AMERICAN JOURNAL OF MEDICAL AND CLINICAL SCIENCES, 2022
VOL 7, NO. 1, PAGE 1 – 8

REVIEW ARTICLE

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Knowledge, Attitude, and Practices Regarding Infection Control Measures among Clinical Medical Students in South Eastern Nigeria

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ABSTRACT

Introduction: HAIs are a major cause of morbidity, mortality and economic burden considering it affects millions of people each year. Evidence has shown that a great proportion of healthcare providers and patients had acquired infections within a healthcare facility.

Methodology: A snowball sampling technique was utilized in the distribution of the online questionnaires sent in the form of a link through social media outlets such as WhatsApp, Face book and emails. This study was carried out among the clinical medical students of the Faculty of Medicine, in all colleges of medicine in south-eastern Nigeria. There was no restriction on the number of clinical medical student per school.

An online survey was created using the free software Google form and distributed through social media networks (WhatsApp, Facebook, Emails). Data was collected within 4 weeks interval. Analysis was performed using the Statistical Software Package SPSS version 22.0. Descriptive statistics (including means and standard deviations) was calculated for the numerical variables. Approval to carry out this study was obtained from the Scientific and Ethical Review Boards of Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State, South East Nigeria.

Result: From the research conducted, out of 333 respondents, a whopping number of 138 medical students (41.4%) admitted to not having undergone any form of hand hygiene training within the past year. Only 78 students (23.4%) have been through frequent hand hygiene training frequently within this period. On universal precaution training within the same period, 150 students (45%) have not received any training while 72 students (21.6%) have frequently been exposed to the training. In addition, 21 students (6.3%) have undergone Needle stick injury training. Meanwhile, 258 students (77.5%) have not within the last 12 months. The same discrepancy is also seen in surgical scrubbing training where 192 students (57.7%) have not undergone any, having only 30 students (9%) admitting to such training.

Conclusion: With clinical medical students having the most exposure to infectious agents during their training, and considering that they are still in their formative years as future clinicians, this study assessed their knowledge, attitude and practices regarding the four major components of Infection control measures (ICMs).

ARTICLE HISTORY

Received 21 December 2021
Accepted 19 January 2022
Published 25 January 2022

KEYWORDS

Infection, Hand washing, Needle prick, Surgical scrubbing and Face Masks.

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Introduction

Nosocomial or healthcare-associated infections (HAIs) are infections that a patient acquires during the period of their stay at a healthcare facility, after getting discharged and also occupational infections among healthcare workers [1]. HAIs are a major cause of morbidity, mortality and economic burden considering it affects millions of people each year [2-4]. Evidence has shown that a great proportion of healthcare providers and patients had acquired infections within a healthcare facility [5-7]. HAIs incidence rate has been reported to be 15.5 per 100 patients in developing countries as compared to 7 per 100 patients in developed countries [8]. Some studies done in some hospitals in developed countries such as the USA demonstrated that HAIs alone account for an estimated 1.7 million infections within a year, with 98,987 HAI-associated deaths [9]. Although there is no well-established data with regards to the burden of HAIs in Africa, however, a systematic review done in the region indicated a possible higher magnitude compared to that in the developed nations [10]. The burden of HAIs is significantly higher in low and middle income countries than in high income countries and this could be attributed to the numerous risk factors, some of which include poor catheter practices, injections, surgery, health care settings that are poorly cleaned and disinfected and communicable disease transmissions between patients and healthcare workers [11].

