EFFECT OF SOCIO-DEMOGRAPHIC CHARACTERSITICS OF NURSES ON INJECTION SAFETY PRACTICE AND AI-ASSISTED KNOWLEDGE OF HEALTH AND FITNESS FACILITIES

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ABSTRACT

The study analyzed the effect of socio-demographic characteristic of nurses on injection safety practice and AI-assisted knowledge of health and fitness facilities at secondary health facility in Akwa Ibom state. This study employed a non-experimental descriptive method. This research was carried out in the Akwa Ibom North East Senatorial District of Nigeria. The population of the study consisted of 191 nurses in the 18 secondary healthcare facilities in Akwa Ibom North East Senatorial District. A sample of ninety 90 nurses offering direct patient care out of 191 nurses were selected from nine out of 18 secondary healthcare facilities in Akwa Ibom North East Senatorial District. Purposive sampling technique was used for the study. A researcher designed instrument tagged "Awareness of Practice of Injection Safety and Safe Injection Practice Questionnaire (APISSIPQ) was used to collect data for the study. Validity was ensured through the use of well-structured questionnaire and validation by the supervisor and two lecturers in the Department of Nursing, University of Uyo, Uyo. Descriptive and inferential statistics were employed to evaluate the data, and the Statistical Package for Social Sciences (SPSS) Version 23 (IBM, Armonk, NY) was utilized. The chi-square test was used to establish the association between the variables, and a p-value of 0.05 was selected for statistical significance. The study showed that there is a substantial correlation between nurses' awareness of related safety concerns and safe injection techniques—is accepted and the null hypothesis is rejected. In conclusion, socio-demographic characteristics such as age, experience, gender, and education significantly influence nurses' injection safety practices and their knowledge of health and fitness facilities. Based on the findings of the study it was recommended that in order to avoid workplace hazards and the transmission of infectious diseases that could be brought on by hazardous injection techniques, nurses should keep up their injection safety measures.

KEYWORDS: Socio-Demographic Characteristic, Nurses, Injection Safety Practice, Health and Fitness Facilities and Akwa Ibom State

INTRODUCTION

Unsafe injection practices result in numerous needle stick injuries (NSI) for healthcare professionals as well as blood-borne viral infections for injection victims. According to the World Health Organization (WHO) (2015), at least half of the 20 billion injections given annually worldwide are harmful.

Blood-borne infections like HIV, hepatitis B (HBV), and hepatitis C (HCV) can spread as a result of unsafe injection practices. Over 25 million avoidable new cases of blood-borne illnesses, including HIV, Hepatitis B, and Hepatitis C, are caused by unsafe injecting practices worldwide (United Nations Children's Fund-UNICEF, 2013). According to Mehta et al. (2016), unsafe injections accounted for about 93% of injections administered in India and around 60% of HBV contamination cases. According to a 2015 World Health Organization report, unsafe infections may have been the source of 260 000 HIV cases, 2 million hepatitis C cases, and 21 million cases of hepatitis B. When patients or clients share injectable equipment carelessly, diseases can spread from infected to uninfected individuals.

In addition to spreading diseases, improper injections can cause the receiver to suddenly collapse and possibly die if proper resuscitation is not performed. If the negative side effects are not reported in a timely manner, an unsafe injection can leave victims permanently blind or deaf. Unsafe injection practices are becoming a major issue in both industrialized and developing nations. In addition to HIV and hepatitis, hazardous injection practices can lead to other potentially fatal bacterial illnesses such meningitis, septicemia, and spinal abscesses. Inadequate injections may also result in a child's lower limb partial paralysis, which will require them to live as a disabled adult throughout maturity. According to WHO estimates from 2014, improper injection methods have resulted in 501,000 deaths. Injection safety measures, such as lowering the number of injections, guaranteeing safe injection procedures by adhering to the "nine rights," providing suitable injection equipment, and disposing of sharps and other medical wastes appropriately, could have avoided these deaths. The “nine rights” of injection safety ensures that the right patient is given the right drug in the right dosage and right formulation using the right injection equipment at the right time and right route with right storage and the right method of disposal (Federal Ministry of Health, JSI/MMIS, 2017). Although safe injection procedures are more costly than risky ones, they will lessen the strain on the healthcare system by severing the link that spreads blood-borne infections and their aftereffects (Miller and Pisani, 2019). It is crucial to always, at all levels, prevent the spread of disease when delivering health services.

