prevention (AOR = 1.84, 95% CI 1.02, 3.31), availability of personal protective equipment (AOR = 1.96, 95% CI 1.16, 3.32), and water (AOR = 4.42, 95% 2.66, 7.34) at workplace were found to have a statistically significant association with healthcare workers self-reported good infection prevention practices. Conclusions. In this study, slightly more than one-third of the healthcare workers reported to have good infection prevention practice. Good knowledge towards infection prevention, working in departments, availability of personal protective equipment, and water at work place were found to have statistically significant association with self-reported good infection prevention practices.

1. Introduction

Infection prevention refers to all policies, procedures, and activities which aim to prevent or minimize the risk of transmission of infectious diseases at healthcare facilities. An effective hospital infection prevention and control program improves patient safety and the quality of patient care and reduces adverse socioeconomic and psychological impact of infectious diseases to patients and health systems [1, 2]. In Ethiopia, infection prevention in healthcare settings is a nationwide initiative that involves the implementation of recommended infection prevention practices in every aspect of patient care. Such practices include hand hygiene, injection safety, and healthcare waste management among infection prevention components [3, 4].

Healthcare-associated infections (HCAIs) are a major challenge for low- and middle-income countries which have limited healthcare resources. HCAIs pose a real and serious threat to both the patients and healthcare workers. Common pathogens may easily be transmitted through healthcare workers’ hands, equipment, supplies, and unhygienic practices [5, 6]. An estimated 10% of hospitalized patients in developed countries and 25% in developing countries develop HCAIs and subsequently result in adverse healthcare outcomes as increased hospital stay, economic burden, significant morbidity, and mortality. It is unevenly distributed in
developing countries where more than 90% of these infections occurred [7–9]. The high burden of HCAs is due to the lack of standardized infection prevention programs, which was neglected due to limited resources, poor sanitary conditions, and hygiene practices [10–12].

The World Health Organization (WHO) estimates that 3 million percutaneous exposures occur annually among 35 million HCWs globally, over 90% occurring in resource constrained countries. Healthcare workers in Africa suffer two to four needlestick injuries per year on average [13, 14], with Nigeria, Tanzania, and South Africa reporting 2.10 injuries per healthcare workers on average. Worldwide occupational exposure accounts for 2.5% of HIV cases and 40% of hepatitis B and C cases among HCWs [15]. Each year as a consequence of occupational exposure, an estimated 66,000 hepatitis B, 16,000 hepatitis C, and up to 1,000 HIV infections occur among healthcare workers. These infections are preventable through infection prevention measures which significantly reduce the risk of HIV and hepatitis transmission among healthcare workers [16].

The Centers for Disease Control and Prevention estimates that 2 million patients suffer from hospital-acquired infections and nearly 100,000 of them die every year. Hepatitis B virus, hepatitis C virus, and HIV infection are mostly transmitted by healthcare workers who fail to practice infection prevention measures. Hence, healthcare workers are front line of protecting themselves and clients from infection [17–19].

A study conducted in Jimma Zone, Ethiopia, also showed that the majority of injections were completed by recapping the syringe and needle. Many healthcare workers reported frequent needlestick injuries in one year, associated with sudden movement of patients, disposal of sharp materials, recapping during surgical procedures, and recapping of needles immediately after use [20, 21].

A study conducted in the west Arsis zone, southeast Ethiopia, indicated that healthcare workers had poor hand-hygiene practice after patient care during their regular activities. About 39% of healthcare workers had a history of contact with blood and body fluids; if such event occurred, 40% of workers believed that cleaning the wound with alcohol was the best measure to be taken to prevent infection while 60% wash/rinse with water [22]. To better understanding of healthcare worker’s compliance with infection prevention measures and to minimize the risk of occupational exposure to healthcare associated infections, the assessment of the current infection prevention practice is vital in Bale zone hospitals. To the best of our knowledge in southeast part of Ethiopia, particularly in Bale zone, there is no study that describes healthcare workers infection prevention status. The current study is the first attempt to describe practice of healthcare workers regarding infection prevention.

