

Knowledge, Attitude and Practice of Health Professionals on Infection Prevention in Northern Red-Sea Hospitals, Eritrea: A Cross sectional study

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Abstract

Background: Healthcare-associated infections have been reported to be a serious problem in the health-care services as they are common causes of illness and mortality among hospitalized patients. Health workers should have a good level of understanding of the knowledge, attitudes and practices in infection prevention and control in health care setups. The objective of this study was to evaluate the knowledge, attitude and practice of health professionals on infection prevention working in Northern Red Sea hospitals (Massawa, Gindae, Afabet, and Nakfa Hospitals).

Methodology: The research was a descriptive cross sectional hospital based study and all nurse categories, medical doctors, and laboratory workers were included in this study. Data was collected by face to face interview using structured questionnaire; then entered and analyzed by CSPro 7.2 and SPSS software version 21 respectively.

Results: The study showed that 43.6% of the respondents were aged below 25 years with 65% has less than five year's clinical experience. Majority of them were from Gindae Zonal Referral Hospital (34.3%) and Massawa Hospital (27.1%). They were dominated by health assistants (47.8%) and comprehensive nurse midwife (20.1%). Of the respondents, 91.6% had good knowledge and positive attitude but only 77.1% reported good practice in infection prevention measures. Health workers in Nakfa Hospital had the highest knowledge (100%) and attitude (100%) but they had the lowest practice (58.3%) compared to other hospitals and laboratory staffs had the highest knowledge (100%), attitude (100%) and practice (90%) by profession.

Conclusion: Health workers in Northern Red Sea region hospitals had good knowledge and positive attitude in infection prevention measures, but they practiced it less frequently. Background of respondent's doesn't show significant association to their knowledge, attitude and practice. Regular training and monitoring, supplementation of personal protective materials and continuous supervision are highly recommended to the health workers.

Keywords: Clinical environment; Hospital-acquired infections; Standard precautions; Knowledge; Attitude; Practice; Infection prevention

Introduction

Healthcare-acquired infections (HAIs) are a common global challenge mainly in low and middle-income countries. An estimated 10% of hospitalized patients in developed countries and 25% in developing countries acquire HAIs and subsequently results in adverse healthcare outcomes as increased hospital stay, economic burden, significant morbidity, and mortality. It is an unevenly distributed in developing countries, more than 90% of these infections occurred. The high burden of HAIs is due to lack of standardized infection prevention program, which was neglected due to limited resources, poor sanitary conditions and hygiene practices [1]. The endemic burden of health care-associated infection is also significantly higher in low- and middle-income than in high-income countries, in particular

in patients admitted to intensive care units and in neonate. Despite the availability of low-cost interventions for infection prevention and control, the compliance with standard infection control practices remains very low, particularly in low-income and middle income countries [2].

Hospital-acquired infections otherwise known as nosocomial infections are infections acquired in the hospital or other health-care facilities that were not present or incubating at the time of the client's admission. Most nosocomial infections are transmitted by health-care personnel who fail to put into practice standard infection prevention measures. Such measures not only protect the patient but also the HCWs and the environment [3]. Implementing standard precautions like safety injection, isolation precautions, patient bathing, antibiotic stewardship, vaccinations, and environmental cleaning, disinfection, and sterilization, comprehensive unit based safety program and surveillance were the major steps of infection prevention. Surveillance data in real time allows infection control practitioners to identify and

understand important nosocomial infections and to detect epidemics or outbreaks [1].