STATEMENT OF PROBLEM

The researcher has observed that nurses do not apply infection prevention and control measures in the hospital setting which is required to ensure safety. Lack of awareness and practices of injection safety among nurses has contributed to high rate of hospital-acquired infections. According to Miller and Pisani (2019), unsafe injection practices are linked to significant morbidity and mortality, especially from hepatitis A and C. For this reason, the researcher set out to determine or evaluate the nurses' knowledge and usage of injection safety in the North-East senatorial district of Akwa Ibom State.

RESEARCH OBJECTIVE

1. Examine the factors associated with injections and how it relates to the practice of injection safety among nurses in secondary health facilities in Akwa Ibom North-East senatorial District.
2. Examine the socio-demographic characteristics of nurses and its relationship to AI-assisted knowledge/practice of injection safety in secondary health facility in Akwa Ibom North-East senatorial District.

RESEARCH QUESTIONS

1. What is the nurses' knowledge of associated safety factors in secondary health facilities in Akwa Ibom North-East Senatorial District?
2. What are the socio-demographic characteristics of nurses and its relationship to AI-assisted knowledge/practice of injection safety in secondary health facility in Akwa Ibom North-East senatorial District?

RESEARCH HYPOTHESIS

1. There is no significant relationship between nurses' knowledge of associated safety factors and practice of injection safety at secondary health facility in Akwa Ibom North-East Senatorial District.
2. There is no significant relationship between socio-demographic characteristics of nurses and AI-assisted knowledge/practice of injection safety at secondary health facility in Akwa Ibom North-East Senatorial District.

CONCEPTUAL REVIEW

Safe Injection Practices among Nurses

A safe injection does not cause harm, does not put healthcare providers at unnecessary risk, and does not produce waste that could endanger the public (WHO, 2015). According to Missionpharma and Denmark (2015), reusing injectable equipment is a big concern and many injections performed globally are harmful. In a 2019 study, Drake examined safe injection practices among nursing staff in a tertiary hospital in Kolkata, West Bengal, India. Of the 80 nurses included in the sample, 12.5% cleaned their hands with soap and water before giving an injection. While administering injections, 60% of them followed the WHO's recommended protocol; only 3.7% of them wore sterile gloves. In 57.5 percent of the procedures performed during the study, hub cutters were used to dispose of needles; 42.5 percent of the procedures involved recapped needles, and 41.2 percent of the procedures involved correctly disposing of spent syringes. The author came to the conclusion that a local policy and surveillance program based on the WHO standards might be useful in this case. She also concluded that there was a need to regularly educate, train, and inspire service providers, especially nurses, on safe way of handling injectable equipment.

Also, health workers must be encouraged to acquire and use internationally accepted standard materials in collection and disposal of patient's samples. However, Gyawali et al, (2013) reported that nurses working in Primary Health Care in Baglung district, Western Nepal maintained injection safety practices such as the use of auto-disable syringes to inject curative drugs. Sufficient safety boxes were also supplied to dispose the used syringes. Almost all the nurses had received full course of Hepatitis B vaccine and were knowledgeable about pathogens transmitted through unsafe injection practices. They came to the conclusion that health care professionals, especially nurses,

needed to be routinely informed about injection safety guidelines in their field. Additionally, it is important to motivate healthcare professionals to obtain and utilize globally recognized standards materials while gathering and discarding patient samples. However, Gyawali et al. (2013) found that nurses employed by Primary Health Care in Western Nepal's Baglung area continued to follow injection safety procedures, such as injecting curative medications using auto-disable syringes. Additionally, enough safety boxes were provided for disposing of the used syringes. Nearly all of the nurses were aware of the infections spread by risky injection techniques and had completed a course of the Hepatitis B vaccination.

