Research

Antibiotic Prescription Patterns in Paediatric Wards of Rivers State University Teaching Hospital, Southern Nigeria: A Point Prevalence Survey

[1]Briggs DC, [2]Oboro IL, [2]Bob-Manuel M, [3]Amadi SC, [2]Enyinnaya SO, [2]Lawson SD, [4]Dan-Jumbo AI

[1]Department of Paediatrics, Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria
[2]Department of Medical Microbiology and Parasitology, Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria
[3]Department of Obstetrics and Gynaecology, Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria
[4]Department of Family Medicine, Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria

Corresponding author: Briggs Datonye, *Department of Paediatrics, Rivers State University Teaching Hospital, Port Harcourt, Rivers State, Nigeria; datonye.briggs1@ust.edu.ng;* +2348088985785

Article history: Received 15 August 2023, Reviewed 31 August 2023, Accepted for publication 5 September 2023

How to cite this article:
Briggs DC et al; Antibiotic prescription patterns in Paediatric wards of Rivers State University Teaching Hospital, Southern Nigeria: A Point Prevalence Survey. The Nigerian Health Journal 2023; 23(3): 837 - 843

Abstract

Background: Antimicrobial resistance remains a threat to patient safety and healthcare outcomes and largely arises from inappropriate antimicrobial prescriptions. This study aimed to determine the pattern of antibiotic prescriptions in the Paediatrics department of Rivers State University Teaching Hospital, Port Harcourt.

Method: A point prevalence survey was conducted in the Paediatric wards and Special Care Baby Unit (SCBU) on 13 November 2021. Records of all children admitted before or at 8:00 a.m. on the day of the survey were descriptively analysed using the protocol and web-based management system of the Global Point Prevalence Survey of Antimicrobial Consumption and Resistance, University of Antwerp.

Results: The antibiotic prevalence in this study was 77.4%. The most common indication(s) for antibiotic use in SCBU was infection prophylaxis (81.3%) and in paediatric wards: Pneumonia, Ear Nose Throat and Soft tissue infections accounted for (23.1%) each. Third-generation cephalosporins and aminoglycosides were predominantly used in all wards and were empirical-based prescriptions. Regarding antibiotic quality indicators of prescriptions: In SCBU: 19 (90.5%) had indication(s) for antibiotics documented, 10 (46.7%) were guideline compliant, and 1 (4.8%) had documented review/stop date. In the paediatric medical and surgical wards, 17(85.0%) vs. 4(100%) had indication(s) for antibiotics documented, 6(30.0%) vs. 0(0%) were guideline compliant, and 1(5.0%) vs. 4(100.0%) had a review/ stop date.

Conclusion: High prevalence of antibiotic use, suboptimal antibiotic quality indicators and absence of laboratory evidence for antibiotic prescriptions were observed in the paediatric units. There is a need to reorientate prescribers and institute strategic measures to improve antimicrobial stewardship.

Keywords: Antibiotic, Prescriptions, Paediatrics, Stewardship, Infection

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Introduction

Antimicrobial drugs are essential in treating infections, but their overuse and misuse have led to the emergence of antimicrobial resistance (AMR) which is a worldwide public health concern that occurs when microbes evolve over time and no longer respond to treatments, making infections more difficult to cure and increasing the risk of disease transmission, severe illness and death.[1,2] In hospitals, antimicrobial agents are frequently prescribed to neonates and children as a preventive measure or for the treatment of suspected or confirmed infections.[3] However, inappropriate antimicrobial usage, including incorrect selection, sub-optimal dosing, unnecessary administration, and prolonged therapy, contributes to the development of AMR in neonatal and paediatric ward settings.[1,4] The spread of multidrug-resistant organisms in healthcare settings poses significant challenges in managing infections effectively, leading to limited treatment options and increased mortality rates.[5,6] Hence, antimicrobial resistance remains a threat to patient safety and healthcare outcomes and has been widely noted to arise from inappropriate antimicrobial prescription patterns.[7]