Client safety in the health-care environment requires the reduction of microorganism transmission. Infection control practices are directed at controlling or eliminating source of infection in the health-care agency, home, or communities to reduce the occurrence and transmission of infectious diseases. Among health workers, nurses spend the greatest time in caregiving setting. Nurses' involvement in infection control measures will yield positive results in infection prevention and control in hospitals [3]. The high costs of treating large numbers of patients and increasing occurrences of infection have posed a threat to standard precautions because these standards constitute the basic principles of HAI control [4]. Standard precautions include hand hygiene, use of appropriate personal protective equipment (PPE), use of aseptic technique to reduce patient exposure to microorganisms and management of sharps, blood spills, linen, and waste to maintain a safe environment [5]. There is an available low-cost intervention for infection prevention. Even though, the proportion of HCAs are much higher in sub-Saharan Africa (18.9% in Mali, 14.8%, in Tanzania, 9.8% in Algeria and 14.9%, in Ethiopia), the majority of healthcare knowledge towards infection prevention strategies is still very low [1]. An assessment of the knowledge, attitude and practice of standard precautions by healthcare workers is a prerequisite for initiating and implementing a successful infection prevention and control strategy in any health facility. Many studies have shown that Health Care Workers display variable knowledge, attitude and practice of standard precautions according to their professional group and duration of professional experience [6]. Healthcare workers should be equipped with the requisite knowledge, skill, and attitude for good infection control practices. Education through various means imparts knowledge about the correct practices, and also helps to update the existing knowledge according to the changing scenarios [7]. Therefore, the objective of the study was to evaluate the knowledge, attitude and practice of health professionals on infection prevention measures in Northern Red Sea hospitals (Massawa, Gindae, Afabet, and Nakfa).

Methodology

Study design and area

A descriptive cross sectional study design was used to determine knowledge, attitudes and practices of health professionals regarding infection prevention in Northern Red Sea region hospitals. In Northern Red Sea, there are four hospitals and these health facilities have 125 nurses of all types, 11 medical doctors and 35 laboratory workers, a total of 170 health professionals. But 30 of the health workers were excluded from the study as they had less than two months work experience and some of them were on vacations and annual leaves during the data collection. Thus a total of 140 health professionals had participated in the study. It was conducted in the clinical environment of the hospitals consisted of medical wards, pediatric wards, emergency department, delivery department (MCH),

laboratory unit and operation theatre. These fields were selected because health workers in these departments have direct contact on patients and should know and apply the infection prevention strategies. All health professionals with the qualification of medical doctors, Bachelor of Science in nursing, comprehensive nurse, associate nurses, and laboratory staffs, who works at least two months in the direct care of patients in the hospitals were included in the research. Health workers who were seriously ill, those on annual leave during data collection and Health workers of other fields were excluded from the survey.

Data collection

The research was conducted in six months duration from June to December 2019, in Gindae Zonal Referral, Massawa, Afabet and Nakfa Hospitals. A structured interviewer administered questionnaire was used as data collection tool. The questionnaire was partly modified from Osuala et al. [3] and adapted to the objective of the study. A pilot study was conducted in Amaterre health center (Massawa) health workers to develop and refine the methodology as to modify the data collection process to be used in the larger study. Ethical reviewing and approval was obtained from the Health Research Ethics Committee of the ministry of health. Informed consent was also asked to the health professionals before enrolment in the survey.

Data analysis and interpretation

Upon completion of data collection, data was coded and captured on CSPro and SPSS version 21 was used to statistically analyze the data. Percentage, frequency, and chi-squared test were used to determine the association of variables. Knowledge was scored by summing up correct responses to eleven knowledge items and expressing as a percentage of the total items. A total of 11 knowledge, 12 attitude and 11 practice questions were summed in each part. These who respond correct were given one point and those didn't respond correctly were given zero. The results were summed in each part and calculated as percent. These with a score of 0–69% were considered poor, and $\geq 70\%$ was considered good knowledge. Attitudes and practices were scored in the same way.

Results

Socio demographic characteristics of respondents

A total of 140 health professionals were participated in the study and the majority was aged below 25 years (43.6%) with male predominance (53.6%). The distribution of the study participants were from Gindae Zonal Referral Hospital (34.3%), Massawa Hospital (27.1%), Afabet Hospital (21.4%) and Nakfa Hospital (17.1%). The study participants were dominated by health assistants (47.8%) and comprehensive nurse midwives (20.1%). Moreover; most of the study participants work in laboratory (15.7%), MCH (15%), and medical ward (15%). Of the respondents, 65% have less than five year's clinical experience (Table1).