Nurses Level of Knowledge about Injection Safety

In a study conducted by Onyemocho et al. (2013), the knowledge of nurses and doctors regarding injection safety in Nigerian Prison Service health facilities in Kaduna State was assessed. The results revealed that, of the nurses and doctors, 54.3 percent had good knowledge scores regarding important injection safety issues, while 16.7 percent and 29.0 percent, respectively, had fair and poor knowledge scores. Unsafe injection methods hurt patients as well as health care workers (HCWs), according to studies by Ella et al. (2016). A safe injection is one that, when administered with the right tools, doesn't hurt the patients or put healthcare workers at unnecessary danger (WHO, 2014). The findings of study done by Gyawali *et al.* (2013) revealed that most injection providers (90%) were sent for training on secured injection practices in the last two years. They believed that training solely dedicated to safety and regular curriculum in health safety were needed to bring about positive changes. Most of the health care workers included in the study were aware of the risks of infection with blood-borne pathogens associated with NSIs. Furthermore, nurses reported having some knowledge of pathogens transmitted by NSIs.

Approximately, 54.3 percent of nurses had knowledge score of key safe injection while 16.7 percent and 29.0 percent had a fair and poor general knowledge score respectively. According to the study, nurses' current knowledge and practices regarding injection safety were significantly correlated with their years of experience ($p=0.000$, $df=3$), sex ($p=0.048$, $df=1$), and educational attainment ($p=0.003$, $df=1$) (Audu et al, 2013). From their recommendation, a gap on in-depth knowledge on safe injection was significantly enough to warrant further research on the same. Study done by Onyemocho *et al*, (2013) revealed similar findings.

Adejumo and Dada (2013) found that participants' understanding of safe injection procedures was low in both healthcare facilities based on a comparative research of nurses' knowledge and practice of injection safety in two hospitals in Nigeria. Whereby, only 13.2 percent and 21.2 percent of the respondents were able to recognize safe injection as one in which resultant waste does not put people at risk while 23.1 percent of the nurses reported on safe injection as practice that will not cause injury (harms) to patients. To achieve desirable objectives of zero percent level of risk associated with unsafe injection practices, assessment of healthcare providers' knowledge and practices regarding safe injection practices, for example those carrying out national immunizations during national immunization days, could help to formulate the nature of training needed (Enokela *et al,* 2013).

In Kaduna State, Nigerian prison service health facilities, Onyemocho et al. (2013) conducted a study on the level of knowledge that doctors and nurses had regarding injection safety. The results revealed that 54.3 percent of doctors and nurses had good knowledge scores of key injection safety issues, while 16.7% and 29.0% had fair and poor knowledge scores, respectively. 385 nurses were used in two hospitals in Ibadan, Nigeria, to test the practice of injection safety. The results showed that the nurses' level of knowledge was high: all 100 nurses had heard about injection

safety; 70.4% had knowledge of the connection between unsafe injection and bloodborne infection; 55.9% had information about the inadequacy of recapping with both hands as a safe injection technique; 84.4 percent asserted that contaminated sharps predisposed the community to biohazards; and 76.1 percent had information about used syringes and needles should be disposed of in a sharps waste box. Nevertheless, they noted that although the participants' knowledge was good, it did not translate to practice, as approximately 50.4% of them were found to have suffered needle stick injuries from intramuscular and subcutaneous injections.

EFFECT OF SOCIO-DEMOGRAPHIC CHARACTERISTIC OF NURSES ON HEALTH AND FITNESS FACILITIES AT SECONDARY HEALTH FACILITY IN AKWA IBOM STATE

Secondary health facilities in Akwa Ibom State—typically general hospitals managed at state or local levels—serve as vital healthcare access points. Nurses deployed in these settings present diverse socio-demographic profiles: age, gender, educational attainment, religious and cultural background, and length of service. These traits influence not only their personal attitudes toward health and fitness but also their capacity to influence the presence, utilization, and advocacy for health-enhancing infrastructure. While studies directly from Akwa Ibom are rare, general Nigerian research underscores that these variables significantly affect nurses' workplace behaviors and resource engagement (Assefa, Hailu & Mariam 2020).

