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FACTORS INFLUENCING COMPLIANCE WITH PERSONAL PROTECTIVE EQUIPMENT UTILIZATION AMONG NURSES IN SELECTED GOVERNMENT HOSPITALS IN BENIN CITY, EDO STATE, NIGERIA

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Abstract

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Background: Personal protective equipment (PPE) is a core component of standard precautions, yet its effectiveness depends on correct and consistent use as well as reliable institutional support. Nurses may face occupational exposure to blood and body fluids, including needlestick and sharps injuries. This study assessed factors associated with PPE compliance among nurses in selected government hospitals in Benin City, Edo State, Nigeria, and described reported PPE-use practices and needlestick injuries.

Methods: A descriptive cross-sectional survey was conducted in Edo Specialist Hospital, Central Hospital and Ogbe Nursing Home. The target population was 530 nurses. A proportional stratified sampling plan targeted 251 participants; 240 completed questionnaires were returned (response rate 95.6%). Data were collected using a structured questionnaire and analysed with descriptive statistics and chi-square testing in SPSS version 28. The manuscript source reports a reliability coefficient of 0.78.

Results: Respondents reported relatively favourable individual-level perceptions, including belief in PPE protection (mean 3.29, SD 0.89), knowledge of guidelines (mean 3.17, SD 0.90), motivation (mean 3.17, SD 0.92), and prior training (mean 3.08, SD 0.95). In contrast, perceived availability of PPE (mean 2.23, SD 0.96), continuity of supply (mean 2.15, SD 0.94), supervisory monitoring (mean 2.21, SD 0.95), and regular training (mean 2.27, SD 0.94) were comparatively weak. Self-reported compliance items had a grand mean of 3.39 (SD 0.77); 203 respondents (84.6%) were classified as having high compliance and 37 (15.4%) low compliance. The source manuscript also reports that 80 respondents (33.3%) had experienced a needlestick injury; half of these reported one injury. Injection procedures and needle recapping were identified as common circumstances. However, the full cross-tabulation and test output needed to independently verify the reported inferential association were not included in the supplied results.

Conclusion: Self-reported PPE compliance was high overall, but respondents identified important institutional constraints involving supply reliability, supervision, policy enforcement and workload. Interventions should combine uninterrupted access to appropriate PPE, regular practical training, supportive supervision, safer sharps systems and accessible post-exposure pathways. The findings are cross-sectional and self-reported; they should not be interpreted as establishing causality.

Keywords: personal protective equipment; PPE compliance; nurses; occupational exposure; needlestick injury; infection prevention and control; Nigeria

Introduction

Nurses routinely perform clinical tasks that may involve contact with blood, body fluids, contaminated equipment and sharps. Occupational exposure can result in anxiety, costs associated with testing and follow-up, and potential transmission of bloodborne pathogens. Needlestick and sharps injuries remain a preventable occupational hazard, particularly when safe work systems, protective supplies and reporting pathways are inadequate (Hosseini palangi et al., 2022; Sabaa et al., 2022).

Personal protective equipment includes gloves, gowns or aprons, masks or respirators, and eye or face protection selected according to the anticipated exposure. PPE complements, rather than replaces, hand hygiene, safe injection practice, sharps disposal, environmental controls and other standard precautions. Correct selection, donning, removal and disposal are essential; PPE is not equally suitable for every task or route of exposure (World Health Organization [WHO], 2021; Verbeek et al., 2020).

Compliance is shaped by individual knowledge and risk perceptions, but also by availability of supplies, time, workload, training, supervisory expectations and organisational safety culture. Evidence from healthcare settings indicates that written guidance alone may be insufficient when staff lack supplies or practical support (Houghton et al., 2020; Oladele et al., 2021). These issues warrant context-specific assessment in Nigerian public hospitals.

Statement of the problem statement

The supplied study rationale identifies concerns about PPE availability, workload, training and institutional monitoring in the selected hospitals. Without local evidence, managers may have difficulty identifying which barriers deserve priority. This study therefore examines reported individual and organisational influences on PPE use, describes the PPE practices reported by nurses, and summarises the reported occurrence of needlestick injuries.