Patients come in contact with a wide range of healthcare professionals including medical students in tertiary care settings and the poor adherence of healthcare workers to Infection Control Measures (ICMs) has been shown to contribute significantly to HAIs [12]. Studies have shown that hand hygiene, surgical scrubbing and adherence to Needle Stick Injury (NSI) protocols and universal precautions are key methods for controlling and reducing the spread of HAIs [1,13]. Reasons for low compliance with infection prevention and control precautions include the following; lack of knowledge and positive role models, classroom and in field gaps, inadequate facilities, psychological barriers and lack of information about standard precautions [14]. A study done in Pakistan showed that only 29.7% of NSIs that occurred among medical students were reported to the hospital authorities, with lack of awareness being the main reason [15]. Studies have also noted that students are usually reluctant to report poor practice due to fear of failing placements and not wanting to be identified negatively by staff [16]. With clinical medical students having the most exposure to infectious agents during their training, and considering that they are still in their formative years as future clinicians, this study was planned to assess their knowledge, attitude and practices regarding the four major components of ICMs. The findings from this study are hoped to potentially contribute to shaping the curriculum regarding ICMs in medical colleges with the aim of reducing the burden of HAIs in the future.

Materials and Methods

Study Location

Nigeria is a country in West Africa with a population of approximately 202 million people.

There are three major ethnic groups in Nigeria; Hausa, Igbo and Yoruba. Nigeria is made up of 36 states and the Federal Capital Territory. These states are located within six geopolitical zones in Nigeria: North-Central, North-east, North-West, South-east, South-South and South-West. In as much as, Nigeria is rich in natural resources with crude oil as its main export, the majority still live in poverty with a minimum monthly wage of N30,000 (approximately $80 a month). According to the World Bank, Nigeria is classified as a low-income country with a rise in unemployment as the core reason for elevated poverty levels, regional and gender inequalities, and socio-political problems [17].

Study Design

A snowball sampling technique was utilized in the distribution of the online questionnaires sent in the form of a link through social media outlets such as WhatsApp, Face book and emails.

Study Participants

This study was carried out among the clinical medical students of the Faculty of Medicine, in all colleges of medicine in South-eastern Nigeria.

Sample Size

There was no restriction on the number of clinical medical student per school.

Inclusion Criteria

Bonafide clinical students of the Faculty on Medicine, in all colleges of medicine in south eastern Nigeria.

Exclusion Criteria

Post graduate, suspended or rusticated students of the faculty of medicine was excluded from the study.

Data Collection/Tools

An online survey was created using the free software Google form and distributed through social media networks (WhatsApp, Facebook, Emails). Data was collected within 4 weeks interval. The questionnaire had four sections; informed consent, participant's demographics, training received on the four major aspects of infection control in the last 12 months, attitude regarding infection control measures and practice of infection control measures. The participants' demographics assessed include age, gender, state of residence and geographical zones, ethnicity, religion, marital status and medical school in which they are receiving their training.

Statistical Analysis

Analysis was performed using the Statistical Software Package SPSS version 23.0. Descriptive statistics (including means and standard deviations) was calculated for the numerical variables.

Ethical Consideration

The entirety of the study with focus on the objective and techniques involved was explained clearly to each participant and an informed consent was obtained. The participants were assured of the confidentiality and anonymity of all information that was supplied in the study.

The participants were also given the freedom to withdraw from the study at any point with an assurance that their decision would not affect them in anyway. Approval to carry out this study was obtained from the Scientific and Ethical Review Boards of Nnamdi Azikiwe University Teaching Hospital Nnewi, Anambra State, South East Nigeria with ethical approval number NAUTH/CS/66/VOL.15/VER.3/298/2021/326.

Results

Out of the 333 students surveyed, 216 (64.9%) were within the age group 20-24 years, followed by 25-29 years with 96 (28.8%). 192 (57.7%) were male and 141 (42.3%) were female. Of these, 147 (44.1%) were from the 4th year of the MBBS programme, 150 (45.0%) 5th and 36 (10.8%) were from the 6th (final) year of their training. Overall, medical students from all

Table 1: showing the Socio-demographic information of the respondents.