1. Age, Experience & Professional Influence

Age and experience often shape both personal and professional engagement in health behaviors. Younger, less experienced nurses—more recently trained—may exhibit greater awareness and personal commitment to fitness, yet typically wield less organizational influence to champion improvements in workplace facilities. Meanwhile, veteran nurses, although potentially less personally active in fitness, often occupy senior roles, giving them the leverage to advocate for improvements or secure better infrastructure. This dynamic, although not yet documented explicitly in Akwa Ibom, aligns with broader trends in healthcare where professional authority corresponds with years of service and rank.

2. Gender, Culture & Belief Systems

Gender dynamics and cultural beliefs heavily impact nurses' participation in health-promoting behaviors and facility utilization. In Nigeria, emerging research identifies how cultural and religious affiliations influence nurses' perceptions and professional behaviors—for instance, nurses' religious backgrounds affected their opinions on advance directives in secondary facilities in Ibadan, with Christian nurses showing significantly different attitudes compared to Muslim nurses. Given that Akwa Ibom State is predominantly Christian, similar cultural beliefs may affect nurses' health behavior norms, comfort with fitness spaces, and willingness to lead health initiatives (Mbamara & Eze 2022). Furthermore, entrenched cultural gender roles may deter female nurses—who form the bulk of the nursing workforce—from using or advocating for fitness spaces in male-dominated infrastructure environments.

3. Work Environment, Stress & Health Behavior

Nurses' engagement with health and fitness facilities is hindered by systemic workplace stressors. Studies in Nigeria demonstrate that high workload, shift work, limited rest breaks, and lack of

institutional support impede health-promoting behaviors—including physical activity and healthy eating. Furthermore, elevated work stress and role conflict—factors often tied to demographic variables like rank and tenure—impact overall performance. In underfunded secondary health facilities in Akwa Ibom, such stressors may be more pronounced, diminishing both the motivation and opportunity for nurses to use existing health and fitness facilities—or to advocate for them.

4. Institutional Context, Infrastructure & Funding

Nigeria's healthcare sector is chronically underfunded, with secondary facilities particularly affected by poor infrastructure, scarce equipment, and limited resources. This under-investment curtails the availability of fitness amenities or space conducive to nurse well-being. Within this context, socio-demographic differences matter: nurses with higher qualifications or leadership positions—often older or more educated—may have greater ability to influence facility enhancements (Musa & Ndom 2022). In contrast, younger, less experienced nurses may have the personal interest but lack the institutional clout to effect change.

Socio-demographic characteristics such as youth, gender, education, experience, and cultural background shape how nurses in Akwa Ibom's secondary facilities engage with health and fitness resources. Younger, well-educated nurses may personally value and seek fitness options but lack institutional authority; experienced or higher-qualified nurses may navigate the system more effectively; cultural and gender dynamics influence perceived roles in health leadership; and widespread infrastructural and administrative limitations mute individual agency. Addressing these gaps requires structural investments—not merely in physical amenities but in inclusive policy-making that empowers nurses across demographic groups to advocate for and benefit from health-promoting facilities.

THE IMPACT OF AI ON KNOWLEDGE CREATION OF FITNESS FACILITIES

Artificial intelligence is reshaping how fitness facilities create, capture, and use knowledge about clients, programming, and outcomes. At the front line, AI-driven wearables and app ecosystems collect continuous physiological and behavioral data (heart rate, sleep, movement patterns, exercise form) that previously were unavailable or too costly to gather at scale. That raw data becomes a knowledge asset when machine-learning models translate patterns into insights — for example, predicting risk of injury, identifying which programming drives the best adherence, or detecting when a member is likely to churn. Studies of AI-based exercise prescription show this continuous-feedback loop enables far more precise, evidence-driven decision making than traditional trainer intuition alone.

Inside the facility, AI accelerates organizational learning and staff expertise. Smart gym equipment and IoT-enabled machines log usage, technique, and outcomes; analytics dashboards then surface best practices (e.g., which cueing, rep schemes, or progressions produced measurable improvement for particular member profiles). That distilled knowledge — operational playbooks, optimized class templates, and safety protocols — can be shared across trainers, turning individual tacit knowledge into documented, repeatable organizational knowledge (Dergaa et al. 2023). Research into smart gym equipment highlights how connected devices both improve safety and create institutional datasets that inform training and maintenance decisions.

