Medical Safety & Global Health

Knowledge, Attitude and Associated Factors towards Instrument Processing among Nurses Working in Ethiopia: A Cross-Sectional Study

Nersin Tekle Aduguna*, Addisu Soykna Wake

Department of Nursing, Arsi University, Asella, Ethiopia

ABSTRACT

Introduction: Globally, hospitals have faced substantial problems because of Healthcare-Associated Infections (HAIs). This study was intended to assess knowledge, attitude, and associated factors towards instrument processing among nurses working in Asella Referal and Teaching hospital, Ethiopia.

Methods: Cross-sectional survey was done on 335 nurses working at Asella Referal and Teaching hospital, Oromia Regional State, Ethiopia. The data were collected from 20th December 2021 to 29th December 2021 by face-to-face interview.

Result: A total of 335 nurses participated in the study and the response rate was 99.11%. This study showed that the level of good knowledge and attitude towards instrument processing among nurses working at Asella Referal and Teaching hospital was 61.8%, and 65.4%, respectively. The multivariable logistic regression analysis showed that average monthly income, working experience, awareness on instrument processing methods, availability of guidelines on instrument processing and department currently serving were factors significantly associated with knowledge towards instrument processing. Gender awareness of instrument processing, department currently serving and knowledge towards instrument processing were factors significantly associated with attitude towards instrument processing.

Conclusion: The level of good knowledge and positive attitude towards instrument processing among nurses was low. Health educational programs, training and demonstrations on instrument processing are essential to solve these problems.

Keywords: Associated factors; Attitude; Hospital acquired infection; Infection; Instrument processing; Knowledge; Sterilization

INTRODUCTION

Instrument processing is important in working to create an environment, which is free of infection. It is important that the clinic staff, including healthcare providers to cleaning and maintenance, should clearly understand the rationale for each of the recommended infection prevention processes [1]. In healthcare facilities, infections are the foremost public health problems. This problem has a worldwide distribution. The transmission of infection could be from client to client, staff to client, client to staff, and from the health institution's environment to clients and staff [2].

Hospital cleaning is an element of infection control, which is neglected. Comprehensive cleaning was found to interrupt the chain of infection between the organisms and patients [3]. In health care environments, using chemicals with toxic characteristics necessitates further protection for health care workers. In addition to worker safety, patient safety is needed to be considered when selecting probably hazardous chemicals to be used in the health care setting [4].

There is contact between a surgical instrument or medical device and a sterile tissue or mucous membrane of the patient during all the invasive procedures involved. During these procedures, there is a substantial risk of pathogenic microbe's introduction that could lead to infection [5]. Since there has been an increase in many infectious diseases because of inadequate sterilization, sterilization and disinfection in hospitals is a significant concern for both medical and community health [6]. Reuse happens frequently for both single use and multiuse medical devices. The protocols

for reprocessing and sterilization exist for many devices that are commonly reused [7].

Reusable medical equipment carries a risk, which is associated with breach of the host barriers if there is a failure to properly disinfect or sterilize them. The level of disinfection or sterilization dependent on the intended use of the object like critical items, semicritical items and noncritical items which require sterilization, high-level disinfection, and low-level disinfection, respectively [5].

HAIs are among the main complications of modern medical therapy, of which those related to invasive devices are the most important HAIs. These are central line-associated bloodstream infection, catheter associated urinary tract infection, ventilator-associated pneumonia, and surgical site infection [8]. The hospitals in all countries around the world have faced common problems and difficulties because of HAIs [9].

HAIs leads to momentous morbidity and mortality. Despite the considerable progress in HAIs prevention has been made over the past decade, many chances for upgrading remain and new challenges continue to arise [10]. HAIs increases patients' length of stay, higher inpatient costs, and of mortality [11]. HAIs are a substantial public health concern both in the United States of America and abroad. It contributes to augmented morbidity, mortality, and health care costs [12]. HAIs are a major cause of morbidity and mortality in hospitalized patients [13]. HAIs occur commonly, cause momentous harm to patients, and lead to excess healthcare expenditure [14]. HAIs leads to considerable increases in healthcare costs, morbidity, and mortality. The case fatality rate from 2.3% to 14.4%, which depends on the type of infection [8].

Estimating the burden of HAIs compared to other communicable diseases is a continuing challenge [15]. HAIs caused by antibiotic-resistant gram-negative pathogens were led to a noteworthy enlarged length of stay and higher hospital costs when compared to those caused by their susceptible counterparts [16]. Disinfection and sterilization in hospitals is of increasing concern because nosocomial infections affect 1 out of 10 patients admitted to the hospital and it is associated with major morbidity, mortality, and increased financial burden [17]. However, the evidence revealed that at least 20% of all nosocomial infections as probably preventable [18]. Infections by multidrug-resistant organisms are common in hospitals in particular and are a worldwide threat [19].

The patients and their careers would be benefited from an effective infection control programme. It will release significant health care resources for alternative use [20]. The study revealed that about 65% to 70% of cases of catheter-associated bloodstream infections, and 55% of cases of ventilator-associated pneumonia and surgical site infections might be preventable [21]. It is likely that restoring hygienic standards in hospitals is a method of controlling HAIs, which is would be cost-effective [3].