Categories	Frequency (N)	Percent (%)
Age group (years)		
<=25	61	43.6

26-30	45	32.1
31-35	11	7.9
>=36	23	16.4
Sex		
Male	75	53.6
Female	65	46.4
Work place		
Massawa Hospital	38	27.1
Gindae Zonal Referral Hospital	48	34.3
Afabet Hospital	30	21.4
Nakfa Hospital	24	17.1
Profession of respondent		
Medical Doctor	9	6.7
Bachelor of Science in Nursing	12	9
Clinical laboratory science	12	9
Medical laboratory technician	10	7.5
Midwife	27	20.1
Health Assistant	64	47.8
Department (ward)		
Medical Ward	21	15
Surgical Ward	10	7.1
Pediatric Ward	12	8.6
Emergency Room	18	12.9
Operation Room	11	7.9
Maternal and Child health	21	15
Laboratory	22	15.7
Others(OPD, Matron, Supervisors)	25	17.9
Work experience		
<=2 years	49	35
3-5 years	42	30
>=6 years	49	35

Table1: Socio demographic characteristics of study participants.

Comprehensive knowledge, attitude and practice of health professionals

Of the study participants, 99.3% responded that shortage of sanitary and personal protective materials could be a risk for infection and 85.7% answered that all patients should be considered potentially infectious. Of the respondents, 83.6% replied that Standard

precautions apply to all patients regardless of their diagnosis and 91.4% of them answered that they knew how to prevent and control hospital-acquired infections and aware recommended guide lines for hand hygiene (96.4%).

Based on the results, 94.3% of the study participants thought that policies and procedures on infection control should be adhered at all

times and 90.7% knew that, it was their responsibility to comply with hospital-acquired infection guidelines. Of the respondents, 58.6% thought that the workload affects their ability to apply infection prevention guidelines, moreover; 92.9% believed that following the prevention guidelines would reduce rates of hospital-acquired infection. In addition to this 93.6% believed that they feel comfortable to tell coughing patients to follow cough hygiene procedures and 92.1% agreed that in the absence of universal precaution hospital facilities could be the source of infection, that nosocomial infection could pose serious outcome (83.6%).

The results showed that, 52.1% of the respondents practiced hand washing before and after direct contact with the patients; moreover,

63.6% reported that personal protective equipment was not always accessible. Of the participants, 81.4% reported that waste bins were available in their ward and 93.6% practiced that they discard sharp materials separately from other wastes after use with 97.9% discard wastes immediately in to their container. Of the respondents, 67.9% responded that they had isolation criteria for those admitted with highly contagious diseases. Even though 98.6% believed that Infection prevention measures could improve patient outcome, only 76.4% used to wear personal protective equipment when handling infectious patient (Table 2).

Parameters	Frequency (%)		
	Yes	No	Don't know
Knowledge			
2.1 Hospital acquired infection can be transmitted by medical equipment such as syringes, needles, thermometers etc.	135(96.4)	5 (3.6)	0(0)
2.2 Nosocomial infection is an infection that the patient comes with from home	20(14.3)	104(74.3)	16(11.4)
2.3 shortage of sanitary and personal protective materials could be a risk for infection	139(99.3)	0 (0)	1(0.7)
2.4 patients with communicable diseases can be admitted in the same ward with other Non-communicable patients.	32(22.9)	104(74.3)	4(2.9)
2.5 Micro-organisms are destroyed by using clean water	8(5.7)	131(93.6)	1(0.7)
2.6 Standard precautions apply to all patients regardless of their diagnosis.	117(83.6)	18(12.9)	5(3.6)
2.7 All patients should be considered potentially infectious.	120(85.7)	17(12.1)	3(2.1)
2.8 You can handle body fluids with bare hands if gloves are not available	4(2.9)	133(95)	3(2.1)
2.9 I know how to prevent and control hospital-acquired infections	128(91.4)	11(7.9)	1(0.7)
2.10 Aware of recommended guide lines for hand hygiene	135(96.4)	4(2.9)	1(0.7)
2.11 Is there infection control committee in your hospital?	80(57.2)	25(17.9)	35(25.0)
Attitude			
3.1 I do not have to wash hands if I used gloves.	9(6.4)	131(93.6)	0(0)
3.2 Policies and procedures on infection control should be adhered at all times	132(94.3)	5(3.6)	3(2.1)
3.3 I should attend training related to infection prevention and control regularly.	127(90.7)	13(9.3)	0(0)
3.4 The workload affects my ability to apply infection prevention guidelines	82(58.6)	57(40.7)	1(0.7)
3.5 It is not my responsibility to comply with hospital-acquired infection guidelines.	9(6.4)	127(90.7)	4(2.9)
3.6 I have enough time to comply with infection prevention guidelines	87(62.1)	51(36.4)	2(1.4)
3.7 I believe that following the prevention guidelines will reduce rates of hospital-acquired infection.	130(92.9)	8(5.7)	2(1.4)
3.8 I should follow the procedure guidelines of the unit.	132(94.3)	8(5.7)	0(0)
3.9 Feeling comfortable to tell coughing patients to follow cough hygiene procedures	131(93.6)	6(4.3)	3(2.1)
3.10 Do you agree that in the absence of universal precaution hospital facilities can be the source of infection	129(92.1)	8(5.7)	3(2.1)
3.11 Do you believe that nosocomial infection can pose serious outcome	117(83.6)	8(5.7)	15(10.7)
Practice			
4.1 I always wash hands before and after direct contact with the patients	73(52.1)	67(47.9)	0(0)
4.2 Knowledge of infection prevention control are being monitored in the hospital	60(42.9)	60(42.9)	20(14.3)

