

An Evaluation of Knowledge and Practice of Injection Safety Among Student Nurses in Lagos State University College of Medicine

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Abstract

Background

Injection safety is essential for preventing infectious diseases, yet unsafe practices persist, endangering both healthcare workers and patients. Student nurses, often limited by inexperience and inadequate adherence to standard precautions, face significant risk. Evaluating their knowledge and practice of injection safety at Lagos State University College of Medicine is vital for strengthening nursing education, clinical competence, and patient safety in Nigeria.

Aim

To assess the knowledge and practice of injection safety among student nurses of Lagos State University College of Medicine (LASUCOM), Ikeja, Lagos, Lagos State, Nigeria.

Methods

A quantitative descriptive cross-sectional design was employed. A proportionate stratified random sample of 103 clinical-year student nurses at the 300, 400, and 500 levels was recruited from a total eligible population of 140. Data were collected through a validated self-administered questionnaire and analyzed using SPSS version 25. Descriptive statistics summarized demographic variables. Knowledge and practice scores were analyzed as continuous variables, with means, standard deviations, medians, and ranges reported. The association between knowledge and practice was assessed using Pearson's correlation and multiple linear regression adjusting for age, gender, and academic level. Categorical classifications of knowledge and practice were retained for secondary exploratory inferential analyses, using chi-square tests at a 0.05 significance level.

Results

The mean knowledge score was 10.63 (SD = 3.06, median = 11.0, range = 4–15) out of a maximum of 15. The mean practice score was 3.86 (SD = 0.53, median = 3.73, range = 2.57–5.00) on a 1–5 scale. Overall, 65% (n = 67) were categorised as having good knowledge and 68% (n = 70) as having good self-reported practice. Pearson's correlation showed a significant positive association between continuous knowledge and practice scores ($r = 0.46$, $p < 0.001$). In multiple linear regression, knowledge score remained a significant independent predictor of practice score ($B = 0.080$, 95% CI = 0.051–0.109, $p < 0.001$) after adjusting for age, gender, and academic level. Knowledge was significantly associated with gender, with female students demonstrating higher knowledge scores ($\chi^2 = 7.17$, $df = 1$, $p = 0.007$), but not with level of education ($\chi^2 = 2.71$, $df = 2$, $p = 0.260$). A positive association was observed between categorised knowledge and practice levels ($\chi^2 = 8.42$, $df = 1$, $p = 0.004$).

Conclusion

Student nurses in LASUCOM have moderate-to-good knowledge and practices in injection safety, but have deficits in compliance with aseptic procedures. To better position human resources to mitigate occupational risk, it is recommended that institutions of higher learning reinforce the curricular focus on this issue, provide on-going clinical supervision, and develop specific training programs to improve the competence of needle-safety professionals.

Introduction

Injections remain one of the most frequently performed medical procedures worldwide and are essential in the administration of vaccines, medications, and intravenous fluids [1]. The World Health Organization [2] estimates that more than 16 billion injections are administered annually, yet nearly 40% are performed with reused or unsterilised equipment, particularly in low- and middle-income countries. Unsafe injection practices contribute substantially to the transmission of bloodborne pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) [3, 4, 5, 6]. Beyond patient risk, unsafe injections also expose healthcare providers to occupational hazards including needlestick injuries and cross-infection [7]. Thus, injection safety is not only a clinical requirement but also a public health and ethical imperative.

Globally, studies have documented persistent gaps in injection safety compliance. A review across 14 of 19 developing countries reported that at least 50% of injections were unsafe, contributing significantly to new cases of HBV, HCV, and HIV infections [8, 9, 5, 10, 11]. In India, although awareness of injection-related risks was high among healthcare workers, unsafe practices such as needle recapping and poor hand hygiene persisted [12, 13]. Similarly, a Nigerian facility-based study found that only 25% of workers practiced safe injection consistently, and 37.5% admitted syringe reuse despite prior training [1]. These findings suggest that knowledge alone does not guarantee safe practice, especially in resource-constrained environments.

In sub-Saharan Africa, unsafe injection practices remain a major contributor to healthcare-associated infections (HAIs). Structural weaknesses such as inadequate infection prevention infrastructure, insufficient training, and weak enforcement of safety protocols continue to hinder progress [14, 15]. A regional analysis reported that the proportion of injections administered with new, unopened syringes ranged from 90.3% in Comoros to 99.0% in Burkina Faso, with lower rates observed in countries such as the Democratic Republic of Congo [16]. WHO AFRO [17] further reported that in some African countries, up to 70% of injections may involve reused or unsterilized equipment, contributing annually to millions of new HBV, HCV, and HIV infections. Studies from Cameroon and Ethiopia have similarly documented high levels of unsafe practices and needlestick injuries among healthcare workers [18, 19, 20].

Within Nigeria, evidence indicates a concerning gap between knowledge and safe practice. Although many healthcare workers can correctly define injection safety, fewer demonstrate adequate practical

compliance [21, 1, 22, 23]. Deficiencies have been particularly noted in hand hygiene, use of personal protective equipment, needle disposal, and avoidance of recapping [24]. These inconsistencies reflect a broader challenge in healthcare training: the persistent gap between theoretical instruction and clinical implementation. While injection safety is embedded in standard nursing curricula, adherence to protocols in clinical settings is often influenced by supervision quality, workload, and resource availability [25, 26, 27, 28, 41].

For student nurses, this issue is particularly critical. As individuals in the novice or advanced beginner stages of skill acquisition, they rely heavily on structured guidance and supervision. Benner's Novice to Expert theory [29] explains that clinical competence develops progressively from rule-dependent behaviour to intuitive expertise. In the context of injection safety, students must transition from theoretical understanding to consistent safe practice through guided clinical exposure. However, limited supervision, insufficient equipment, and high-pressure environments may compromise this developmental process. Although studies indicate that nursing students often demonstrate good theoretical knowledge, adherence to safe practices is sometimes suboptimal [30].

