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ORIGINAL RESEARCH

Compliance with Standard Precautions and Associated Factors Among Health Professionals in Public Hospitals of East Wallaga Zone, Oromia Regional State, Ethiopia

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Purpose: Health care workers are potentially exposed to infections through contact with blood and bodily fluids while performing their duties. Compliance with the standard precautions reduces the risks of health care workers' exposure to blood and bodily fluids. However, the compliance level among health care workers is not well studied in the study area. Therefore, this study aimed to assess the level of compliance with standard precautions and its associated factors among health care workers in all public hospitals of East Wallaga Zone, Western Ethiopia.

Materials and Methods: Multi-facility-based cross-sectional study was conducted among 392 health care workers, from January to February, 2022. Simple random sampling technique was used to select study participants. Logistic regression model was fitted to determine presence of statistically significant associations. A p-value of less than or equal to 0.05 along with the adjusted odds ratio of 95% confidence interval was used to declare statistical significance.

Results: The proportion of health care workers who comply with standard precautions was found to be 51.6% [95% CI; 46.9–56.7%]. Having positive attitude towards standard precautions (AOR=2.71; 95% C.I: 1.68–4.39), having training on standard precautions (AOR=3.27; 95% C.I: 2.019–5.29), and working in referral hospitals (AOR=1.83; 95% C.I: 1.13–2.96) were the associated factors of good compliance with standard precautions.

Conclusion: In this study, half of the health care workers comply with standard precautions. Positive attitude, training, and level of hospitals were factors for compliance with the standard precautions. As a result, to sustain and improve compliance of health care workers on standard precautions, periodic in-service training is needed to bring about behavioral changes among health care workers, particularly for those working in other settings than referral hospitals.

Keywords: compliance, standard precautions, health care workers, public hospitals, Ethiopia

Introduction

Standard precautions (SPs) are a basic level of infection control precautions in the care of all patients to reduce the risk of transmission of blood-borne and other pathogens from both recognized and unrecognized sources.[1] Implementing standard precaution measures is an effective means to reduce transmission of hospital acquired infections (HAIs) to patients, visitors, and employees.[1,2] The core components of standard precautions are hand and respiratory hygiene, use of personal protective equipment, appropriate handling of patient care equipment and soiled linen, safe injection, environmental cleaning and spills-management, and waste management.[1,2]

Hospital acquired infections pose a serious threat to both patients and health care workers. They affect hundreds of millions of patients, and about 3 million health care professionals around the world every year, irrespective of the

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economic level of countries.[2] Hepatitis B virus, Hepatitis C Virus and HIV infection are commonest HAIs, mostly transmitted by health care workers who fail to practice infection prevention measures.[3,4]

The World Health Organization (WHO) estimated that about 2.5% of HIV infections and 40% of HBV and HCV infections among health care workers worldwide were as a result of exposure following a needle stick injury.[5] The proportion of infections is frequently much higher in developing countries.[6]

Even though HAI is suggested to be reduced by applying standard precautions, the practice among HCWs in clinical settings is low, thus exposing them to risk of infections.[7,8] In Ethiopia, only about half of the HCWs practiced appropriate standard precautions.[9–11] The studies identified the associated factors for the poor compliance of the HCWs to the SPs, including lack of infection control programs, lack of training, lack of knowledge and negative attitude towards SPs, inadequate management support, lack of supplies, crowded hospitals and excessive workloads.[12–14]

Different initiatives were set globally and nationally to improve the wellbeing of patients, visitors, attendants, support staff, HCWs and general community in health care facilities, including Clean Care is Safer Care (WHO) and Ethiopian hospitals reform implementation guidelines (EHRG) aiming to improve quality of service and Clean and Safe Hospitals (CASH) aiming to make hospitals a clean, comfortable and safe environment for HCWs by Ethiopian government.[15–17]

In spite of different initiatives, studies indicated that there is poor compliances to SPs among HCWs and there is a need to identify the associated factors to the problem. Therefore, the current study aimed to measure the level of compliance of health care workers to the SPs and its associated factors in public hospitals of East Wallaga Zone, Western Ethiopia.

Materials and Methods

Study Area and Design

Multi-facility-based cross-sectional study design was employed from January to February, 2022 in the public hospitals of East Wallaga Zone. There were five public hospitals in the Zone with a total of 902 health care workers. All five public hospitals were included in the study.

The source population of the study comprised all health care workers who were working in the five public hospitals of East Wallaga Zone. Whereas he study population was randomly selected health care workers who have direct contact with patients, bodily fluids, specimens and medical devices (physicians, nurses, midwives and laboratory professionals) in the study area, who presented during the data collection period.