2. Materials and Methods

2.1. Study Area and Period. A cross-sectional study of healthcare workers practices regarding infection prevention was conducted in Bale zone hospitals, southeast Ethiopia. In Bale zone, there are 84 health centers and five hospitals (One Primary and Referral Hospital, three General Hospitals). All hospitals found in the Bale zone were included in the study. The sampling frames of healthcare workers were prepared for each hospital, and the simple random sampling method was used to selected study participants by the lottery method. The study period was from February 01/2018 to 28/2018.

2.2. Source and Study Population. The source and study populations were all healthcare workers (HCWs) except pharmacists, druggists, and environmental health officers who provide healthcare services in Bale zone hospitals.

2.2.1. Inclusion Criteria. Healthcare workers who had at least one of four possible contacts (patient, medical equipment, linens, and high-risk waste).

2.2.2. Exclusion Criteria. The healthcare workers who were on annual leave, on maternity leave, and ill and who had night duty were excluded from the study.

2.3. Sample Size Determination. The sample size was determined using the single-population proportion formula with a 5% margin of error (d) and a confidence level of 95% (Z). The sample size calculated for practice of healthcare workers regarding infection prevention was 382, and a 5% nonresponse rate was considered giving a final sample size of 402.

2.4. Data Collection Tool and Technique. Data were collected by interview using pretested, structured questionnaires containing health care workers’ sociodemographic characteristics, practices, and knowledge regarding infection prevention.

2.5. Data Quality Control. The questionnaire was developed first in English and translated to local languages by an expert of both languages “Amharic” and “Afaan Oromoo” and then back to English to check for consistency of the translation. To assure the data quality, data collection instruments were pretested, and in order to minimize over-reporting of infection prevention practices, the questionnaire was also set in PK (Practice and Knowledge) order. For each component, the reliability test was done and the reliability coefficient for practice and knowledge items had a Cronbach’s alpha of 0.750, and 0.732 was found to be the acceptable level. A pretest was conducted using 5% of the intended total sample size (20 individuals). By doing so, the tool was checked for its clarity, understandability, and completeness.

2.6. Data Processing and Analysis. The returned questionnaires were checked for completeness, and then, data were coded, entered, cleaned, and stored using SPSS Version 20 statistical software for analysis. Descriptive statistics (mean
(SD), median, mode, and frequency tables) were computed to check normal distribution of data and describe practice of healthcare workers regarding infection prevention. Bivariate logistic regression analysis was used to identify the candidate variables for multivariable logistic regression by using a \( p \) value less than 0.2. Adjusted odds ratio with 95% confidence interval was calculated to determine the strength of association, and variables having a \( p \) value <0.05 in the final model were considered as statistical significance.

2.7. Operational Definition. Practices of healthcare workers regarding infection prevention were assessed for main domains of infection prevention measures like hand hygiene, utilization of personal protective equipment (PPE), and postexposure prophylaxes (PEP), healthcare waste management, and safe injection. Infection prevention knowledge and practice of healthcare workers were assessed by using 20 items/questions (10 for each of them).

2.7.1. Good Infection Prevention Practice. Respondents who correctly answer questions regarding infection prevention practice scored above (≥70%). In the same manner, the knowledge of healthcare workers regarding infection prevention was assessed.

3. Results

3.1. Sociodemographic and Work-Related Characteristics of Study Participants. Among 402 healthcare workers selected, 394 healthcare workers were interviewed with a response rate of 98%. From total study participants, 202 (51.3%) males and 192 (48.7%) females were participated in study with age ranging from 18 to 43 years and mean age of 28.8 years (SD ± 5.2) (Table 1).

3.2. Practices of Healthcare Workers regarding Infection Prevention. A summary score was developed from continuous data of practice of healthcare workers regarding infection prevention. The mean was 5.5 (SD ± 2.22), and the median and mode were 6. Using this cutoff point, the practices of healthcare workers were categorized as good (code = 1 above mean value or ≥70%) and poor (code = 0 score less than 70%). Accordingly, 145 (36.8%) (95% CI 32), 42%, of HCWs had good self-reported infection prevention practice with while 249 (63.2%) of HCWs had poor practice (Table 2).