Variable	Frequency	Percentage
Age (years)		
15-19	6	1.8
20-24	216	64.9
25-29	96	28.8
30 and Above	15	4.5
Gender		
Female	141	42.3
Male	192	57.7
Year of study		
400l	147	44.1
500l	150	45.0
600l	36	10.8
Religion		
Atheist	3	0.9
Christianity	327	98.2
Muslim	3	0.9
Marital Status		
Married	12	3.6
Single	321	96.4
Ethnicity		
Hausa	3	0.9
Igbo	276	82.9
Yoruba	6	1.8
Others	48	14.4
State of Origin		
Abia	33	9.0
Akwaibom	3	0.9
Anambra	135	40.5
Bayelsa	3	0.9
Delta	15	4.5
Ebonyi	54	16.2
Ekiti	3	0.9
Enugu	42	12.6
Foreigner	3	0.9
Imo	39	11.7
Ondo	3	0.9
Taraba	3	0.9
Name of your institution		
ABSUTH	36	10.8
COOUTH	27	8.1
EBSUTH	42	12.6
ESUTH	33	9.9
IMSUTH	33	9.9
NAUTH	132	39.6
UNTH	30	9.0

Table 2: Showing the training received in the last 12 months.

Questions	<1 hour No. (%)	>3 hours No. (%)	1-3 hours No. (%)	Frequently No. (%)	Once No. (%)	None No. (%)
Hand hygiene training duration in last 12 months?	69 (20.7)	15 (4.5)	30 (9.0)	78 (23.4)	3 (0.9)	138 (41.4)
Universal precautions training duration in last 12 months?	51 (15.3)	9 (2.7)	48 (14.4)	72 (21.6)	3 (0.9)	150 (45.0)
Needle stick injury training duration in last 12months?	21 (6.3)	9 (2.7)	21 (6.3)	21 (6.3)	3 (0.9)	258 (77.5)
Surgical scrubbing training duration in last 12 months?	51 (15.3)	21 (6.3)	36 (10.8)	30 (9.0)	3 (0.9)	192 (57.7)

Table 3: showing the attitude of the respondents towards Infection control measures (ICM).

Statements	Strongly Agree No. (%)	Agree No. (%)	Disagree No. (%)	Strongly Disagree No. (%)	Not Applicable No. (%)
I cannot follow hand hygiene because patients' care is more important	3 (0.9)	0 (0.0)	102 (30.6)	213 (64.0)	15 (4.5)
I cannot always follow universal precautions because patients' needs come first	12 (3.6)	18 (5.4)	129 (38.7)	159 (47.7)	15 (4.5)
I feel free to report safety violations regarding universal precautions	54 (16.2)	180 (54.1)	57 (17.1)	9 (2.7)	33 (9.9)
I need more training regarding universal precautions	174 (52.3)	147 (44.1)	9 (2.7)	0 (0.0)	3 (0.9)
I need more training regarding needle stick injury protocols	189 (56.8)	138 (41.4)	3 (0.9)	0 (0.0)	3 (0.9)
I think there are adequate facilities in my institution for surgical scrubbing	39 (11.7)	120 (36.0)	120 (36.0)	45 (13.5)	9 (2.7)

Table 4: Depicting the respondents' practice of Infection control measures (ICM).

Variable	Frequency	Percentage
Have you received the necessary vaccines?		
No	198	59.5
Yes	135	40.5
How often do you wash your hands?		
2-3 times	75	22.5
4-5 times	30	9.0
As the need arises	222	66.7
Once	6	1.8
How do you dispose used gloves?		
Dispose immediately after use into Waste bin	324	97.3
On the floor	3	0.9
Reuse of gloves	6	1.8
Wash gloves after use and use again	0	0.0
How do you dispose used facemasks?		
dispose immediately after use into Waste bin	162	48.6
On the floor	0	0.0
Reuse of facemasks	96	28.8
wash facemasks after use and use again	75	22.5

the 7 Medical Schools in the South-eastern geo-political zone were involved in the study.

With regards to training received in the last 12 months on four major aspects of infection control, majority of the students received no training at all (Table 2) as regards hand hygiene, universal precautions, needle stick injury and surgical scrubbing with 138 (41.4%), 150 (45.0%), 258 (77.5%) and 192 (57.7%) respectively.