Sample Size and Sampling Procedures

Single-population proportion formula was used to determine the sample by considering the proportion of good practice of standard precautions, 57.8% from previous study in Ethiopia,[9] 95% confidence interval (CI), and margin of error of 5%. After adding a 5% non-response rate, the final sample size was 392. A sampling frame of health care workers in each hospital was prepared, and the total sample of 392 was allocated to each hospital based on the proportion of HCWs. The sample assigned to each hospital was proportionally allocated to each category of HCWs. The study unit was selected by using simple random sampling.

Study Variables and Measurements

The dependent variable is compliance of HCWs to the standard precautions, and independent variables include socio-demographic characteristics (age, gender, marital status, professional category, educational level, working experience), health care worker-related factors (HCWs' knowledge of and attitude toward SPs), health facility-related factors (availability of personal protective equipment [PPE], availability of water, availability of guidelines), and availability of supportive supervision, infection prevention committee, workload, training and hospital level.

Compliance of health care workers regarding standard precautions was assessed for the main elements of standard precaution measures like hand hygiene, utilization of PPE, health care waste management, and disposal of sharp materials. Three-point Likert-type scale options ranging from "never" to "always" were employed by the study participants. Each response was dichotomized as compliant or non-compliant. Those who always fulfill all the

requirements of SPs were categorized as compliant, while those who missed one or more of the items (those who reported never and sometimes) were categorized as non-compliant.[18,19] The scoring for analysis was: those who practiced the SPs always=1; those who claimed to never or sometimes practice the SPs=0. Then, HCWs' scores for compliance with infection prevention measures were summed to give the total compliance level. The total scores were classified based on the mean average:.those above the mean were compliant, those below the mean were non-compliant.

To measure respondents' knowledge and attitude status, for each factor five questions were provided. To get their knowledge status, score of 1 was assigned for each correct answer and 0 for incorrect answer; hence the total score of knowledge items ranges from 0 to 5. Consequently, HCWs' knowledge of SPs was classified into two categories: good knowledge (if greater than or equal to the mean) and poor knowledge (if below the mean). For attitude status, mean value of attitude score was calculated and respondents were classified as having a positive attitude if equal to or above the mean, and a negative attitude if below the mean.[18,19]

Data Collection Tools and Procedures

The questionnaire was developed using Ethiopian infection prevention guidelines and other literature.[15] It was collected through a self-administered structured questionnaire. Four trained BSc nurses were selected from hospitals to collect the data. Data collectors were trained and well-experienced personnel with the necessary proper supervision.

To ensure the quality and consistency of the tool and its clarity and ability to be easily understood by each respondent, the questionnaire was pretested at Gimbi General Hospital, and modification of some questions was done accordingly. The reliability of the tool was checked using Cronbach alpha, which was 86%. The supervisors checked the completeness of the questionnaire and its clarity by continuous supervision and monitoring.

Statistical Analysis

After evaluation of the response completeness, coding was performed by the researchers and entered into Epi data 3.1 using double-entry techniques. Then, data was exported and analyzed by using SPSS version 26. Any errors identified at the time were corrected after referring to the original data using the code numbers. Based on the nature of variable frequency distributions, summary statistics were computed to summarize as well as describe the data.

Variables were checked for multi-collinearity using variance inflation factor (VIF). All the candidate variables had VIF of less than 1.06. Hosmer–Lemeshow was used to check model fitness. Logistic regression model was employed to compute bivariable and multivariable analysis. Those variables with a p-value of <0.25 in bivariable analysis were fit into a multivariable logistic regression model to control for confounders, and identify the independent predictors of compliance with standard precautions. A p-value of ≤0.05 was considered statistically significant in the multivariable logistic regression. Finally, the strength of association was measured using adjusted odds ratios with a 95% confidence interval.

Results

Socio-Demographic Characteristics

Out of 392 sampled health care workers, 372 participated in this study, making a 94.8% response rate. The mean age of the study participants was 34.6 and (SD ± 5.33) years, ranging from 27 to 59 years. The majority (225, 60.5%) of the respondents were nurses and more than half (198, 53.2%) were female. Concerning marital status, the majority of respondents (237, 66.6%) were married and most (156, 41.9%) had served between 6 and 10 years. Regarding level of education, most respondents (250, 67.2%) were BSC holders (Table 1).

Practices of Health Care Workers Regarding Standard Precautions

The practices of health care workers were categorized as compliant if they fulfilled all SPs and non-compliant if they missed one or more SP items. Accordingly, 192 (51.6%; 95% CI; 46.9–56.7) were compliant with SP activities (Table 2).

