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Attitudes of Nigerian Orthopedic Surgeons Toward Peri-operative Antibiotic Practices: A 2024 Perspective

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Abstract

Background and Aim: Surgical site infections (SSIs) remain a major complication in orthopedic surgery, contributing to morbidity, prolonged hospitalization, and economic burden. This study explores the attitudes of Nigerian orthopedic surgeons toward peri-operative antibiotic practices. ***Material and Methods:*** A descriptive cross-sectional survey was conducted among 34 orthopedic surgeons in Nigeria, including consultants and senior registrars across public and private hospitals. Data were collected via a structured, self-administered online questionnaire covering socio-demographics, antibiotic practices, and attitudes toward stewardship. Responses were analyzed using SPSS v27, with descriptive statistics applied. ***Results:*** Respondents had a mean age of 44.3 years (SD 8.1); most were male (86.9 %) and worked in teaching hospitals (41.7 %). Cephalosporins were the most prescribed prophylactic agents (63.1 %), with combination therapy more common (59.5 %). Timing was split between intra-operative (58.3 %) and pre-operative (41.7 %) administration. SSI rates were estimated as <1 % by 47.6 % of respondents, though 75.0 % reported no departmental audits. Willingness to engage in quality improvement was high (95.2 %), yet only 27.4 % were open to alternative regimens. Research evidence (36.5 %) and patient-specific factors (29.2 %) were the main drivers for potential change. ***Conclusion:*** Nigerian orthopedic surgeons demonstrate reliance on personal experience and broad-spectrum antibiotic use, with limited audit practices and partial alignment with global guidelines. High willingness to improve suggests that evidence-based, locally contextualized stewardship interventions could optimize peri-operative antibiotic use and reduce SSI risk.

Keywords: ***Peri-operative antibiotics, Surgical site infections, Orthopedic surgery.***

Introduction

Infection control in orthopedic surgery remains a fundamental component of patient safety and surgical success [1]. Surgical site infections (SSIs) are associated with increased morbidity, extended hospital stays, and substantial economic burden across healthcare systems [2,3]. Peri-operative antibiotic prophylaxis, when timed and selected appropriately, plays a central role in reducing SSI incidence [4]. Despite its proven efficacy, adherence to perioperative antibiotic guidelines among orthopedic practitioners remains variable internationally, highlighting a critical need to understand surgeon attitudes and decision-making processes [5,6].

Previous investigations into surgeon practices report a spectrum of compliance. For example, in a comprehensive audit of peri-operative antibiotic use, Owens and Stoessel observed considerable deviations from guideline-recommended timing and dosing [7], while Ozgun et al. noted that institutional protocols and surgeon experience significantly influenced antibiotic administration behavior [8]. Such findings highlight an interplay between evidence-based recommendations and practical constraints, including concerns about antibiotic resistance, cost, or hospital resource limitations [9]. Comparatively, some studies report greater guideline adherence in high-income countries, where standardized processes and stewardship programs are more established [10,11], whereas low- and middle-income contexts often face unique challenges tied to infrastructure, training, and supply chain issues [12].

Attitudinal studies reveal that orthopedic surgeons' perceptions of infection risk, personal experience with SSIs, and trust in antibiotic guidelines significantly mediate their prophylactic practices [13]. In exploring this complex attitudinal landscape, it is essential to consider the cognitive and cultural factors that drive decision-making. While Lohiniva et al. emphasized the importance of behavioral interventions in enhancing guideline uptake in surgery [14], Gunaratnam and Bernstein illustrated the role of peer norms and

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institutional expectations in shaping surgeon behavior across specialties, including orthopedics [15].

Despite the growing body of literature across diverse global settings, evidence that specifically addresses the Nigerian situation remains limited. The Nigerian healthcare system, characterized by a mix of tertiary, secondary and primary facilities, wide variability in available resources, and pronounced regional disparities, provides a distinctive setting in which to examine peri operative antibiotic attitudes and practices [16,17]. Earlier Nigerian studies have primarily concentrated on the incidence of surgical site infections or on broad patterns of antibiotic use, yet they rarely explore the attitudinal dimensions among orthopedic surgeons [19,20]. This gap is significant because in a context already challenged by antimicrobial resistance, inconsistent supply chains and resource limitations [20], surgeon attitudes are shaped not only by clinical knowledge but also by systemic pressures and institutional realities.

Against this backdrop, this study seeks to explore and articulate the attitudes of Nigerian orthopedic surgeons towards peri-operative antibiotic practices. Understanding these attitudes offers more than descriptive insight: it paves the way for targeted stewardship interventions, policy refinement, and contextually appropriate guideline implementation. By situating the inquiry within Nigeria's dynamic healthcare landscape, this research aims to illuminate both the opportunities and barriers inherent to elevating peri-operative antibiotic practice in Nigerian orthopedics.