The World Health Organisation (WHO) has called for increased antibiotic surveillance and research among healthcare practitioners.[2] Promoting rational antimicrobial prescribing practices is crucial to addressing the challenges of AMR and hospital-acquired infections or healthcare-associated infections (HAI), which are illnesses acquired in the hospital that are usually not present or are incubating at the time of admission.[8] These infections are typically acquired during hospitalization and usually manifest after two days of admission.[8] This involves implementing evidence-based guidelines and protocols for antimicrobial use, emphasizing the importance of accurate diagnosis, appropriate dosing, and duration of therapy.[9] In hospital settings therefore, antibiotic quality indicators are a composite measure employed to assess how well antibiotics are utilised in accordance with the documented clinical diagnosis, compliance with standard treatment guidelines and whether or not a review and stop dates for prescribed antibiotics were appropriately documented.[10] Consequently, when inadequate healthcare provider practices are discovered, they should be re-educated on the concepts of antimicrobial stewardship to ensure the prudent use of antimicrobial agents, hence minimising the establishment and spread of drug-resistant bacteria.

A recent review by Abubakar and Salman[1] of antibiotic use among hospitalized patients in Africa which included point prevalence studies reported an overall prevalence of antibiotic use to range from 27.6% to 83.5% with West Africa having the higher estimates compared to the rest of Africa. In particular, patients in the intensive care units and paediatric wards were found with the highest prevalence of antibiotic use. Community-acquired infections were the most common indications for antibiotic use and Ceftriaxone and metronidazole were the most common antibiotics prescribed and the antibiotic quality indicators also varied widely across the continent with documentation of reasons for antibiotic use and review/stop dates being as low as 37.3% and 19.6% respectively. Antibiotic stewardship was still advocated in light of the increasing use of drugs within the WHO 'Watch' Category. The review, however, only included a few studies[7,11,12] within neonatal and paediatric ward settings.

Surveillance of antibiotic prescription patterns in the hospital setting is imperative to provide baseline data for appropriate antimicrobial stewardship interventions, especially where this has previously been unreported.[4,13] The Rivers State University Teaching Hospital had recently formed an Infection, Prevention and Control/Antimicrobial Stewardship team comprising specialists from diverse sub-specialties and this survey was the first point prevalence antibiotic survey that aimed at determining the antibiotic prevalence and prescription patterns in the Paediatrics Department of the Rivers State University Teaching Hospital, Port Harcourt.

Method

This was a point prevalence survey conducted on the 13th of November 2021. The study was conducted at the Special Care Baby Unit (SCBU) and the Paediatric medical and surgical wards of the Department of Paediatrics, Rivers State University Teaching Hospital, Rivers State, Southern Nigeria.

All children below 18 years who were on admission on the day of the survey were assessed for eligibility. Any newborn or child who had been admitted for at least 24 hours to either the Special Care Baby Unit (SCBU) or the Paediatric Medical and Surgical wards and who was still there as of 8 a.m. on the survey day was included in the study. Whereas, any newborn or newly admitted child whose antibiotics were stopped before 8 a.m., who arrived after 8 a.m. on the survey day, who was only

Print ISSN: 0189-9287 Online ISSN: 2992-345X

receiving intravenous fluids, or who was not receiving antibiotics at the time of the survey was excluded.

Trained members of the Infection Prevention and Control/Antimicrobial Stewardship team retrieved the folders of all the newborns and children. They then collected the data in accordance with the guidelines and standardised data collection forms created by the Global Point Prevalence Survey of Antimicrobial Consumption and Resistance at the University of Antwerp in Belgium. From the patients' case notes and antibiotic records, information was gathered on the antimicrobial(s) each neonate or child was currently taking, their indications, whether antimicrobial guidelines were available or not, as well as laboratory evidence and resistance profiles of isolated organisms. These were input, validated and analysed using the web-based automated data management system on the Global Point Prevalence Survey website (https://www.global-pps.com), as designed by the University of Antwerp in Belgium. No patient interaction was required.

