Original Research Article

Evaluation of Healthcare Workers' Knowledge, Attitude and Practices of Aseptic Techniques in Primary Health Care Centres in Edo State, Nigeria

ABSTRACT

Aim: This study aimed to assess the knowledge, attitude, practices, and challenges faced by primary healthcare workers in maintaining aseptic techniques in their workplace.

Methodology: This study employed a cross-sectional, descriptive research design to assess the knowledge, attitude, practices, and challenges faced by primary healthcare workers in maintaining aseptic techniques in their workplace. A total of four hundred and fifty (450) primary health care workers from selected Primary Health Centres (PHCs) in Edo State, Nigeria were recruited for this study. Participants were selected using a stratified random sampling method, ensuring representation from different facilities, professions, and geographical locations. A self-administered, structured questionnaire was used for data collection.

Results: Out of the 450 questionnaires administered, 441 were valid and included in the analysis. The demographic information of the respondents varied, with the majority being female (78.91%) and nurses (50.57%). The results demonstrated that the respondents had a good understanding of aseptic techniques, with most recognizing their importance in preventing the spread of infections. The majority of respondents considered aseptic techniques as important or very important and were confident in their ability to perform them. However, 57.14% felt that their workplace did not provide adequate training and resources for implementing aseptic techniques. When assessing practices and adherence, most healthcare workers frequently used aseptic techniques and had received training. However, there was still room for improvement in hand washing, wearing personal protective equipment, and sterilizing or disinfecting equipment. Additionally, 80.95% of respondents had observed colleagues not following aseptic techniques, and only 6.80% reported having ongoing initiatives or programs to promote aseptic techniques in their workplace. Regarding challenges faced, the majority (74.15%) reported multiple challenges in maintaining aseptic techniques, including insufficient training, lack of resources, time constraints, and inadequate support. Most participants (90.25%) have encountered situations where aseptic techniques could not be performed due to resource or equipment shortages. Suggested improvements included adequate training, increased resources, better PPE supply, and staff motivation, with 73.70% of participants endorsing all these suggestions.

Conclusion: This study highlights the need for improvements in primary healthcare worker training, resources, and support to enhance the implementation of aseptic techniques, ultimately leading to better infection control and prevention in healthcare settings.

Keyword: Aseptic techniques; hospital acquired infections; knowledge, attitude and practices; primary healthcare workers

1. INTRODUCTION

Despite improvements in medical technology and treatment, the burden of hospital acquired infections (HAIs) is rising internationally [1]. HAIs are nosocomially acquired infections that are not present or incubating at the time of admission to a hospital. These infections include catheter-

associated urinary tract infections, central line-associated bloodstream infections, surgical site infections, ventilator-associated pneumonia, hospital-acquired pneumonia, and Clostridium difficile infections. The World Health Organization (WHO) reports that 5.7% to 19.1% of hospital settings worldwide have a HAI prevalence [2]. According to recent studies, the prevalence of HAIs in the USA [4] and Europe [3] was 3.2% and 6.5%, respectively. In contrast to high-income nations, the burden of HAIs is noticeably greater in low-resource countries [5-7]. In high-income and low- and middle-income nations, respectively, the prevalence of HAIs ranges between 7.6% and 15.5%, according to a WHO-led systematic review [2]. HAIs increase the length of hospital stays, contribute to high mortality, raise health care expenses, and place a financial burden on families, communities, and even nations [2, 8]. As a result, HAI prevention and control seem to be crucial public health issues [9].

HAIs have been linked mostly to contaminated healthcare workers' (HCWs) hands and medical supplies [6,10]. When HCWs do not adequately wash their hands after caring for one patient and contacting another patient, the bacteria that cause HAIs are frequently transferred from one patient to another [11]. Several categories of clinical departments have varied HAI incidence rates. According to a study from Norway, intensive care units have the highest infection rates, followed by newborn and burns units [12]. According to the WHO, inadequate environmental hygiene and waste disposal practices, inadequate equipment and manpower, crowded living conditions, a lack of national guidelines, limited knowledge of and poor application of basic infection control measures, and poor infrastructure are the main causes of HAIs [13]. Aseptic techniques were created by the Centres for Disease Control and Prevention (CDC) and describe in-depth steps that must be taken to stop the spread of disease-causing agents and hence stop HAIs [14]. For all patients in all settings, a consistent protocol must always be followed in accordance with the established infection control measures [1]. This recommendation is based on the idea that all patients, even those who are asymptomatic, carry infectious agents [14]. Hand hygiene, gown use, equipment washing and disinfection, facial protection (such as masks and goggles), disposal of sharp objects, management of medical waste, and proper coughing technique are among the standard precautions [1]. Conversely, Hein and colleagues [15] revealed that in Burkina Faso, only 30% of HCWs adhere to the recommended hand hygiene practices. According to research, the incorrect use of personal protective equipment (PPE) is responsible for roughly 42% of Corona Virus Disease-2019 among health care workers [16]. A heavy workload, drawn-out clinical procedures, and skin condition have all been identified as major obstacles to following hand hygiene recommendations [17,18].

Poor knowledge, attitude, and practice (KAP) are among the major determinants of HAIs, according to the WHO [13]. When he described the KAP theory, Kelman asserted that knowledge is necessary to transform practice and that a positive attitude is a major catalyst for change [19,20]. Hence, it is essential to analyze KAP among HCWs in order to investigate the causes of noncompliance and determine the steps that should be taken to enhance infection control procedures and prevent HAIs [11]. This study was aimed at assessing knowledge, attitude, and practice of aseptic techniques by primary healthcare centre workers.

