

Knowledge, Perception, and Practices of Infection Prevention and Control Among Primary Healthcare Workers in Rural Benue State, Nigeria

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ABSTRACT

Background: Infection prevention and control (IPC) is fundamental to safe healthcare delivery and the prevention of healthcare-associated infections. However, effective IPC implementation remains challenging in many rural primary healthcare settings in Nigeria because of persistent resource and health system constraints. **Aim:** To assess the knowledge, perception, and practices of IPC among primary healthcare workers in rural Benue State, Nigeria. **Materials and Methods:** A facility-based cross-sectional study was conducted among 382 healthcare workers selected through multistage sampling from 20 primary healthcare facilities in Gwer East Local Government Area, Benue State, Nigeria. Data were collected using a pretested, semi-structured questionnaire adapted from the 2023 World Health Organization IPC Minimum Requirements Assessment Tool and analyzed using SPSS version 20. **Results:** The mean age of respondents was 36.3 ± 5.3 years, and 54.5% were female. Overall, 93.2% demonstrated good IPC knowledge, 91.0% had positive perceptions, and 91.6% exhibited good IPC practices. About two-thirds (67.0%) had received prior IPC training. Compliance with key IPC measures included hand hygiene before and after patient contact (68.3%), consistent glove use when handling blood and body fluids (62.3%), routine environmental and equipment disinfection (91.6%), and application of standard precautions regardless of patients' infection status (88.0%). Despite these findings, 74.6% reported previous occupational exposure to blood or body fluids. **Conclusion:** Primary healthcare workers demonstrated strong IPC knowledge, positive perceptions, and adherence to good practices. However, the high prevalence of occupational exposure highlights the need for sustained IPC training, adequate provision of personal protective equipment and essential IPC supplies, and strengthened supportive supervision to improve workplace safety.

Keywords: Infection prevention and control; Primary healthcare workers; Knowledge, perception, and practices; Rural health facilities; Nigeria

INTRODUCTION

Infection prevention and control (IPC) is a cornerstone of quality healthcare delivery and a critical strategy for reducing healthcare-associated infections (HAIs), protecting healthcare workers, and improving patient outcomes.¹ IPC comprises evidence-based measures such as hand hygiene, appropriate use of personal protective equipment (PPE), environmental cleaning, safe injection practices, waste management, and adherence to standard precautions. When implemented effectively, these interventions prevent the spread of infectious agents in healthcare settings, promote patient safety, and help mitigate the growing threat of antimicrobial resistance.¹

Healthcare-associated infections remain a major global public health challenge, with the burden disproportionately affecting low- and middle-income countries (LMICs).² Weak health systems, inadequate infrastructure, poor water, sanitation and hygiene services, overcrowding, and inconsistent adherence to IPC guidelines continue to facilitate disease transmission in healthcare facilities.² The World Health Organization (WHO) estimates that comprehensive IPC programmes based on its core components, particularly effective hand hygiene, can reduce HAIs by up to 70%.³ Globally, approximately one in ten hospitalized patients acquires at

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least one HAI, with the risk being substantially higher in LMICs than in high-income countries.³ Inadequate IPC also contributes significantly to the global burden of antimicrobial resistance, which is associated with approximately five million deaths annually.⁴ In Europe alone, HAIs account for an estimated nine million infections annually, resulting in approximately 25 million additional hospital days and healthcare costs exceeding 13 billion Euros.⁵

In Nigeria, neonatal sepsis, a largely preventable condition through effective IPC, remains a major contributor to neonatal mortality, with reported case fatality rates ranging from 15% to 45%.⁶ Primary healthcare (PHC) facilities are the foundation of healthcare systems and serve as the first point of contact for most rural populations. Besides providing essential preventive and curative services, they play a central role in disease surveillance, immunization, maternal and child health, and health promotion. However, many rural PHC facilities face persistent resource constraints, including shortages of PPE, inadequate water supply and sanitation, weak institutional IPC programmes, limited continuing professional education, and insufficient supervisory support. These deficiencies compromise the implementation of standard precautions and increase the risk of healthcare-associated infections among patients and healthcare workers.²