Despite these concerns, empirical evidence focusing specifically on Nigerian student nurses remains limited [31]. Most available studies concentrate on qualified healthcare workers, leaving a critical gap regarding those still in training who constitute the future workforce. Ensuring that student nurses internalize safe injection practices is vital not only for their occupational safety but also for patient protection and long-term professional conduct [25, 32]. Strengthening competency development aligns with global patient safety goals and Sustainable Development Goal 3, which emphasizes reducing communicable diseases and promoting health for all.

Within Lagos State, Nigeria's most populous and medically active state, the need for evidence-based evaluation is particularly pressing. Lagos State University College of Medicine (LASUCOM), as a leading state-owned institution, trains a substantial number of future nurses who will serve in diverse clinical environments. However, data regarding the extent to which student nurses at LASUCOM possess adequate knowledge of injection safety and translate it into clinical practice remain scarce.

Accordingly, this study evaluates the knowledge and practice of injection safety among student nurses at LASUCOM. Specifically, it examines students' understanding of injection safety principles, their adherence to these principles in clinical settings, and the demographic or institutional factors influencing compliance. By narrowing from global concerns to the local training context, this study addresses a critical gap in Nigerian nursing education and provides empirical evidence to inform curriculum improvement, institutional policy strengthening, and enhanced patient and provider safety.

Materials and Methods

Study Design

This research adopted a descriptive cross-sectional design, which is widely applied in public health and nursing research to investigate the existing level of knowledge, attitude, and practices of a defined population at a particular point in time [33]. It was selected for its efficiency in evaluating behavioural and cognitive dimensions such as injection safety among student nurses.

Study Setting

The study was carried out at the Lagos State University College of Medicine (LASUCOM) in Ikeja, Lagos in Nigeria. LASUCOM is among the foremost public medical institutions of learning in Nigeria, offering undergraduate and postgraduate courses in medicine, nursing and allied health sciences. Its Nursing Department combines both theoretical and clinical education and clinical placements are carried out in Lagos State University Teaching Hospital (LASUTH). This dual setting for participant selection offered a perfect context to evaluate how student nurses translate the appropriate epistemological knowledge on injecting safety into practice in a clinical context.

Study Population

The target population comprised all student nurses enrolled in the Bachelor of Nursing Science (B.N.Sc.) programme at the Lagos State University College of Medicine (LASUCOM) during the 2023/2024 academic session. The total eligible population comprised 140 student nurses across the three clinical levels (300, 400, and 500), distributed as follows: 44 students at the 300 level, 47 at the 400 level, and 49 at the 500 level. The inclusion criteria were: (1) active enrolment in the B.N.Sc. programme; (2) current participation in clinical rotations at the Lagos State University Teaching Hospital (LASUTH); and (3) willingness to provide written informed consent. Students who were in 100 and 200 level were excluded since they are not yet classified or registered as nursing students.

The total population of eligible student nurses across the three clinical levels (300, 400, and 500) was 140 students. The distribution by level was 44 students at the 300 level, 47 at the 400 level, and 49 at the 500 level. To ensure adequate representation across all levels and to account for the finite population, a proportionate stratified random sampling technique was employed.

Sample size/Sampling Technique

Due to the fact that the study population was finite ($N = 140$), a proportionate stratified random sampling technique was employed rather than a census. The minimum sample size was determined using Cochran's formula for descriptive studies, with a standard normal deviation of 1.96, a proportion of 0.5 for maximum variability, and a margin of error of 0.05 [34]. The sample size for this descriptive study was determined using the Cochran's formula:

$$n = \frac{Z^2 * P * (1 - P)}{E^2}$$

Where:

$Z = 1.96$ (95% confidence level)

$P = 0.5$ (maximum variability assumption)

$E = 0.05$ (margin of error)

$$n_0 = \frac{(1.96)^2 \times 0.5 \times (1-0.5)}{(0.05)^2} \quad n_0 = \frac{3.8416 \times 0.25}{0.0025} \quad n_0 = \frac{0.9604}{0.0025} \quad n_0 = 384.16$$

Thus, the initial sample size for an infinite population was approximately **384**.

Finite Population Correction

Since the study population was finite (**N ≈ 140**), the sample size was adjusted using the finite population correction (FPC) formula:

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

Substituting:

$$n = \frac{384}{1 + \frac{383}{140}} \quad n = \frac{384}{1 + 2.736} \quad n = \frac{384}{3.736} \quad n = 102.8$$

Thus, the adjusted sample size for the finite population was approximately **103**.

Participants were selected using proportionate stratified random sampling across the three clinical levels (300, 400, and 500). The sample for each stratum was determined using the proportionate allocation formula:

$$n_h = \frac{N_h}{N} \times n$$

where n_h is the sample size for each stratum, N_h is the population of each clinical level, N is the total study population, and n is the overall sample size. Based on a total sample size of **103**, the proportionately allocated samples were 32, 35, and 36 participants from the 300, 400, and 500 levels, respectively. Participants within each stratum were then selected using simple random sampling.

The sampling frame was the official class/clinical rotation roster; participants were selected by simple random sampling using a computer-generated random number list. Eligibility (current enrolment and

active clinical rotation) was verified from the roster and by clinical supervisors. Written informed consent was obtained before data collection, and confidentiality and ethical approvals were ensured. All 103 selected students agreed to participate and completed the questionnaire, yielding a 100% response rate among the sampled participants.