2. RESEARCH METHODOLOGY

2.1 Study Area

Edo State is a state in Nigeria's South-South geopolitical zone. The state was the 24th most populous in Nigeria as of the 2006 National Population Census (3,233,366). There are currently about 8,000,000 people living in the state [21]. Benin City, the capital and largest metropolis of the state, is also the hub of Nigeria's rubber industry and the country's fourth-largest city. Edo State which was formed in 1991 from the old Bendel State is often referred to as the heartbeat of the nation. Ondo State borders Edo State to the west, Kogi State to the northeast, Anambra State to the east, Delta State to the southeast and south [22]. Bini, Etsako, Esan, Owan, and Akoko Edo constitute the majority of the ethnic groups in Edo State. Almost all of the tribes can trace their roots back to Benin City, hence the dialects change depending on how far they are from that city. Seven of the state's 18 Local Government Areas (LGAs) are home to the Bini-speaking population, which makes up 57.54% of the total. Esan (17.14%), Etsako (12.19%), Owan (7.43%), and Akoko Edo (5.70%) are the other

participants [23]. Also, there are Igbira-speaking populations in Akoko Edo, Itsekiri populations in Ikpoba-Okha, and Ijaw Izons and Urhobos, particularly in the border regions, in the Ovia North East and South West Local Government Areas. Moreover, there are Igbo-speaking villages in Igbanke (Ika) of the Orhionmwon LGA. The state's official language is English [21].

2.2 Study Design

This study employed a cross-sectional, descriptive research design, collecting data at a single point in time to describe the level of knowledge on standard precautions for tuberculosis among primary health care workers. The sampling unit for this study were trained primary health care workers. The formula for calculating sample for one proportion stated by Lemeshow *et al*. [24] was used to estimate the sample size and was based on a prevalence of 89.2% of satisfactory knowledge regarding tuberculosis among healthcare workers from a similar study carried out in Lesotho [25]. The estimated sample size was 450. The study population consisted of primary health care workers, including physicians, nurses, and other allied health professionals working in primary health care settings. A total of four hundred and fifty (450) primary health care workers from selected Primary Health Care (PHCs) Centres in Edo State, Nigeria were recruited for this study. Participants were selected using a stratified random sampling method, ensuring representation from different facilities, professions, and geographical locations.

A self-administered, structured questionnaire was used for data collection. The questionnaire was developed based on relevant literature and guidelines, and its content validity was ensured through expert review. The questionnaire was pilot-tested on a small group of primary health care workers to evaluate its clarity, relevance, and comprehensiveness. Necessary modifications were made based on the feedback received. Participants were given the self-administered questionnaire to fill out in a private space, ensuring confidentiality. Participants were given sufficient time to complete the questionnaire, and their anonymity and confidentiality were maintained throughout the study.

2.3 Data Analysis

Data were entered into a statistical software package (SPSS), and descriptive statistics were computed to summarize the data collected and the results are presented in frequency tables.

3. RESULTS

A total of four hundred and fifty (450) questionnaires were administered to respondents and they were all retrieved. Out of these, four hundred and forty one (441) were valid. This was due to irregular, incomplete and inappropriate responses to some questionnaires. These 441 questionnaires were cleansed for analysis. The results for the demographic information of the respondents as presented in Table 1 revealed that 161 representing 36.51% of the respondents were between the age categories of 35-44 years, 103 (23.36%) of the respondents were between the ages of 25 and 34 years, 92 (20.86%) of the respondents were between the ages of 45 and 54 years, 56 (12.70%) of the respondents were between the age of 18 and 24 years, and the least age category was 6.58% of the respondents (more than 55 years). More than two-third (78.91%) of the respondents were female and the remaining 93 representing 21.09% were males. The majority (55.78%) of the respondents were married, 102 (23.12%) were single, and 93 (21.09%) of the respondents were separated, divorced or widowed. According to the professional roles of the respondents, 223 (50.57%) were Nurses, 74 (16.78%) were Physicians, 29 (6.58%) were community health workers, and 115 representing 26.08% of the respondents identified themselves as others. Out of the 441 valid respondents, 119 (26.98%) had 6 to 10 years of experience, 97 (22.00%) had between 11 and 15 years of experience, 96 (21.77%) had 1 to 5 years of experience, 86 (19.50%) had between 16 and 20 years of experience, 23 (5.22%) had more than 20 years of experience and only 20 (4.54%) said they had less than 1 year of experience.

The participants' responses to questions concerning their knowledge on aseptic techniques are presented in table 2. Many respondents (46.94%) correctly identified the primary purpose of aseptic techniques as preventing the spread of infection. Most respondents (75.74%) correctly identified that all the listed components (hand hygiene, personal protective equipment (PPE), sterilization of