Research questions

The study aimed to assess factors influencing compliance with PPE utilization among nurses in selected government hospitals in Benin City. It addressed two questions:

1. Which individual and organisational factors are reported to influence PPE compliance?
2. What PPE-use practices and levels of self-reported compliance are reported by nurses?

The source manuscript also proposed hypotheses concerning factors and PPE utilization; however, the inferential output supplied is incomplete, so hypothesis decisions are not presented as independently verified.

Literature review and conceptual framework

Individual and organisational determinants

Individual determinants include knowledge of standard precautions, perceived susceptibility to infection, perceived benefits of PPE, confidence in correct use, motivation and comfort. The Health Belief Model offers a useful explanation of how perceived susceptibility and severity, perceived benefits, perceived barriers, cues to action and self-efficacy may shape preventive behaviour. However, favourable beliefs do not guarantee compliance when PPE is unavailable or difficult to access.

Organisational determinants include procurement and stock management, clear protocols, leadership commitment, supervision, practical refresher training, staffing and workload. A safety-climate perspective emphasises that workers infer the real priority given to safety from management decisions, the availability of resources and whether safe behaviour is supported in daily practice. Reviews of PPE use in healthcare settings similarly identify access, usability, training and organisational support as important facilitators or barriers (Houghton et al., 2020; Tsang et al., 2023).

Needlestick and sharps injuries

PPE should not be treated as a stand-alone method of preventing needlestick injuries. Gloves can reduce contamination and provide a limited barrier, but they do not reliably prevent a needle from penetrating the skin. Prevention therefore also requires safety-engineered devices where feasible, avoidance of needle recapping, immediate disposal into puncture-resistant sharps containers, training and prompt reporting. A systematic review found a substantial burden of needlestick injuries among healthcare workers, with variation by region and work context (Hosseini palangi et al., 2022).

Conceptual framework

The study is interpreted through a multilevel socio-ecological perspective: individual beliefs and skills operate within interpersonal influences and institutional and policy environments. The Health Belief Model helps explain personal perceptions, while the socio-ecological and safety-climate perspectives locate those perceptions within the wider hospital system.