4.3 Personal protective equipment are always accessible	51(36.4)	85(60.7)	4(2.9)
4.4 Do you recap used needle?	42(30)	98(70)	0(0)
4.5 Do you have isolation criteria for those admitted with highly contagious diseases?	95(67.9)	34(24.3)	11(7.9)
4.6 Do you discard sharp materials separately from other wastes?	131(93.6)	6(4.3)	3(2.1)
4.7 Infection prevention measures can improve patient outcome	138(98.6)	1(0.7)	1(0.7)
4.8 Wear personal protective equipment when handling infectious patient	107(76.4)	30(21.4)	3(2.1)
4.9 Do you discard wastes immediately in to their container?	137(97.9)	3(2.1)	0(0)
4.10 Waste bins are available in my ward	114(81.4)	18(12.9)	8(5.7)
4.11 Do you wear personal protective measures as gowns and gloves when caring patient?	129(92.1)	11(7.9)	0(0)

Table 2: Assessment of Comprehensive knowledge, attitude and practice of health professionals of Northern Red Sea region hospitals.

Health professionals of Northern Red Sea were having a good knowledge (91.4%) and attitude on infection prevention measures (91.4%) but their practice was slightly lower (77.1%) (Table 3).

	Frequency (N)	Percent (%)
Comprehensive knowledge		
Good knowledge	128	91.4
Poor knowledge	12	8.6
Comprehensive attitude		
Positive attitude	128	91.4
Negative attitude	12	8.6
Comprehensive practice		
Good practice	108	77.1
Poor practice	32	22.9

Table 3: Comprehensive knowledge, attitude and practice of respondents.

Socio demographic and comprehensive knowledge, attitude and practice of respondents

Health workers from Nakfa Hospital had reported the highest knowledge (100%) on infection prevention followed by Afabet (96.7%) and Massawa Hospital (89.5%). According to department, those who work in the pediatric ward (100%) and laboratory (100%) were having the highest knowledge and the lowest knowledge was reported in surgical (70%) and emergency department (83.3%). By profession, Laboratory staffs and health assistants were having the highest knowledge (100%) and (90.6%) respectively, while nurse degree workers were having the lowest knowledge (83.3%) in the infection prevention measures. There was no significant association of the background of the health workers to their knowledge on infection prevention.

Males were having positive attitude (96%) when compared to females (86.2%) and health workers in Nakfa Hospital were having the best attitude (100 %) while the lowest was reported in Massawa

Hospital (84.2%). Health workers who work in medical ward and laboratory reported the highest attitude while the lowest was observed in the pediatric ward (75.0%). By profession, Medical doctors and laboratory staffs were having the best attitude on infection prevention and the lowest was reported in health assistants (85.9%). The socio-demographic characteristics of the health workers don't show significant association to their attitude on infection prevention (Table 4). Of the respondents, those working in Massawa Hospital were having the best practice (89.5%) on infection prevention and the lowest was seen in those working in Nakfa Hospital (58.3%). By department, good practice was reported in those working in surgical ward (90%) and laboratory department (86.4%), while the lowest practice was observed in the operation room (63.6%) and MCH (71.4%) workers. By profession, good practice was reported in the medical laboratory technicians (90%) and medical doctors (88.9%). The background of the health workers doesn't show significant association to their practice on infection prevention measures Table 4.