According to health care workers' self-reported hand-washing, 200 (53.8%) did so after contact with blood or bodily fluids and contaminated objects, 177 (47.6%) did so after patient care, 149 (40%) did so before aseptic procedures,

Table 1 Socio-Demographic Characteristics of Health Care Workers in Public Hospitals of East Wallaga Zone, Western Ethiopia, 2022 (n=372)

Characteristics	Category	Frequency	Percentage
Age	20–30	84	22.6
	31–40	229	61.6
	41–50	59	15
Sex	Male	174	46.8
	Female	198	53.2
Marital status	Single	101	27.2
	Married	245	65.9
	Widowed/Divorced	26	7
Professional category	Physician	46	12.4
	Nurse	225	60.5
	Laboratory tech.	38	10.2
	Midwife	63	16.9
Level of qualification	MSc. and above	63	16.9
	Degree	250	67.2
	Diploma	59	15.9
Service year	1–5 yrs	120	32.3
	6–10 yrs	156	41.9
	11–15 yrs	81	21.8
	>16	15	4.0

Table 2 Frequency Distribution of Compliance with Standard Precautions Among Heath Care Workers in Public Hospitals of East Wallaga Zone, Western Ethiopia, 2022 (n=372)

Variables	Frequency		
	Never, N (%)	Sometimes, N (%)	Always, N (%)
I wash my hands with water and soap before patient care	108 (29)	117 (31.5)	147 (39.5)
I wash my hands with water and soap after patient care	31 (8.3)	164 (44.1)	177 (47.6)
I wash my hands with water and soap before aseptic procedures	100 (26.9)	123 (33.1)	149 (40)
I wash my hands with water and soap after touching blood, bodily fluids and contaminated items	28 (7.5)	144 (38.7)	200 (53.8)
I wear a gown during patient care	11 (3)	83 (22.3)	278 (74.7)
I wear clean gloves whenever there is a possibility of any bodily fluids	14 (3.8)	96 (25.8)	262 (70.4)
I change gloves between contacts with different patients	125 (33.6)	175 (47)	72 (19.4)
I use respiratory protection/face masks	26 (7)	146 (39.2)	200 (53.8)
I use eye protection whenever there is a possibility of bodily fluids splashing in my face	132(35.5)	145 (39)	95 (25.5)
I wear a waterproof apron whenever there is a possibility of bodily fluids splashing on my body	147 (39.5)	130 (35)	95 (25.5)
I practice high-level disinfection where sterilization is not applicable	138 (37.1)	145 (39)	89 (23.9)
I clean and disinfect all equipment and environmental surfaces with 0.5% chlorine solution	73 (19.6)	190 (51.1)	109 (29.3)
I recap needles after use	212 (57)	81 (21.8)	79 (21.2)
I dispose of non-reusable sharp material waste in safety box	26 (7)	61 (16.4)	285 (76.6)
I segregate wastes appropriately as infectious and non-infectious	29 (7.8)	238 (64)	105 (28.2)
Composite score (reliability scale=0.807)	21.5%	36.5%	42%

and 147 (39%) did so before patient care. Concerning use of PPE, more than half (278, 74.4%) wear a gown, 262 (70.4%) wear gloves, 200 (53.8%) wear a mask, 95 (25.5%) wear an apron, 95 (25.5%) wear eye protection, and 72 (19.4%) change gloves in between patient contacts.

Among participants, 285 (76.6%) dispose of sharp materials appropriately; 109 (29.3%), 105 (28.2%), 89 (23.9%), and 79 (21.2%) clean equipment and environmental surfaces with 0.5% chlorine solution, segregate wastes appropriately, practice high-level disinfection where sterilization is not applicable, and recap needles after use, respectively (Table 2).

Health Worker-Related Factors

The overall knowledge and attitude status of respondents was measured by computing their response on each of those items. The results show that 272 (73.1%) had good knowledge about SPs and100 (26.9%) had poor knowledge; 237 (63.7%) had a positive attitude regarding SPs practice and 135 (36.3%) had a negative attitude (Table 3).

Health Facility-Related Factors

Results of this study show that 224 (60.2%) respondents had received training on infection prevention, and 280 (75.3%) reported that there are IP guidelines in their working department. Only 17 (4.6%) reported on the functioning of an infection prevention committee in their hospitals. Nearly one-fourth (68, 18.3%) of the health care workers reported that they had received supervision in the last year and more than half (243, 64.9%) reported that they have enough manpower for their work. Regarding PPE, 141 (37.9%) reported that they have a sufficient quantity and 147 (39.5%) reported having a functioning hand hygiene station.