With regards to attitude, 321 (96.4%) and 327 (98.2%) felt they need more training regarding universal precautions and needle stick injury protocols. However, 234 (70.3%) believed they felt free to report safety violations regarding universal precaution, while 165 (49.5%) do not think there are adequate facilities in their institution for surgical scrubbing (Table 3).

With respect to self-reported practices, 135 (40.5%) reported to have received the necessary vaccine while 198 (59.5%) are yet to 222 (66.7%), 324 (97.3%), and 162 (48.6%) students reported washing their hands as the need arises, dispose used gloves and facemasks immediately into waste-bin respectively, however 96 (28.8%) and 75 (22.5%) reported reuse of facemasks and washing facemasks after use and reusing again.

Table 5: Showing the Associations between gender and practice of infection control measures among the respondents.

						Chi-Square	df	p-value (<0.05)
Gender	**Have you received the necessary vaccines?**							
		Yes	No	Total				
	Female	63 (44.7%)	78 (55.3%)	141		1.7	1	0.19
	Male	72 (37.5%)	120 (62.5%)	192				
	Total	135	198	333				
	How often do you wash your hands?							
		Once	2-3 times	4-5 times	As the need arises	Total		
	Female	3 (2.1%)	30 (21.3%)	12 (8.5%)	96 (68.1%)	141	0.5	3	0.93
	Male	3 (1.6%)	45 (23.4%)	18 (9.4%)	126 (65.6%)	192			
	Total	6	75	30	222	333			
	How do you dispose used gloves?							
		Reuse of gloves	dispose immediately after use into Waste bin	On the floor	Total			
	Female	0 (0.0%)	141 (100.0%)	0 (0.0%)	141		6.8	2	0.03
	Male	6 (3.1%)	183 (95.3%)	3 (1.6%)	192				
	Total	6	324	3	333				
	How do you dispose used facemasks?							
		Reuse of facemasks	wash facemasks after use and use again	dispose immediately after use into Waste bin	Total			
	Female	27 (19.1%)	45 (31.9%)	69 (48.9%)	141		17.5	2	0.00
	Male	69 (35.9%)	30 (15.6%)	93 (48.4%)	192				
	Total	96	75	162	333				

Table 6: Showing the Associations between year of study and practice of infection control measures among the respondents

							Chi-square (x^2)	df	p-value (<0.05)
Year of Study	**Have you received the necessary vaccines?**								
		Yes	No	Total					
	400l	42 (28.6%)	105 (71.4%)	147					
	500l	81 (54.0%)	69 (46.0%)	150			20.8	2	0.00
	600l	12 (33.3%)	24 (66.7%)	36					
	Total	**135**	**198**	**333**					
	How often do you wash your hands?								
		Once	2-3 times	4-5 times	As the need arises	Total			
	400l	0 (0.0%)	27 (18.4%)	12 (8.2%)	108 (73.5%)	147	15.6	6	0.02
	500l	6 (4.0%)	42 (28.0%)	12 (8.0%)	90 (60.0%)	150			
	600l	0 (0.0%)	6 (16.7%)	6 (16.7%)	24 (66.7%)	36			
	Total	6	75	30	222	333			
	How do you dispose used gloves?								
		Reuse of gloves	dispose immediately after use into Waste bin	On the floor	Total				
	400l	0 (0.0%)	144 (98.0%)	3 (2.0%)	147		15.1	4	0.01
	500l	3 (2.0%)	147 (98.0%)	0 (0.0%)	150				
	600l	3 (8.3%)	33 (91.7%)	0 (0.0%)	36				
	Total	6	324	3	333				
	How do you dispose used facemasks?								
		Reuse of facemasks	wash facemasks after use and use again	dispose immediately after use into Waste bin	Total				
	400l	36 (24.5%)	33 (22.4%)	78 (53.1%)	147		23.5	4	0.00
	500l	39 (26.0%)	42 (28.0%)	69 (46.0%)	150				
	600l	21 (58.3%)	0 (0.0%)	15 (41.7%)	36				
	Total	96	75	162	333				

There was significant relationship between gender and practice of infection control measures as female dispose used gloves properly into waste-bin immediately after use compared to their male counterparts (p<0.03). Similar findings also applied to disposal of facemasks (p<0.01).