Data were also entered into a Microsoft Excel spreadsheet and analysed. Data were summarized using descriptive statistics and presented as frequency tables and charts as necessary.

Results

A total of 31 admitted children were surveyed: 13 (41.9%) were in the children's (medical and surgical) wards and 18 (58.1%) were in the SCBU. Of these, only 24 were on antimicrobials. There were 15 (62.5%) males and 9 (37.5%) females with a M:F ratio of 1.7:1. Mean age (SD) among neonates on admission in SCBU was 4.4 (2.6) days and the mean age (SD) among children admitted in Paediatric wards was 4.9 (5.0) years.

Table 1: Demographics of children on antimicrobials (N=24)

Variable	Freq.	Percent
Age (years)		
0 – 28 days	11	45.8
1 month - 5 years	8	33.3
6 – 10 years	3	12.5
11 – 15 years	3	12.5
16 – 18 years	0	0.0
Ward type		
Paediatric (medical & surgical)	13	54.2
SCBU	11	45.8

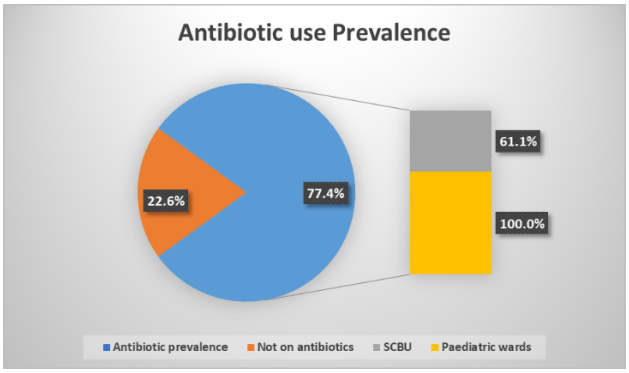

Figure 1: Pie Chart demonstrating the Antibiotic Prevalence

Antibiotic Prevalence and Utilization

Twenty-four children on admission on the day of the survey were on at least one type of antibiotic, giving an overall antibiotic prevalence was 77.4% (Figure. 1). There was a higher prevalence of antibiotic use among children in the paediatric wards compared to neonates in SCBU – [13(100% Vs 11 (61.1%)]. The most common indication(s) for antibiotic use in SCBU was infection prophylaxis (81.3%) and in paediatric wards: Pneumonia, Ear Nose Throat and Soft tissue infections accounted for (23.1%) each as seen in Table 2.

Table 2. Indications for antibiotics use

SCBU	**N = 11**	**Percent**
Sepsis	1	9. 1
Pneumonia	1	9. 1
Infection Prophylaxis	9	81.8
Children's Ward	**N = 13**	
Pneumonia	3	23.1
ENT	3	23.1
Wound (SST)	3	23.1
Meningitis	2	15.3
Bone and Joint infections	1	7.7
Infection prophylaxis	1	7.7

As regards proportional antibiotic use (% of prescriptions) among neonates admitted in the SCBU, it was found that of the 21 prescriptions made for the 11 neonates treated, most were third-generation cephalosporins [Ceftazidime – 11 (52.4%)] and then aminoglycosides [gentamicin – 10 (47.6%)], as seen in Figure 3. With regards to proportional antibiotic use among children in both the medical and surgical wards, it was found that of 24 prescriptions made for the 13 children treated, the top four antibiotics found to be in use were the third-generation cephalosporins

Print ISSN: 0189-9287 Online ISSN: 2992-345X

(Ceftriaxone [7] and Ceftazidime [3]) in 10 (41.7%), aminoglycosides (gentamicin) in 6 (25.0%), the second-generation cephalosporins (Cefuroxime) 2 (8.3%) and the fluoroquinolones (Ciprofloxacin [1], levofloxacin [1]) in 2 (8.3%) as shown in Table 3.