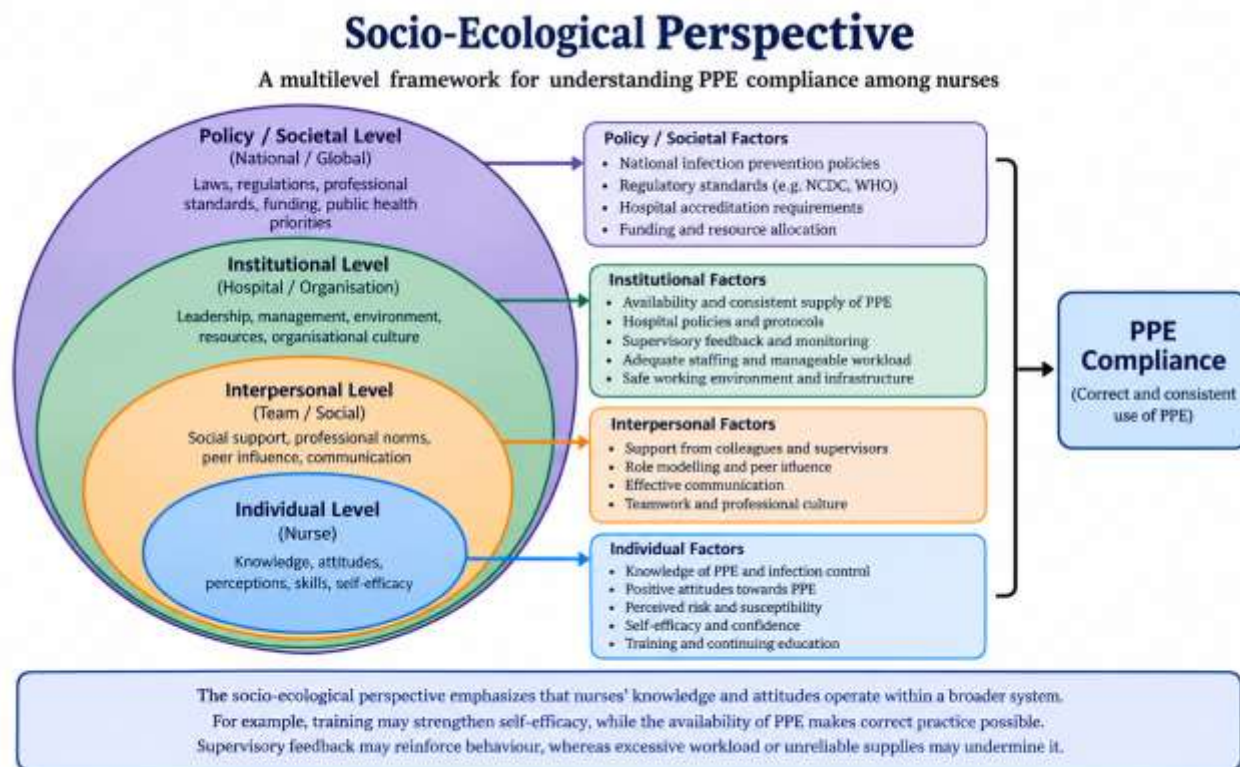


Figure 1. Conceptual representation of the multilevel determinants of PPE compliance.

Figure 1. Conceptual representation of multilevel determinants of PPE compliance among nurses.

Methods

Design and setting

A descriptive cross-sectional survey was conducted in three government-owned facilities in Benin City, Edo State: Edo Specialist Hospital, Central Hospital and Ogbe Nursing Home. The design captured respondents' reports at one period and cannot establish temporal order or causation.

Population, sample and sampling

The source manuscript reported a population of 530 nurses: 208 at Edo Specialist Hospital, 180 at Central Hospital and 142 at Ogbe Nursing Home. A sample of 228 was estimated using the Taro Yamane formula with a 5% margin of error, then increased by approximately 10% to a target of 251. Proportional stratified sampling was used.

Facility	Nurses in population	Target sample
Edo Specialist Hospital	208	98
Central Hospital	180	85
Ogbe Nursing Home	142	68
Total	530	251

Eligible participants were full-time registered nurses who were present during data collection and willing to participate. Nurses who were absent or declined participation were excluded. The source manuscript reports 240 completed questionnaires from 251 distributed, giving a 95.6% response rate.

Instrument and data collection

Data were collected using a semi-structured questionnaire. The described sections covered participant characteristics, factors influencing PPE compliance, PPE types used, compliance behaviours and related safety issues. Items used four-point response scales. The instrument was reviewed for face, content and constructs validity by relevant academic and practice experts. A pilot test involving 26 nurses at Stella Obasanjo Hospital was reported, with an overall reliability coefficient of 0.78. The original manuscript inconsistently describes the reliability statistics by section; the coefficient is therefore reported as supplied rather than reclassified.

Analysis and ethics

The source manuscript states that data were analysed using IBM SPSS version 28.0, with frequencies, percentages, means and standard deviations. A mean of 2.5 was used as the stated cut-off for four-point

scales, and chi-square tests were planned at $p < .05$. The supplied material did not include a complete ethics approval identifier, consent procedure details, or full inferential output. These details should be added from the original study records before journal submission; they should not be invented.

Results

Respondent and injury profile

Respondent and Needlestick-Injury Profile

Percentages for questionnaire completion, injury experience, and injury frequency among injured respondents. The injury-frequency percentages use only the 80 respondents who reported an injury, whereas questionnaire completion and injury experience use the full survey sample or invited sample.

Figure 2. Respondent and needlestick-injury profile

Respondent and Needlestick-Injury Profile

Percentages for questionnaire completion, injury experience, and injury frequency among injured respondents.