Healthcare workers' knowledge, perceptions, and practices are fundamental determinants of effective IPC implementation. Adequate knowledge enables healthcare workers to recognize infection risks and correctly apply standard precautions, while positive perceptions promote sustained adherence to recommended IPC guidelines. Conversely, inadequate knowledge, misconceptions, and poor compliance increase the likelihood of occupational exposure, cross-infection, and healthcare-associated outbreaks. Consequently, improving healthcare workers' competence and attitudes toward IPC remains essential for strengthening patient safety and occupational health in resource-constrained settings.¹

Evidence from Nigeria indicates that important gaps in IPC knowledge and practice persist despite increasing attention to infection prevention. In Plateau State, 38.0% of primary healthcare workers demonstrated poor knowledge of IPC, while 21.5% reported not routinely using personal protective equipment.⁷ Similarly, a study conducted in Benue State found that 41.8% of healthcare

workers believed used needles should be recapped, while 45.1% lacked knowledge of the recommended duration of hand hygiene.⁸ Although PPE was available in many facilities, its utilization remained suboptimal, suggesting that availability alone does not ensure compliance with recommended practices.⁸ Furthermore, the implementation of an improved injection safety training programme in North-Central Nigeria significantly reduced needle recapping among healthcare workers in both Nasarawa and Benue States, demonstrating the positive impact of continuous capacity building on IPC practices.⁹

Despite the availability of national IPC guidelines and increased awareness following outbreaks of emerging infectious diseases, implementation gaps remain widespread, particularly in rural primary healthcare facilities where infectious diseases are highly prevalent and healthcare resources are limited.^{4,10} Rural healthcare workers often operate under conditions characterized by inadequate staffing, limited access to IPC supplies, and insufficient opportunities for continuing professional development, all of which undermine compliance with standard precautions.¹¹ Beyond increasing the risk of healthcare-associated infections, occupational exposure to blood and body fluids places substantial health and socioeconomic burdens on healthcare workers and their families through increased treatment costs, productivity losses, disability, and premature mortality.¹¹

Although previous studies have examined selected aspects of IPC among healthcare workers in Benue State, available evidence remains limited and outdated, particularly regarding rural primary healthcare settings where implementation challenges are greatest.⁸ Contemporary evidence is therefore needed to evaluate healthcare workers' knowledge, perceptions, and practices in these settings. Accordingly, this study assessed the knowledge, perceptions, and practices of infection prevention and control among healthcare workers in rural primary healthcare facilities in Benue State, North-Central Nigeria. The findings are expected to inform policy, strengthen IPC programmes, guide targeted capacity-building interventions, improve occupational safety, and ultimately reduce the burden of healthcare-associated infections in resource-limited primary healthcare settings.⁸

MATERIALS AND METHODS

Study Design, Population, and Area

This study employed a cross-sectional design among healthcare workers in rural primary healthcare (PHC) facilities in Gwer East Local Government Area (LGA), Benue State, North-Central Nigeria. The study population comprised healthcare workers involved in clinical and non-clinical service delivery, including doctors, nurses, community health extension workers, laboratory personnel, cleaners, morticians, security personnel, administrative staff, and waste management workers. Eligible participants were those who had worked in the selected PHC facilities for at least three months and provided written informed consent to participate in the study, while those who were ill or declined participation were excluded. Gwer East LGA, headquartered in Aliade, covers approximately 2,294 km² and comprises 14 council wards distributed across the Yonov, Ngyohov, and Njiriv districts. The LGA is served by a network of public and private PHC facilities that provide essential healthcare services, including health promotion, disease prevention, immunization, maternal and child healthcare, treatment of common illnesses, and disease surveillance. At the time of the study, the LGA had 28 PHC facilities serving as the first point of healthcare contact for most rural residents.^{12,13}

Sample Size Estimation and Sampling Technique

A minimum sample size of 382 healthcare workers was estimated using Cochran's formula for single proportions,⁷ based on a 34.0% prevalence of adequate IPC knowledge among healthcare workers in a previous study,¹⁴ with adjustment for a 10% non-response rate. A multistage sampling technique was employed to select participants. In the first stage, 20 of the 28 PHC facilities were selected by simple random sampling (balloting), comprising seven facilities each from the Yonov and Ngyohov districts and six facilities from the Njiriv district. In the second stage, a proportionate allocation was used to determine the number of participants recruited from each selected facility, based on staff strength. Subsequently, systematic random sampling was used to select eligible healthcare workers from each facility's staff register until the required sample size was obtained.