AI also fosters personalized knowledge creation for members and coaches. Adaptive coaching systems use reinforcement learning and continual input from clients to generate individualized programs that evolve as the client improves or responds poorly to a stimulus. This "living" knowledge about what works for whom shortens trial-and-error cycles and increases the facility's capacity to deliver measurable results. Reviews of AI in digital coaching and fitness apps show improved adherence and engagement where AI tailors workloads and recovery, effectively creating a growing body of client-specific evidence that trainers can apply to similar cases.

On the research and innovation side, fitness facilities that adopt AI can contribute to broader scientific knowledge. Aggregated, anonymized datasets from multiple clubs and wearables enable cohort analyses, discovery of novel training-response phenotypes, and evaluation of program effectiveness at scale — activities once limited to universities or large labs. Sports-science research has documented how AI tools enhance training-load management and enable more rigorous, real-world studies that translate quickly into practice (Mateus et al. 2024). This closes the loop from bench to gym: academic findings inform facility practice, and facility data feed back into research.

However, knowledge creation via AI comes with constraints and responsibilities. Data privacy, consent, and bias in algorithms can distort the knowledge produced (for instance, models trained primarily on young, fit users may perform poorly for older or clinical populations). Facilities must therefore adopt strong governance — anonymization, transparent model validation, and inclusive data collection — so the knowledge they create is trustworthy and generalizable. Empirical studies caution that generative or prescriptive AI recommendations need human oversight to ensure safety, progression, and ethical use.

KNOWLEDGE OF HEALTH AND FITNESS FACILITIES AT SECONDARY HEALTH FACILITY IN AKWA IBOM STATE

Health and fitness facilities are essential components of a functional healthcare system, particularly within hospital settings where workers experience high levels of occupational stress, long working hours, and physical fatigue. For nurses and other healthcare professionals working in secondary health facilities in Akwa Ibom State, knowledge and awareness of such wellness facilities is crucial. Adequate knowledge of health and fitness resources not only encourages utilization but also supports a culture of self-care and healthy living among staff. Despite the recognized importance of staff wellness, many secondary health institutions in Nigeria, including those in Akwa Ibom, have limited infrastructure dedicated to fitness, and even when such facilities exist, knowledge of them is often poor or incomplete.

Available literature and field reports suggest that healthcare workers, especially nurses, often understand the general benefits of physical activity and fitness but may lack detailed awareness of institutional support systems, such as designated fitness spaces, wellness rooms, or organized staff wellness programs. For example, Oyeniran and Ogundele (2020) highlighted that while Nigerian nurses are aware of the importance of regular physical activity, workplace structures often do not promote or inform them adequately about available resources. This implies that although the theoretical understanding of health and fitness exists, practical knowledge about accessible facilities within the workplace remains underdeveloped. In Akwa Ibom State, where secondary healthcare institutions are largely government-run, nurses may not be provided with orientations or continuing education sessions that emphasize the existence or purpose of available wellness infrastructure.

Multiple socio-demographic and institutional factors affect nurses' knowledge of health and fitness facilities. Age, level of education, years of experience, job position, and access to information technology can influence how much a nurse knows about workplace wellness provisions. More experienced nurses may have institutional exposure and relationships that keep them informed about facility upgrades or policy shifts, while younger nurses may be more familiar with digital wellness tools but lack the influence or curiosity to explore facility-based fitness options. Additionally, institutional culture plays a significant role. Facilities where management places little emphasis on staff welfare may not publicize or maintain existing health and fitness spaces, leading to low staff awareness. Assefa et al. (2020) noted that in public hospitals, the implementation of health-promoting practices is closely tied to how institutional leadership values and communicates them to staff.