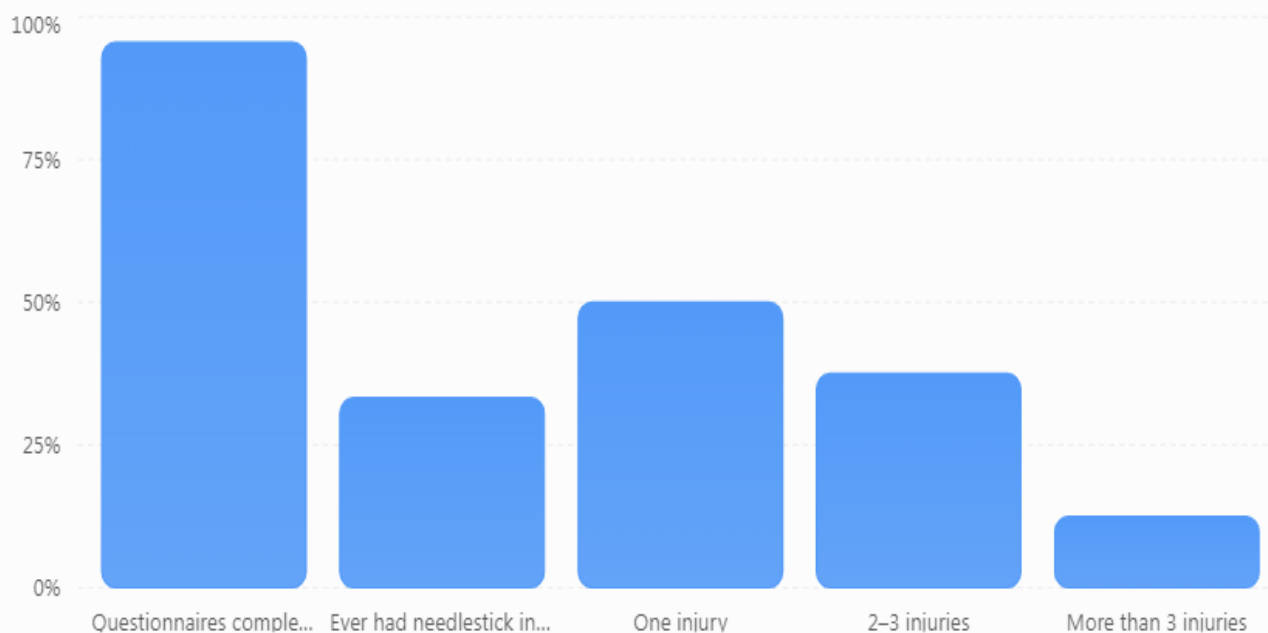


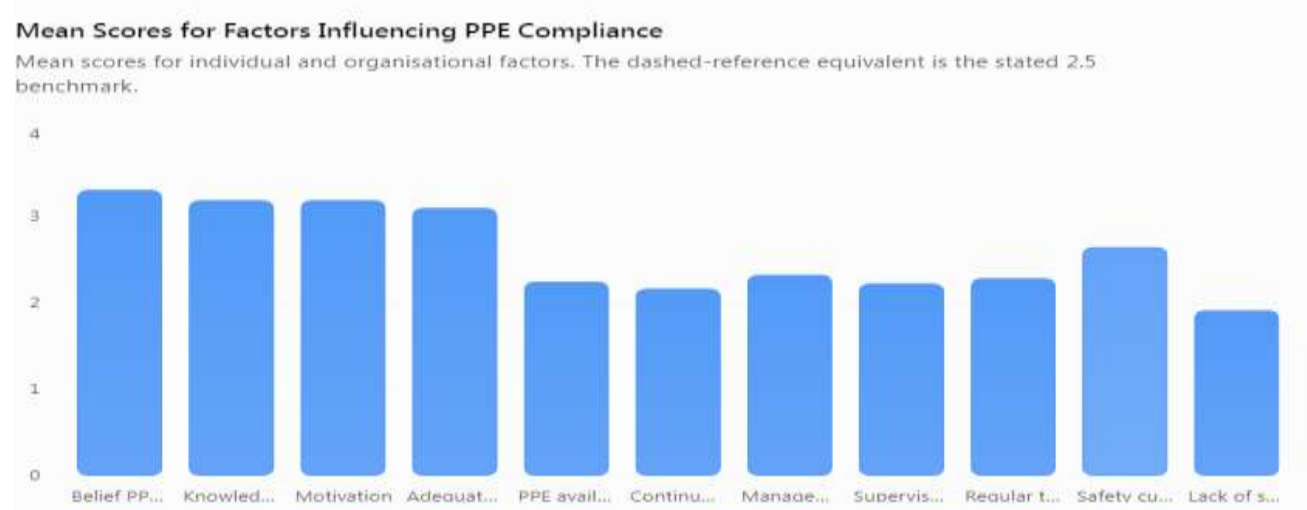
Table 2: Respondent and needlestick-injury profile