However, the control of infection and prevention of healthcare associated infections is a continuing problem globally. The healthcare workers' practice is still reported as suboptimal and these infections persist, despite the initiatives and strategies to lessen the burden of infection [22]. The protection of patients from the problems related to HAIs necessitates the allocation of adequate financial resources, scientific research, and a strong commitment from all healthcare providers [10]. The standard precautions are suggested to avoid transmission of infection in hospitals. But, the implementation is reliant on the knowledge and attitudes of healthcare workers [23]. Having poor level of awareness

and practice of infection control creating a significant risk of HAIs for patients and staff [24].

As explained above, the magnitude of HAIs is growing globally. This causes considerable morbidity and mortality. However, there is a limitation of the studies that have addressed knowledge, attitude, and associated factors of instrument processing among nurses working in the study setting, including worldwide. Therefore, this study was intended to assess knowledge, attitude, and associated factors of instrument processing among nurses working at Asella Referal and Teaching hospital, Oromia Regional State, Ethiopia.

MATERIALS AND METHODS

Study area and period

Asella Referal and Teaching hospitals is one of the oldest public hospitals in the country. It is located in Asella town, 175 km far to Southeast of Addis Ababa, the capital city of Ethiopia. It provides services for approximately 3.5 million population to Arsi zone and nearby zones like Bale and West Arsi Zones. The hospital serves as teaching and clinical services in surgery, internal medicine, gynecology and obstetrics, pediatrics and child health, maxillofacial surgery, psychiatry, ophthalmology, pathology, and radiology. The inpatient department services include general surgery, urologic surgery, neurosurgery, and renal surgery. The study was conducted from 20th December 2021 to 29th December 2021.

Study design

An institution-based cross-sectional survey was done at Asella Referal and Teaching hospital.

Source population

The source population for this study were all nurses working at Asella Referal and Teaching hospital.

Study population

The study population for this study were all nurses working at Asella Referal and Teaching hospital and who fulfilled the inclusion criteria.

Eligibility criteria

Inclusive criteria: All nurses working at all clinical departments and those who were willing to participate in the study were included.

Exclusion criteria: Nurses who were on study leave and annual leave were excluded from this study.

Sample size determination

Since we did the complete survey, all nurses working at Asella Referal and Teaching hospital were included into this study. By using the census method, we have included all nurses who were working at Asella Referal and Teaching hospital and who fulfilled the inclusion criteria during the data collection period. Lastly, we obtained the sample size of 335 for this study.

Sampling technique and procedure

During this study, initially we checked the eligibility of the nurses using the Asella Referal and Teaching hospital nursing staff registration, which we got from nursing matron. After this, all

nurses available during a day of data collection period and nurses who fulfilled the inclusion criteria and volunteers to participate in this study were included in to this survey.

Study variables

Dependent variables: i) Knowledge toward instrument processing and ii) Attitude toward instrument processing.

Independent variables: i) Sociodemographic factors: Gender, age, level of education, marital status, and average monthly income and ii) Institutional and personal related factors: Working experience ever had infection prevention training, awareness on instrument processing methods, availability of posters on instrument processing, availability of guidelines on instrument processing, vaccination against hepatitis B, and department currently serving.

Operational definitions

Good knowledge toward instrument processing: If nurses scored the mean and above the mean value on knowledge questions related to instrument processing [25].

Poor knowledge toward instrument processing: If nurses scored below the mean value on the knowledge questions related to instrument processing [25].

Positive attitude: If nurses scored mean and above the mean value for the attitude questions related to instrument processing.

Negative attitude: If nurses scored below the mean value on the attitude questions related to instrument processing.

Data collection tools, procedures and data quality assurance

Data were collected by using a semi structured face-to-face interview based questionnaire. The questionnaire was prepared in English from relevant literature reviewed [25]. The questionnaire includes 5 parts, sociodemographic characteristics of nurses, institutional and personal related factors, knowledge and attitude toward on instrument processing. There were 12 questions to assess knowledge towards instrument processing and 10 questions to assess attitude towards instrument processing. We have done a pretest on 15 nurses out of the study settings and the reliability of the questionnaire was checked by using reliability analysis. Training was provided on the data collection tools and procedures for data collectors for one day. Supervision was carried out at the time of data collection period.

Data processing and analysis

EpiData version 4.2.0.0 was used for data entry. The data were exported to Statistical Package for the Social Sciences (SPSS) window version 2.3. The descriptive statistics and frequency distribution were used to present the descriptive results. The results were presented by text, tables, and pie chart. Bivariable logistic regression was used to analyze the association between outcome and potential predictor variables. Then independent variables with p value less than 0.25 were considered as a candidate for multivariable logistic regression analysis. During this, to display the strength of the association, Crude Odds Ratio (COR) and Adjusted Odds Ratio (AOR) with 95% Confidence Interval (CI) was calculated. Model fitness was checked by Hosmer-Lemeshow's goodness-of-fit test for knowledge and attitude while the result

was (p value=0.127) and (p value=0.899) respectively, which was p value>0.05. Finally, p value<0.05 was considered as statistically significant for independent variables in the multivariable logistic regression analysis.