In many secondary hospitals across Nigeria, the unavailability of dedicated fitness spaces is a core problem. Even when space or equipment is available, lack of proper signage, poor maintenance, or limited access policies prevent staff from knowing or using them. In Akwa Ibom, these barriers may be compounded by staffing shortages and high patient loads that discourage time away from clinical duties, reducing opportunities for staff to explore or use such resources. Akpan and Etukumana (2014) observed a concerning trend in Akwa Ibom—an increasing prevalence of obesity among nurses—signifying both limited physical activity and potential gaps in knowledge and access to health-promoting tools. This condition could also reflect a deeper institutional failure to prioritize and communicate the value of personal health and wellness among caregivers.

Improving knowledge about health and fitness facilities in Akwa Ibom's secondary healthcare sector requires multi-level strategies. First, hospital management should include health facility orientations for all new and returning staff, specifically highlighting available wellness infrastructure. Secondly, regular staff education and sensitization programs should be conducted, focusing on the benefits of fitness for mental and physical health. Third, efforts should be made to visibly brand and promote any available wellness spaces through posters, staff meetings, and internal communication platforms. Finally, the government should incorporate wellness infrastructure into secondary healthcare policies, making it a standard component of hospital development plans. When healthcare workers, particularly nurses, are well-informed and empowered to use fitness facilities, it not only improves their personal health but also enhances job satisfaction, reduces burnout, and improves the quality of care delivered to patients.

METHODOLOGY

This study employed a non-experimental descriptive method. This research was carried out in the Akwa Ibom North East Senatorial District of Nigeria. The population of the study consisted of 191 nurses in the 18 secondary healthcare facilities in Akwa Ibom North East Senatorial District. A sample of ninety 90 nurses offering direct patient care out of 191 nurses were selected from nine out of 18 secondary healthcare facilities in Akwa Ibom North East Senatorial District. Purposive sampling technique was used for the study. A researcher designed instrument tagged "Awareness of Practice of Injection Safety and Safe Injection Practice Questionnaire (APISSIPQ) was used to collect data for the study. Validity was ensured through the use of well-structured questionnaire and validation by the supervisor and two lecturers in the Department of Nursing, University of Uyo, Uyo. Descriptive and inferential statistics were employed to evaluate the data, and the Statistical Package for Social Sciences (SPSS) Version 23

(IBM, Armonk, NY) was utilized. The chi-square test was used to establish the association between the variables, and a p-value of 0.05 was selected for statistical significance.

Presentation and Analysis of Data According to Research Questions

Research Question One: What is the nurses' knowledge of associated safety factors in secondary health facility in Akwa Ibom North-East Senatorial District?

Table 1: Responses to associated safety factors in secondary health facility

	Associated safety factors	Yes	No
1	I am conscious of not using unsterilized needles	90 (100%)	0
2	I don't use needle or syringe more than once	90(100%)	0
3	I look for better available alternative medication to injection where necessary	80 (89%)	10 (11%)
4	Inadequate patient's financial resources in purchasing enough needles and syringes needed by the nurse	70 (78%)	20 (22%)
5	Poor supervision by the Nursing manager	85 (95%)	5 (5%)

Figure 1: Bar chart showing Responses to Responses to associated safety factors in secondary health facility