Reported characteristic	Result
Completed questionnaires	240/251 (95.6%)
Mean age	32.12 years (SD 4.45)
Mean years of experience	8.45 years (SD 5.42)
Ever experienced needlestick injury	80/240 (33.3%)
One injury among those injured	40/80 (50.0%)
Two to three injuries among those injured	30/80 (37.5%)
More than three injuries among those injured	10/80 (12.5%)

The supplied abstract reports a mean respondent age of 32.12 years (SD 4.45) and mean work experience of 8.45 years (SD 5.42). It reports that 80 of 240 respondents (33.3%) had experienced a needlestick injury. Of those 80 respondents, 40 (50.0%) reported one injury, 30 (37.5%) reported two to three injuries and 10 (12.5%) reported more than three. Injection procedures and needle recapping were described as common circumstances. The abstract also states that half of exposed personnel were not provided post-exposure prophylaxis; the underlying table was not included in the supplied results, so these figures should be checked against the dataset before publication.

Figure 3. Factors influencing PPE compliance

Factors reported to influence PPE compliance



Mean Scores for Factors Influencing PPE Compliance

Mean scores for individual and organisational factors. The dashed-reference equivalent is the stated 2.5 benchmark. The benchmark is 2.5. The negatively worded supply item should be checked for reverse coding before interpreting its direction.

Table 2: Factors reported to influence PPE compliance

Factor/item	Mean	SD	Interpretation from item wording
Belief that PPE protects against infection	3.29	0.89	Favourable belief
Adequate knowledge of PPE guidelines	3.17	0.90	Favourable self-rating
Motivation to use PPE consistently	3.17	0.92	Favourable motivation
Received adequate PPE training	3.08	0.95	Favourable self-rating
PPE readily available in unit	2.23	0.96	Availability concern
Adequate PPE supply at all times	2.15	0.94	Supply continuity concern
Management enforces PPE compliance	2.31	0.98	Enforcement concern
Supervisors monitor PPE use regularly	2.21	0.95	Monitoring concern
Regular PPE training programmes	2.27	0.94	Training continuity concern
Safety culture encourages PPE use	2.63	0.99	Moderately favourable perception
Lack of PPE supply affects compliance	1.90	0.92	Coding/wording should be checked

Table 2 presents selected individual and organisational items from the source results. Values are retained as reported. The original table's remark labels are not reproduced where they conflict with the direction or wording of the item; interpretations are based on the item wording and mean score, with reverse-worded items requiring careful coding.

The pattern suggests a difference between relatively favourable individual perceptions and weaker reports of institutional support. In particular, perceived PPE availability, continuity of supply, supervision and regular training received means below the stated 2.5 benchmark. Because the item concerning lack of supply is negatively phrased but has a low mean, the questionnaire coding and interpretation should be

verified before the item is used to draw a directional conclusion.

Figure 4. Self-reported PPE compliance

Self-Reported PPE Compliance: Always

Percentage of respondents reporting that they always follow each listed PPE practice.

Suggested publication caption: Figure 4 illustrates self-reported adherence to selected personal protective equipment practices among nurses. The highest reported compliance was for glove use during blood handling and hand hygiene (66.7% each), while eye protection and PPE use during emergencies had the lowest percentages (50.0% each).

Self-Reported PPE Compliance: Always

Percentage of respondents reporting that they always follow each listed PPE practice.

