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Analyzing Antibiotic Utilization Patterns From 2018 To 2022: A Comprehensive Study at A tertiary hospital in Bayelsa State, Nigeria

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Abstract

This research investigates the longitudinal trends in antibiotic utilization from 2018 to 2022 at Diette Koki Memorial Hospital, Bayelsa State, Nigeria. An extensive analysis encompassed 15,108 drugs within 3692 antibiotic prescriptions, with 640, 383, 1245, 522, and 902 prescriptions extracted from records for 2018, 2019, 2020, 2021, and 2022, respectively. The average drugs per prescription were reported at 4.0921 +/- 2.08104, with 3.1484 +/- 2.51027 prescribed using generic names. Notably, 76.94% of drugs were prescribed using generic names. Analysis indicated statistically insignificant decreases in the number of drugs per prescription ($R^2 = 0.300$), coupled with negligible increases in generic prescriptions ($R^2 = 0.462$). Consequently, this study underscores the imperative need for a concerted drive toward structured antibiotic stewardship initiatives to rectify these observed inadequacies. The implications of this study extend to the broader healthcare landscape, advocating for enhanced antibiotic prescription practices aligned with global guidelines. Addressing these deficiencies through targeted interventions can significantly mitigate the risk of antimicrobial resistance while optimizing patient care and treatment outcomes.

Keywords: Antibiotics, Stewardship, Prescribing, Patterns, Pharmacy, Clinical

Introduction

Antibiotics play an indispensable role in modern healthcare by mitigating infectious diseases and preventing associated complications **[5]**. Within the context of Nigeria's healthcare landscape, where antibiotic consumption rates are significant, concerns arise regarding the prudent utilization of these vital medications. The adherence to established guidelines for antibiotic prescription practices remains a critical issue, despite the presence of clear recommendations **[8]**. This discrepancy between guidelines and actual practices contributes to the exacerbation of AMR, necessitating a thorough assessment of antibiotic prescription patterns. Nigeria, like many other developing nations, faces significant public health challenges associated with antibiotic misuse and AMR **[7]**. However, there remains a dearth of comprehensive research examining longitudinal trends in antibiotic utilization within specific healthcare settings in the country. Understanding such trends is crucial for informing targeted interventions and policy measures to mitigate the escalating threat of AMR and optimize patient care outcomes **[5,9]**. this study seeks to address the longitudinal trends in antibiotic prescribing patterns at Diette Koki Memorial Hospital from 2018 to 2022; whether antibiotic prescriptions adhere to established guidelines, including generic prescribing practices and utilization of drugs listed in the Essential Drug List (EDL); and the implications of observed trends in antibiotic utilization for patient care outcomes, antimicrobial resistance rates, and healthcare policy formulation within the context of Diette Koki Memorial Hospital and broader healthcare provision in Bayelsa State, Nigeria.

Aim of the Study

The main aim of this study is to analyze antibiotic utilization patterns from 2018 to 2022 using Diette Koki Memorial Hospital, Bayelsa state, Nigeria.

Specific Objectives of the Study

1. To determine the number of drugs contained per antibiotic prescription in Diette Koki Memorial Hospital, Bayelsa state, Nigeria.
2. To determine the percentage of drugs prescribed in their generic names per antibiotic prescription in Diette Koki Memorial Hospital, Bayelsa state, Nigeria.

Study Design

This study involves the use of a retrospective study design.

Study Area

Diete Koki Memorial Hospital is a private health institution in Bayelsa State, Nigeria.

Target Population

The study used all medical patient folders containing antibiotics from the years 2018 to 2022. Adult patient antibiotic paper records for patients treated at the hospital between 2018 and 2022 were used for the study.

Sample Size

A total of 15,108 drugs in 3692 prescriptions containing antibiotics at the Diette-Koki Memorial Hospital, Opolo, Yenagoa Bayelsa state from the year 2018 to 2022 were used in the study. A total of 640, 383, 1245, 522, and 902 prescriptions were successfully extracted from the records in the year 2018, 2019, 2020, 2021 and 2022 respectively.

Data Collection Instrument

The data collection instruments for this study were paper records for patients treated with antibiotics at the hospital between 2018 and 2022. The patient prescriptions in the pharmacy unit and that of the Pharmacy Record were useful sources of information. A guide was used in the systematic collection of data. This guide was called the "Antibiotic Prescribing Indicator Form", which was adapted from the WHO/INRUD "Prescribing Indicator Form".

Data Collection Process

Training of research assistants

Field assistants were trained on how to make use of the antibiotic prescribing indicator form.

Data Collection

Data was collected from the pharmacy records. All the prescription in the pharmacy unit was assessed and those containing antibiotics were selected.

Data Analysis

Longitudinal Data Analysis

This was done to examine the collected data to track changes or patterns in antibiotic prescriptions over the specified timeframe.

Temporal Comparison

This was done to compare and contrast antibiotic prescription patterns across different years within the study period.

Statistical Analysis

In this study, statistical methods (e.g., regression analysis) were employed to quantify trends and identify statistically significant changes in prescription practices over time.

Ethical Consideration

Ethical consideration was sorted by the management of the Diette-Koki Memorial Hospital, Opolo, Yenagoa, Bayelsa State, to carry out this scholarly work.