Study Instrument

Data were obtained using a structured self-administered questionnaire, modified from the Best Practices for Injections and Related Procedures Toolkit developed by WHO [35] and from previously validated instruments employed in similar studies [36, 1]. The questionnaire had four sections:

1. Socio-demographic information (age, gender, and academics at school);
2. Knowledge of injection safety measured by 15 closed-ended true/false/unsure items covering: (a) definition and scope of injection safety (2 items); (b) hand hygiene and aseptic technique (3 items); (c) use of sterile single-use equipment (2 items); (d) needle safety and recapping (3 items); (e) waste segregation and disposal (2 items); and (f) occupational exposure and bloodborne pathogen transmission (3 items). Each correct response was scored 1, and incorrect or unsure responses were scored 0, yielding a total knowledge score ranging from 0 to 15;
3. Injection safety practice evaluated against 12 behavioural statements assessed on a 5-point Likert scale (1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always). The statements covered: (a) hand hygiene before and after injection (2 items); (b) use of sterile single-use syringes (2 items); (c) needle recapping behaviour (2 items); (d) immediate sharps disposal (2 items); (e) use of personal protective equipment (2 items); and (f) reporting of needle-stick injuries and post-exposure procedures (2 items). The total practice score ranged from 12 to 60, with a possible mean item score ranging from 1.0 to 5.0; and
4. Barriers to compliance assessed via an open-ended question: "What factors, if any, hinder your consistent adherence to safe injection practices during clinical rotations?" Participants could provide multiple responses.

The face and content validity of the instrument was determined by three senior nursing educators from LASUCOM. A pre-test was conducted with ten student nurses from the School of Nursing, Lagos State University Teaching Hospital (LASUTH) two weeks before the main study (2nd–4th January 2024). The draft questionnaire was self-administered in a supervised classroom setting, followed by a structured debriefing to assess clarity, comprehension, and appropriateness of items. Feedback was reviewed by the principal investigator and validators, and minor revisions were made to two knowledge items and one practice item. The refined instrument yielded a Cronbach's alpha of 0.82, consistent with acceptable reliability standards in nursing research [37].

Data Collection Procedure

Data were collected using a self-administered paper-based questionnaire administered through face-to-face contact in a supervised classroom setting at LASUCOM. No online platforms or electronic forms were used. Data collection occurred from 15th January to 2nd February 2024, on weekdays between 9:00 a.m. and 4:00 p.m.

Three research assistants with B.N.Sc. degrees and prior data collection experience supported the principal investigator. They underwent a one-day training on 12th January 2024 at the Seminar Room, Department of Nursing, LASUCOM, conducted by the principal investigator with oversight from the research supervisor. The six-hour training covered study objectives, questionnaire administration, informed consent procedures, data quality assurance, and mock administration.

Access to participants was facilitated through class representatives. The principal investigator or a trained research assistant explained the study objectives and obtained written informed consent before questionnaire administration. To ensure independent responses, participants were seated at least one metre apart, mobile phones were switched off, and research assistants monitored the room without interfering with responses. Participants were given 20–25 minutes to complete the questionnaire.

Upon completion, questionnaires were immediately reviewed for completeness and internal consistency. Those with more than 10% missing data were followed up the same day; no questionnaires required replacement. Completed questionnaires were stored in a locked cabinet and entered into a password-protected computer within 48 hours.

Measurement of Variables

Knowledge score was calculated by giving "1" point for each correct response and "0" point for incorrect or "unsure" response across 15 items. The maximum possible score was 15 and the minimum was 0. The observed score range in this study was 4 to 15. Participants that had a score of 10 (66.7%) were categorised as having good knowledge and those with scores that were below 10 were categorised as having poor knowledge [38]. The 66.7% threshold was selected because it represents performance at or above two-thirds of the maximum possible score, a cut-off widely applied in similar nursing knowledge assessments [38].

Similarly, practice was measured on a 5-point Likert scale that ranged from "Always" (5) to "Never" (1) across 12 items. Total practice scores ranged from 12 to 60, with a possible mean item score range of 1.0 to 5.0. The observed mean item score range was 2.57 to 5.00. Mean practice scores ≥ 3.5 were categorised as good practice and scores < 3.5 as poor adherence. This threshold represents performance at or above 70% of the maximum Likert response, consistent with prior studies defining adequate adherence to safety protocols [36].

Data Analysis

Data was coded and analysed by using IBM SPSS statistics Version 25.0. Descriptive statistics, frequencies, percentages, means, and standard deviations were used for the summary of respondent's demographic characteristics and levels of knowledge/practice. Knowledge and practice scores were analysed as continuous variables. Means, standard deviations, medians, and observed ranges are reported for both scales. The association between continuous knowledge and practice scores was assessed using Pearson's correlation coefficient (or Spearman's rank correlation if distributions were non-normal). Multiple linear regression was performed as the principal analysis to examine the independent effect of knowledge score on practice score after adjusting for age, gender, and academic level. Age and academic level were treated as ordinal variables (scored 1–3 across their respective categories: age < 20 = 1, 21–25 = 2, 26–30 = 3; academic level 300 = 1, 400 = 2, 500 = 3), and gender was coded as male = 0 and female = 1. Model assumptions (linearity, normality of residuals, and homoscedasticity) were verified. Model fit statistics (adjusted $R^2 = 0.21$, $F_{4,98} = 7.42$, $p < 0.001$) and diagnostic results indicated adequate model fit. Unstandardised regression coefficients (B) with 95% confidence intervals are presented. For secondary exploratory inferential purposes, chi-square (χ^2) tests were also used to examine associations between categorised knowledge, practice and selected socio-demographic variables at a 5% significance level ($p < 0.05$). This analytical approach has been widely used in other research studies in assessing healthcare safety behaviour [26].

Ethical Considerations

Ethical approval

for this study was obtained from the Lagos State University College of Medicine (LASUCOM) Institutional Review Board with Approval reference number: LREC/06/10/2025. Participation was entirely voluntary, and written informed consent was obtained from all respondents prior to data collection. Confidentiality and anonymity were conferred through the coding of questionnaires without people's names or any information that identifies them. Data were stored secure on password-protected devices that were accessible to the principal investigator. Participants were informed that they had the right to withdraw at any time without any consequences.

Quality Control

To ensure reliability and validity of findings, a number of control measures were used. Data collectors (three research assistants with B.N.Sc. degrees) were briefed and trained about the standard ethical and process guidelines before the fieldwork started. Data collectors (three research assistants with B.N.Sc. degrees) were briefed and trained about the standard ethical and process guidelines before the fieldwork started. Questionnaires were reviewed daily in order to find and correct inconsistencies. Double data entry was carried out with an objective of eliminating as much as possible the errors during transcription. These measures are in accordance with the World Health Organisation [39] recommendation on data integrity endorsements of health research settings.