RESULTS

Sociodemographic characteristics of nurses

A total of 335 nurses were participated in the study, providing a response rate of 99.11%. The mean age of the nurse was 31.16 years (standard deviation=5.253). About 184 (54.9%) of the nurses were aged below 31 years. The majority 182 (54.3%) of the nurses were male. Most 305 (91.0%) of the nurses were qualified for BSc degree and above. About 150 (44.8%) of the nurses were orthodox followers (Table 1).

Table 1: Sociodemographic characteristics of the nurses working at Asella Referral and Teaching Hospital, Asella, Oromia Regional State, Ethiopia,2021 (n=335).

Variables	Category	Frequency	Percent
Age	<31 years	184	54.9
	≥ 31 years	151	45.1
Gender	Male	182	54.3
	Female	153	45.7
Marital status	Unmarried	123	36.7
	Married	212	63.3
Educational level	Diploma	30	9.0
	BSc degree and above	305	91.0
Religion	Orthodox	150	44.8
	Protestant	73	21.8
	Muslim	104	31.0
	Catholic	8	2.4
Ethnicity	Oromo	243	72.5
	Amhara	86	25.7
	Tigre	6	1.8
Average monthly income	<7000 ETB	124	37.0
	≥ 7000 ETB	211	63.0

Institutional and personal related factors

The majority 284 (84.8%) of the nurses were served for less than 10 years. About two-third 222 (66.3%) of nurses ever had infection prevention training. The majority 301 (89.9%) of nurses responded as they had awareness about instrument processing methods (Table 2).

Table 2: Institutional and personal related factors of the nurses working at Asella Referal and Teaching hospital, Asella, Oromia Regional State, Ethiopia,2021 (n=335)

Variables	Category	Frequency	Percent
Working experience	<10Years	284	84.8
	≥ 10 Years	51	15.2
Ever had infection prevention training	Yes	222	66.3
	No	113	33.7

Awareness of instrument processing methods	Yes	301	89.9
	No	34	10.1
Availability of posters on instrument processing	Yes	201	60.0
	No	134	40.0
Availability of guidelines on instrument processing	Yes	184	54.9
	No	151	45.1
Vaccination against hepatitis B	Yes	226	67.5
	No	109	32.5
Department currently serving	Surgical ward	64	19.1
	Gynecologic and Obstetrics ward	40	11.9
	Emergency	46	13.7
	Medical ward	24	7.2
	ART, EPI, TB, and OPD	123	36.7
	Pediatric ward	38	11.4

Note: ART: Antiretroviral Therapy; EPI: Expanded Programme on Immunization; TB: Tuberculosis; OPD: Outpatient Department.

Nurses' level of knowledge towards instrument processing

In this study, the nurses' good level of knowledge about instrument processing was 61.8% (n=207, 95% CI: 56.5, 66.9) (Figure 1).
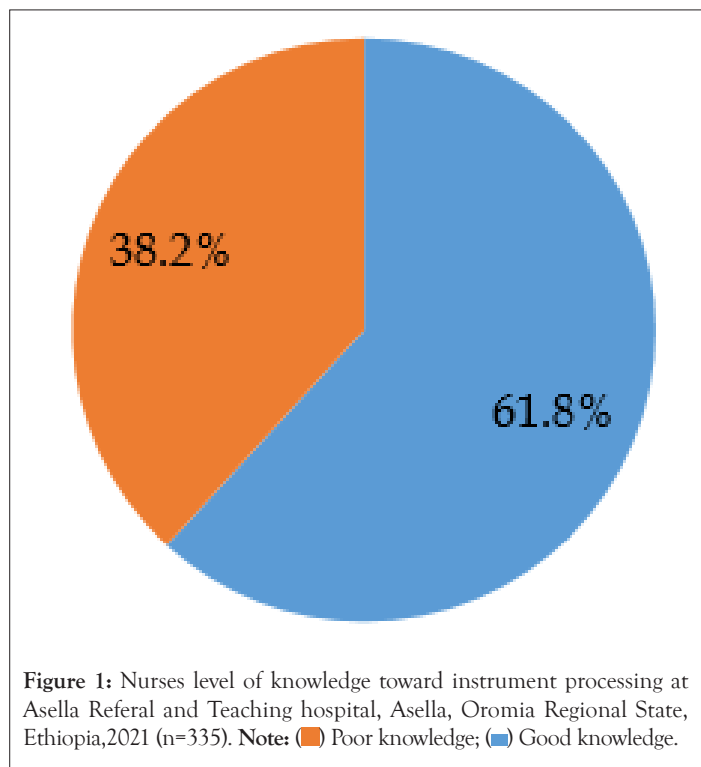

Figure 1: Nurses level of knowledge toward instrument processing at Asella Referal and Teaching hospital, Asella, Oromia Regional State, Ethiopia,2021 (n=335). **Note:** (⬤) Poor knowledge; (⬤) Good knowledge.