Category	Good knowledge	Poor knowledge	p- value	Positive attitude	Negative attitude	p- value	Good practice	Poor practice	p- value
	N (%)		N (%)	N (%)					
Sex									
Male	69 (92.0)	6(8.0)	0.67	72 (96.0)	3(4.0)	0.37	60(80.0)	15(20.0)	0.25
Female	59 (90.8)	6(9.2)		56 (86.2)	9(13.8)		48(73.8)	17(26.2)	
Work place (hospital)									
Massawa	34(89.5)	4(10.5)	0.53	32(84.2)	6(15.8)	0.78	34(89.5)	4(10.5)	0.45
Gindae	41(85.4)	7(14.6)		45(93.8)	3(6.3)		37(77.1)	11(22.9)	
Afabet	29(96.7)	1(3.3)		27(90.0)	3(10.0)		23(76.7)	7(23.3)	
Nakfa	24(100)	0(0)		24(100)	0(0)		14(58.3)	10(41.7)	
Departments (Ward)									
Medical	20(95.2)	1(4.8)	0.64	21(100.0)	0(0)	0.28	17(81.0)	4(19.0)	0.66
Surgical	7(70.0)	3(30.0)		9(90.0)	1(10.0)		9(90.0)	1(10.0)	
Pediatric	12(100.0)	0(0)		9(75.0)	3(25.0)		9(75.0)	3(25.0)	
Emergency	15(83.3)	3(16.7)		14(78.8)	4(22.2)		13(72.2)	5(27.8)	
OR	10(90.9)	1(9.1)		10(90.9)	1(9.1)		7(63.6)	4(36.4)	
MCH	20(95.2)	1(4.8)		20(95.2)	1(4.8)		15(71.4)	6(28.6)	
Laboratory	22(100)	0(0.0)		22(100)	0(0.0)		19(86.4)	3(13.6)	
Profession									
MD	8(88.9)	1(11.1)	0.41	9(100.0)	0(0.0)	0.12	8(88.9)	1(11.1)	0.83
BSN	10(83.3)	2(16.7)		11(91.7)	1(8.3)		9(75.0)	3(25.0)	
CLS	12(100.0)	0(0.0)		12(100.0)	0(0.0)		10(83.3)	2(16.7)	
MLT	10(100.0)	0(0.0)		10(100.0)	0(0.0)		9(90.0)	1(10.0)	
Midwife	24(88.9)	3(11.1)		26(96.3)	1(3.7)		20(74.1)	7(25.9)	
HA	58(90.6)	6(9.4)		55(85.9)	9(14.1)		50(78.1)	14(21.9)	

Table 4: Association of socio demographic to comprehensive knowledge, attitude and practice of respondents.

Discussion

Knowledge and practice of infection prevention measures are vital for controlling and management of different diseases. Therefore the objective of this study was to evaluate the knowledge, attitude and practice of health professionals on infection prevention in Northern Red Sea hospitals; namely Gindae zonal referral hospital, Massawa referral hospital, Afabet and Nakfa hospitals.

Based on this study, almost all of the health workers have responded that shortage of sanitary and personal protective materials could be a risk for infection and about half of them had practiced that they always wash hands before and after direct contact with the patients. This was higher to a study in the Healthcare Workers of Rural Nepal, although 97% agreed that hand should be washed before and after examining the patient, only 17.6% of them informed that they do not always wash their hands before and after examining a patient [8].

This study showed that, 91.4% of the health workers had good knowledge, which is lower to a study in Wolaitta Sodo Otona teaching and referral hospital, Ethiopia (99.3%) [2] and Dessie Referral Hospital (95.2%) [9]. But this result was higher when compared to a study in Northwest Ethiopia by Melaku et al. (84.7%) [1]; Kelemua et al. in Palestine hospital (53.9%) [10], Mohammed et al. in Baghdad city (31%)[11]; Hamed et al. in teaching hospital of Zabol, (57%)[4], and Imad et al. in Bahir-dar city health institutions(84.5%)[12]. This difference in the level of knowledge could be mainly due to inconsistent training among hospitals, availability of written guidelines, sample size difference on some fields, and individual knowledge background of the study participants.