Methodology

This study employed a descriptive cross sectional survey design to explore the attitudes of orthopedic surgeons in Nigeria toward peri operative antibiotic practices. The study population consisted of practicing orthopedic surgeons in Nigeria. This included consultants and senior registrars working in public and private healthcare institutions across different regions of the country. The inclusion criteria were orthopedic surgeons currently in clinical practice and willing to provide informed consent. Surgeons not in active practice, as well as respondents who did not complete the survey, were excluded from the analysis. A purposive sampling approach was used to ensure that the study targeted surgeons with direct involvement in orthopedic surgical care. Recruitment was facilitated through professional associations, institutional mailing lists, and peer referral. Surgeons received a study invitation that included a secure link to the online questionnaire.

Data were collected using a structured self-administered questionnaire developed in Google Forms. It contained sections on socio demographic details, knowledge of recommended antibiotic practices, attitudes toward guideline adherence, and self-reported prescribing behavior. The questionnaire was pre tested among a small group of surgeons for clarity and relevance, and adjustments were made before full deployment. The online questionnaire link was circulated electronically via email and professional platforms such as WhatsApp and Telegram groups of Nigerian orthopedic surgeons. Respondents were able to access and complete the form using their mobile devices or computers at their convenience. Participation was voluntary, and informed consent was obtained at the beginning of the survey.

Data Management and Analysis

Completed responses were automatically collated in Google Forms and exported into Microsoft Excel before being transferred into SPSS version 27 for analysis. Descriptive statistics were used to summarize data, including frequencies, percentages, means and standard deviations. Pearson correlation was applied to examine associations between demographic characteristics and attitudinal variables. Statistical significance was set at $p < 0.05$.

Ethical Considerations

Ethical approval was obtained from the appropriate institutional ethics review committee before commencement of the study. Participation was voluntary, and informed consent was sought electronically from all respondents. The anonymity of participants was maintained by not collecting identifying information, and data were stored securely with restricted access to the research team only.

Results

According to Table 1, the socio-demographic profile of the respondents showed that the mean age was 44.3 years with a standard deviation of 8.1. The majority were male, accounting for 86.9%, while females represented 13.1%. Most respondents were married (89.3%), with 7.1% single and 3.6% widowed. In terms of years of surgical practice, 39.3% had practiced for less than five years, 15.5% had between five and fifteen years of experience, and 45.2% had more than fifteen years. Regarding professional rank, 54.8% were senior registrars, 34.5% consultants, and 10.7% professors. With respect to facility type, 41.7% practiced in teaching hospitals, 36.9% in federal medical centres, and 21.4% in private hospitals. Concerning specialty, orthopedic trauma accounted for the largest proportion (57.1%), followed by arthroplasty (25.0%), spine (6.0%), orthopedic oncology (7.1%), and pediatric orthopedics (4.8%).

As presented in Table 2, cephalosporins (such as cefuroxime and cefazolin) were by far the most commonly prescribed peri-operative antibiotics, reported by 63.1% of respondents, either alone or in combination with other agents. Other regimens included cephalosporins with fluoroquinolones (19.0%), cephalosporins with glycopeptides (6.0%), fluoroquinolones alone (4.8%), carbapenems with cephalosporins (4.8%), and aminoglycosides with cephalosporins (2.4%). Combination antibiotic therapy was more common than single-agent use (59.5% vs. 40.5%). The main determinants of antibiotic choice were personal experience (37.6%), research evidence (21.5%), patient-specific factors (16.1%), hospital policy (15.1%), and cost considerations (9.7%). Timing of administration varied, with 58.3% administering antibiotics intra-operatively (within 30 minutes or during anaesthesia), while 41.7% administered them pre-operatively (an hour before surgery). Most respondents (63.1%) reported repeating antibiotic doses only occasionally during surgery. The main reasons for repetition included extended surgical duration exceeding two hours (37.4%), excessive blood loss greater than one litre (28.3%), breaks in asepsis (24.2%), and local or systemic sepsis (5.1%). Only 5.1% reported never repeating the dose.