equipment, environmental cleaning, and waste disposal) are part of aseptic techniques. Similarly, 64.63% of respondents correctly stated that hand hygiene should be performed before and after patient contact. A vast majority (92.52%) agreed that aseptic techniques are used for the care of all patients regardless of their diagnosis and perceived infection status. In the same vein, 77.55% of respondents correctly recognized isolation precaution as an element in aseptic techniques. All (100%) of respondents correctly stated that washing hands after contact with the patient's environment is one of the elements in aseptic techniques. It was also observed that 22% of respondents incorrectly believed that alcohol-based rubs are used after removing gloves. Almost all respondents (99.77%) correctly stated that performing hand hygiene is required before and after patient care. All respondents agreed that hands should be washed with soap and water before and after handling potentially infectious materials, regardless of wearing gloves. We also observed that 69.84% of respondents correctly identified personal protective equipment (PPE) as important in aseptic techniques. All (100%) of respondents agreed that gloves must be worn when handling potentially infectious materials. Furthermore, 61.00% correctly stated that gloves must be changed during patient care if moving hands from a contaminated body site to a clean body site. All respondents agreed that surgical masks can protect the nose and mouth when procedures and activities are likely to generate splashes or sprays of blood and body fluids. All respondents agreed that the purpose of using a gown or apron is to protect clothes from splashes or sprays of blood and body fluids. We found that 67.57% of respondents correctly stated that all personal protective equipment (PPE) should be removed before leaving the patient's environment. It was also seen that 70.07% correctly identified stationary and telephones kept in wards, and doorknobs as potential sources of infections. All respondents agreed that all linen from an infectious patient should be thrown in a red linen bag, even when it is free from visible blood or body fluids. The results also showed that 65.31% correctly stated that segregation of clinical and non-clinical waste is important for preventing the spread of infection. Almost all (90.70%) of the respondents correctly stated that used ampoules injection must be disposed of in the clinical waste bin. More than two-third (71.66%) of the participants of this study incorrectly believed that recapping needles is appropriate. We also observed that 62.13% correctly stated that puncturing your hand with sharp instruments must be reported to the concerned authorities. Almost all (97.96%) of the respondents correctly recognized the importance of using puncture-proof containers for the disposal of sharp objects. Similarly, 99.77% agreed that masks must be placed on coughing patients to prevent potential dissemination of infectious respiratory secretions from the patient to others. In the same vein, 91.61% correctly identified that reusing disposable gloves is NOT considered a part of aseptic techniques. The correct order of putting on personal protective equipment (PPE) had varied responses, with 28.80% choosing the correct order: gown, gloves, mask, goggles/face shield. Respondents' self-assessment of their knowledge of aseptic techniques revealed that none considered their knowledge poor, 9.75% rated it as fair, 64.85% rated it as good, and 25.40% rated it as excellent.

The responses of the participants of this study regarding their attitude towards aseptic techniques are presented in table 3. The vast majority of respondents consider aseptic techniques to be important (57.14% "Very important" and 40.59% "Important") in healthcare practice. Most respondents are confident in their ability to perform aseptic techniques correctly, with 26.08% being "Very confident" and 49.87% being "Confident." Aseptic techniques are used frequently in daily work, with 27.89% stating "Very frequent" usage and 64.85% stating "Frequent" usage. All respondents (100%) agree that using aseptic techniques in healthcare has benefits. The majority of respondents (76.87%) think that not using aseptic techniques in healthcare has risks. A significant proportion (58.73%) of respondents thought that aseptic technique is difficult to follow. All respondents (100%) agree or strongly agree that aseptic techniques prevent the spread of infections between patients and healthcare workers. Most respondents (78.78%) disagree or strongly disagree that it is difficult to work wearing PPE. The majority (94.33%) disagreed or strongly disagree that changing gloves during procedures is unnecessary, even if heavily contaminated. Most respondents (93.87%) agree or strongly agree that adequate disinfection of medical equipment should be ensured by all healthcare workers. All respondents (100%) agree or strongly agree that adhering to standard and contact precautions

can reduce the transmission of infectious organisms. The majority (76.19%) agreed or strongly agreed that it is not logical to assume all patients are contagious unless their infection has been confirmed. The vast majority (98.64%) agreed or strongly agreed that healthcare providers should ensure the availability of adequate protective barriers. The majority of respondents (57.14%) felt that their workplace did not provide adequate training and resources for implementing aseptic techniques. Most respondents (95.01%) felt that aseptic techniques should be emphasized more in healthcare worker training.

The results providing insights into the practices and adherence to aseptic techniques among healthcare workers are presented in table 4. When asked about hand washing before and after patient care, 22.45% of respondents always wash their hands, while 57.37% do so most of the time, and 20.18% sometimes. No one reported rarely or never washing their hands. On wearing personal protective equipment (PPE), 23.13% always wore PPE, 50.11% said most of the time, and 24.94% said sometimes. Only 1.81% rarely wore PPE, and none reported never wearing PPE. On sterilizing or disinfecting equipment, 14.06% always sterilize/disinfect, 42.86% said most of the time, and 38.32% said sometimes, a small percentage (4.76%) rarely do so, and no one reported never doing it. On routine environmental cleaning and disinfection, 22% clean multiple times a day, and 78% clean daily. No one reported cleaning weekly, monthly, or less often/never. On aseptic technique training, 90.48% have received training, and 9.52% have not. Among those trained, 83.46% received training annually and 16.54% biannually, none reported receiving training every 3-5 years or every 5-10 years. On observing colleagues not following aseptic techniques, 80.95% of the respondents have observed this, while 19.05% have not. On rating adherence to aseptic techniques, 0% rated it poor, 9.75% fair, 24.04% average, 46.26% good, and 19.95% excellent. On proper disposal of sharps and contaminated materials, 22% use designated sharps containers, 72.79% use regular waste bins, 3.85% use biohazard bags, and 1.36% use other methods. On incidents involving non-adherence to aseptic techniques, 29.25% of the respondents were involved in such incidents, while 70.75% were not. When asked about their confidence in educating others about aseptic techniques, 70.06% of the respondents were confident, while 29.48% were not. Concerning ongoing initiatives or programs to promote aseptic techniques, only 6.80% said they have such initiatives, while 93.20% do not.

The results on assessing the challenges healthcare workers face in maintaining aseptic techniques in their workplace is presented in table 5. When asked on the challenges or barriers in maintaining aseptic techniques: 37 participants (8.39%) said insufficient training, 17 participants (3.85%) said lack of resources or supplies, 34 participants (7.71%) said time constraints, 26 participants (5.90%) said inadequate support from colleagues or management, and 327 participants (74.15%) said all of the above challenges. When asked if they have encountered situations where aseptic techniques could not be performed due to lack of resources or equipment, 398 participants representing 90.25% of the respondents said yes while the remaining 43 (9.75%) said no. when asked for suggested improvements for implementing aseptic techniques in healthcare practice, 23 participants (5.22%) suggested adequate training, 29 (6.58%) suggested increase in resources, 45 participants (10.20%) suggested supply of personal protective equipment (PPE), 19 participants (4.31%) suggested motivation of staff, and 325 participants (73.70%) said all of the above improvements. The majority (74.15%) of healthcare workers surveyed faced multiple challenges in maintaining aseptic techniques, including insufficient training, lack of resources, time constraints, and inadequate support. Most participants (90.25%) have experienced situations where they couldn't perform aseptic techniques due to resource or equipment shortages. The respondents believed that improvements could be made through adequate training, increased resources, better PPE supply, and staff motivation, with 73.70% of participants endorsing all these suggestions.