Also, significant relationship was noticed for year of study and practice of infection control measures with 6th year being better than their counterparts in 5th and 4th year as regards receiving the necessary vaccines (p<0.01). However, 4th year did better concerning how often they wash their hands (p<0.02) and dispose used facemasks (p<0.01), while both 4th and 5th year students dispose their used gloves better than their final year counterpart (p<0.01).

Discussion

This research assessed the knowledge, attitude, and practices regarding infection control measures among clinical medical students in south eastern Nigeria. The research attempted to answer the research questions.

Training received on four major aspects of infection control in the last 12 months

From the research conducted, out of 333 respondents, a palpable number of 138 Clinical medical students (41.4%) admitted to not having undergone any form of hand hygiene training within the past year. Only 78 students (23.4%) have been through frequent hand hygiene training within this period. Hand washing compliance among health professionals, in general, is unacceptably low, especially in developing countries. This finding is supported by Suoud in his study on knowledge and practices of hand washing among health professionals in Northeast Ethiopia, where he revealed that the majority of health professionals, 51 (56.0%), had poor practice and 40 (43.0%) of them had good practice of hand washing [18]. Hence, the study concurs that being a health professional also did not translate into having good hand washing practices as shown in this current study. This finding is also comparable to findings from Jimma University Hospital Ethiopia where hand-washing practice by the nursing staff was inadequate, with only 43.2% of Nurses practicing adequate hand washing [18].

On universal precaution training within the same period, 150 students (45%) have not received any training while 72 students (21.6%) have frequently been exposed to the training. This finding is relative to Nmadu's study on the effect of training on knowledge and practice of universal precautions among primary healthcare workers in Northern Nigeria, where he reported a relatively low level of staff training on universal precautions (UP) [19]. The low awareness and consequent low practice of universal precaution as revealed from this study may be owing to the reported low staff training on UP. These practice guidelines referred to as 'Universal Precautions' (UP) were developed to enhance healthcare workers safety by minimizing the likelihood of exposure to blood, needles, and sharps. Evidence exists that knowledge is a prerequisite for positive health behaviour, including the adoption of safety practices that would minimize occupational accidents and the subsequent ill health that can emanate thereof.

In addition, 21 students (6.3%) have undergone Needle stick injury training-meanwhile, 258 students (77.5%) have not within the last 12 months. The same discrepancy is also seen in surgical scrubbing training where 192 students (57.7%) have not undergone any, having only 30 students (9%) admitting to such training. Supportively, Fatima et al (2018) found that students had the poorest knowledge on surgical scrubbing with a mean percentage of only 49.51% of questions answered correctly, comparable to findings from this study [20]. These values reveal the inadequacy of the medical training curriculum as it has failed to include this training to be done regularly to guide the students on best practices towards better and safe healthcare delivery. Comparably, a study conducted by Eskander, Morsy, and Elfeky assessing critical nurses' knowledge and evaluating their practice regarding infection control standard precautions revealed that approximately two thirds (63.6%) of the study sample had unsatisfactory knowledge levels with more than half (57.1%) of the studied sample having satisfactory performance level [21]. However, positive correlations were found between mean knowledge scores and mean practice scores; age, and years of experience.