Data Collection

Data were collected using a pretested, semi-structured, self-administered questionnaire adapted from the 2023 World Health Organization (WHO) Infection Prevention and Control Minimum Requirements Assessment Tool

for healthcare facilities. The questionnaire consisted of four sections covering respondents' sociodemographic characteristics, knowledge of infection prevention and control, perceptions toward IPC, and routine IPC practices. The independent variables were the respondents' sociodemographic characteristics, while the outcome variables were knowledge, perceptions, and practices regarding IPC. To ensure content validity and clarity, the questionnaire was pretested with 30 healthcare workers at two primary healthcare facilities in Tarka Local Government Area, Benue State, which have characteristics similar to those of the study area. Feedback obtained during the pretest was used to refine the questionnaire before data collection began.¹⁵ The internal consistency and temporal stability of the knowledge domain were assessed using an eight-item scale. Perception was assessed using a five-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree."¹⁶

Data Analysis

Data were entered, cleaned, and analyzed using IBM SPSS Statistics version 20. Quantitative variables were summarized using means and standard deviations, while categorical variables were presented as frequencies and percentages. The findings were presented in tables and figures. Knowledge, perception, and practice constituted the primary outcome variables. Each domain comprised eight assessment items. For the knowledge domain, each correct response was scored 1 point, while incorrect or "Don't know" responses were scored 0. Perception items were assessed using a five-point Likert scale, whereas practice was evaluated using responses to standard IPC measures. Composite scores were computed for each domain, and participants who achieved at least 50% of the obtainable score were classified as having good knowledge, positive perception, or good practice. Similarly, those scoring below 50% were classified as having poor knowledge, poor perception, or poor practice, according to the modified Bloom's criteria.¹⁶

Ethical Consideration

Ethical approval for the study was obtained from the Benue State Ministry of Health Research Ethics Committee before the study commenced. Administrative permission was also obtained from the Benue State Primary Health Care Development Board and the Gwer East Local Government Authority before data collection. The purpose of the study was explained to all eligible participants, and written informed consent was obtained before enrolment. Participation was voluntary, and

respondents were assured that their information would be kept confidential and anonymous. Personal identifiers were excluded from the data collection instruments, and participants were informed of their right to decline participation or withdraw from the study at any stage without any adverse consequences.

RESULTS

Respondents' sociodemographic characteristics

Three hundred and eighty-two primary healthcare workers from 20 primary healthcare facilities in Gwer East Local Government Area, Benue State, participated in the study, giving a response rate of 100%. The respondents had a mean age of 36.29 ± 5.25 years, with the largest proportion (42.4%) aged 30–45 years, followed by those younger than 30 years (33.2%). Females constituted a slight majority (54.5%), while over half of the respondents were married (51.3%). All participants identified as Christians, and the Tiv ethnic group accounted for approximately two-thirds (66.2%) of the study population. Community Health Extension Workers (26.8%) and nurses/midwives (26.3%) constituted the largest professional groups, whereas doctors represented the smallest proportion (1.0%) of respondents [Table 1].

Educational level and working experience of respondents

Three hundred and eighty-two primary healthcare workers from 20 primary healthcare facilities in Gwer East Local More than half of the respondents (51.8%) possessed diploma-level qualifications, while 33.0% had secondary education and 15.2% held university degrees. Regarding professional experience, 40.3% had worked for 6–10 years, 30.1% had more than 10 years of experience, 20.2% had 2–5 years of experience, and only 9.4% had worked for one year or less [Table 2].