3.3. Factors Associated with Practices of HCWs regarding Infection Prevention. Healthcare workers working in pediatric wards had 66% lower odds of self-reported good infection prevention practices than HCWs working in medical and surgical wards (AOR = 0.34, 95% CI (0.15, 0.76)). In this study, waste handlers had 75% lower odds of self-reported good practice regarding infection prevention than healthcare workers who had the profession of medical laboratory technician or technologist and other professions (AOR = 0.25, 95% CI (0.08, 0.78). The study participants who had all necessary personal protective equipment (AOR = 1.96, 95% CI 1.16, 3.32) and water (AOR = 4.42, 95% 2.66, 7.34) at their work place nearly two and four times more likely reported to have good infection prevention practice than their counterpart, respectively (Table 3).

4. Discussion

Hospital-acquired infection is a common problem all over the world. Without adequate infection prevention practice,
healthcare workers are at a higher risk of acquiring infectious diseases. Therefore, up-to-date healthcare workers knowledge and practice can play important roles in infection prevention and control [23, 24].

Based on the responses provided, in this study, slightly more than one-third (36.8%) of healthcare workers had good self-reported infection prevention practice, which is lower than study findings in an Egyptian hospital, 57.3% [25], in Bihar Dar city, Ethiopia, 54.2% [26], in governmental healthcare facilities, Addis Ababa, 66.1% [27], and in Shenen Gibe hospital, 68.08% [28]. The possible reason for the current low practice might be due to 1) variation in cut of point which is used to determine the outcome variable 2) variation in type and number of healthcare facilities included in these studies, 3) difference in healthcare worker infection prevention training (e.g., only 13.2% of healthcare works reported that they received infection prevention training in the past 12 months), and 4) sample size discrepancy. Healthcare workers who had good knowledge appeared to have nearly two times the likelihood of reporting good practice scores than those who had poor knowledge. In addition, the healthcare workers who had all the necessary personal protective equipment (PPE) and water supply at their workplace were nearly two and four times more likely to report good practice than their counterparts (who had none of these supplies). This finding was consistent with the study finding in a governmental healthcare facility in Addis Ababa where healthcare workers who had PPE and continuous water supply were 1.37 and 1.68 times more likely to have good infection prevention practice, respectively [27]. In this study, 62.3% and 37.7% of healthcare workers had a history of sharp material injuries within the lifetime and the last one year, respectively. This finding was comparable with the study finding from three regional hospitals in Trinidad and Tobago in India, 20.3% [32], and lower than the study finding from a study conducted in Bihar Dar City administration, 84.2% [26], and in Wolaitta Sodo Otona Teaching and Referral Hospital, 99.3% [33]. These study findings were higher than an equivalent study finding of governmental healthcare facilities in Addis Ababa, 55.6% [27].

Table 2: Practice of healthcare workers regarding infection prevention in Bale zone hospitals, 2018 (n = 394).

| Variables                                      | Response option | Frequency | Percent |
|------------------------------------------------|-----------------|-----------|---------|
| Wash your hands at all critical times          | Yes             | 236       | 59.90   |
|                                                | No              | 158       | 40.10   |
| Use single-paired glove repeatedly             | Yes             | 179       | 53.60   |
|                                                | No              | 155       | 46.40   |
| Wearing an apron when blood or body fluid splash is expected | Yes             | 191       | 48.50   |
|                                                | No              | 203       | 51.50   |
| Use mask to protect yourself from pulmonary TB infection | Yes             | 159       | 40.40   |
|                                                | No              | 235       | 59.60   |
| Wearing all necessary personal protective equipment | Yes             | 276       | 70.10   |
|                                                | No              | 118       | 29.9    |
| Soak contaminated medical equipment in 0.5% chlorine solution | Yes             | 275       | 69.80   |
|                                                | No              | 119       | 30.2    |
| How long did you soak                          | For 10 minutes  | 202       | 72.90   |
|                                                | For 1 hr        | 68        | 24.50   |
|                                                | For 24 hr       | 7         | 2.5     |
| Segregation of wastes as infectious and noninfectious | Yes             | 215       | 54.70   |
|                                                | No              | 179       | 45.30   |
| Dispose nonreusable sharp materials wastes in safety box | Yes             | 226       | 67.70   |
|                                                | No              | 108       | 32.30   |
| Two hand recapping of needles after injection  | Yes             | 92        | 27.60   |
|                                                | No              | 241       | 72.40   |