Table 1: Demographic Distribution of Respondents

Demographic Information	Frequency	Percentage (%)

Age (in years)		
18 – 24	56	12.70
25 – 34	103	23.36
35 – 44	161	36.51
45 – 54	92	20.86
55 and Above	29	6.58
Gender		
Male	93	21.09
Female	348	78.91
Marital Status		
Single	102	23.12
Married	246	55.78
Separated/Divorced/Widowed	93	21.09
Professional Role		
Physician	74	16.78
Nurse	223	50.57
Community health worker	29	6.58
Others	115	26.08
How many years of experience do you have working in primary health care?		
Less than 1 year	20	4.54
1 – 5 years	96	21.77
6 – 10 years	119	26.98
11 – 15 years	97	22.00
16 – 20 years	86	19.50
21 or more years	23	5.22

Table 2: Knowledge of Aseptic Techniques

Variable	**Frequency (n)**	**Percentage (%)**
What is the primary purpose of aseptic techniques?		
To prevent the spread of infection	207	46.94
To sterilize medical instruments	91	20.63
To provide a clean environment	124	28.12
To administer medication	19	4.31

Which of the following are components of aseptic techniques?		
Hand hygiene	31	7.03
Personal protective equipment (PPE)	11	2.49
Sterilization of equipment	19	4.31
Environmental cleaning	25	5.67
Waste disposal	21	4.76
All of the above	334	75.74
How often should you perform hand hygiene?		
Before and after patient contact	285	64.63
Only after patient contact	138	31.29
Only before patient contact	18	4.08
Only when hands are visibly dirty	00	0.00
Are aseptic techniques used for the care of all patients regardless of their diagnosis and perceived infection status?		
Yes	408	92.52
No	33	7.48
Is isolation precaution one of the elements in aseptic techniques?		
Yes	342	77.55

No	99	22.45
Is washing hands after contact with the patient's environment one of the elements in aseptic techniques?		
Yes	441	100.00
No	00	0.00
Are alcohol-based rubs used after removing gloves?		
Yes	97	22.00
No	344	78.00
Is performing hand hygiene required before and after patient care?		
Yes	440	99.77
No	1	0.23
Hands should be washed with soap and water before and after handling potentially infectious materials irrespective of wearing gloves?		
Yes	441	100.00
No	00	0.00
Is personal protective equipment (PPE) important in aseptic techniques?		
Yes	308	69.84
No	133	30.16
Must gloves be worn each time when handling potentially infectious materials?		

Yes	441	100.00
No	00	0.00
Must gloves be changed during patient care if you move hands from 'contaminated body site' to 'clean body site'?		
Yes	269	61.00
No	172	39.00
Can surgical masks protect the nose and mouth when procedures and activities are likely to generate splashes or sprays of blood and body fluids?		
Yes	441	100.00
No	00	0.00
The purpose of using a gown or apron is to protect clothes from splashes or sprays of blood and body fluids?		
Yes	441	100.00
No	00	0.00
Should all personal protective equipment (PPE) be removed before leaving the patient's environment?		
Yes	298	67.57
No	143	32.43
Can stationary and telephones kept in wards, and doorknobs be sources of infections?		
Yes	309	70.07
No	132	29.93

Should all linen from an infectious patient be thrown in a red linen bag even when it is free from visible blood or body fluids?		
Yes	441	100.00
No	00	0.00
Is segregation of clinical and non-clinical waste important for preventing the spread of infection?		
Yes	288	65.31
No	153	34.69
Must ampoules injection that has been used be disposed of in the clinical waste bin?		
Yes	400	90.70
No	41	9.30
Is Recapping of needles, in general, appropriate?		
Yes	316	71.66
No	125	28.34
If you puncture hand with sharp instruments, must you report to the concerned authorities?		
Yes	274	62.13
No	167	37.87
Should puncture-proof containers be used for disposal of sharps objects?		
Yes	432	97.96

No	9	2.04
Must mask be placed on coughing patients to prevent potential dissemination of infectious respiratory secretions from the patient to others?		
Yes	440	99.77
No	1	0.23
Which of the following is NOT considered a part of aseptic techniques?		
Hand hygiene	00	0.00
Wearing personal protective equipment	1	0.23
Reusing disposable gloves	404	91.61
Sterilization of medical instruments	4	0.91
None of the above	32	7.26
What is the correct order of putting on personal protective equipment (PPE)?		
Gown, gloves, mask, goggles/face shield	127	28.80
Mask, gown, goggles/face shield, gloves	89	20.18
Goggles/face shield, mask, gown, gloves	119	26.98
Gloves, mask, goggles/face shield, gown	106	24.04
Overall, how would you rate your knowledge of aseptic techniques?		
Poor	00	0.00

Fair	43	9.75
Good	286	64.85
Excellent	112	25.40

Table 3: Attitude towards Aseptic Techniques

Variable	Frequency (n)	Percentage (%)
How important do you think aseptic techniques are in healthcare practice?		
Very important	252	57.14
Important	179	40.59
Somehow important	10	2.27
Not important	00	0.00
How confident are you in your ability to perform aseptic techniques correctly?		
Very confident	115	26.08
Confident	220	49.87
Somehow confident	100	22.68
Not confident	6	1.36
How frequently do you use aseptic techniques in your daily work?		