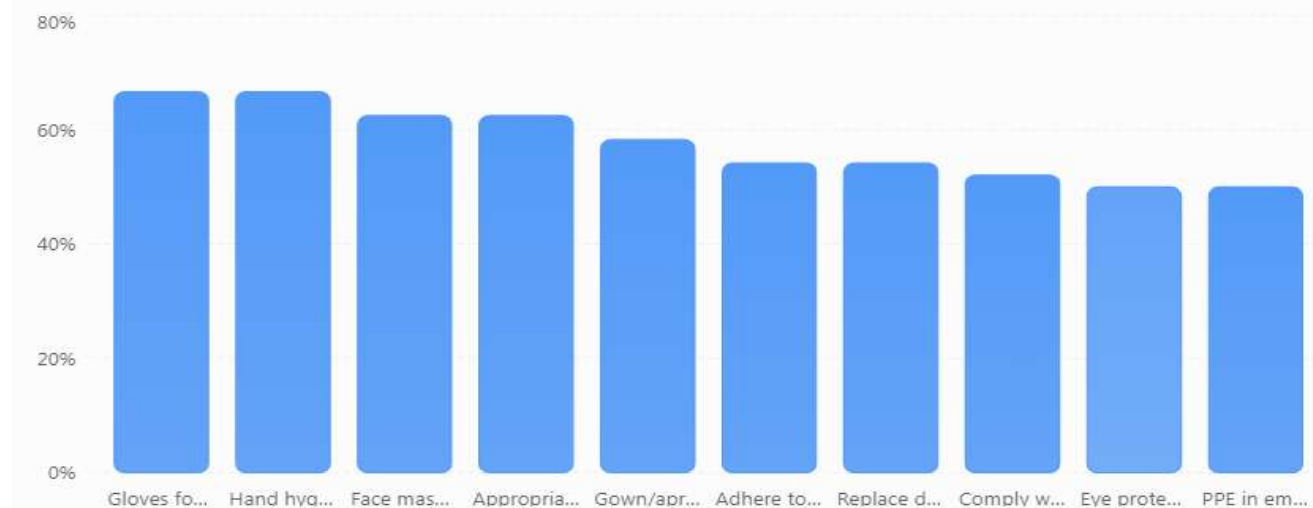


Table 3: Self-reported PPE compliance

Practice item	Always n (%)	Mean	SD
Wear gloves when handling blood	160 (66.7)	3.50	0.72
Perform hand hygiene	160 (66.7)	3.50	0.72
Use face masks during splash-risk procedures	150 (62.5)	3.46	0.74
Dispose of PPE appropriately	150 (62.5)	3.46	0.74
Wear gowns/aprons when necessary	140 (58.3)	3.42	0.75
Adhere to PPE protocols	130 (54.2)	3.33	0.79
Replace damaged PPE	130 (54.2)	3.33	0.79
Comply even without supervision	125 (52.1)	3.31	0.80
Use eye protection when required	120 (50.0)	3.29	0.81
Use PPE in emergencies	120 (50.0)	3.29	0.81
Grand mean (reported)	—	3.39	0.77

The overall reported compliance mean was 3.39 (SD 0.77). The source manuscript classified 203 respondents (84.6%) as having high compliance and 37 (15.4%) as having low compliance. The highest mean scores were for gloves during blood handling and hand hygiene; the lowest item means were for eye protection and PPE use during emergencies, although both were still labelled high in the source. These are self-reported practices and were not verified by direct observation.

Hypothesis testing

The source abstract reports a statistically significant difference in needlestick injury occurrence between nurses classified as having high and low PPE compliance ($\chi^2 = 24.61$, $df = 1$, $p < .001$). However, the results section does not provide the required 2×2 contingency table, cell counts, expected frequencies or complete test output. This statistic should therefore be treated as a source-reported result pending verification against the dataset. The two hypotheses listed in the original methods are not sufficiently matched to the reported analysis to support transparent decisions in this version.