Nurses' level of attitude towards instrument processing

In this study, the nurses' positive level of attitude about instrument processing was 65.4% (n=219, 95%CI: 60.5, 70.4) (Figure 2).
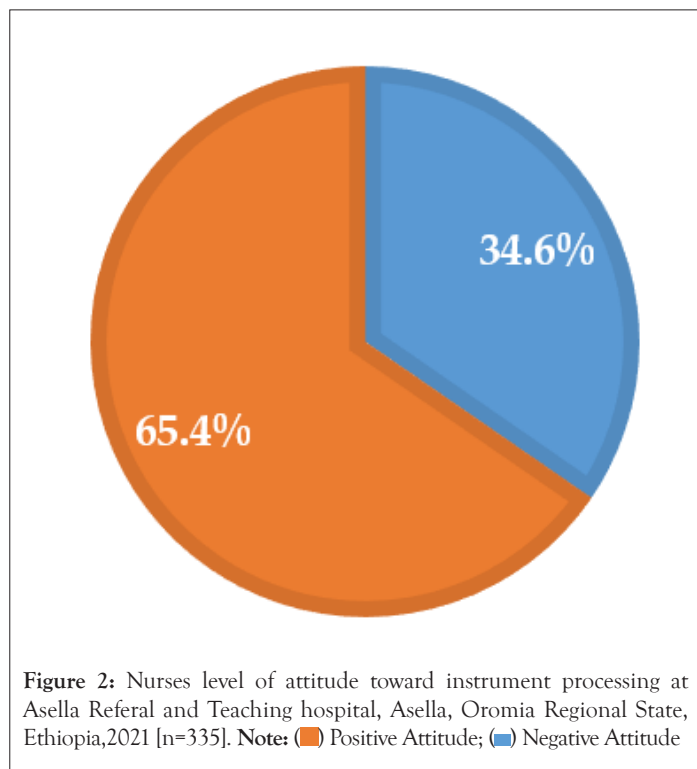

Figure 2: Nurses level of attitude toward instrument processing at Asella Referal and Teaching hospital, Asella, Oromia Regional State, Ethiopia,2021 [n=335]. **Note:** (⬤) Positive Attitude; (⬤) Negative Attitude

Factors associated with knowledge towards instrument processing

Age, gender, marital status, educational level, average monthly income, working experience, ever trained on infection prevention, having awareness on instrument processing, availability of posters on instrument processing, availability of guideline on instrument processing, being vaccinated against hepatitis B, and department currently serving were checked for their association with knowledge towards instrument processing. In bivariable logistic regression, only gender was factor that had a p value>0.25 and they were omitted from the final model, multivariable logistic regression while the rest factors had a p value<0.25. However, in multivariable logistic regression, only average monthly income, working experience, awareness on instrument processing methods, availability of guideline on instrument processing and department currently serving were factors significantly associated with knowledge towards instrument processing.

The odds of having good knowledge towards instrument processing among nurses who had an average monthly income of ≥ 7000 Ethiopian Birr (ETB) was 2.595 times (AOR=2.595, 95% CI: 1.49,4.53; p=0.001) higher when compared with nurses who had an average monthly income of<70000 ETB. The likelihood of having good knowledge towards instrument processing among nurses who had a working experience of ≥ 10 Years was 5.06 (AOR=5.06, 95%CI: 1.90,13.45; p=0.001) more likely than nurses who had a working experience of <10 Years.

The odds of having good knowledge towards instrument processing among nurses who had an awareness on instrument processing methods was 5.366 times (AOR=5.366, 95% CI: 2.05,14.05; p=0.001) higher when compared with their contrary. The likelihood of having good knowledge towards instrument processing among nurses who responded the availability of guideline on instrument processing within their department was 3.611 (AOR=3.611, 95% CI: 1.897,6.88; p=0.000) more likely than nurses who responded

that the was no availability of guideline on instrument processing within their department.

Moreover, the odds of having good knowledge towards instrument processing among nurses who were currently working in surgical ward was 2.495 times (AOR=2.495, 95% CI: 1.008,6.18; p=0.048), currently working in Antiretroviral Therapy (ART), Expanded Programme on Immunization (EPI), Tuberculosis (TB), and Out Patient Department(OPD) was 2.29 times (AOR=2.29, 95% CI: 1.029,5.098; p=0.042), and currently working in pediatric ward was 4.74 times (AOR=4.74, 95% CI: 1.536,14.63; p=0.007) higher when compared with nurses currently working in emergency department (Table 3).

Table 3: Bivariable and multivariable logistic regression analysis of factors associated with knowledge towards instrument processing among nurses working at Asella Referral and Teaching hospital, Asella, Oromia Regional State, Ethiopia,2021 (n=335).