Very frequent	123	27.89
Frequent	286	64.85
Somehow frequent	32	7.26
Rarely	00	0.00
Do you think using aseptic techniques in healthcare has benefits?		
Yes	441	100.00
No	00	0.00
Do you think not using aseptic techniques in healthcare has risks?		
Yes	339	76.87
No	102	23.13
Do you think aseptic technique is difficult to follow?		
Yes	259	58.73
No	182	41.27
Aseptic techniques prevent the spread of infections from patients to HCWs and vice versa		
Strongly Agree	239	54.20
Agree	202	45.80
Disagree	00	0.00

Strongly Disagree	00	0.00
It is difficult to work wearing PPE		
Strongly Agree	00	0.00
Agree	98	22.22
Disagree	222	50.34
Strongly Disagree	121	28.44
Changing gloves is not necessary during procedures even if heavily contaminated		
Strongly Agree	11	2.49
Agree	14	3.17
Disagree	278	63.04
Strongly Disagree	138	31.29
Adequate disinfection of medical equipment should be ensured by all healthcare workers		
Strongly Agree	218	49.43
Agree	196	44.44
Disagree	27	6.12
Strongly Disagree	00	0.00
Transmission of infectious organisms can be reduced by adhering to standard and contact precautions		

Strongly Agree	303	68.71
Agree	138	31.29
Disagree	00	0.00
Strongly Disagree	00	0.00
It is not logical to assume all patients contagious unless their infection has been confirmed		
Strongly Agree	124	28.12
Agree	212	48.07
Disagree	91	20.63
Strongly Disagree	14	3.17
Healthcare providers should ensure the availability of adequate protective barriers		
Strongly Agree	175	39.68
Agree	260	58.96
Disagree	6	1.36
Strongly Disagree	00	0.00
Do you feel that your workplace provides adequate training and resources for implementing aseptic techniques?		
Yes	189	42.86
No	252	57.14

Do you feel that aseptic techniques should be emphasized more in healthcare worker training?		
Yes	419	95.01
No	22	4.99

Table 4: Practices of Aseptic Techniques

Variable	Frequency (n)	Percentage (%)
How often do you wash your hands before and after patient care?		
Always	99	22.45
Most of the time	253	57.37
Sometimes	89	20.18
Rarely	00	0.00
Never	00	0.00
How often do you wear personal protective equipment (PPE) when caring for patients?		
Always	102	23.13
Most of the time	221	50.11
Sometimes	110	24.94
Rarely	8	1.81

Never	00	0.00
How often do you sterilize or disinfect equipment before and after use?		
Always	62	14.06
Most of the time	189	42.86
Sometimes	169	38.32
Rarely	21	47.62
Never	00	0.00
How frequently do you perform routine environmental cleaning and disinfection in patient care areas?		
Multiple times a day	97	22.00
Daily	344	78.00
Weekly	00	0.00
Monthly	00	0.00
Less often or never	00	0.00
Have you ever received training on aseptic techniques?		
Yes	399	90.48
No	42	9.52
If yes, how frequently do you receive training?		

Annually	333	83.46
Biannually	66	16.54
Every 3 – 5 years	00	0.00
Every 5 – 10 years	00	0.00
Have you ever observed a colleague not following aseptic techniques?		
Yes	357	80.95
No	84	19.05
How would you rate the level of adherence to aseptic techniques in your primary healthcare center?		
Poor	00	0.00
Fair	43	9.75
Average	106	24.04
Good	204	46.26
Excellent	88	19.95
How do you ensure the proper disposal of sharps and contaminated materials in your workplace?		
Designated sharps containers	97	22.00
Regular waste bins	321	72.79
Biohazard bags	17	38.55

Others	6	1.36
In the past 12 months, have you been involved in any incidents where aseptic techniques were not followed, leading to potential or actual harm to a patient?		
Yes	129	29.25
No	312	70.75
Are confident in your ability to educate others on the importance of aseptic techniques and how to implement them?		
Yes	311	70.06
No	130	29.48
Does your primary healthcare center have any ongoing initiatives or programs to promote and reinforce aseptic techniques among staff?		
Yes	30	6.80
No	411	93.20

Table 5: Barriers to Implementing Aseptic Techniques

Variable	**Frequency (n)**	**Percentage (%)**
What challenges or barriers do you face in maintaining aseptic techniques in your workplace?		
Insufficient training	37	8.39
Lack of resources or supplies	17	3.85
Time constraints	34	7.71

Inadequate support from colleagues or management	26	5.90
All of the above	327	74.15
Have you ever encountered a situation where you could not perform aseptic techniques due to lack of resources or equipment?		
Yes	398	90.25
No	43	9.75
What improvements do you think could be made to make it easier to implement aseptic techniques in healthcare practice?		
Adequate Training	23	5.22
Increase in resources	29	6.58
Supply of PPE	45	10.20
Motivation of Staff	19	4.31
All of the above	325	73.70

4. DISCUSSION

Hospital acquired infections (HAIs) are a widespread issue worldwide [26]. As a result, current knowledge and abilities might be crucial to infection control. Infection control should be practiced regularly by healthcare workers (HCWs) as a crucial component of patient care. The current study was conducted for this reason. The findings of this study shed important light on the aseptic behaviors, attitudes, and understanding of healthcare professionals. According to the results, women made up the majority of responders, and those between the ages of 35 and 44 were the most common. This conclusion supports those of Johnson et al. [27], Janjua et al. [28], and Reda et al. [29], highlighting the need of safeguarding against hospital infections for this group of employees who are in the prime of their careers. The demographic makeup of the healthcare workforce may be reflected in this. Because that nurses are heavily involved in providing direct patient care, a higher percentage of nurses than other healthcare professionals was seen in the distribution of professional jobs.