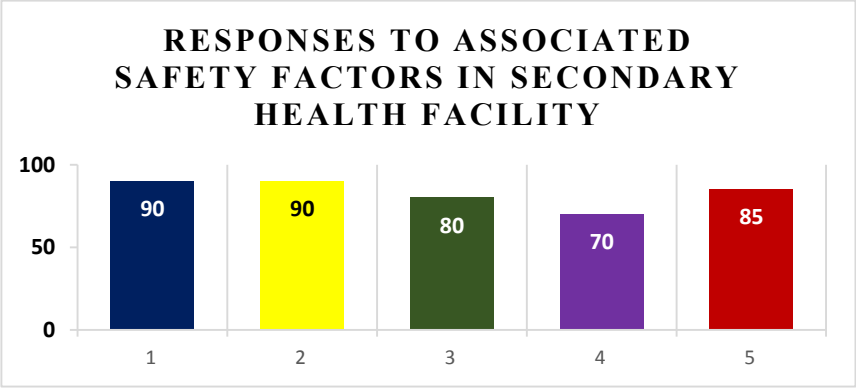

Table 1 and fig. 1 show responses to associated safety factors in secondary health facilities where 100 percent of nurse respondents said they were conscious of not using unsterilized needles and don't use needle or syringe more than once as knowledge of observance of associated safety factors in injection practice. 89 percent say they look for better available alternative medication to injection where necessary. Among associated safety factors, 78 percent of the respondents attributed inadequate patient's financial resources in purchasing enough needles and syringes needed by the nurse as associated safety factors inhibiting safe injection practices while 95 percent said poor supervision by nurse managers was part of the associated safety factors militating safe injection practices.

Research Question Two: What are the socio-demographic characteristics of nurses and its relationship to AI-assisted knowledge/practice of injection safety in secondary health facility in Akwa Ibom North-East senatorial District?

Figure 2: Bar chart showing Responses to socio-demographic characteristics of nurses in secondary health facility

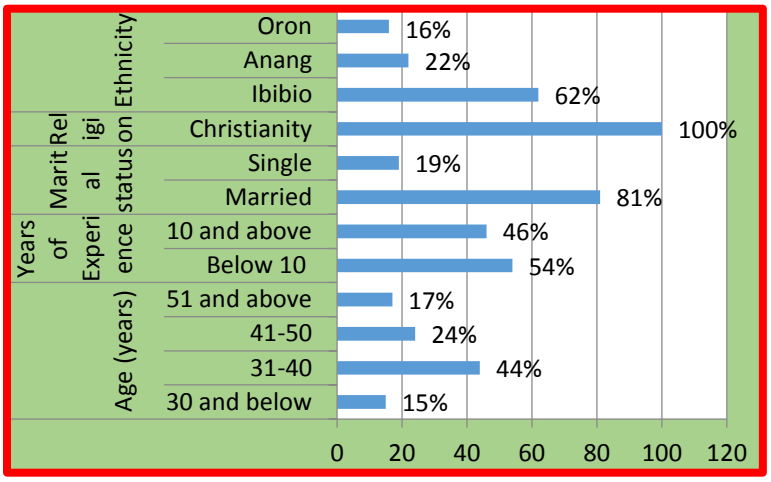

Figure 2 presents graphically the socio-demographic characteristics of nurses in secondary health facilities in Akwa Ibom North-East Senatorial District in terms of ethnicity, religion, marital status, years of experience and age. Majority of the nurses 60 percent were of Ibibio ethnicity, while 100 percent of the respondents were Christians. 81 percent were married. 54 percent were below 10 years of experience while 46 percent were 10 years and above of experience. 44 percent were from 31 to 40 years of age, 24 percent were from 41 to 50 years of age while 15 percent were 30 years and below.

Hypothesis Testing

Hypothesis 1

There is no significant relationship between nurses' knowledge of associated safety factors and practice of injection safety at secondary health facilities in Akwa Ibom North-East Senatorial strict.

Table 3:
Chi-square analysis of knowledge of associated safety factors and practice of injection safety

			Safe injection practice			df	X^2	P-value	Decision at 0.05 alpha level
			Yes	No	Total	1	15.58	0.014	Significant
Knowledge of associated safety factors	Yes	n	83	2	85				
		%	97.6%	2.4%	100.0 %				
	No	n	3	2	5				
		%	60.0%	40.0%	100.0 %				
Total		n	86	4	90				
		%	95.6%	4.4%	100.0 %				

Table 3 presents the results of testing hypothesis 5, which indicates that the X^2 value of 15.58 at 1 degree of freedom is significant at a computed p-value of 0.014 less than 0.05 alpha level of significance ($X^2 = 15.58$, df = 1, p-value = $0.014 \leq 0.05$). As a result, the alternative—that there is a substantial correlation between nurses' awareness of related safety concerns and safe injection techniques—is accepted and the null hypothesis is rejected.

Hypothesis Two

There is no significant relationship between socio-demographic characteristics of nurses and its relationship to AI-assisted knowledge/practice of injection safety in secondary health facility in Akwa Ibom North-East senatorial District.