This study showed that 91.4% of the respondents had positive attitude on infection prevention measures. This was almost similar to a study conducted in Wolaitta Sodo Otona teaching and Referral Hospital, Ethiopia by Hussen (93.4%) [2], but it was higher to a study

conducted by Hamed (33%) [4] and Kelemua (55.6%) [10]. This variation could be mainly explained due to difference in the level of knowledge of the health workers, health system structures and amount of trainings given to the workers. Based on this study 77.1% of the respondents had good practice on infection prevention measures. This was lower to a study conducted by Kelemua (87.5%) [10]; Imad (91.1%) [12], but it was higher to studies conducted in Ethiopia by Hussen (60.5%) [2], Melaku Desta (57.3%) [1]; Hamed (34%) [4].

This discrepancy in practice could be mainly due to some difference in the participant's background, their level of knowledge and the availability of the personal protective materials and sanitary materials. The amount of trainings given to the health workers, availability of written guidelines about infection prevention in each hospital and the level of monitoring and supervision during their clinical practice could also contribute on their level of practice.

Most health workers have good knowledge and positive attitude, and about half of the health workers were aged less than 25 years with one third of them have less than two years clinical experience and one third health workers reported that, Personal protective equipment was always accessible. Moreover; about half of the participants answered that workload affects their ability to apply infection prevention guidelines and knowledge of infection prevention control are being monitored in their hospital.

This could be partially explained by lack of clinical experience, consistent supply, monitoring and supervision which are very vital for a good practice in infection prevention in clinical practice. This shows that adequate knowledge and attitude might not be translated to good practice due to different constrains. Health workers in Nakfa Hospital have the highest knowledge and attitude scores compared to other hospitals of Northern Red Sea, but they had the lowest practice score. This result showed that even though they have the awareness on infection prevention, they didn't practically practice on clinical practice. This could be due to shortage of supply and irregular monitoring and supervision at hospital and zonal levels.

Respondents working in surgical wards had the lowest knowledge score, but their practice was highest compared to the other departments. In addition; health workers from laboratory department had the highest knowledge and attitude score, and their practice was among the highest group by profession. This variation by department and profession could be explained by the level of their knowledge, effective monitoring of their head departments, specific availability of department guidelines in the fields and might be due to these departments could have enough supply of the infection prevention materials. Even though this study showed difference in knowledge, attitude and practice in the specific hospitals, departments and professions, there was no significant association to their background characteristics. Hamed reported that, there was only significant relationship between knowledge and gender [4] and Melaku stated that older age, lengthy work experience and higher educational status were significantly associated with their knowledge and practice [1].

Conclusion

Most of the health workers in Northern Red Sea hospitals have adequate knowledge and attitude but their comprehensive practice was slightly low. Background of the health workers doesn't show significant association to their level of knowledge, attitude and practice. Providing adequate infection prevention materials, regular hospital scrubs, trainings related to infection prevention, continuous monitoring and

supportive supervision from hospital, zonal and national levels, written guideline in which every health worker should use and abide at daily activities are recommended. Health workers should advocate practicing appropriate infection prevention measures, each hospital to have infection prevention committee with regular meeting. Supervisors and matrons in every hospital should monitor their health workers on the use of personal protective materials and availability of these materials should be secured continuously.

The strength of this study was that health workers with good knowledge were not able to translate to best practice mainly due to different constrains of supply and monitoring. Further researches that include direct observation of health professionals practice and with larger sample size and adequate sample by department, profession and hospitals are highly recommended. This research was not without limitations. As the response of the health workers were self-reported, there might have a reporting bias. Practical clinical observation was not done to ascertain their practice, which could strength their responses. The sample size of specific fields was small, which could also have negative impact on the result of the specific fields.

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Author's contribution

BT and YK have drafted the first part of the proposal and all authors contributed in finalizing the proposal. BT, SA and YG had participated in data collection and supervision of data collectors. FK designed the data entry tool and BT entered the data in CSPro and FK analyzed the data by SPSS software. All authors participated on drafting the first manuscript then BT and FK have designed the final form of the paper, finally all authors has reviewed and approved the final manuscript.

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