The majority of respondents correctly identified aseptic techniques' goal, elements, and significance in preventing the transmission of infection, showing that the respondents generally had a strong understanding of them. The level of knowledge was found to be lower than that reported in other studies [27, 33, 34],

but higher than that reported in Northern Nigeria [30], the Federal Medical Centre, Asaba [31], and Talaat and Shamia's study [32]. Yet, other myths were identified, such as the notion that alcohol-based rubs should be used after taking off gloves and that recapping needles is acceptable. Recapping needles can significantly increase the risk of infection and needle-stick injuries. These myths need to be dispelled through focused educational efforts since they could raise the risk of healthcare-associated illnesses. More training and reinforcement in this area may be necessary given that responses to the proper order of donning personal protective equipment (PPE) varied.

Most of the respondents had a favorable opinion of aseptic techniques, acknowledging their value in medical practice and their capacity to stop the transmission of infections between patients and medical personnel. Despite this, a sizable number of respondents believed that their workplace lacked the tools and resources necessary for putting aseptic practices into practice. All HCWs must receive education as part of their training, especially in nations without official, well-structured infection control systems [26]. Developing nations like Nigeria still have to deal with difficult problems connected to enforcing mandatory precautions and occupational exposure to bloodborne viruses despite their low resources. Due to a lack of appropriate needle disposal systems, incorrect medical waste disposal, and an insufficient supply of personal protective equipment, the danger of occupational exposure is enhanced in this situation. This idea is further confirmed by the finding that the majority of respondents (90.25%) have encountered circumstances in which they were unable to undertake aseptic methods because of a lack of resources or equipment. Parallel to this, the finding that more than half of the respondents found it challenging to follow aseptic practices is alarming and may point to the need for more streamlined and approachable rules to assure compliance. Despite a sizeable portion of respondents believing it to be difficult to follow aseptic techniques, they all largely agreed on the advantages and necessity of these procedures in limiting the spread of diseases.

The findings indicated that while the majority of respondents reported good levels of adherence, there were still some gaps in aseptic procedures and adherence among healthcare personnel. For instance, just 23.13% of respondents said they always used PPE, and only 22.45% said they always washed their hands before and after patient care. This runs counter to numerous awareness campaigns, particularly those by the WHO, that aim to increase HCWs' compliance with hand washing [35]. Also, 80.95% of respondents said they have seen coworkers who weren't using aseptic procedures, showing a need for better adherence and reinforcement of these procedures in medical settings. In a similar vein, other respondents mentioned inconsistent equipment sterilization/disinfection procedures and insufficient aseptic technique training. This underscores the necessity for ongoing education and the reinforcement of good practices and may help spread illnesses in healthcare settings. The need for ongoing oversight and reinforcement of these practices is further highlighted by the fact that a sizeable number of respondents were involved in instances involving non-adherence to aseptic techniques. This agrees with earlier research [36, 37]. During disease outbreaks and pandemics, such as the severe acute respiratory syndrome epidemic and the influenza pandemics, HCWs have been known to contract the disease [38–40]. The high frequency of HAIs in these earlier studies may be due to sporadic disease outbreaks that put additional strain on HCWs who are already short-staffed, leading to poor safety compliance with aseptic methods and HAIs.

The outcomes also brought to light the difficulties faced by healthcare professionals in upholding aseptic procedures at work. The majority of respondents (74.15%) experienced a variety of difficulties, such as inadequate training, a lack of resources, time restraints, and insufficient assistance from coworkers or management. The necessity for healthcare facilities to give priority to the supply of necessary resources for infection prevention is highlighted by the fact that 90.25 percent of respondents had experienced circumstances where they couldn't implement aseptic procedures owing to resource or equipment constraints.

Respondents recommended changes like adequate training, more resources, improved PPE supply, and staff motivation to address the gaps in knowledge, attitude, and practice as well as the difficulties faced by healthcare personnel. This suggests that in order to solve the

difficulties faced by healthcare personnel, a multifaceted strategy is needed. If adopted, these recommendations could greatly improve aseptic technique adherence and lower the risk of infection transmission in hospital settings. Strategies should be customized for various healthcare settings, taking into account their unique requirements and resource availability.

5. CONCLUSION

This study highlights the importance of aseptic techniques in healthcare settings and the need for ongoing education, training, and resource allocation to ensure their effective implementation. Addressing the challenges faced by healthcare workers in maintaining aseptic techniques is crucial to preventing the spread of infection and ensuring the safety of both patients and healthcare workers. Future research should focus on the development and evaluation of targeted interventions to improve adherence to aseptic techniques and address the identified gaps in knowledge, attitudes, and practices among healthcare workers.

6. RECOMMENDATIONS

Based on the findings of this study, the following recommendations are proposed to improve the knowledge, attitude, and practices of healthcare workers regarding aseptic techniques and to address the challenges they face in maintaining these techniques:

1. **Regular and Comprehensive Training**: Healthcare institutions should ensure that all staff members receive regular and comprehensive training on aseptic techniques, with an emphasis on practical application. This training should be conducted at least annually and should cover all aspects of aseptic techniques, including hand hygiene, personal protective equipment (PPE), sterilization of equipment, environmental cleaning, and waste disposal.
2. **Adequate Resources and Supplies**: Healthcare facilities should ensure the availability of adequate resources and supplies for the proper implementation of aseptic techniques. This includes providing sufficient PPE, sterilization and disinfection equipment, and designated waste disposal facilities for clinical and non-clinical waste.
3. **Time Management**: Healthcare institutions should develop strategies to help staff manage their time more effectively, allowing them to prioritize and allocate sufficient time for the implementation of aseptic techniques in their daily work.
4. **Supportive Work Environment**: Healthcare facilities should foster a supportive work environment where members of staff feel encouraged to maintain aseptic techniques and report any instances of non-adherence. This includes creating a culture of open communication and feedback, as well as providing adequate support from colleagues and management.
5. **Continuous Assessment and Improvement**: Healthcare institutions should implement regular assessments of staff knowledge, attitudes, and practices regarding aseptic techniques, identifying areas for improvement and addressing any identified gaps in training, resources, or support.
6. **Ongoing Initiatives and Programs**: Healthcare facilities should develop and maintain ongoing initiatives or programs to promote and reinforce the importance of aseptic techniques among staff members. This may include incorporating aseptic technique education into staff meetings, organizing workshops, and providing updated resources and guidelines.
7. **Addressing Misconceptions**: Efforts should be made to address misconceptions about aseptic techniques, such as the belief that recapping needles is appropriate or that disposable gloves can be reused. This can be achieved through targeted education and the promotion of evidence-based best practices.
8. **Encourage Staff Motivation**: Healthcare facilities should recognize and reward staff members who consistently demonstrate adherence to aseptic techniques, fostering a sense of ownership and pride in maintaining high standards of infection prevention and control.
9. **Collaborative Learning**: Healthcare workers should be encouraged to share their experiences and best practices in

maintaining aseptic techniques, fostering a culture of continuous learning and improvement.

By implementing these recommendations, healthcare facilities can effectively address the challenges faced by healthcare workers in maintaining aseptic techniques, ultimately improving patient safety and reducing the risk of healthcare-associated infections.

Ethical Approval and consent

After obtaining the required ethical approvals and permissions, the researchers visited the selected primary health care centres. The purpose of the study was explained to the participants, and their informed consent was obtained.

REFERENCES

1. Moralejo D, El Dib R, Prata, RA, Barretti P, Corrêa I. Improving adherence to Standard Precautions for the control of health care-associated infections. *Cochrane Database Syst. Rev.* 2018; 13(9):142-149.
2. World Health Organization. Report on the Burden of Endemic Health Care-Associated Infection Worldwide: A Systematic Review of the Literature; World Health Organization: Geneva, Switzerland, 2021.
3. Magill SS, O'Leary E, Janelle SJ, Thompson DL, Dumyati G, Nadle J, Wilson LE, Kainer MA, Lynfield R, Greissman S. Changes in Prevalence of Health Care-Associated Infections in U.S. Hospitals. *N. Engl. J. Med.* 2018, *379*, 1732–1744.
4. Suetens C, Latour K, Kärki T, Ricchizzi E, Kinross P, Moro ML, Jans B, Hopkins S, Hansen S, Lyytikäinen O. Prevalence of healthcare-associated infections, estimated incidence and composite antimicrobial resistance index in acute care hospitals and long-term care facilities: Results from two European point prevalence surveys, 2016 to 2017. *Eurosurveillance* 2018, *23*, 1800516.
5. Habibi S, Wig N, Agarwal S, Sharma SK, Lodha R, Pandey RM, Kapil A. Epidemiology of nosocomial infections in medicine intensive care unit at a tertiary care hospital in northern India. *Trop. Dr.* 2018, *38*, 233–235.
6. Lahsaeizadeh S, Jafari H, Askarian M. Healthcare-associated infection in Shiraz, Iran 2004–2005. *J. Hosp. Infect.* 2018, *69*, 283–287.
7. Daxboeck F, Budic T, Assadian O, Reich M, Koller W. Economic burden associated with multi-resistant Gram-negative organisms compared with that for methicillin-resistant *Staphylococcus aureus* in a university teaching hospital. *J. Hosp. Infect.* 2006, *62*, 214–218.
8. Andersson AE, Bergh I, Karlsson J, Nilsson K. Patients' experiences of acquiring a deep surgical site infection: An interview study. *Am. J. Infect. Control* 2020, *38*, 711–717.
9. Byarugaba DK. A view on antimicrobial resistance in developing countries and responsible risk factors. *Int. J. Antimicrob. Agents,* 2004, *24*, 105–110.
10. Adebimpe WO, Olufunmilayo AOE, Bamidele JO, Lanre AO, Adekunle OA. Comparative study of awareness and attitude to nosocomial infections among levels of health care workers in Southwestern Nigeria. *Cont. J. Trop. Med.* 2011, *5*, 5.
11. Wu W, Wang W, Yuan Y, Lin L, Tan Y, Yang J, Dai L, Wang Y. Knowledge, attitude and practice concerning healthcare associated infections among healthcare workers in Wuhan, China: Cross-sectional study. *BMJ Open* 2021, *11*, e042333.
12. Koch AM, Nilsen RM, Eriksen HM, Cox RJ, Harthug S. Mortality related to hospital-associated infections in a tertiary hospital; repeated cross-sectional studies between 2004–2011. *Antimicrob. Resist. Infect. Control* 2015, *4*, 57.
13. World Health Organization. *Health Care-Associated Infections*; WHO: Geneva, Switzerland, 2016.
14. Siegel JD, Rhinehart E, Jackson M, Chiarello L. Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings. *Am. J. Infect. Control* 2007, *35*, S65–S164.
15. Hien H, Drabo M, Ouédraogo L, Konfé S, Sanou D, Zéba S, Compaoré SC, Ouédraogo JB, Meda N. Knowledge and practices of health care workers in the area of healthcare-associated infection risks. A case study in a district hospital in Burkina Faso. *Sante Publique* 2013, *25*, 219–226.
16. Jin YH, Huang Q, Wang YY, Zeng XT, Luo LS, Pan ZY, Yuan YF, Chen ZM, Cheng ZS, Huang X. Perceived infection transmission