Results

Socio-Demographic Characteristics of Respondents

The total number of students nurses who took part in the study was 103, giving response rate of 100% among the sampled participants. Table 1 shows demographic information of the participants. Most of them were female (79.6%), accounting for 20.4% male. Most of the respondents were in the age group of 21–25 years (62.1%), followed by (26–30) years (25.2%) and below 20 years age group (12.6%). For the academic level there were 35% of 500 level, 34% of 400 level, and 31% of 300 level. This distribution represents the gender and age issues typical in the nursing student population in Nigeria, as nursing remains a largely female dominated profession. The large representation from final-year students ensured that there was exposure to actual clinical practice for meaningful assessment of the injection safety competencies.

Table 1
Demographic Characteristics of Respondents (n = 103)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	< 20	13	12.6
	21–25	64	62.1
	26–30	26	25.2
Gender	Male	21	20.4
	Female	82	79.6
Academic Level	300 level	32	31.1
	400 level	35	34.0
	500 level	36	35.0

Figure 1 shows the age distribution of the respondents. The majority (62.1%) were aged 21–25 years, followed by 26–30 years (25.2%) and < 20 years (12.6%).

Knowledge of Injection Safety

The mean knowledge score was 10.63 (SD = 3.06, median = 11.0, range = 4–15) out of a maximum of 15. Analysis of the knowledge scores showed that 65% (n = 67) of respondents had good knowledge of injection safety, and 35% (n = 36) of respondents showed poor knowledge as shown in Fig. 2. Table 2 further summarises certain areas of knowledge.

A vast majority (90.3%) recognised the need to use single-use syringes to ensure injection safety, whereas 85.4% were aware of the significance of hand hygiene before procedures. However, only 47.6% correctly knew that recapping used needles poses a risk of needle-stick injury, while 52.4% incorrectly believed that recapping was safe or were unsure. Similarly, only 46.6% correctly identified that safe waste segregation is part of injection safety.

Table 2
Knowledge of Injection Safety among Student Nurses (n = 103)

Knowledge Item	Correct n (%)	Incorrect/Unsure n (%)
Injection safety involves protection for both patient and provider	92 (89.3)	11 (10.7)
Handwashing before and after injection is mandatory	88 (85.4)	15 (14.6)
Always use a single-use sterile syringe and needle	93 (90.3)	10 (9.7)
Recapping used needles is safe	49 (47.6)	54 (52.4)
Proper waste segregation is part of injection safety	48 (46.6)	55 (53.4)
Needle-stick injuries can transmit HBV/HCV/HIV	95 (92.2)	8 (7.8)
Safe injection protects the community from waste hazards	89 (86.4)	14 (13.6)

Practice of Injection Safety

The mean practice score was 3.86 (SD = 0.53, median = 3.73, range = 2.57–5.00) on the 1–5 scale. Overall, 68% (n = 70) of respondents rated themselves as good practice and 32% (n = 33) as poor practice as shown in Fig. 3 below. The basic results are summarised in Table 3.

Table 3 presents a selected subset of six representative items (one from each of the six practice domains) drawn from the full 12-item scale. For clarity of presentation, the original five Likert response categories have been collapsed into three response categories: "Always" (original score 5), "Sometimes" (original scores 2–4 combined: rarely, sometimes, and often), and "Never" (original score 1).

In total, 84.5% of respondents always checked the sterilisation of syringes before use. However, only 54.4% reported that they never recap used needles, while 24.3% sometimes recapped and 21.4% always recapped. Hand hygiene before each injection was reported as "always" by only 63.1%, and immediate sharps disposal into safety boxes was "always" performed by only 59.2%. This gap between knowledge and regular practice stresses the need for behavioural reinforcement provided by clinical supervision and periodic training.

Table 3
Injection Safety Practice among Student Nurses (n = 103)

Practice Statement	Always n (%)	Sometimes n (%)	Never n (%)
Wash hands before each injection	65 (63.1)	32 (31.1)	6 (5.8)
Use only sterile, single-use syringes	87 (84.5)	14 (13.6)	2 (1.9)
Recap needles after use	22 (21.4)	25 (24.3)	56 (54.4)
Dispose sharps immediately into safety box	61 (59.2)	28 (27.2)	14 (13.6)
Report accidental needle-stick injuries	72 (69.9)	20 (19.4)	11 (10.7)
Wear gloves during injection	79 (76.7)	18 (17.5)	6 (5.8)

Association between Knowledge, Practice, and Socio-Demographic Variables

Table 4 presents the principal multiple linear regression analysis and secondary exploratory inferential analyses. A multiple linear regression was conducted with practice score as the dependent variable and knowledge score, age, gender, and academic level as independent variables. The model assumptions of linearity, normality of residuals, and homoscedasticity were satisfied. The model explained 21% of the variance in practice scores (adjusted $R^2 = 0.21$, $F_{4,98} = 7.42$, $p < 0.001$). Knowledge score remained a statistically significant independent predictor of practice score ($B = 0.080$, 95% CI = 0.051–0.109, $p < 0.001$) after adjusting for age, gender, and academic level. Neither age ($B = -0.008$, 95% CI = -0.057–0.040, $p = 0.736$) nor academic level ($B = 0.136$, 95% CI = -0.044–0.316, $p = 0.138$) was significantly associated with practice scores. Female gender showed a positive association with higher practice scores that did not reach conventional statistical significance in the adjusted model ($B = 0.255$, 95% CI = -0.039–0.548, $p = 0.088$).

As secondary exploratory inferential analyses, chi-square tests were used to examine associations between categorised knowledge, practice, and selected socio-demographic variables (Table 4). A significant association was observed between gender and knowledge level ($\chi^2 = 7.17$, $df = 1$, $p = 0.007$), with female students demonstrating slightly higher knowledge scores. No statistically significant relationship was found between academic level and knowledge ($\chi^2 = 2.71$, $df = 2$, $p = 0.260$) or between age and knowledge ($\chi^2 = 3.25$, $df = 2$, $p = 0.200$). Furthermore, a positive association was identified between knowledge and practice ($\chi^2 = 8.42$, $df = 1$, $p = 0.004$), indicating that students with higher knowledge scores were more likely to exhibit safe injection practices.