Knowledge of infection prevention and control among respondents

Awareness of infection prevention and control (IPC) was universal, with all respondents reporting having heard of it. Hospital workshops and training programmes were the predominant source of information (65.7%), followed by co-workers (23.3%), while relatively few obtained information through television, radio, social media (6.3%), or friends (4.7%). Nearly all respondents (93.2%) correctly identified IPC as practices designed to prevent and reduce the transmission of infections in healthcare settings, whereas only 6.8% incorrectly considered IPC to

involve handwashing alone. Approximately two-thirds (67.0%) had previously received formal training on standard precautions and IPC. Overall knowledge of core IPC principles was high. Most respondents (85.1%) correctly recognized that administering antibiotics is not an IPC practice, while 74.9% correctly stated that standard precautions should be applied to all hospitalized patients. All respondents acknowledged the importance of hand hygiene in preventing healthcare-associated infections, and 94.5% correctly recognized that safe disposal of sharps reduces the risk of needle-stick injuries. Overall, 93.2% of respondents demonstrated good knowledge of IPC, whereas only 6.8% had poor knowledge [Table 3].

Table 1: Respondents' sociodemographic characteristics

Variables	Frequency (%) n = 382
Age group (years)	
<30	127 (33.2)
30–45	162 (42.4)
46–60	93 (24.3)
Mean = 36.29 ± 5.25	
Sex	
Male	174 (45.5)
Female	208 (54.5)
Marital status	
Single	162 (42.4)
Married	196 (51.3)
Others	24 (6.3)
Religion	
Christianity	382 (100.0)
Tribe	
Tiv	253 (66.2)
Idoma	64 (16.8)
Igede	41 (10.7)
Others	24 (6.3)
Occupation	
Doctor	4 (1.0)
Nurse/midwife	100 (26.3)
CHEW*	104 (26.8)
Laboratory scientist	51 (13.5)
Cleaner	82 (21.6)
Mortician	19 (5.0)
Administrative staff	22 (5.8)

*CHEW: Community Health Extension Worker

Perception of infection prevention and control among respondents

Respondents demonstrated highly favourable perceptions towards IPC. All participants either agreed or strongly agreed that standard precautions protect both patients and healthcare workers from infection. Similarly, all respondents expressed a willingness to practice standard precautions consistently and unanimously supported the

enforcement of IPC compliance within healthcare facilities. Most respondents (89.0%) also expressed interest in receiving additional IPC training, although 11.0% were undecided. The majority rejected the perception that standard precautions are time-consuming or unnecessary, with 74.3% disagreeing or strongly disagreeing with the statement. Furthermore, over 90% agreed that IPC is the responsibility of every healthcare worker, while approximately 70% reported that encouragement from colleagues motivated adherence to IPC protocols. Overall, 91.0% of respondents had a good perception of IPC, whereas 9.0% had a poor perception [Table 4].

Table 2: Educational level and working experience of respondents

Variables	Frequency (%) n = 382
Education level	
Secondary	126 (33.0)
Diploma	198 (51.8)
Degree	58 (15.2)
Length of working experience (years)	
≤1	36 (9.4)
2-5	77 (20.2)
6-10	154 (40.3)
>10	115 (30.1)

Infection prevention and control practices among respondents

Respondents generally reported high adherence to recommended IPC practices. Nearly two-thirds (64.9%) consistently adhered to standard precautions during patient care, while 68.3% reported performing hand hygiene before and after every patient contact. The routine use of gloves when handling blood and body fluids was reported by 62.3% of respondents, and 64.9% indicated that they never recapped used needles after administration. In addition, 88.0% consistently applied standard precautions irrespective of patients' perceived infection status, while 91.6% routinely disinfected medical equipment and environmental surfaces. The majority of respondents (78.3%) reported safely disposing of used sharps in designated safety boxes. Despite these encouraging practices, nearly three-quarters (74.6%) reported having experienced occupational exposure to blood or body fluids during their professional practice [Figure 1].

Overall, the composite practice assessment showed that 91.6% of respondents demonstrated good IPC practices, while only 8.4% had poor IPC practices [Figure 2].