Variables	Category	Knowledge Good		COR (95% CI) Poor	AOR (95% CI	p value
Age	<31 years	99 (53.8%)	85 (46.2%)	1	1	
	≥31 years	108 (71.5%)	43 (28.5%)	2.156 (1.36,3.41)	1.40 (0.796,2.47)	0.242
Gender	Male	113 (62.1%)	69 (37.9%)	1.028 (0.66,1.60)	NA	
	Female	94 (61.4%)	59 (38.6%)	1		
Marital status	Unmarried	68 (55.3%)	55 (44.7%)	1	1	
	Married	139 (65.6%)	73 (34.4%)	1.54 (0.978,2.426)	0.91 (0.51,1.597)	0.732
Educational level	Diploma	18 (60.0%)	12 (40.0%)	1		
	BSc degree and above	189 (62.0%)	11 6(38.0%)	1.086 (0.505,2.34)	NA	
Average monthly income	<7000 ETB	61 (49.2%)	63 (50.8%)	1	1	
	≥ 7000 ETB	146 (69.2%)	65 (30.8%)	2.32 (1.468,3.67)	**2.595 (1.49,4.53)**	**0.001**
Working experience	<10Years	163 (57.4%)	121 (42.6%)	1	1	
	≥10 Years	44(86.3%)	7 (13.7%)	4.666(2.03,10.72)	**5.06 (1.90,13.45)**	**0.001**
Ever had infection prevention training	Yes	149 (67.1%)	73 (32.9%)	1.936 (1.22,3.076)	0.78 (0.424,1.44)	0.424
	No	58 (51.3%)	55 (48.7%)	1	1	
Awareness on instrument processing methods	Yes	197(65.4%)	104 (34.6%)	4.546 (2.09,9.868)	**5.366 (2.05,14.05)**	**0.001**
	No	10 (29.4%)	24 (70.6%)	1	1	
Availability of posters on instrument processing	Yes	138 (68.7%)	63 (31.3%)	2.063 (1.314,3.24)	1.05 (0.573,1.93)	0.874
	No	69 (51.5%)	65 (48.5%)	1	1	
Availability of guideline on instrument processing	Yes	137 (74.5%)	47 (25.5%)	3.373 (2.128,5.35)	**3.611 (1.897,6.88)**	**0**
	No	70 (46.4%)	81(53.6%)	1	1	
Vaccination against hepatitis B	Yes	156 (69.0%)	70 (31.0%)	2.534 (1.584,4.06)	1.414 (0.79,2.52)	0.242
	No	51 (46.8%)	58 (53.2%)	1	1	
Department currently serving	Gynecologic and Obstetrics ward	24 (60.0%)	16 (40.0%)	1.50 (0.637,3.534)	1.252 (0.46,3.40)	0.659
	Surgical ward	42 (65.6%)	22 (34.4%)	1.909 (0.88,4.142)	**2.495 (1.008,6.18)**	**0.048**
	Medical ward	15 (62.5%)	9 (37.5%)	1.667 (0.608,4.57)	1.225 (0.383,3.92)	0.732
	ART, EPI, TB, and OPD	74 (60.2%)	49 (39.8%)	1.51 (0.764,2.985)	**2.29 (1.029,5.098)**	**0.042**
	Pediatric ward	29 (76.3%)	9 (23.7%)	3.22 (1.252,8.292)	**4.74 (1.536,14.63)**	**0.007**
	Gynecologic and Obstetrics ward	24 (60.0%)	16 (40.0%)	1.50 (0.637,3.534)	1.252 (0.46,3.40)	0.659

Note: Figures in bold show statistically significant (p<0.05); number 1 represents the reference category; NA refers to variables omitted from multivariable logistic regression analysis because of their p value >0.25 in bivariable logistic regression analysis. The currency for the monthly income is ETB. Abbreviations: COR=Crude Odds Ratio; AOR=Adjusted Odds Ratio; CI=Confidence Interval; ETB=Ethiopian Birr, NA=Not applicable.

Factors associated with attitude towards instrument processing

Age, gender, marital status, educational level, average monthly income, working experience, ever trained on infection prevention, having awareness on instrument processing, availability of posters on instrument processing, availability of guidelines on instrument processing, being vaccinated against hepatitis B, department currently serving and knowledge towards instrument processing were checked for their association with attitude towards instrument processing. In bivariable logistic regression, only educational level and average monthly income were factors that had a p value>0.25 and they were omitted from the final model, multivariable logistic regression. However, in multivariable logistic regression, only gender, awareness on instrument processing, department currently serving and knowledge towards instrument processing were factors significantly associated with attitude towards instrument processing.

The odds of having positive attitude towards instrument processing among nurses who were male was 1.697 times (AOR=1.697, 95% CI: 1.005, 2.865; p=0.048) higher when compared with female nurses. The likelihood of having positive attitude towards instrument processing among nurses who had awareness about instrument processing methods was 3.789 (AOR=3.789, 95% CI: 1.50,9.573; p=0.005) more likely than nurses who had no awareness about instrument processing methods.