Table 4
Bivariate and Multivariable Associations between Knowledge, Practice, and Socio-Demographic Variables

Variable	Analysis	Statistic	Value	p-value
Knowledge score	Descriptive	Mean $\pm$ SD	10.63 $\pm$ 3.06	
		Median (range)	11.0 (4–15)	
Practice score	Descriptive	Mean $\pm$ SD	3.86 $\pm$ 0.53	
		Median (range)	3.73 (2.57–5.00)	
Knowledge $\times$ Practice	Bivariate	Pearson's r	0.46	< 0.001
Knowledge $\rightarrow$ Practice (adjusted)	Multivariable	B (95% CI)	0.080 (0.051–0.109)	< 0.001
Age $\rightarrow$ Practice (adjusted)	Multivariable	B (95% CI)	–0.008 (–0.057–0.040)	0.736
Gender $\rightarrow$ Practice (adjusted)	Multivariable	B (95% CI)	0.255 (–0.039–0.548)	0.088
Academic Level $\rightarrow$ Practice (adjusted)	Multivariable	B (95% CI)	0.136 (–0.044–0.316)	0.138
Model fit	Multivariable	Adjusted R ² (F-statistic)	0.21 (F _{4,98} = 7.42)	< 0.001
Gender $\times$ Knowledge (categorical)	Chi-square (secondary)	χ^2 (df = 1)	7.17	0.007
Age $\times$ Knowledge (categorical)	Chi-square (secondary)	χ^2 (df = 2)	3.25	0.200
Academic Level $\times$ Knowledge (categorical)	Chi-square (secondary)	χ^2 (df = 2)	2.71	0.260
Knowledge $\times$ Practice (categorical)	Chi-square (secondary)	χ^2 (df = 1)	8.42	0.004
<i>Note. Age and academic level were entered as ordinal variables (scored 1–3 across their respective categories); gender was coded male = 0, female = 1. Diagnostic checks confirmed linearity, normality of residuals, and homoscedasticity.</i>				

Barriers to Safe Injection Practices

Barriers were assessed through an open-ended question to which participants could provide multiple responses. Two independent coders (the principal investigator and a trained research assistant) reviewed all responses and inductively developed a coding frame comprising four dominant themes. Each participant was assigned to the single most frequently cited or most significant barrier they reported. Inter-coder agreement was assessed (Cohen's κ = 0.88), and disagreements were resolved through discussion and adjudication by a third reviewer (the research supervisor) when necessary.

Because each participant was classified into one primary barrier category, the frequencies in Table 5 sum to the total sample (n = 103).

Open-ended responses uncovered a number of perceived barriers. About 41% responded to say that the reasons for breaches include lack of supply of personal protective equipment (PPE) like gloves, safety boxes, etc; 27% said lack of supervision during clinical sessions; and 22% sent their compliments to high patient workload. The other 10% said they are afraid to report needle stick injuries as they feel they will be blamed by the instructors. This is expressed in Table 5 below;

Table 5
Perceived Barriers to Safe Injection Practices

Barrier	n	%
Lack of supply of personal protective equipment (PPE) - gloves, safety boxes, etc.	42	41
Lack of supervision during clinical sessions	28	27
High patient workload	23	22
Fear of reporting needle stick injuries (afraid of being blamed by instructors)	10	10
Total	103	100

Discussion

This study assessed the knowledge and practice of injection safety among student nurses of Lagos State University College of Medicine (LASUCOM). The results indicate that although most students had good theoretical knowledge and relatively safe self-reported injection practices, gaps remained in consistent self-reported adherence to hand hygiene, sharps disposal, and reporting of injuries. These findings highlight a persistent challenge in nursing education: the translation of theoretical knowledge into habitual, evidence-based practice.

Awareness on Injection Safety

The result that 65% of respondents showed good knowledge of safety in injections is in line with previously reported research in Nigeria and other developing countries. Abubakar et al. [1] found a comparable level (63%) among healthcare workers in a secondary healthcare facility in the northern region of Nigeria, which implies that baseline awareness of the principles of safety in injections is moderately high across health institutions. Comparable knowledge levels have been reported in other African settings, suggesting regional consistency in familiarity with basic injection safety standards.

However, misconceptions regarding recapping and waste segregation are concerning. More than half of respondents (52.4%) incorrectly believed that recapping used needles was safe or were unsure of the risk, while only 47.6% correctly identified that recapping poses a risk of needle-stick injury. International guidelines and studies on needlestick injuries explicitly discourage needle recapping, as this behaviour is

associated with a substantial proportion of percutaneous injuries among healthcare personnel [10, 40, 42].

The fact that this misconception has remained suggests the presence of gaps in the behavioural training rather than informational deficiency. While classroom instruction may cover procedures for good infection-safety protocol, students may not infuse safe habits when good clinical supervision is irregular. Studies by Alhumaid et al [41] and Uwaibi et al [36] have shown that student nurses have the tendency to model the behaviour of senior colleagues and supervisors. Moreso, this finding aligns with previous findings by Ugbelu and Onunze [38] and WHO [4], both of which emphasise that adequate knowledge is a strong predictor of safe clinical behaviour.

If mentors do not model safe behaviours students are unlikely to stick to the theoretical principles strictly. This highlights Benner's Novice to Expert Theory [29] which states that professional competence develops in a form of guided learning through experience. In the absence of strong role models, it can be the case that progression from novice to competent practitioner will stagnate.