DISCUSSION

This study assessed the knowledge, perception, and practices of infection prevention and control (IPC) among primary healthcare workers in rural Benue State, Nigeria. The study found that 93.2% of respondents had good knowledge of IPC, with universal awareness of IPC, widespread recognition of hand hygiene and safe sharps disposal as essential preventive measures, and a high proportion correctly identifying standard precautions as applicable to all patients. These findings suggest that respondents possessed a sound understanding of the fundamental principles of IPC. The high level of knowledge is consistent with reports from Plateau State, Kano State, and Osun State, where healthcare workers similarly demonstrated good IPC knowledge.^{7,17,18}

Comparable findings may reflect the growing emphasis on IPC training, continuing professional education, and the strengthening of primary healthcare services across Nigeria, particularly following national investments in health system capacity and infection prevention programmes. Conversely, studies conducted in Enugu, Edo State, and Ghana reported lower levels of IPC knowledge among healthcare workers.¹⁹⁻²¹ These differences may be attributable to variations in study settings, participant characteristics, access to regular IPC training, and institutional support for infection prevention programmes.

Respondents also demonstrated highly positive perceptions towards IPC, with 91.0% exhibiting good overall perception. All participants acknowledged the protective value of standard precautions for both patients and healthcare workers, expressed willingness to comply with IPC measures, and supported institutional enforcement of IPC guidelines. Furthermore, nearly 9 out of 10 respondents expressed interest in additional IPC training, indicating sustained motivation to improve professional competence. These findings are consistent with studies from Cross River State, Osun State, and Kano, which similarly reported favourable attitudes towards IPC among healthcare workers.^{17,18,22}

Table 3: Knowledge of infection prevention and control among respondents

Variables	Frequency (%), n = 382
Ever heard of infection prevention and control	
Yes	382 (100.0)
No	0 (0.0)
If yes, source of information	
TV/radio/social media	24 (6.3)
Hospital workshop/training	251 (65.7)
Co-workers	89 (23.3)
Friends	18 (4.7)
Infection prevention and control means:	
Guidelines on how to administer antibiotics to patients	0 (0.0)
Only handwashing practices among staff	26 (6.8)
Practices designed to prevent and reduce the transmission of infections in healthcare settings	356 (93.2)
Ever received training on standard precautions and infection control.	
Yes	256 (67.0)
No	126 (33.0)
Among the following, this is not an example of infection prevention and control practices:	
Hand washing	12 (3.1)
Use of personal protective equipment	27 (7.1)
Waste management and disposal	18 (4.7)
Giving antibiotics	325 (85.1)
Infection prevention and control practices should be followed in or at:	
All hospitalized patients	286 (74.9)
When the patient has a known or suspected infection	84 (22.0)
At the discretion of the health worker	12 (3.1)
Hand hygiene is key to preventing infections.	
True	382 (100.0)
False	0 (0.0)
Not sure	0 (0.0)
Safe sharps disposal reduces needle injuries.	
True	361 (94.5)
False	0 (0.0)
Not sure	21 (5.5)
Knowledge grading	
Good knowledge	358 (93.2)
Poor knowledge	24 (6.8)

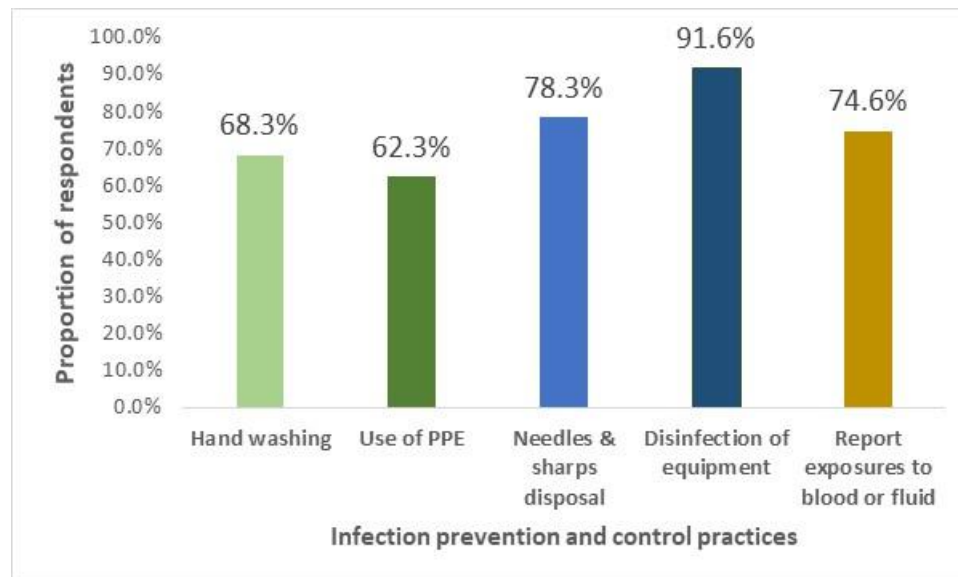
Positive perceptions are important because favourable attitudes have consistently been associated with greater adherence to recommended infection prevention practices and stronger institutional safety cultures.