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Table 3: Bivariate and multivariable logistic regression analysis of factors associated with practice of healthcare workers regarding infection prevention in Bale zone hospitals, 2018 (n = 394).

| Variables                             | Level of healthcare workers | IP practice | p value | Crude OR (95% CI) | Adjusted OR (95% CI) | p value |
|---------------------------------------|----------------------------|-------------|---------|-------------------|----------------------|---------|
|                                       | Good n (%) | Poor n (%)   |         |                   |                      |         |
| **Level of hospital**                 |              |              |         |                   |                      |         |
| Referral                              | 57 (39.6)   | 87 (60.4)    | 0.13    | 1.96 (0.83, 4.68) |                      |         |
| General                               | 80 (36.7)   | 138 (63.3)   | 0.20    | 1.74 (0.75, 4.05) |                      |         |
| Primary                               | 8 (25)      | 24 (75)      | 1       |                   |                      |         |
| **Working place**                     |              |              |         |                   |                      |         |
| Surgical and medical ward             | 50 (41.7)   | 70 (58.3)    | 1       |                   |                      | 0.009   |
| Pediatrics ward                       | 13 (24.5)   | 40 (75.5)    | 0.03    | 0.46 (0.22, 0.94) | 0.34 (0.15, 0.76)** | 0.12    |
| GI/Ob/ward                            | 37 (33)     | 75 (67)      | 0.18    | 0.69 (0.40, 1.18) | 0.62 (0.34, 1.14)   | 0.12    |
| Lab and others                        | 45 (41.3)   | 64 (58.7)    | 0.95    | 0.98 (0.58, 1.67) | 1.24 (0.62, 2.51)   | 0.54    |
| **Sex**                               |              |              |         |                   |                      |         |
| Male                                  | 81 (40.1)   | 121 (59.9)   | 0.16    | 1.34 (0.89, 2.02) |                      |         |
| Female                                | 64 (33.3)   | 128 (66.7)   | 1       |                   |                      |         |
| **Age**                               |              |              |         |                   |                      |         |
| <25 years                             | 33 (29.7)   | 78 (70.3)    | 1       |                   |                      |         |
| 25–30 years                           | 58 (34.5)   | 110 (65.5)   | 0.40    | 1.25 (0.74, 2.09) |                      |         |
| >30 years                             | 54 (47)     | 61 (53)      | 0.008   | 2.09 (1.21, 3.62)**|                      |         |
| **Profession**                        |              |              |         |                   |                      |         |
| Nurses and midwives                   | 110 (45.6)  | 131 (54.4)   | 0.37    | 0.7 (0.63, 2.67)  | 1.91 (0.77, 4.72)   | 0.16    |
| Physicians and HO                     | 13 (23.2)   | 43 (76.8)    | 0.11    | 0.49 (0.20, 1.18) | 0.79 (0.26, 2.42)   | 0.68    |
| Healthcare waste handler              | 6 (10.9)    | 49 (89.1)    | 0.003   | 0.20 (0.07, 0.57)**| 0.25 (0.08, 0.78)** | 0.02    |
| Lab. technologist and others          | 16 (38.1)   | 26 (61.9)    | 1       |                   |                      |         |
| **Educational status**                |              |              |         |                   |                      |         |
| First degree and above                | 87 (39.4)   | 134 (60.6)   | 0.001   | 4.73 (2.05, 10.90)*|                      |         |
| Diploma                               | 51 (44.3)   | 64 (55.7)    | 0.001   | 5.81 (2.43, 13.88)*|                      |         |
| Below diploma                         | 7 (12.1)    | 51 (87.9)    | 1       |                   |                      |         |
| **Service years**                     |              |              |         |                   |                      |         |
| <2 years                              | 27 (23.3)   | 89 (76.7)    | 1       |                   |                      |         |
| 2–5 years                             | 44 (38.6)   | 70 (61.4)    | 0.013   | 2.07 (1.17, 3.67)*|                      |         |
| >5 years                              | 74 (45.1)   | 90 (54.9)    | 0.001   | 2.71 (1.60, 4.60)*|                      |         |
| **IP training in past 12 months**     |              |              |         |                   |                      |         |
| Yes                                   | 24 (46.2)   | 28 (53.8)    | 0.14    | 1.57 (0.87, 2.82) |                      |         |
| No                                    | 121 (64.6)  | 221 (64.6)   | 1       |                   |                      |         |
| **Presence of IP committee**          |              |              |         |                   |                      |         |
| Yes                                   | 105 (41.7)  | 147 (58.3)   | 0.008   | 1.82 (1.17, 2.84)*|                      |         |
| No                                    | 40 (28.2)   | 102 (71.8)   | 1       |                   |                      |         |
| **Presence of IP guideline**          |              |              |         |                   |                      |         |
| Yes                                   | 95 (42.2)   | 130 (57.8)   | 0.01    | 1.74 (1.14, 2.66)*|                      |         |
| No                                    | 50 (29.6)   | 119 (70.4)   | 1       |                   |                      |         |
| **PPE availability**                  |              |              |         |                   |                      |         |
| Yes                                   | 111 (42.2)  | 151 (57.6)   | 0.001   | 2.12 (1.34, 3.36)*| 1.96 (1.16, 3.32)** | 0.01    |
| No                                    | 34 (25.8)   | 98 (74.2)    | 1       |                   | 1                    |         |
| **Continuous water supply**           |              |              |         |                   |                      |         |
| Yes                                   | 115 (49.1)  | 119 (50.9)   | 0.001   | 4.19 (2.61, 6.72)*| 4.42 (2.66, 7.34)** | 0.001   |
| No                                    | 30 (18.8)   | 130 (81.2)   | 1       |                   | 1                    |         |
| **Vaccinated for hepatitis B virus**  |              |              |         |                   |                      |         |
| Yes                                   | 110 (43.8)  | 141 (56.2)   | 0.001   | 2.41 (1.53, 3.80)*|                      |         |
| No                                    | 35 (24.5)   | 108 (75.5)   | 1       |                   |                      |         |
| **IP knowledge of HCWs**              |              |              |         |                   |                      |         |
| Good                                  | 121 (42.6)  | 163 (57.4)   | 0.001   | 2.66 (1.60, 4.43)*| 1.84 (1.02, 3.31)** |         |
| Poor                                  | 24 (21.8)   | 86 (78.2)    | 1       |                   |                      |         |