According to Table 3, 47.6% of respondents estimated their surgical site infection (SSI) rate in 2023 as less than 1%, 17.9% reported 1–5%, and 34.5% reported 6–10%. Review of SSI rates was reported "often" by 46.4% of participants, "occasionally" by 44.0%, and "rarely" by 9.5%. Departmental audits on antibiotic use and SSI rates were not regularly conducted, with 75.0% reporting no audits, compared to 25.0% who confirmed regular auditing. Almost all respondents (95.2%) expressed willingness to participate in quality-improvement initiatives aimed at optimizing peri-operative antibiotic use. Satisfaction with current antibiotic regimens was high (88.1%), with only 4.8% dissatisfied and 7.1% uncertain. However, only 27.4% were willing to consider alternative regimens, while 31.0% were undecided and 41.7% unwilling to change. The most influential factors for changing antibiotic regimens were new

research evidence (36.5%) and patient-specific considerations (29.2%), followed by cost considerations (15.6%) and changes in hospital policy (14.6%). Influence from pharmaceutical companies was least cited (4.2%).

Table 1: Socio demographics of respondents

Variables	Frequency	Percentage
Age		
Mean ± SD	44.3 ± 8.1	
Sex		
Male	73	86.9
Female	11	13.1
Marital Status		
Single	6	7.1
Married	75	89.3
Widow	3	3.6
Years of surgical practice (Years)		
Less than 5	33	39.3
5-15	13	15.5
15 and above	38	45.2
Rank		
Senior Registrar	46	54.8
Consultant	29	34.5
Professor	9	10.7
Facility Type		
Teaching Hospital	35	41.7
Federal Medical Centre	31	36.9
Private Hospital	18	21.4
Speciality		
Arthroplasty	21	25.0
Orthopedic Oncology	6	7.1
Orthopedic Trauma	48	57.1
Pediatric Orthopedics	4	4.8
Spine	5	6.0

Table 2: Antibiotic Choice and Peri Operative Practices of Respondents

Variables	Frequency	Percentage
Most commonly used Antibiotics		
Aminoglycosides (e.g., gentamicin), Cephalosporins (e.g., cefuroxime, cefazolin), Fluoroquinolones (e.g., ciprofloxacin, levofloxacin)	2	2.4
Carbapenems (Imipenem), Cephalosporins (e.g., cefuroxime, cefazolin)	4	4.8
Cephalosporins (e.g., cefuroxime, cefazolin)	53	63.1
Cephalosporins (e.g., cefuroxime, cefazolin), Fluoroquinolones (e.g., ciprofloxacin, levofloxacin)	16	19.0
Cephalosporins (e.g., cefuroxime, cefazolin), Glycopeptides (e.g., vancomycin)	5	6.0
Fluoroquinolones (e.g., ciprofloxacin, levofloxacin)	4	4.8
Use of single agent or combination antibiotic therapy		
Combination	50	59.5
Single	34	40.5
Antibiotics influence choice[m]		
Personal experience	35	37.6
Research Evidence	20	21.5
Hospital/Thrust policy	14	15.1
Cost consideration	9	9.7
Patient-specific factors (e.g., allergy, renal function)	15	16.1
When to administer peri-operative antibiotics		
Intra-operatively (within 30mins or during anaesthetisia)	49	58.3
Pre-operatively (an hour before surgery)	35	41.7
How often do you repeat the drug intra-operatively		
Always	4	4.8
Never	4	4.8
Occasionally	53	63.1
Often	17	20.2
Rarely	6	7.1

Why did you have to repeat the dose[m]		
Excessive blood loss (more than 1litre)	28	28.3
Extended surgery duration (more than 2hours)	37	37.4
Break in Asepsis	24	24.2
Local or systemic sepsis	5	5.1
Do not repeat dose	5	5.1

M: Multiple response

Table 3: Attitudes toward Infection Control and Antibiotic Regimens

Variables	Frequency	Percentage
Estimated SSI rate for the past year (2023)		
Less than 1%	40	47.6
1-5%	15	17.9
6-10%	29	34.5
How often do you review SSI rates in your department/unit		
Occasionally	37	44.0
Often	39	46.4
Rarely	8	9.5
Does your department/unit conduct regular audits on antibiotic use and SSI rates?		
No	63	75.0
Yes	21	25.0
Would you be interested in participating in quality improvement initiatives to optimize peri-operative antibiotic use?		
No	4	4.8
Yes	80	95.2
Are you satisfied with your current peri-operative antibiotic regimen		
No	4	4.8
Yes	74	88.1
Maybe	6	7.1
Would you consider alternative antibiotic regimens or protocols for the coming year		
No	35	41.7
Undecided	26	31.0
Yes	23	27.4
Factors would influence your decision to change your antibiotic regimen[m]		
New research evidence	35	36.5
Changes in hospital policy	14	14.6
Cost considerations	15	15.6
Patient specific factors	28	29.2
Influence of pharmaceutical companies/incentives	4	4.2

Discussion

This study provided insight into the antibiotic prophylaxis practices of Nigerian orthopedic surgeons, highlighting key trends and contrasts with global evidence. The mean respondent age was 44.3 years, with most participants being male, married, and practicing in teaching hospitals. This demographic pattern mirrors other Nigerian studies, where the majority of surgical specialists fall within mid-career age groups and are institutionally based [21,22]. Surgeons in this age bracket often rely on established clinical routines, which may explain the observed reliance on personal experience in antibiotic choice, rather than consistent adherence to standard protocols. In fact, despite widespread awareness of guidelines, adherence in Nigeria remains as low as 30 % [23], a trend also documented in other low- and middle-income countries [24].