routes, infection control practices, psychosocial changes, and management of COVID-19 infected healthcare workers in a tertiary acute care hospital in Wuhan: A cross-sectional survey. *Mil. Med. Res.* 2020, *7*, 24.
17. Patarakul K, Tan-Khum A, Kanha S, Padungpean D, Jaichaiyapum OO. Cross-sectional survey of hand-hygiene compliance and attitudes of health care workers and visitors in the intensive care units at King Chulalongkorn Memorial Hospital. *J. Med. Assoc. Thail.* 2005, *88* (Suppl. 4), S287–S293.
18. Batuduwaarachchi V, Balasubramanium M, Balasooriya D, Senerath L. Compliance with aseptic procedures during intravenous access among the nursing staff at the National Hospital of Sri Lanka. *Int. J. Infect. Control* 2011, *7*, 1–6.
19. Kelman HC. The role of action in attitude change. In *Nebraska Symposium on Motivation*; Howe, H.E., Jr., Page, M.M., Eds.; University of Nebraska Press: Lincoln, NE, USA, 1980; pp. 117–194.
20. Jiang H, Zhang S, Ding Y, Li Y, Zhang T, Liu W, Fan Y, Li Y, Zhang R, Ma X. Development and validation of college students' tuberculosis knowledge, attitudes and practices questionnaire (CS-TBKAPQ). *BMC Public Health* 2017, *17*, 949.
21. Okeowo, G, Fatoba, I. (2022). "State of States 2022 Edition" (PDF). Budgit.org. BudgIT. Retrieved 2023-04-17.
22. Koutonin M. "Story of cities #5: Benin City, the mighty medieval capital now lost without trace". the Guardian.2016. Retrieved 2023-04-16.
23. Obinyan TU. The Annexation of Benin. Journal of Black Studies. Sage, 1988;19 (1): 29-40. doi:10.1177/002193478801900103. JSTOR 2784423. S2CID 142726955.
24. Lemeshow S, Hosmer DW, Klar J, Lwanga SK, World Health Organization. Adequacy of sample size in health studies. John wiley & sons, Chichester, 2019.
25. Bhebhe L, Van Rooyen C, Steinberg W. Attitudes, knowledge and practices of healthcare workers regarding occupational exposure of pulmonary tuberculosis. *African Journal of Primary Health Care & Family Medicine*, 2014. Available at: http://www.phcfm.org/index.php/phcfm/article/view/597/1003.
26. Fashafsheh I, Ayed A, Eqtait F, Harazneh L. Knowledge and practice of nursing staff towards infection control measures in the Palestinian hospitals. Journal of Education and Practice. 2015; 6(4):79-90.
27. Johnson OE, Asuzu MC, Adebiyi AD. Knowledge and practice of universal precautions among professionals in public and private health facilities in Uyo, Southern Nigeria- a comparative study. Ibom Med. J. 2013; 6(1): 9-19.
28. Janjua NZ, Razaq M, Chandir S, Rozi S, Mahmood B. Poor knowledge predictor of nonadherence to universal precautions for blood borne pathogens at first level care facilities in Pakistan. BMC Infect Dis., 2017;7: 81-89.
29. Reda AA, Frisseha S, Mengistie B, Vanderweerd J. Standard precautions: occupational exposure and behavior of health care workers in Ethiopia. Plos One, 2020; 5 (12): e14420.
30. Abdulraheem IS, Amodu MO, Saka MJ, Bolarinwa OA, Uthman MMB. Knowledge, Awareness and Compliance with Standard Precautions among Health Workers in North Eastearn Nigeria. J. Community Med Health Edu 2012; 2:131. doi:10.4172/jcmhe.1000131.
31. Isara AR, Ofili AN. Knowledge and practice of standard precautions among health care workers in the Federal Medical Centre, Asaba, Delta state, Nigeria. Niger Postgrad. Med. J., 2020; 12(3): 204-209.
32. Talaat E, Shamia E. Developing a control action plan for infection prevention at the endoscopy unit. Journal of international Academic research. 2020; 2(4): 412-420.
33. Vaz K, McGrowder D, Lindo R.A, Gordon L, Brown P, Irving R. Knowledge, Awareness and Compliance with Universal Precautions among Health Care Workers at the University Hospital of the West Indies, Jamaica. 2010; 1 (4); 171-181.
34. Labrague LJ, Rosales RA, Tizon MM. Knowledge of and compliance with standards precautions among student nurses. International journal of advanced nursing studies. 2022; 1(2):84-97. www.sciencepubco.com/index.php/IJANS
35. World Health Organization. WHO guidelines on hand hygiene in health care. Geneva: World Health Organization; 2009. [Online] Available from: http://whqlibdoc.who.int/hq/2009/WHO_IER_PSP_2009.07_eng.pdf

36. Shimokura G, Weber DJ, Miller WC, Wurtzel H, Alter MJ. Factors associated with personal protection equipment use and hand hygiene among hemodialysis staff. Am J Infect Control 2006; 34(3): 100-107.
37. Stutz N, Becker D, Jappe U, John SM, Ladwig A, SpornraftRagaller P, et al. Nurses' perceptions of the benefits and adverse effects of hand disinfection: alcohol-based hand rubs vs. hygienic handwashing: a multicentre questionnaire study with additional patch testing by the German Contact Dermatitis Research Group. Br J Dermatol 2019; 160(3): 565-572.
38. Ofner-Agostini M, Gravel D, McDonald LC, Lem M, Sarwal S, McGeer A. Cluster of cases of severe acute respiratory syndrome among Toronto healthcare workers after implementation of infection control precautions: a case series. Infect Control Hosp Epidemiol 2016; 27(3): 473-478.
39. Ho PL, Tang XP, Seto WH. SARS: hospital infection control and admission strategies. Respirology 2003; 8: 41-45.
40. Centers for Disease Control. Use of influenza A (H1N1) 2009 monovalent vaccine: recommendations of the Advisory Committee on Immunization Practices (ACIP), 2009. USA: Centers for Disease Control; 2009. [Online] Available from: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr58e0821a1.htm.