AOR: adjusted odds ratio; COR: crude odds ratio; CI: confidence interval, HCWs: healthcare workers; IP: infection prevention; PEP: postexposure prophylaxis; PPE: personal protective equipment; others: BSc in optometry, BSc in dental, psychiatric nurse, radiographer, laundry workers; *significant association (p < 0.05) crude; **significant association (p < 0.05) adjusted.
5. Limitations of the study
As participants were only chosen from hospital settings, generalization of this study is limited to hospitals of Bale Zone and not to smaller healthcare facilities found in the Bale zone.

6. Conclusions
Regardless of the above limitation, this study enables us to determine the status of healthcare workers’ self-reported practice regarding infection prevention revealing that slightly more than one-third of them have good self-reported practice. Good knowledge of healthcare workers regarding infection prevention, profession of healthcare workers, working place, availability of personal protective equipment, and water at the work place were found to have significant association with practice of healthcare workers infection prevention. Therefore, this required strong effort of all stakeholders, especially all levels of hospital administration, hospital infection prevention committee, and healthcare workers and updating healthcare workers infection prevention knowledge and practice through off-job and on-job training. Hospitals should improve infection prevention practices of healthcare workers by establishing or providing infection prevention facilities and supplies, continuous water supply at all working departments, hand washing sinks, and all necessary personal protective equipment. Besides, enforcement of existing laws on infection prevention at work places and continuous monitoring should be performed to increase adherence of healthcare workers to infection prevention practices.

Data Availability
The datasets used and analyzed during the current study are available from the corresponding author upon reasonable request.

Conflicts of Interest
The authors declare no conflicts of interest.

Acknowledgments
The authors would like to thank Dr. David Allison, all study participants, data collectors, supervisors, and Bale zone hospital administration for their helpful participation in this study.

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