Similarly, the present study demonstrated a high level of IPC practice, with 91.6% of respondents classified as having good practices. Most respondents reported adherence to standard precautions, routine hand hygiene, appropriate glove use during contact with blood and body fluids, avoidance of needle recapping, proper disposal of used sharps, regular environmental disinfection, and consistent application of standard precautions regardless of patients' apparent infection status. These findings compare favourably with studies conducted in Cross River State, Plateau State, and India, where good IPC practice was also reported, although at lower levels than observed in the present study.^{7,22,23}

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Table 4: Perception of infection prevention and control among respondents

Statements	Strongly agree Freq (%)	Agree Freq (%)	Not sure Freq (%)	Disagree Freq (%)	Strongly Disagree Freq (%)
Standard precautions are useful for protecting patients against infection (n = 382)	236 (61.8)	146 (38.2)	0 (0.0)	0 (0.0)	0 (0.0)
Standard precautions are useful for protecting health workers against infection (n = 382)	200 (52.4)	182 (47.6)	0 (0.0)	0 (0.0)	0 (0.0)
If possible, I would like to practice standard precautions and infection control completely (n = 382)	219 (57.3)	163 (42.7)	0 (0.0)	0 (0.0)	0 (0.0)
Hospital management should enforce compliance with infection prevention and control (n = 382)	205 (53.7)	177 (46.3)	0 (0.0)	0 (0.0)	0 (0.0)
I would like to receive more training on standard precautions and infection control (n = 382)	179 (46.9)	161 (42.1)	42 (11.0)	0 (0.0)	0 (0.0)
Standard precautions are time-consuming and unnecessary (n = 382)	0 (0.0)	14 (3.7)	84 (22.0)	70 (18.3)	214 (56.0)
Infection prevention and control is everyone's responsibility (n = 382)	206 (53.9)	142 (37.2)	23 (6.0)	11 (2.9)	0 (0.0)
My colleagues motivate me to adhere to infection prevention and control protocols (n = 382)	165 (43.2)	102 (26.7)	74 (19.4)	27 (7.1)	14 (3.7)
Perception grading	Frequency (%), n = 382				
Good perception	348 (91.0)				
Poor perception	34 (9.0)				