The dominant use of cephalosporins (63.1 %) aligns with international recommendations that first-generation cephalosporins such as cefazolin remain the agents of choice for orthopaedic prophylaxis [25,26]. However, the frequent use of combination therapy (52.9 %) diverges from stewardship principles that advocate narrow-spectrum, single-agent regimens unless justified by specific patient or procedural risks [27]. Similar patterns of broad-spectrum or multiple antibiotic use have been reported in African surgical practice, often driven by concerns about high infection risk, limited surveillance, and weak stewardship oversight [28].

Timing of administration was divided between intra-operative (58.3 %) and pre-operative (41.7%) dosing. International guidelines strongly recommend prophylaxis within one hour before incision [29,30]. Deviation from this window is associated with higher surgical site infection (SSI) rates. Comparable findings from Ethiopia and Ghana showed that pre-incision dosing occurred in fewer than half of surgeries, reflecting systemic gaps in peri-operative coordination [31,32]. Most respondents repeated doses occasionally, commonly when surgeries exceeded two hours, which is consistent with global recommendations for prolonged procedures or excessive blood loss [33].

Respondents perceived SSI rates to be low, with 47.6% estimating <1%. Yet, global orthopaedic SSI rates range between 2% and 22% [7]. The low estimates may reflect underreporting, as 75.0% of participants reported no regular departmental audits. Lack of surveillance has been repeatedly identified as a barrier to accurate infection measurement in low-resource settings [34]. Studies from

Nigeria and Ghana have shown higher actual SSI rates than those perceived by clinicians [32,35]. This discrepancy highlights the need for systematic infection surveillance and feedback loops. Despite these gaps, willingness to improve was nearly universal (95.2%), although satisfaction with current regimens was also high (88.1%). Only 27.4% indicated openness to alternative antibiotic protocols.

Finally, factors influencing potential change were primarily research evidence (36.5%) and patient-specific needs (29.2%). Cost and policy exerted less influence. This preference suggests that stewardship interventions should be framed around evidence generation and patient outcomes rather than administrative mandates. Similar patterns have been documented in Australia and the UK, where clinicians reported greater willingness to adapt practice when presented with strong clinical trial data and patient safety arguments rather than top-down enforcement [36,37].

Limitations

This study has some limitations that must be acknowledged. The relatively small sample size restricts the generalizability of the findings to all orthopaedic surgeons in Nigeria. Data collection through self-administered online forms may also have introduced response bias, as surgeons with greater interest in antimicrobial use or infection control were more likely to participate. The reliance on self-reported practices, rather than objective clinical audit or prescription records, raises the possibility of recall bias and social desirability bias, potentially underestimating deviations from standard guidelines. Furthermore, the cross-sectional design captures practices at a single point in time, without accounting for temporal or institutional variations. Finally, the absence of microbiological surveillance data on surgical site infections limited the ability to correlate prophylactic practices with actual infection outcomes.

Conclusion

Despite these limitations, this study highlights important trends in antibiotic prophylaxis practices among Nigerian orthopaedic surgeons. While cephalosporins remain the preferred prophylactic agents, variations in timing, duration, and the frequent use of combination therapy suggest persistent gaps between practice and international guidelines. The low rates of departmental audits and reliance on personal experience underscore the need for structured antimicrobial stewardship interventions. Surgeons expressed willingness to improve, particularly when presented with research evidence and patient-centered data, suggesting that local evidence generation, regular audit and feedback, and context-specific stewardship programs may drive more consistent practice. Bridging the gap between routine habits and evidence-based protocols is crucial to reducing surgical site infections, optimizing antimicrobial use, and improving orthopaedic surgical outcomes in Nigeria.

List of Abbreviations

SSI: Surgical Site Infections
SSIs: Surgical Site Infections (plural)
SPSS: Statistical Package for the Social Sciences
M: Multiple response (noted in tables)
P: Probability (in statistical significance context)

Declarations

Ethical Considerations

The study was approved by Babcock University Health Research Ethics Committee (BUHREC). Data were collected anonymously.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Data Availability

The datasets generated and analyzed during this study are not publicly available to protect participant confidentiality but may be made accessible by the corresponding author upon reasonable request, subject to approval.

Conflict of Interest

The authors declare no conflicts of interest.

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