Safety of Practice of Injection

The result of the study showed that 68% of the respondents practiced the safety of injection adequately which is slightly higher than that reported by Uwaibi et al. [36], which reported 61% in primary healthcare workers in Southwest Nigeria. However, given this relatively good performance, there are some unsafe behaviours which are still evident. Only 54.4% of students reported that they never recap used needles, while 21.4% always recapped and 24.3% sometimes recapped. Furthermore, only 59.2% always disposed of used needles into safety boxes immediately after injection, and 36.9% did not always practice hand hygiene before performing procedures.

These results are similar to those documented across Africa as a whole. For example, in the work of Ali and Eldessouki [26], although the healthcare workers in the East Africa had adequate knowledge on the protocols that are to be followed in cases of infection prevention, there was usually a lack of compliance coupled with the time pressure, poor infrastructure and unavailability of protective equipment. These systemic problems are reflective of those in many Nigerian hospitals where the limitations of resources affect the adherence to global practices.

One more factor that has an influence on practice is the risk perception. Some of the respondents revealed that they do not report small needle-stick injuries frequently, in fear of being punished or of being called careless. This finding echoes the caution of World Health Organisation's [42] warning that under-reporting is a significant impediment to proper surveillance of infection. Similarly, Auta et al. [43] found that 97% of healthcare students in Nigeria did not report cases of incident exposures and this were mainly attributable to perceived stigma and bureaucratized reporting systems in Nigeria. Establishing a non-punitive safety culture among clinical education thus is essential to raising compliance.

Relationship of knowledge and Practice

The significant association that was observed existed between knowledge and practice which may indicate that the higher awareness of the people was associated with safer behaviours. This relationship agrees with the previous results of Ugbelu and Onunze [38] who showed that nurses with higher knowledge scores were twice as likely to follow aseptic protocols. It is also consistent with models in favour of behavioural theory, which will suggest that knowledge is necessary but not sufficient for change in behaviour. The Health Belief Model [44] states that people only act in ways that increase their safety provided they determine the threat to be serious and the preventative behaviour to be beneficial. Therefore, although students may know the risks associated with unsafe injection practice, sustained safe practice is dependent on motivation, reinforcement and institutional support.

Interestingly, in this study, there was no significant relationship between the academic level and knowledge ($p = 0.26$). This is in contrast to findings by Aboumatar et al. [45], who found that senior students had a higher safety knowledge level as a result of the cumulative clinical exposure. The lack of variation here may indicate that the nursing curriculum at LASUCOM offers early and uniform exposure of the students to curriculum related to infection control training, and this decreases differences across the academic levels. However, the significant difference in gender, with females performing better ($p = 0.007$), is consistent with findings from Nigerian nursing education contexts where female students have demonstrated higher clinical competence levels in direct patient care settings [46].

Institutional and Systems Barriers

The qualitative results add extra depth to the quantitative results. Limited supplies of gloves and safety boxes as reported by 41% of respondents reflect infrastructural deficit in other studies on Nigeria [15, 26]. The WHO [35] emphasises the importance of creating an enabling environment for safe injection practice, which involves having reliable supplies, disposal systems and supervision. Where these are lacking even well-trained students may resort to unsafe short-cuts.

Another barrier that was found was poor supervision during clinical practice. The importance of effective preceptorship in bridging the theory-practice gap is well established. According to Benner's theory, safety training can be accomplished with mentorship from competent practitioners which assists the novice to internalise safe habits through observation and guided reflection. Studies by Amavasi and Zimmerman [11] demonstrate that consistent feedback and clinical supervision lead to a significant increase in infection prevention standards adherence among nursing students. Therefore, the findings highlight the need for institutional investments in mentoring frameworks in nursing institutions in Nigeria.

Implications for Nursing Education & Practice

The findings suggest several targets for intervention. First, the need for a review of the nursing curriculum to incorporate more practical learning on injection safety, particularly through simulation-based training. Evidence from Ignacio et al. [47] indicates that simulation exercises not only reduce

procedural anxiety but also improve compliance and competency among nursing trainees. Thus, by providing students with realistic, hands-on practice in a controlled environment, simulation-based learning allows trainees to make mistakes and learn from them without putting patients at risk.

Second, continuous professional development (CPD) programs for both nursing students and clinical instructors may help ensure that what is taught in the classroom aligns with what is practiced in clinical settings. Countries such as the United Kingdom and India have demonstrated that structured CPD programs for educators and practitioners enhance procedural consistency and reinforce infection control practices [48, 49]. Implementing similar programs in Nigerian nursing institutions would help maintain high standards of safety.

Third, policy enforcement and structural support at clinical training sites are critical. Ensuring the availability of sterile equipment and functional safety boxes is fundamental to safe injection practices. Without these structural provisions, even well-trained nursing staff may be unable to apply their knowledge effectively. Lessons from Rwanda and Kenya illustrate that strengthening infrastructure, coupled with strict adherence to infection control policies, significantly improves compliance rates [50, 51]. For Nigeria, guaranteeing adequate resources and monitoring adherence to safety protocols is essential to creating an environment where best practices in injection safety can thrive.

Finally, institutional audits and performance monitoring can play a vital role in promoting accountability and sustaining a culture of safety. Rwanda and Kenya provide practical examples where audit-based structured infection control has led to measurable improvements in safety compliance [51]. Introducing similar audit mechanisms in Nigerian teaching hospitals would not only strengthen safety culture but also ensure that nursing practice aligns with global standards.

Conclusion

This study revealed that the knowledge of student nurses in Lagos State University College of Medicine regarding injection safety is commendable but self-reported adherence is inconsistent. While a majority of respondents had a good grasp of the principles of sterile technique and occupational protection, lapses remain in the areas of hand hygiene, sharps disposal and reporting of injury. The positive correlation between knowledge and practice scores, and the independent effect of knowledge on practice after adjusting for demographics, suggest that educational interventions may support safer self-reported behaviour, though this cross-sectional study cannot establish causality. Sustainable improvement in injection safety not only requires cognitive competence, but also supportive learning environment, availability of resources and a culture of accountability ingrained into the medical profession. Strengthening supervision and incorporating training with simulations related to safe injection practices and encouraging a non-punitive mechanism for reporting related incidents will be instrumental in ensuring that safe injection practices become second nature and are professionally maintained among the next generation of nurses.