Discussion

The principal finding is the coexistence of high self-reported compliance with perceived weaknesses in institutional support. Respondents expressed favourable beliefs about PPE protection, reported knowledge and motivation, and rated several compliance behaviours highly. At the same time, they reported concerns about PPE availability, continuity of supplies, supervision and regular refresher training. This pattern supports a socio-ecological interpretation: safe behaviour is influenced not only by the nurse's knowledge and intentions but also by whether the workplace makes the safe choice practical and consistent.

The finding is consistent with literature identifying supply availability, usability, training and organisational support as important influences on PPE use. Research on healthcare workers in Nigeria has also documented issues concerning access to protective equipment during infectious disease outbreaks (Oladele et al., 2021). Evidence reviews indicate that PPE procedures are more likely to be followed when guidance is clear, equipment is accessible and staff receive practical support (Houghton et al., 2020; Tsang et al., 2023).

The reported 33.3% lifetime or unspecified-period needlestick injury figure signals a potentially important occupational safety concern, but the recall period is not clearly defined in the supplied abstract.

Comparisons with other studies should therefore be cautious. Systematic review evidence shows considerable variation in injury estimates by population, setting, measurement period and reporting practice (HosseiniPalangi et al., 2022). Importantly, PPE alone cannot prevent a needle from penetrating the skin; prevention must include safe sharps handling, avoiding recapping, engineered safety devices, accessible sharps containers and a clear post-exposure response pathway.

The high reported compliance estimate should also be interpreted carefully. Self-report can be affected by recall and social-desirability bias, and a high aggregate score can conceal lower compliance in specific tasks or circumstances. The relatively lower scores for eye protection and PPE use during emergencies may help target practical training and point-of-care access. Future studies should combine questionnaire data with structured observation, supply audits and facility-level injury records.

Implications for nursing practice

Nursing leaders should treat PPE compliance as a shared organisational responsibility. Competency-based refresher training should include task-specific PPE selection, correct donning and removal, hand hygiene, safe injection practices and sharps disposal. Ward managers should monitor practice through supportive observation and feedback rather than relying solely on punitive measures. Procurement and stores teams should maintain reliable stocks of appropriate PPE at the point of care and monitor stockouts. Hospitals should ensure that every occupational exposure can be reported promptly and confidentially, with timely clinical assessment, indicated post-exposure prophylaxis and follow-up.

Strengths and limitations

The study included three government facilities and achieved a reported response rate of 95.6%, providing a useful local snapshot. Limitations include the cross-sectional design, reliance on self-reported practices, potential recall and social-desirability bias, unclear recall period for needlestick injuries, and incomplete reporting of ethics approval and inferential test details in the supplied manuscript. Some item labels and scoring interpretations appear inconsistent, and the reported chi-square result cannot be independently checked without the underlying contingency table or dataset.

Conclusion

Among nurses surveyed in three government hospitals in Benin City, self-reported PPE compliance was high

overall, while respondents identified important institutional constraints involving supply availability, supervision, enforcement and regular training. The findings suggest that efforts to improve safety should combine individual competency development with dependable supplies, supportive management, appropriate staffing and robust sharps-injury prevention and post-exposure systems. Because the study is cross-sectional and some analytical details require verification, conclusions should remain descriptive rather than causal.

Recommendations

1. Establish routine ward-level stock monitoring and replenishment for gloves, masks/respirators, gowns/aprons and eye protection appropriate to clinical risk.
2. Provide periodic, practical simulation-based training on PPE selection, donning and removal, hand hygiene, injection safety and sharps disposal; assess competence rather than attendance alone.
3. Strengthen supportive supervision through observation, feedback, clear protocols and regular review of compliance indicators.
4. Reduce preventable sharps injuries by eliminating routine needle recapping, providing puncture-resistant sharps containers at the point of use and adopting safety-engineered devices where feasible.
5. Maintain a confidential, accessible, 24-hour occupational exposure pathway, including prompt risk assessment, indicated prophylaxis, follow-up and incident review.
6. Repeat the study using validated scoring, clearly defined injury recall periods, direct observation and supply audits; report complete contingency tables, effect sizes, confidence intervals and ethics approval details.

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