The odds of having positive attitude towards instrument processing among nurses who were currently working in surgical ward was 39.7% times (AOR=0.397, 95% CI: 0.159,0.989; p=0.047) less likely when compared with nurses currently working in emergency department. The likelihood of having positive attitude towards instrument processing among nurses who had good knowledge towards instrument processing was 4.041 (AOR=4.041, 95% CI: 2.303, 7.092; p=0.000) more likely than their contrary (Table 4).

Table 4: Bivariable and multivariable logistic regression analysis of factors associated with attitude towards instrument processing among nurses working at Asella Referral and Teaching Hospital, Asella, Oromia Regional State, Ethiopia,2021 [n=335].

Variables	Category	Attitude		COR (95% CI)	AOR (95% CI)	p value
		Positive	Negative			
Age	<31 years	105 (57.1%)	79 (42.9%)	1		
	≥ 31 years	114 (75.5%)	37 (24.5%)	2.318 (1.446,3.716)	1.622 (0.909,2.895)	0.102
Gender	Male	127 (69.8%)	55 (30.2%)	1.531(0.974,2.407)	1.697 (1.005,2.865)	0.048
	Female	92 (60.1%)	61 (39.9%)	1		
Marital status	Unmarried	74 (60.2%)	49 (39.8%)	1		
	Married	145 (68.4%)	67 (31.6%)	1.433 (0.902,2.276)	0.880 (0.495,1.565)	0.665
Educational level	7.07(3.59-13.9)	7.07(3.59-13.9)	7.07(3.59-13.9)	7.07(3.59-13.9)	7.07(3.59-13.9)	7.07(3.59-13.9)
	Diploma	20 (66.7%)	10 (33.3%)	1		
	BSc degree and above	199 (65.2%)	106 (34.8%)	0.939 (0.424,2.078)	NA	
Average monthly income	<7000 ETB	77 (62.1%)	47 (37.9%)	1		
	≥ 7000 ETB	142 (67.3%)	69 (32.7%)	1.256 (0.791,1.996)	NA	
Working experience	<10Years	179 (63.0%)	105 (37.0%)	1		
Ever had infection prevention training	≥ 10 Years	40 (78.4%)	11 (21.6%)	2.133 (1.049,4.336)	1.239 (0.534,2.871)	0.618
	Yes	159 (71.6%)	63 (28.4%)	2.229 (1.392,3.570)	1.373 (0.754,2.502)	0.300
Awareness on Instrument processing methods	No	60 (53.1%)	53 (46.9%)	1		
	Yes	210 (69.8%)	91 (30.2%)	6.410 (2.879,14.275)	3.789 (1.50,9.573)	0.005
Availability of posters on instrument processing	No	9 (26.5%)	25 (73.5%)	1		
	Yes	142 (70.6%)	59(29.4%)	1.782 (1.127,2.816)	1.40 (0.754,2.601)	0.287
Availability of guideline on instrument processing	No	77 (57.5%)	57 (42.5%)	1		
	Yes	131 (71.2%)	53 (28.8%)	1.770 (1.123,2.787)	0.921 (047,1.802)	0.809
Vaccination against hepatitis B	No	88 (58.3%)	63 (41.7%)	1		
	Yes	156 (69.0%)	70 (31.0%)	1.627 (1.014,2.612)	0.929 (0.509,1.694)	0.809

	No	63 (57.8%)	46 (42.2%)	1	
	Emergency	32 (69.6%)	14 (30.4%)	1	
Department currently serving	Gynaecologic and Obstetrics ward	29 (72.5%)	11 (27.5%)	1.153 (0.452,2.941) 1.294 (0.449,3.734)	0.633
	Surgical ward	36 (56.3%)	28 (43.8%)	0.563(0.253,1.251) 0.397 (0.159,0.989)	0.047
	Medical ward	14 (58.3%)	10 (41.7%)	0.613(0.22,1.709) 0.445(0.141,1.411)	0.169
	ART, EPI, TB, and OPD	78 (63.4%)	45 (36.6%)	0.758(0.366,1.569) 0.686(0.297,1.582)	0.377
Knowledge towards instrument processing	Podiatric ward	30 (78.9%)	8 (21.1%)	1.641(0.603,4.466) 1.168(0.374,3.648)	0.790
	Poor	56 (43.8%)	72 (56.3%)	1	

DISCUSSION

In this study, the nurses' good level of knowledge about instrument processing were 61.8% (n=207, 95% CI: 56.5, 66.9). This finding was higher than the study conducted in Addis Ababa, Ethiopia (46.3%) [25]. The variation might be due to that the difference in the study population, the study of Addis Ababa, Ethiopia was done among healthcare workers. This finding was also higher than the study conducted in Trinidad and Tobago (20.3%) [26]. The possible justification would be that the study of Trinidad and Tobago was conducted on the assessment of knowledge towards infection prevention. Besides, it was done among healthcare workers. This finding was lower than the study done in Saudi Arabia (68.4%) [27]. The variation might be due to that the study of Saudi Arabia was conducted the assessment of knowledge about infection control and also difference in study population, while the study of Saudi Arabia was done among primary care professionals.

