

## Research Article

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

Demisu Zenbaba <sup>1</sup>, Biniyam Sahiledengle <sup>2</sup> and Daniel Bogale<sup>2</sup>

<sup>1</sup>Department of Environmental Health, Madda Walabu University Goba Referral Hospital, Bale Goba, Ethiopia

<sup>2</sup>Department of Public Health, Madda Walabu University Goba Referral Hospital, Bale Goba, Ethiopia

Correspondence should be addressed to Demisu Zenbaba; [zdemisu@gmail.com](mailto:zdemisu@gmail.com)

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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% CI 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 (HCAs) are a major challenge for low- and middle-income countries which have limited healthcare resources. HCAs 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 HCAs 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 ( $\geq 70\%$ ). 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 ( $SD \pm 5.2$ ) (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 ( $SD \pm 2.22$ ), 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  $\geq 70\%$ ) 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%

TABLE 1: Sociodemographic and work-related characteristics of the study participants in Bale zone hospitals, 2018 ( $n = 394$ ).

Variables	Frequency	Percent
<i>Respondents by their hospitals levels</i>		
Delo-mana general hospital	57	14.50
Ginner general hospitals	82	20.80
Goba referral hospital	144	36.50
Madda Walabu primary hospital	32	8.10
Robe general hospital	79	20.10
<i>Respondents working place</i>		
Surgical ward	54	13.71
Medical ward	66	16.75
Pediatrics ward	53	13.45
Obstetrics ward	65	16.50
Gynecology ward	47	11.92
Laboratory, X-ray, triage, VCT, MCH	40	10.15
OPDs (adult and under five OPD)	26	6.60
Clinics (eye, dental, ART, psychiatry clinics)	20	5.08
MOR, NICU, OR	18	4.57
Laundry	5	1.27
<i>Sex of respondents</i>		
Male	202	51.27
Female	192	48.73
<i>Age groups</i>		
18–24	80	20.31
25–31	206	52.28
32–38	83	21.07
39–45	25	6.35
<i>Educational status</i>		
Medical doctors	49	12.44
Masters	5	1.27
Degree	167	42.39
Diploma	115	29.19
1–8 <sup>th</sup> grade	4	0.10
9–12 <sup>th</sup> grade	54	13.71
<i>Profession</i>		
Physicians	48	12.18
Nurses	183	46.45
Midwives	58	14.72
Laboratory technician and technologist	18	4.57
Healthcare waste handler	55	13.96
Others*	32	8.12
<i>Service years or work experience</i>		
<2 years	116	29.44
2–5 years	114	28.93
5–10 years	125	31.73
>10 years	39	9.89

OPD = outpatient department, OR = operating theater, MOR = minor operation room, NICU = neonatal intensive care unit; \*BSc in dental, radiographer, psychiatric nurse, BSc in optometry, cataract surgeon, and laundry worker.

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,

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	30.20
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

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 work place 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 reported 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 appears to be higher than of study findings in two

administrative regions of Ethiopia, where the lifetime and last one year exposure were 30.5% and 25.7%, respectively [29]. Similarly, this finding was higher than a previous study of the prevalence of needlestick injury in Bale zone hospitals, 37.1% lifetime and 19.1% last one year [30]. The possible explanation for this discrepancy might be the number of healthcare facilities included in the study, duration of the study, and characteristics of study participants. The percent of healthcare workers with two hand needle recapping practice was 27.6%. This finding was comparable with the study finding in Mizan Aman general hospital, 27.8% [31]. Waste segregation is a hospital strategy to dispose infectious wastes off safely. In this study, 45.3% of healthcare workers reported not segregating waste at their work place. Healthcare workers report that 59.9% practice hand washing practices at all critical times; of these, 71% of HCWs report washing their hands before and after procedures. This result was better than the finding of 29.8% reporting hand washing in Shenen Gibe Hospital, southwest Ethiopia [28], and higher than the result reported from a study conducted in Bihar Dar City administration, 61% [26]. Majority of the healthcare workers (72.1%) appear to have good knowledge regarding infection prevention. This finding was better than the study finding from three regional hospitals in Trinidad and Tobago in India, 20.3% [32], and lower than the study finding 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]. The possible justification for this difference might be due to difference level of hospitals (only general), level or types of healthcare facilities (governmental vs. private, hospital vs. health center), sample size, and study participant characteristics.

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		<i>p</i> value	Crude OR (95% CI)	Adjusted OR (95% CI)	<i>p</i> value
	Good <i>n</i> (%)	Poor <i>n</i> (%)				
<i>Level of hospital</i>						
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		
<i>Working place</i>						
Surgical and medical ward	50 (41.7)	70 (58.3)		1	1	
Pediatrics ward	13 (24.5)	40 (75.5)	0.03	0.46 (0.22, 0.94)	0.34 (0.15, 0.76)**	0.009
G/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
<i>Sex</i>						
Male	81 (40.1)	121 (59.9)	0.16	1.34 (0.89, 2.02)		
Female	64 (33.3)	128 (66.7)		1		
<i>Age</i>						
<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)*		
<i>Profession</i>						
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	1	
<i>Educational status</i>						
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		
<i>Service years</i>						
<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 year	74 (45.1)	90 (54.9)	0.001	2.71 (1.60, 4.60)*		
<i>IP training in past 12 months</i>						
Yes	24 (46.2)	28 (53.8)	0.14	1.57 (0.87, 2.82)		
No	121 (64.6)	221 (64.6)		1		
<i>Presence of IP committee</i>						
Yes	105 (41.7)	147 (58.3)	0.008	1.82 (1.17, 2.84)*		
No	40 (28.2)	102 (71.8)		1		
<i>Presence of IP guideline</i>						
Yes	95 (42.2)	130 (57.8)	0.01	1.74 (1.14, 2.66)*		
No	50 (29.6)	119 (70.4)		1		
<i>PPE availability</i>						
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	
<i>Continuous water supply</i>						
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	
<i>Vaccinated for hepatitis B virus</i>						
Yes	110 (43.8)	141 (56.2)	0.001	2.41 (1.53, 3.80)*		
No	35 (24.5)	108 (75.5)		1		
<i>IP knowledge of HCWs</i>						
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	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.

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