Study Limitations

Although this study is important, it is limited in that it is cross-sectional in design, which limits one from making inference about cause and effect. Self-reported data may also be prone to response bias, with some subjects reporting a higher level of adherence than they actually have in order to try to please others. This study measured self-reported practice rather than observed clinical competence; therefore, the findings may not reflect actual behaviour in clinical settings. Additionally, the current study was conducted in one institution and thus may not be generalisable. Future studies should use longitudinal or mixed method approaches with direct observation to investigate how the knowledge and practice will change over time and under a variety of institutional conditions.

Declarations

Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from the Lagos State University College of Medicine (LASUCOM) Institutional Review Board with Approval reference number: LREC/06/10/2025. The research was conducted in accordance with the ethical principles of the Declaration of Helsinki (1964, revised 2013). Written informed consent was obtained from all participants prior to data collection. Participants were assured of voluntary participation, confidentiality, anonymity, and their right to withdraw from the study at any time without any consequences.

Consent for Publication

All authors have reviewed and approved the final version of the manuscript and consent to its publication.

Competing Interests

The authors declare that they have no competing interests.

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Author Contribution

Uchechi Ngozichukwu Obiefule conceptualised the study and supervised data collection. Patience Madu contributed to the study design and manuscript review. Chineye Fabian Adili-George and Uchenna

Anyanwu contributed to methodology development, data validation, and critical revision of the manuscript. Uwemedimo Sunday Isaiah performed the statistical analysis, interpreted the data, and drafted the manuscript. All authors read and approved the final manuscript.

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Data Availability

The datasets generated and/or analysed during the current study are not publicly available due to ethical considerations and the need to protect participant confidentiality. However, the data are available from the corresponding author upon reasonable request at: [uwemedimoisaiah.msc@uniuyo.edu.ng] (mailto:uwemedimoisaiah.msc@uniuyo.edu.ng) .

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Figures

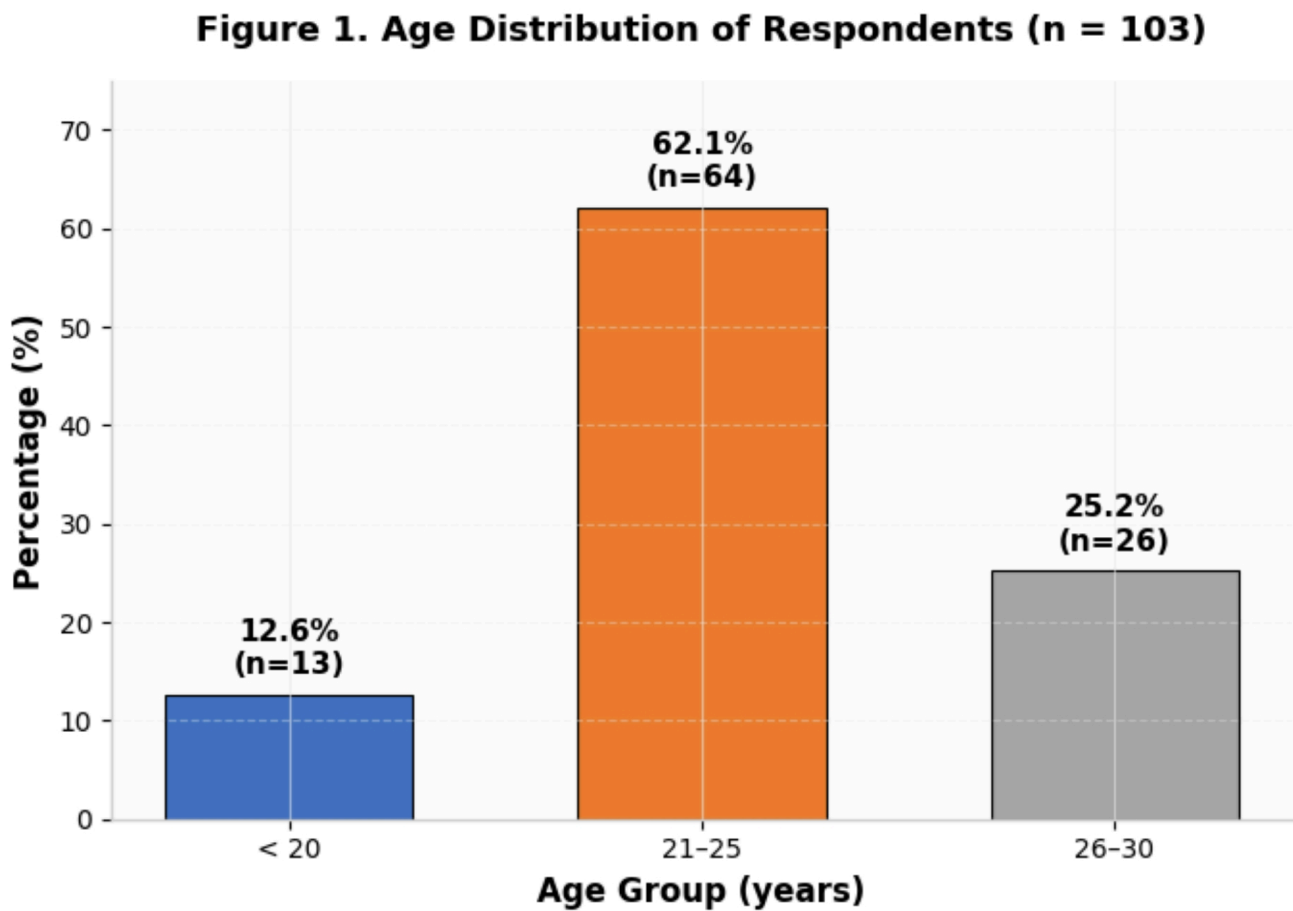


Figure 1

Figure 2. Knowledge of Injection Safety (n = 103)