Table 3 Distribution of Knowledge About and Attitude of Health Care Workers to Standard Precautions in Public Hospitals of East Wallaga Zone, Western Ethiopia, 2022 (n=372)

Variables	**Frequency**		
Knowledge questions	**Yes (%)**		**No (%)**
Standard precautions should be applied to all patients regardless of their diagnosis	310(83.3%)		62(16.7%)
All staff and patients should be considered potentially infectious	287(77.2%)		85(22.8%)
Needles should not be recapped before disposal.	133(35.8%)		239(64.2%)
Gloves provide complete protection from acquiring/transmitting infection	298(80.1%)		74(19.9%)
Protective clothing minimizes hospital acquired infection	334(89.8%)		38(10.2%)
Composite score	73.2%		26.8%
Reliability scale	0.75		
Attitude questions	**Disagree**	**Neutral**	**Agree**
Frequent hand washing damages skin and causes dryness and irritation	221(59.4%)	60(16.1%)	91(24.5%)
Standard precautions should be used only when attending to high-risk patients	260(69.9%)	60(16.1%)	52(14%)
Hand washing is unnecessary when gloves are worn	265(71.2%)	49(13.2%)	58(15.6%)
I am not at risk of Covid-19 pandemic because my health facilities were not the center for treating Covid-19 patients	275(73.9%)	55(14.8%)	42(11.3%)
You have a very low risk of acquiring infections from your patients	262(70.4%)	45(12.1%)	65(17.5%)
Composite score	69%	14.5%	16.5%
Reliability scale	0.75		

Exposure Status of Respondents to Needle Stick Injuries and Blood and Bodily Fluids

Of all participants, 372 responded to questions regarding the experience of occupational exposure to needle stick injuries (NSIs) and blood and bodily fluids (BBF): 144 (39%) reported experiencing NSIs at least once during the previous year and 173 (46%) reported exposure to BBF at least once during the previous year. Among these, only 111 (31.5%) followed post-exposure prophylaxis procedures after potential exposure (Table 4).

Factors Associated with Compliance with Standard Precautions

Logistic regression analysis shows that training, attitude and level of hospitals were significantly associated with compliance with standard precautions. In this study, those who had a positive attitude towards their job were 2.71 times more likely to comply with SPs (AOR: 2.71, 95% CI: 1.68–4.39) when compared to their counterparts. Those who got training were 3.27 times more likely to comply with SPs (AOR: 3.27, 95% CI; 2.019–5.29) when compared to those who did not get training. Similarly, the odds of complying with SPs were about 2 times higher in those who work in referral hospitals when compared to those who work in general hospitals (AOR: 1.83, 95% CI; 1.133–2.96) (Table 5).

Table 4 Health Facility-Related Factors Among Health Care Workers for Compliance with SPs in Public Hospitals of East Wallaga Zone, 2022

Variables	Response	Frequency	Percentage
Standard precaution training given	Yes	224	60.2
	No	148	39.8
Availability of standard precaution guidelines	Yes	280	75.3
	No	92	24.7
Supervised for standard precaution activities	Never	72	19.4
	Sometimes	232	62.4
	Always	68	18.3
Having enough manpower	Yes	243	64.9
	No	129	35.1
Functionality of infection prevention committee	Never	242	65.1
	Sometimes	113	30.4
	Always	17	4.6
Availability of enough personal protective equipment	Never	38	10.2
	Sometimes	193	51.9
	Always	141	37.9
Availability of hand hygiene stations	Never	75	20.2
	Sometimes	150	40.3
	Always	147	39.5
Level of hospital	General	143	34.7
	Referral	229	65.3

Table 5 Logistic Regression Analysis for the Factors Associated with Compliance with Standard Precautions Among HCWs in East Wallaga Zone, 2022

Characteristics		Compliance status		COR (95% CI)	AOR (95% CI)
		Compliant	Non-compliant		
Professional category	Nurse	119	106	1.92(0.95,3.91)	1.799(0.817,3.69)
	Physician	24	22	1.87(0.78,4.49)	1.800(0.670,4.83)
	Midwife	35	28	2.14(0.94,4.89)	2.12(0.893,5.68)
	Laboratory professional	14	24	1	1
Experiences in years	1–5	60	60	1	1
	6–10	83	70	1.18(0.735,1.91)	1.18(0.691,2.02)
	11–15	44	40	1.10(0.63,0.92)	1.56(0.833,2.95)
	>16	5	10	0.50(0.161,1.52)	0.40(0.115,1.40)
Knowledge	Good knowledge	145	125	1.35(0.86,2.14)	1.31(0.772,2.21)
	Poor knowledge	47	55	1	1
Attitude	Negative attitude	50	85	1	
	Positive attitude	142	95	2.54(1.64,3.94)	2.71(1.68,4.39)*
Training	Yes	141	83	3.23(2.09,4.98)	3.27(2.019,5.29)*
	No	51	97	1	1
Level of hospital	General	52	77	1	1
	Referral/specialized	140	103	2.01(1.30,3.03)	1.83(1.133,2.96)*
Manpower	Yes	131	112	1.30(0.85,2.00)	1.19(0.755,2.11)
	No	61	68	1	

Note: *Significant at p-value ≤0.05.