Concerning the Antibiotic quality indicators in the paediatric wards, it was found that in the medical ward, of the 20 prescriptions reviewed, 17 (85.0%) had reason(s) in notes for the antibiotic in use, 3 (15%.0%) had guidelines missing, 6 (30.0%) were guideline compliant and only 1 (5.0%) had a review/ stop date documented. Also, in the paediatric surgical ward, of the 4 prescriptions reviewed, all 4 (100%) had reason in notes for the antibiotic in use, 2 (50.0%) had guidelines missing, 0 (0.0%) were guideline compliant and all 4 (100.0%) had a review/ stop date documented. However, in SCBU of the 21 prescriptions reviewed, 19 (90.5%) had reason in notes for the antibiotic prescribed, 1 (4.8%) had guidelines missing, 10 (47.6%) were guideline compliant and only 1 (4.8%) had a review/ stop date documented.

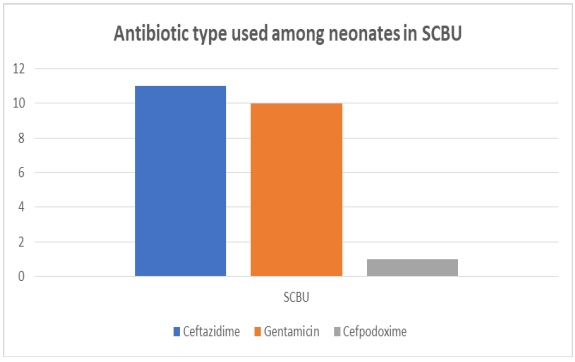

Figure 3: Antibiotic type used among neonates admitted into the Special Care Baby Unit [21 prescriptions]

Table 3: Antibiotic type used among children in the medical and surgical paediatric wards

ATC4	Antibiotic Subgroup	Frequency	Percentage
JO1DD	Third-generation cephalosporins [Ceftriaxone, Ceftazidime]	10	41.7
JO1GB	Other Aminoglycosides [Gentamicin]	6	25.0
JO1DC	Second-generation cephalosporins [Cefuroxime]	2	8.3
JO1MA	Fluroquinolones [levofloxacin/ ciprofloxacin]	2	8.3
JO1XD	Imidazole derivatives [Metronidazole]	1	4.2
JO1FA	Macrolides [Azithromycin]	1	4.2
JO1FF	Lincosamides [Clindamycin]	1	4.2
JO1EE	Comb. Sulfanamides//Trimethoprim [septrin]	1	4.2
JO1CA	Penicillins with extended-spectrum	0	0
JO1CE	Beta-lactamase sensitive penicillins	0	0

Table 3: Antibiotic type used among children admitted into the Paediatric Wards [24 prescriptions]

Antibiotic Quality Indicators:

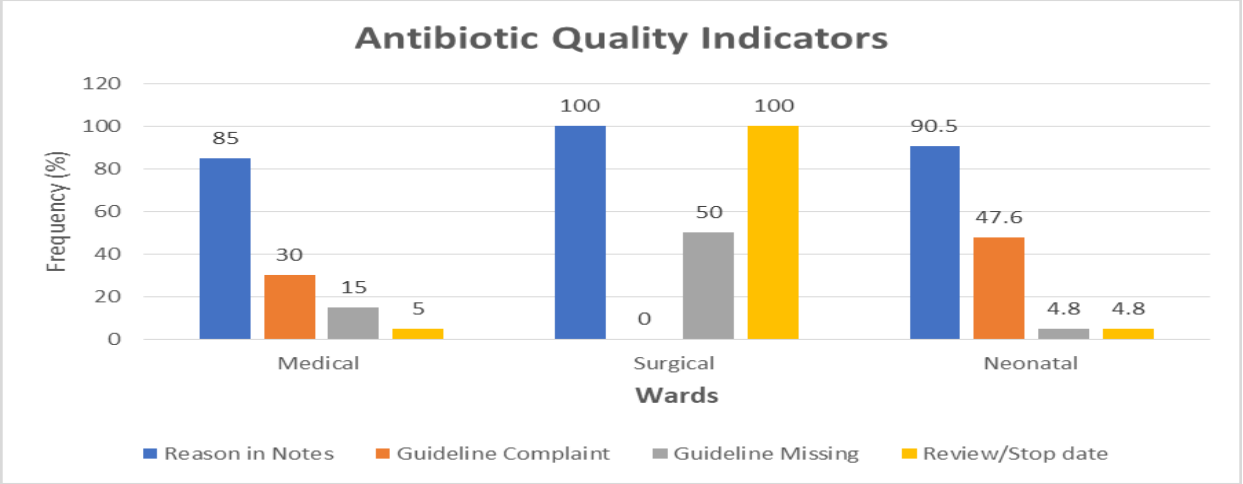

Figure 5: Assessment of Antibiotic Prescription Patterns using the Antibiotic Quality Indicators

Print ISSN: 0189-9287 Online ISSN: 2992-345X

As regards the type of antibiotic treatment received, the selection of antibiotic treatment among 45 prescriptions reviewed revealed that in both paediatric wards and SCBU, antibiotic treatments were only for empirical-based prescriptions and 42 (93.7%) of prescribed antibiotics were administered via the parenteral route [not in the tables].

Discussion

This study aimed to determine the prevalence and pattern of antibiotic use in the department of Paediatrics and found that antibiotic use is high with about three-quarters of admitted children receiving at least one type of antibiotic. Our finding was consistent with reports from other authors in South East Nigeria[11], Northern Nigeria [14,15] and Uganda[16] but about one-half times more than the estimates reported in other studies conducted in other facilities in South West[17] and South-South Nigeria.[18,19] Although this was the first study of its kind in our facility, variations in reported point prevalence may suggest a low threshold for the use of antibiotics in neonates and children due to their lower immunity and vulnerability to infection with resultant increased morbidity and mortality.

The 3rd generation cephalosporin – Ceftazidime and aminoglycoside–gentamicin were the predominant antibiotics prescribed in SCBU, whereas ceftriaxone and gentamicin were the most prescribed antibiotics in the paediatric wards, followed by cefuroxime a 2nd generation cephalosporin. This was similar to other Nigerian studies in which cephalosporins were the most prescribed antibiotics.[17,18] These belong to the *Watch group* in the WHO's – Access, Watch, Reserve - 'AWARE' classification of antibiotics which should not be prescribed indiscreetly. The high use of 3rd generation cephalosporins in our department is a cause for concern as we found an over-prescription of antibiotics in SCBU for infection prophylaxis alone without antimicrobial testing to exclude sepsis. This has been similarly reported in other studies by Manga and colleagues[15], in Gombe State, Nigeria. This suggests unnecessary exposure to antimicrobials which can result in drug resistance. Findings from other Nigerian studies suggest pressure from the use of these classes of drugs has resulted in the emergence of resistant bacterial strains, particularly extended-spectrum beta-lactamase-producing gram-negative bacteria.[5]

Consistent with findings from other studies [10,11,14,16–18] was the observation in this study that all antibiotic prescriptions were empirical-based. This was probably because some of the medical conditions among the neonates and children in this study had standard guidelines and/or protocols for empirical treatment. However, even for some of the variety of medical and surgical conditions on the Paediatric medical and surgical wards with no national guidelines [i.e., guideline missing/ guideline non-compliant], health workers' prescribing practices were still not guided by any microbiological testing. Our findings may also be reflective of several other factors including the failure of the attending health worker to request a microbiological test due to poor attitude towards requesting and filling out the required investigation forms or a lack of confidence in either the quality or turn-around time of microbiological reports. On the other hand, as has been similarly reported in other studies in Uganda and Niger,[16] when caregivers present with very ill neonates or children to the hospital and have to pay out-of-pocket but are low on funds; the health worker is often challenged with having to prioritize empirical-based medication prescriptions over microbiological tests to support clinical diagnosis.