Figure 1: Infection prevention and control practices among respondents

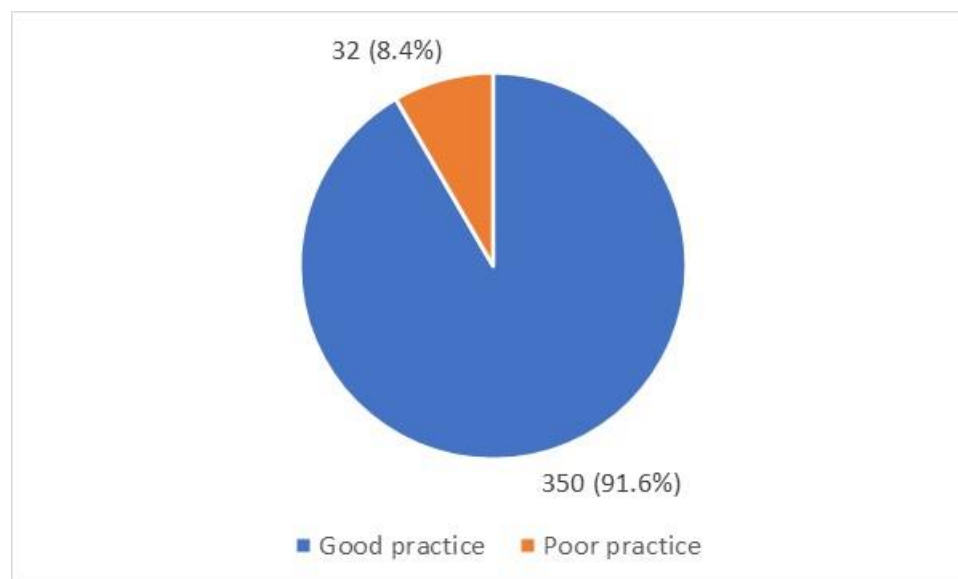


Figure 2: Respondents' infection prevention and control status

Despite the encouraging overall practice scores, some important gaps remain. Although approximately two-thirds of respondents reported consistent hand hygiene before and after patient contact and routine glove use, these proportions indicate that a sizeable minority still do not consistently adhere to these critical preventive measures. Similar challenges regarding hand hygiene compliance have been reported in studies from India, Ghana, Kano, and Benue State, underscoring the persistent difficulty of achieving universal adherence to standard precautions.^{8,17,21,23} Likewise, the reported use of personal protective equipment aligns with findings from Osun State. Still, it contrasts with studies from Delta, Benue, and Cross River States, where inadequate availability of protective equipment contributed to poorer IPC practices.^{8,25,26} The respondents in this study widely practiced safe disposal of sharps, consistent with findings from Enugu but differing from earlier reports from Benue State that documented lower compliance with recommended sharps disposal practices.^{19,27} Regular environmental disinfection observed among respondents also corroborates findings from India, Ghana, and Osun State, where routine decontamination formed an important component of IPC practice.^{18,24,27}

A notable finding of this study was that 74.6% of respondents reported prior occupational exposure to blood or body fluids, despite high levels of reported IPC compliance. This suggests that occupational exposure

remains a significant hazard for primary healthcare workers and may reflect the inherently high-risk nature of clinical practice, occasional lapses in adherence to standard precautions, heavy workloads, or inadequate access to protective resources. Although studies from Ghana have reported high rates of reporting occupational exposures following such incidents,²⁴ the present finding emphasizes the need to strengthen occupational health programmes, ensure uninterrupted availability of personal protective equipment, reinforce compliance with standard precautions, and improve access to post-exposure management services. Sustained in-service training, supportive supervision, and continuous monitoring of IPC practices will be essential to maintaining high compliance while reducing preventable occupational exposures among primary healthcare workers. Overall, the findings demonstrate high levels of IPC knowledge, favourable perceptions, and good preventive practices among respondents. Nevertheless, the high prevalence of occupational exposure to blood and body fluids highlights persistent gaps in workplace safety despite the encouraging levels of IPC compliance.

STUDY LIMITATIONS

Some limitations should be considered while interpreting the results of this study. The cross-sectional nature of this study limits the ability to establish causal relationships between respondents' characteristics and their infection

prevention and control (IPC) knowledge, perceptions, and practices. In addition, the use of self-reported data to assess IPC practices may have introduced recall and social desirability bias. Since the study was conducted in primary healthcare facilities within a single Local Government Area, caution should be exercised when generalizing the findings to other settings. Furthermore, the inclusion of healthcare workers from diverse professional cadres, each with varying educational and clinical backgrounds, may have influenced the observed levels of IPC knowledge and practice. However, routine in-service IPC training across the facilities may have reduced this variation.

CONCLUSION

This study found that primary healthcare workers in rural Benue State demonstrated high levels of knowledge of infection prevention and control (IPC), positive perceptions, and good IPC practices. Nevertheless, the high prevalence of occupational exposure to blood and body fluids indicates that important gaps in workplace safety remain. Strengthening regular IPC training, ensuring the consistent availability of essential IPC supplies and personal protective equipment, and reinforcing compliance with standard precautions through supportive supervision, routine monitoring, and institutional accountability are recommended to sustain good practices and further reduce occupational risks among primary healthcare workers.

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Source of support

Nil.

Conflict of interest

None declared.

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