Discussion

The current study reveals that about half of the health care workers were compliant with SPs. The compliance level of SPs among HCWs was similar with that of studies conducted at Addis Ababa Hospital and Hawasa University Comprehensive Hospital, in which 50.65% and 56.7% of HCWs were compliant with SPs, respectively.[20,21] This result is higher than in the studies into respondent compliance with SPs conducted at Gondar University Comprehensive Specialized Hospital (12%),[6] in West Arsi Zone (36.3%),[14] and in Northern Cyprus (30.6%).[22] When our results are compared with studies conducted in Dawuro Zone[18] and Tanzania,[23] in which 65.0% and 77% of HCWs complied with standard precautions, respectively, we found a low level of compliance.

The differences in compliance level could be attributable to the differences in methodological and demographic characteristics of the participants. Some of the studies conducted in the aforementioned health facilities had included HCWs in health centers as study participants in addition to hospital health workers. [6,10,22] Another study included non-health professionals as data participants.[24] In addition, one study used a measurement mechanism for dependent variables that differed from our study.[6]

This study identifies factors that are significantly associated with SPs. HCWs who were given training on standard precautions were 3.27 times more likely to comply with SPs than HCWs who did not get such training. This finding is similar to those from studies done at Hawasa Comprehensive Hospital,[21] Health Institution in Enugu, Nigeria,[24] Kembata Tembaro Zone,[19] West Arsi Zone,[14] Mekelle Special Zone,[25] and Debre Markos Referral Hospital.[26] The possible explanation for this finding could be that training upgrades the knowledge and skills of HCWs so that they implement compliance with SPs more easily and frequently.

Respondents who had a positive attitude towards SPs were 2.7 times more likely to comply with SPs than those who had a negative attitude. This result was similar to the findings at Gondar University Comprehensive Specialized Hospital,[6] and hospitals in Hadiya Zone,[27] which showed that HCWs who had a positive attitude were about 3.5 times and 3.1 times more likely to always comply with SPs than those who had a negative attitude, respectively.

Hospital level was another factor which was significantly associated with SP compliance; HCWs working in referral hospitals were 1.8 times more likely to comply with SPs than those working in general hospitals. This finding is similar to those from Addis Ababa hospitals,[20] in which the odds of developing SPs for HCWs working in specialized hospitals are 2.4 times higher than for HCWs working in general hospitals. This might be because HCWs in the referral hospitals have opportunities to engage in various SP training, making it likely that their levels of compliance with SPs would be higher than those of HCWs working in general hospitals.

One of the limitations of this study is that it could not show cause and effect relationships. Also, since participants were only chosen from hospital settings, generalization of this study is limited to hospitals found in East Wallaga Zone. In addition, a bias of over-reporting or under-reporting of respondents' practices probably occurred.

Conclusions

Generally, only half of the study participants comply with the SPs in the public hospitals of East Wallaga Zone. This compliance level is so low that there is the likelihood of acquiring health care associated infections. Having training regarding SPs, having a positive attitude towards SPs, and working in referral hospitals were significantly associated with complying with SPs. Administrative bodies of hospitals need to provide comprehensive and continuous in-service training for all HCWs. Health care workers need to strengthen their adherence to SPs.

Data Sharing Statement

The datasets used and analyzed during the current study are available from the corresponding author, Bikila Regassa Feyisa, on reasonable request.

Ethical Approval and Consent to Participate

Ethical clearance was granted by Wallaga University research ethics review committee, reference no. DPH/037/2013. A formal, official letter of cooperation was written by Wallaga University, Institute of Health Sciences.

This official letter from East Wallaga zonal health office giving permission for the study to be conducted in the hospitals was given to the hospitals' management bodies. The purpose and significance of the study was explained for each participant. Written consent was obtained from each study participant before they filled in the questionnaire, and participants' involvement was only on a voluntary basis. Confidentiality of the participants' information was maintained, and the collected data was used for the research purposes only. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Declaration of Helsinki 1975, as revised in 2008.

Consent for Publication

All authors consent to the publication of the results of this study.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that they do not have any conflicts of interest.

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