The odds of having good knowledge towards instrument processing among nurses who had an awareness on instrument processing methods was 5.366 times (AOR=5.366, 95% CI: 2.05,14.05; p= 0.001) higher when compared with their contrary. The likelihood of having good knowledge towards instrument processing among nurses who responded the availability of guidelines on instrument processing within their department was 3.611 (AOR=3.611, 95% CI: 1.897, 6.88; p=0.000) more likely than nurses who responded that there was no availability of guideline on instrument processing within their department. The odds of having good knowledge towards instrument processing among nurses who were currently working in surgical ward was 2.495 times (AOR=2.495, 95% CI: 1.008, 6.18; p= 0.048), currently working in ART, EPI, TB, and OPD was 2.29 times (AOR= 2.29, 95% CI: 1.029, 5.098; p=0.042), and currently working in pediatric ward was 4.74 times (AOR=4.74, 95% CI: 1.536, 14.63; p=0.007) higher when compared with nurses currently working in emergency department.

In this study, the nurses' positive level of attitude about instrument processing was 65.4% (n=219, 95% CI: 60.5, 70.4). This finding was higher than the study conducted in Trinidad and Tobago (46.7%) [26]. The possible justification would be that the study of Trinidad and Tobago was conducted the assessment of attitude towards infection prevention. Besides, it was done among healthcare workers. This finding was lower when compared with the study done in Saudi Arabia (88.2%) [27]. The variation might be due to that the study of Saudi Arabia was conducted the assessment of attitude toward infection control policy and procedures, and also difference in study population, while the study of Saudi Arabia was done among primary care professionals.

The odds of having positive attitude towards instrument processing among nurses who were male was 1.697 times (AOR=1.697, 95% CI: 1.005, 2.865; p=0.048) higher when compared with female nurses. The likelihood of having positive attitude towards instrument processing among nurses who had awareness about instrument processing methods was 3.789 (AOR=3.789, 95%CI: 1.50,9.573; p=0.005) more likely than nurses who had no awareness about Instrument processing methods. The odds of having positive attitude towards instrument processing among nurses who were currently working in surgical ward was 39.7% times (AOR=0.397, 95% CI: 0.159,0.989; p=0.047) less likely when compared with nurses currently working in emergency department. The likelihood of having positive attitude towards instrument processing among nurses who had good knowledge towards instrument processing was 4.041 (AOR=4.041, 95% CI: 2.303, 7.092; p=0.000) more likely than their contrary. This study was not finalized in the absence of limitations. Starting from the study design used, which was a cross-sectional. A cross-sectional design does permit to determine the cause-and-effect relationship. Furthermore, there were limitations of the studies that addressed this important topic, even worldwide. Hopefully, this study will help in minimizing such challenges for future researchers who will conduct a study on these problems.

CONCLUSION

This study showed that the level of good knowledge and attitude towards instrument processing among nurses working at Asella Referral and Teaching hospital was 61.8% (n=207, 95% CI: 56.5, 66.9) and 65.4% (n=219, 95% CI: 60.5, 70.4), respectively. The multivariable logistic regression analysis showed that average monthly income, working experience, awareness on instrument processing methods, availability of guideline on instrument processing and department currently serving were factors significantly associated with knowledge towards instrument processing. Gender, awareness of instrument processing, department currently serving and knowledge towards instrument processing were factors significantly associated with attitude towards instrument processing. We recommend that health educational programs, training, and demonstrations on instrument processing are essential to improve the knowledge and attitude towards instrument processing.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Ethical clearance was received from Department of Nursing, College of Health Sciences, Arsi University. Then the official letter was submitted to Asella Referral and Teaching hospital. Then,

permission was obtained from the concerned body. The necessary information about the study was explained to all nurses recruited to the study before data collection. Moreover, the nurses were assured about the confidentiality of the information they provide us for this study. Finally, we have received the written informed consent from the nurses who participated in this study.

AUTHORS' CONTRIBUTIONS

Lidiya Tekle Gebreyohannes and Addisu Dabi Wake have designed the study and supervised the data collection, contributed to data analysis, drafting, or revising the article, gave final approval of the version to be published, and agreed to be accountable for all aspects of the work.

AVAILABILITY OF DATA AND MATERIALS

The data used to support the findings of this study are included within the article.

ACKNOWLEDGMENTS

COMPETING INTERESTS

The authors declare that they have no conflicts of interest in this work.

REFERENCES

1. Infection prevention guidelines for healthcare facilities in Ethiopia. Federal Ministry of Health Ethiopia Disease Prevention and Control Department. Addis Ababa Ethiopia. 2004.

2. National Infection prevention guidelines for healthcare facilities in Ethiopia. Federal Ministry of Health Ethiopia Disease Prevention and Control Department. Addis Ababa Ethiopia. 2005.

3. Dancer SJ. Mopping up hospital infection. J Hosp infect.1999;43(2):85-100.

4. Abdallah SA, Al-Shatti L, Al-Awadi B, Al-Hammad N. Disinfectants use awareness among college of nursing students and nurses in some healthcare settings, Kuwait. Middle East J Sci Res. 2012;12(7):964-969.