Our study also found that the antibiotic quality indicators observed were sub-optimal. Although high frequencies were found for the reasons for antibiotic prescription use among the paediatric wards and SCBU; prescriptions being in accordance with guidelines and having clear documentation of review or stop dates of prescribed antibiotics were largely absent. This suggests the possibility of administering antibiotics for prolonged periods which can bring about the emergence of drug resistance and invariably increase financial costs on the patients' caregivers. This was similarly documented in other studies in Nigeria.[18]

Conclusion

There was a high prevalence of antibiotic use among children admitted to the neonatal and paediatric wards. No targeted antibiotic prescription was found, and antibiotic quality indicators were suboptimal. There is a need to reorientate paediatric caregivers and institute strategic measures to improve adherence to antimicrobial prescription guidelines and antimicrobial stewardship.

Limitations of the study: Our study is limited in that being a point prevalence survey may not typify the trend over time. The Children's Emergency Room was not included due to infrastructural adjustments at the time of the survey, hence a repeat larger study preferably after targeted training and implementation have been done is recommended.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

Declarations

Ethical consideration: Ethical approval: The Research Ethics Committee at RSUTH approved (Ref: RSUTH/REC/2021120, dated 1st November 2021) the conduct of the study.

Conflict of interest: **None declared.**

Funding: Authors personally funded the research

Authors' contribution: BDC – Conceptualization, study design, Data collation, Data analysis, writing of initial draft of manuscript, reviewing manuscript of intellectual content and Approval of final draft.
OIL – Conceptualization, study design, Data collation, Data analysis, review of manuscript for intellectual content, approval of final draft.
B-MM – Data collation, review of manuscript for intellectual content, Approval of final draft.
ASC, ESO, LSD, D-JAI – Data collation, Study design, Approval of final draft.

Acknowledgement: None

References

1. Abubakar U, Salman M. Antibiotic Use Among Hospitalized Patients in Africa: A Systematic Review of Point Prevalence Studies. J Racial Ethn Health Disparities. 2023 doi:10.1007/s40615-023-01610-9
2. World Health Organization. Antimicrobial resistance: global report on surveillance. World Health Organization, Geneva; 2014. Available from: https://www.who.int/publications/i/item/9789241564748
3. Mustafa ZU, Khan AH, Salman M, Syed Sulaiman Mustafa ZU, Khan AH, Salman M, Syed, Sulaiman SA, Godman B. Antimicrobial Utilization among Neonates and Children: A Multicenter Point Prevalence Study from Leading Children's Hospitals in Punjab, Pakistan. Antibiot Basel Switz. 2022;11(8): 1056.doi:10.3390/antibiotics11081056
4. Pauwels I, Versporten A, Vermeulen H, Vlieghe E, Goossens H. Assessing the impact of the Global Point Prevalence Survey of Antimicrobial Consumption and Resistance (Global-PPS) on hospital antimicrobial stewardship programmes: results of a worldwide survey. Antimicrob Resist Infect Control. 2021;10(1):138. doi: 10.1186/s13756-021-01010-w
5. Tanko N, Bolaji RO, Olayinka AT, Olayinka BO. A systematic review on the prevalence of extended-spectrum beta-lactamase-producing Gram-negative bacteria in Nigeria. J Glob Antimicrob Resist. 2020;22:488–96.
6. Obakiro SB, Napyo A, Wilberforce MJ, Adongo P, Kiyimba K, Anthierens S, et al. Are antibiotic prescription practices in Eastern Uganda concordant with the national standard treatment guidelines? A cross-sectional retrospective study. J Glob Antimicrob Resist. 2022;29:513–9.
7. Manga MM, Mohammed Y, Suleiman S, Fowotade A, Yunusa-Kaltungo Z, et al., Antibiotic prescribing habits among primary healthcare workers in Northern Nigeria: a concern for patient safety in the era of global antimicrobial resistance. PAMJ - One Health. 2021; 5:19. [doi: 10.11604/pamj-oh.2021.5.19.30847]
8. Monegro AF, Muppidi V, Regunath H. Hospital-Acquired Infections. In: StatPearls. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2023 Sep 4]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK441857/
9. Kallen MC, Prins JM. A Systematic Review of Quality Indicators for Appropriate Antibiotic Use in Hospitalized Adult Patients. Infect Dis Rep. 2017;9(1):6821. [doi:10.4081/idr.2017.6821]
10. Siachalinga L, Godman B, Mwita JC, Sefah IA, Ogunleye OO, Massele A, et al. Current Antibiotic Use Among Hospitals in the sub-Saharan Africa Region; Findings and Implications. Infect Drug Resist. 2023;16:2179–90.
11. Umeokonkwo CD, Madubueze UC, Onah CK, Okedo-Alex IN, Adeke AS, Versporten A, et al. Point prevalence survey of antimicrobial prescription in a tertiary hospital in South East Nigeria: A call for improved antibiotic stewardship. J Glob Antimicrob Resist. 2019;17:291–5.