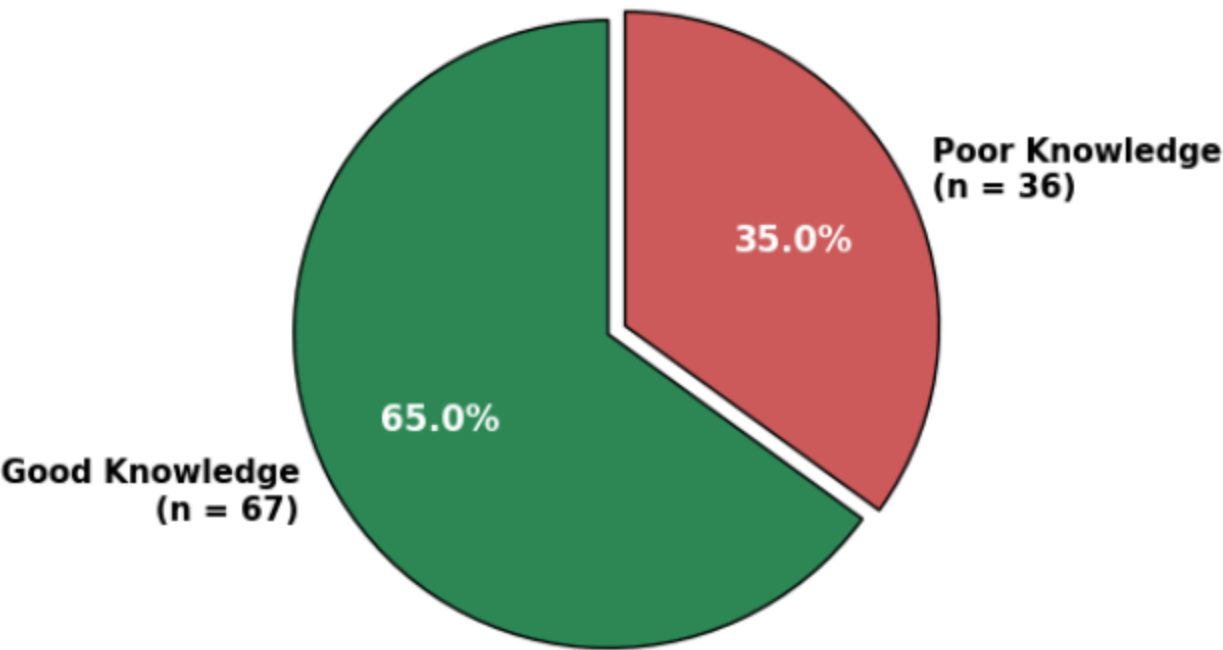


Figure 2

Above shows that 67 (65.0%) respondents’ knowledge level on injection safety was good while that of 36 (35.0%) respondents was poor.

Figure 3. Safe Injection Practices of Respondents (n = 103)

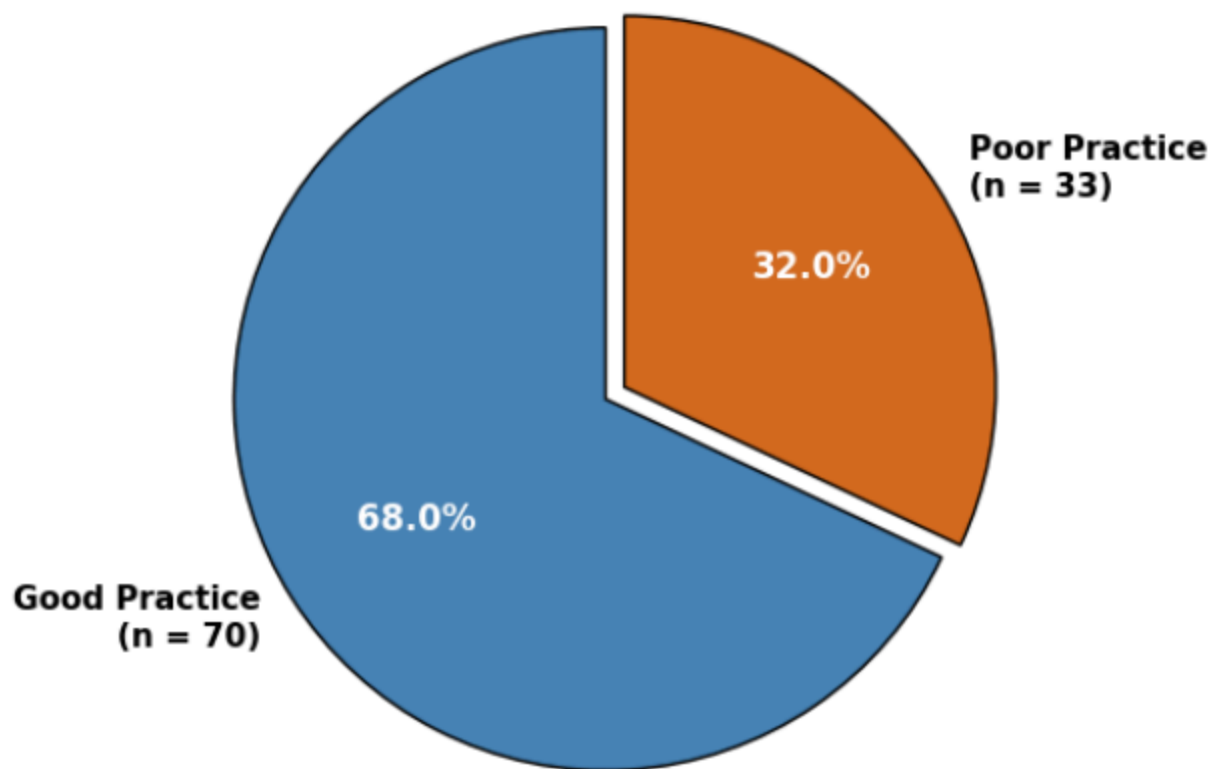


Figure 3

Above shows that the safe injection practices of 70 (68.0%) respondents were good while that of 33 (32.0%) respondents was poor.