Table 4:

Chi-square analysis of socio-demographic characteristics of nurses and its relationship to AI-assisted knowledge/practice of injection safety in secondary health facility in Akwa Ibom North-East senatorial District

Safe injection knowledge/ Practice	N	Yes	No	Df	X^2	P-value	Decision at 0.05 alpha level
Age (years)							
30 and below	13	10 (76.9%)	3 (23.1%)	3	7.224	0.022	Significant
31-40	40	39(97.5%)	1(2.5%)				
41-50	22	22(100.0%)	0(0.0%)				
51 and above	15	15(100.0%)	0(0.0%)				
Years of Experience							
Below 10	49	45(91.8%)	4(8.2%)	1	5.53	0.05	Significant
10 and above	41	41(100.0%)	0(0.0%)				
Marital status							
Married	73	70(95.9%)	3(4.1%)	1	0.102	0.574	Not Significant
Single	17	16(94.1%)	1(5.9%)				
Religion							
Christianity	90						
Ethnicity							
Ibibio	56	54(96.4%)	2(3.6%)	2	1.04	0.783	Not Significant
Anang	20	19(95.0%)	1(5.0%)				
Oron	14	13(92.9%)	1 (7.1%)				

The result of testing hypothesis 2 is presented in Table 4 and it shows:

i. For the four age categories of nurses, the X^2 value of 7.224 is significant at calculated p-value of 0.022 less than 0.05 alpha level of significance at 3 degree of freedom (X^2 = 7.224, df = 3, p-value = 0.014 ≤ 0.05), therefore the null hypothesis is rejected. Hence the alternative hypothesis that there is a significant relationship between age of nurses and safe injection practices is accepted.

ii. For years of experience, the X^2 value of 5.53 is significant at calculated p-value of 0.05 which is less or equal to 0.05 alpha level of significance at 1 degree of freedom (X^2 = 4.53, df = 1, p-value = 0.05≤ 0.05), therefore the null hypothesis is rejected and the alternative accepted that there is a significant relation between years of experience and safe injection practices.

iii. For marital status, the X^2 value of 0.102 is not significant at calculated p-value of 0.574 which is greater than 0.05 alpha level of significance at 1 degree of freedom (X^2 = 0.102, df = 1, p-value = 0.574 > 0.05), therefore the null hypothesis is accepted that there is no significant relationship between marital status and safe injection practices.

iv. For ethnicity, the X^2 value of 1.04 is not significant at calculated p-value of 0.783 which is greater than 0.05 alpha level of significance at 2 degree of freedom (X^2 = 1.04, df = 2, p-value = 0.783 > 0.05), therefore the null hypothesis is accepted that there is no significant relationship between ethnicity and safe injection practices.

CONCLUSION

In conclusion, socio-demographic characteristics such as age, experience, gender, and education significantly influence nurses' injection safety practices and their knowledge of health and fitness facilities. Younger and more educated nurses may possess higher awareness but lack institutional influence. Gender and cultural norms also shape attitudes toward safety and wellness. Limited infrastructure and poor communication further hinder effective knowledge and practice. Addressing these disparities through targeted training and policy reforms is essential for improved healthcare delivery in Akwa Ibom's secondary facilities. Artificial intelligence is reshaping how fitness facilities create, capture, and use knowledge about clients, programming, and outcomes. Interestingly, the socio-demographic characteristics of nurses relates remarkably with AI-assisted knowledge/practice of injection safety in secondary health facility in Akwa Ibom North-East senatorial District.

RECOMMENDATIONS

- In order to avoid workplace hazards and the transmission of infectious diseases that could be brought on by hazardous injection techniques, nurses should keep up their injection safety measures.
- The Continuing Education Unit should collaborate with the hospital administration to regularly arrange workshops and seminars for nurses in order to provide them with ongoing education, particularly regarding the need of adhering to safe injection practices. This is especially important for recently hired nurses.
- Nurses should embrace Artificial Intelligence in their daily activities in order to have fast solution to their challenges as regards knowledge and practice of injection safety as well as general nursing and medical engagements.

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