Print ISSN: 0189-9287 Online ISSN: 2992-345X

12. Oduyebo O, Olayinka A, Iregbu K, Versporten A, Goossens H, Nwajiobi-Princewill P, et al. A point prevalence survey of antimicrobial prescribing in four Nigerian Tertiary Hospitals. Ann Trop Pathol. 2017;8(1):42.
13. Oshun PO, Roberts AA, Osuagwu CS, Akintan PE, Fajolu IB, Ola-Bello OI, et al. Roll out of a successful antimicrobial stewardship programme in Lagos University Teaching Hospital Nigeria using the Global-Point Prevalence Survey. Afr J Clin Exp Microbiol. 2021 Apr 8;22(2):260–72.
14. Shuaibu M, Ramatu AZ, Lawal H. Point Prevalence Study of Antibiotics use in Paediatric Wards of a Tertiary Health Facility in Kaduna Nigeria. Int J Innov Sci Res Technol. 2023;8(1):555–62.
15. Manga MM, Ibrahim M, Hassan UM, Joseph RH, Muhammad AS, Danimo MA, et al. Empirical antibiotherapy as a potential driver of antibiotic resistance: observations from a point prevalence survey of antibiotic consumption and resistance in Gombe, Nigeria. Afr J Clin Exp Microbiol. 2021;22(2):273–8.
16. Mambula G, Nanjebe D, Munene A, Guindo O, Salifou A, Mamaty AA, et al. Practices and challenges related to antibiotic use in paediatric treatment in hospitals and health centres in Niger and Uganda: a mixed methods study. Antimicrob Resist Infect Control. 2023;12(1):67. https://doi.org/10.1186/s13756-023-01271-7
17. Akintan P, Oshun P, Osuagwu C, Ola-Bello O, Fajolu I, Roberts A, et al. Point Prevalence Surveys of Antibiotic Prescribing in Children at a Tertiary Hospital in a resource constraint, low- income sub-Saharan African country. In Review; 2022 [cited 2023 Aug 12]. Available from: https://www.researchsquare.com/article/rs-2165984/v1
18. Awopeju A, Robinson N, Ossai-Chidi L, Jonah A, Alex-Wele M, Oboro I, et al. Point Prevalence Survey of Antimicrobial Prescription and Indicators in a Tertiary Healthcare Center in Southern Nigeria. South Asian J Res Microbiol. 2023;15:1–9.
19. Ekuma A, Ijezie E, Akpabio T, Onwuezobe I. Survey of antimicrobial consumption in a university teaching hospital in Southern Nigeria. Ann Trop Pathol. 2019;10(1):48-51.

Print ISSN: 0189-9287 Online ISSN: 2992-345X