5. Rutala WA, Weber DJ. Disinfection and sterilization in health care facilities: What clinicians need to know. Clin Infect Dis. 2004;39(5):702-709.

6. Sukhlecha AG, Vaya SSV, Parmar GG, Chavda KD. Knowledge, attitude, and practice regarding sterilization among health-care staff in a tertiary hospital of Western India. Int J Med Sci Public Health. 2015;4:1377-1382.

7. Shuman EK, Chenoweth CE. Reuse of medical devices: Implications for infection control. Infect Dis Clin North Am. 2012 ;26(1):165-172.

8. Al-Tawfiq JA, Tambyah PA. Healthcare Associated Infections (HAI) perspectives. J infect and public health. 2014;7(4):339-344.

9. Sarani H, Balouchi A, Masinaeinezhad N, Ebrahimitabs E. Knowledge, attitude and practice of nurses about standard precautions for hospital-acquired infection in teaching hospitals affiliated to Zabol University of Medical Sciences. Glob J Health Sci. 2016;8(3):193-198.

10. Calfee DP. Crisis in hospital-acquired, healthcare-associated infections. Annu Rev of Med. 2012;63:359-371.

11. Glance LG, Stone PW, Mukamel DB, Dick AW. Increases in mortality, length of stay, and cost associated with hospital-acquired infections in trauma patients. Arch surg. 2011;146(7):794-801.

12. Llata E, Gaynes RP, Fridkin S, Weinstein RA. Measuring the scope and magnitude of hospital-associated infection in the United States: The value of prevalence surveys. Clin Infect Dis. 2009;48(10):1434-1440.

13. Souza ES, Belei RA, Carrilho CM, Matsuo T, Yamada-Ogatta SF, Andrade G, et al. Mortality and risks related to healthcare-associated infection. Texto Contexto Enferm. 2015;24(1):220-228. .

14. Lewis SS, Moehring RW, Chen LF, Sexton DJ, Anderson DJ. Assessing the relative burden of hospital-acquired infections in a network of community hospitals. Infect Control Hosp Epidemiol. 2013;34(11):1229-1230.

15. Cassini A, Plachouras D, Eckmanns T, Sin AM, Blank HP, Ducomble T, et al. Burden of six healthcare-associated infections on European population health: Estimating incidence-based disability-adjusted life years through a population prevalence-based modelling study. PLoS med. 2016;13(10):e1002150.

16. Mauldin PD, Salgado CD, Hansen IS, Durup DT, Bosso JA. Attributable hospital cost and length of stay associated with health care-associated infections caused by antibiotic-resistant gram-negative bacteria. Antimicrob Agents Chemother. 2010;54(1):109-115.

17. Revelas A. Healthcare–associated infections: A public health problem. Niger Med J. 2012;53(2):59-64.

18. Harbarth S, Sax H, Gastmeier P. The preventable proportion of nosocomial infections: An overview of published reports. J Hosp Infect. 2003;54(4):258-266.

19. Barrasa-Villar JI, Aibar-Remón C, Prieto-Andrés P, Mareca-Doñate R, Moliner-Lahoz J. Impact on morbidity, mortality, and length of stay of hospital-acquired infections by resistant microorganisms. Clin Infect Dis. 2017;65(4):644-652.

20. Plowman R. The socioeconomic burden of hospital acquired infection. Euro surveill. 2000;5(4):49-50.

21. Umscheid CA, Mitchell MD, Doshi JA, Agarwal R, Williams K, Brennan PJ. Estimating the proportion of healthcare-associated infections that are reasonably preventable and the related mortality and costs. Infect Control Hosp Epidemiol. 2011;32(2):101-114.

22. Jackson C, Lowton K, Griffiths P. Infection prevention as "a show": A qualitative study of nurses' infection prevention behaviours. Int J Nurs Stud. 2014;51(3):400-408.

23. Ogoina D, Pondei K, Adetunji B, Chima G, Isichei C, Gidado S. Knowledge, attitude and practice of standard precautions of infection control by hospital workers in two tertiary hospitals in Nigeria. J Infect Prev. 2015;16(1):16-22.

24. Ferguson JK. Preventing healthcare-associated infection: Risks, healthcare systems and behavior. Intern Med J. 2009;39(9):574-581.

25. Geberemariyam BS. Instrument processing knowledge and practice amongst healthcare workers in Addis Ababa, Ethiopia. Int J Infect Control. 2018;14.

26. Unakal CG, Nathaniel A, Keagan B, Alexandria B, Lauralee B, Varun C, et al. Assessment of knowledge, attitudes, and practices towards infection prevention among healthcare workers in Trinidad and Tobago. Int J Community Med Public Health. 2017;4:2240-2247.

27. Al-Ahmari AM, Alkhaldi YM, Al-Asmari BA. Knowledge, attitude and practice about infection control among primary care professionals in Abha City, kingdom of Saudi Arabia. J Family Med Prim Care. 2021;10(2):662-668.