Attitude Of The Respondents Towards Infection Control Measures (ICM)

Out of the 333 respondents, none agreed to not following hand hygiene because patient care is more important with 213 students (64%) strongly disagreeing with the fact.288 students (86.4%) strongly disagreed with not always following universal precautions because patients' needs come first. Only 18 students (4%) agree to this. The intervention to curb this usually consists of problem-based and task orientated hand hygiene education, enhancement of minimal handling protocol and clustering of nursing care, liberal provision of alcohol-based hand antiseptic, improvement in hand hygiene facilities, ongoing regular hand hygiene audit, and implementation of healthcare-associated infection surveillance. The study by Barbara and Josephene revealed an improvement in most aspects of hand-washing technique owing to the prescribed intervention, with the healthcare–associated infection rate decreasing from 11.3 to 6.2 per 1000 patient-days and at such, emphasizing the need for a problem-based and task-orientated education program that can improve hand hygiene compliance [22].

Furthermore, 234 students (70.3%) felt free to report safety violations regarding universal precautions while 66 students (19.8%) felt restricted in making such reports. There were 174 students (52.3%) who strongly agreed to the need for more training regarding universal precaution while 147 students (44.1%) merely agreed. Only 9 students (2.7%) were in objection to this. Supportively, a study by Mahmud and Abdul-Sahib among nurses at surgical wards in Azady Teaching Hospital revealed that the majority (91.9%) of the nurses did not get training sessions regarding infection control and (83.4%) of them had not participated in continuous learning about infection control [23]. However, the level of practices towards standard precautions among these nurses was relatively low.

Similarly, findings from this study showed that 189 students (56.8%) strongly agreed to the need for more training regarding needle stick injury protocols while 120 students just agree.

Only 3 students (0.9%) disagreed. This shows that almost all the students are aware of the problem and acknowledge that more needs to be done. On the adequacy of facilities for surgical scrubbing, 159 (47.7%) students agree that their institutions have enough while 165 students (49.5%) disagree. This can be attributed to the poorly planned or financed health institutions especially in the eastern part of Nigeria where most of the respondents are schooling.

Practice of Respondents towards Infection Control Measures (ICM)

Vaccination is well encouraged in health institutions especially for medical students who are one of the high-risk groups for various vaccine-preventable diseases but from the study, 198 students (59.5%) have not received the necessary vaccines leaving the minority of 135 students (40.5%) to be adequately vaccinated. Female medical students happen to be more in the adequately vaccinated population (44.7%) than their male counterparts (37.5%). In terms of hand washing, 222 students (66.7%) washes their hands as the need arises with only 6 students (1.8%) admitted to washing hands only once. These positive values can be highly attributed to the massive sensitization and awareness creation about hand washing that followed the novel COVID-19 that shook the whole world. Again, female students were more involved in the act than their male counterparts.

There is also a positive correlation to disposal of gloves as 324 students (97.3%) disposes off used gloves immediately after use into the waste bin. 3 students (0.9%) dispose on the floor while 6 students (1.8%) reuse gloves. None of the respondents wash gloves for reuse. All the female respondents dispose off used gloves immediately into the waste bin while for the males, 6 (3.1%) reuse gloves and 3 (1.6%) dispose on the floor.

On the disposal of facemasks, 162 students (48.6%) dispose immediately after use into the waste bin while the reuse of facemasks was relatively high as 96 students (28.8%) admitted to reusing. With 75 students (22.5%) washing their facemasks for reuse and this is so for cloth facemasks which are relatively common in this part of the world as disposable facemasks might prove unreadily available or expensive. This too can explain the high rate of reuse of disposable masks. From the study, none of the respondents disposes used facemask on the floor. The disposal of used masks into the waste bin was balanced between both genders with males and females having 48.9% and 48.4% respectively with more male respondents (35.9%) reusing their masks. The overall poor practice of facemask use as revealed in this study can be correlated to findings seen among Kuwaiti medical students with a prevalence of poor practice at 27.7%. Also, there was generally a better attitude from the female clinical students than their male colleagues.

Conclusion

With clinical medical students having the most exposure to infectious agents during their training, and considering that they are still in their formative years as future clinicians, this study assessed their knowledge, attitude and practices regarding the four major components of ICMs.

Acknowledgments

The authors wish to acknowledge all the respondents who made this study possible.

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