Population Participation and Characteristics

The study was carried out on 15,108 drugs in 3692 prescriptions containing antibiotic drugs at the Diette-Koki Memorial Hospital, Opolo, Yenagoa, Bayelsa state from the year 2018 to 2022. A total of 640, 383, 1245, 522, and 902 prescriptions were extracted from the records in the year 2018, 2019, 2020, 2021, and 2022 respectively. A total mean of 4.09+/_2.08 of drugs were reported to be contained per prescription. Also, about 3.14+/-2.51 and 3.06 +/-1.58 drugs were respectively reported to be prescribed using their generic names and also found in the EDL. The study also revealed that 76.94% of the total drugs were prescribed using their generic name, 26.94% were antibiotics, 14.50% as injections, and 74.78% as drugs prescribed from the EDL.

The Pattern of Distribution of the Number of Drugs Used From 2018 to 2022 Bayelsa State

The result showed that in 2018, 2019, 2020, 2021, and 2022, an average of 4.18+/-2.13, 4.08+/-2.061, and 4.15 +/- 2.09, 4.07+/-2.02 and 4.09+/-2.08 drugs were contained in the individual prescriptions.

Table 1: Pattern of Distribution of Number of Drugs Use

No. of Drugs	Date				
	2018(N=640)	**2019(N=383)**	**2020(N=1245)**	**2021(N=522)**	**2022(N=902)**
1	53	35	103	55	80
2	92	53	170	83	130
3	94	71	200	99	150
4	168	85	323	122	226
5	77	50	159	61	115
6	84	49	158	58	111
7	39	21	74	26	52
8	12	6	19	4	11
9	3	5	7	5	6
10	7	5	10	3	7
11	6	0	12	0	6
12	3	3	6	6	6
13	0	0	0	0	0
14	2	0	4	0	2
15	0	0	0	0	0
Total number	2676	1564	5171	2020	3677
Mean	4.18	4.083	4.15	3.86	4.07

Trend analysis reveals that the average number of drugs usually contained per prescription decreases down the years, as is seen in this study (R^2 = 0.300), but the trend was not revealed to be significantly contributed by differences in practice patterns from each year (p=.082, F=2.071, df =4).

Number of Drugs Prescribed Using Generic Names From 2018 to 2022

The number of drugs in a prescription that are prescribed using their generic name by prescribers ranges from 70% to 80.64% in the study environment. This observed percentages of drug prescriptions or generic name scores

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below the recommended WHO 100% standard. Exactly 70.06%, 74.10%, 73.08%, 80.64%, and 75.11% of the drugs were prescribed in their generic names in the year 2018, 2019, 2020, 2021 and 2022 respectively. This is shown in table 2 below.

Table 2: Number of Drugs Prescribed Using Generic Names From 2018 to 2022

	2018(N=640)	**2019(N=383)**	**2020(N=1245)**	**2021(N=522)**	**2022(N=902)**
	2676	1564	5171	2020	3677
1	149	76	256	109	184
2	123	83	234	87	165
3	165	101	331	136	241
4	116	58	237	95	168
5	45	34	94	48	71
6	29	22	66	34	53
7	3	1	6	2	4
8	1	3	5	4	5
9	4	2	8	4	6
10	2	2	2	1	1
11	1	1	2	2	2
12	0	0	0	0	0
13	2	0	4	0	2
Total	1875	1159	3779	1629	2762
Percentage	70.06%	74.10%	73.08%	80.64%	75.11%
Ref. point	100%	100%	100%	100%	100%

An average of about 3.1484+/-2.51027 drugs were reported to be prescribed in their generic names per prescription. There were no statistically significant differences in performance when individual means of the separate years were compared (p-2.51027, F=.868, df=4). Trend analysis reveals an increasing percentage in the number of generic drug prescriptions within the years of study ($R^2 = 0.462$), depicting the year 2036 for possible 100% generic drug prescriptions if this tempo is maintained.

Discussion

The study aimed to analyze antibiotic utilization patterns from 2018 to 2022 being a comprehensive study at Diette Koki Memorial Hospital, Bayelsa State, Nigeria. The study was carried out on 15,108 drugs in 3692 prescriptions containing antibiotics at the Diette-Koki Memorial Hospital, Opolo, Yenagoa Bayelsa state from the year 2018 to 2022. A total of 640, 383, 1245, 522, and 902 prescriptions were extracted from the records in the year 2018, 2019, 2020, 2021, and 2022 respectively. An average of 4.0921 +/_2.08104 drugs were reported to be contained per prescription of which an average of 3.1484 +/-2.51027 drugs were prescribed using their generic names. The study reported an insignificant decrease in the number of drugs usually contained per prescription though ($R^2 = 0.300$), and an insignificant increase in the percentage of drugs prescribed in their generic names ($R^2 = 0.462$). The study noted an average of 4.0921 drugs per prescription, with a slight decrease observed over the years ($R^2 = 0.300$). However, this decrease was reported as statistically insignificant. The coefficient of determination (R^2) is reported as 0.300, suggesting that around 30% of the variation in the average number of drugs per prescription can be explained by the changes observed over the years. However, the statement mentions that this decrease is statistically insignificant. In statistical terms, this could mean that the observed decrease is not large enough to confidently conclude that it is a real and meaningful change rather than just a random variation. The insignificance could be due to the fact that the change is within the margin of error or variability expected in the data. In summary, while there is a slight decrease in the average number of drugs per prescription, the statistical analysis suggests that this decrease is not significant enough to draw strong conclusions about a real trend.

On average, 76.94% of total drugs were prescribed using their generic names, showing a slight but statistically insignificant increase over the years ($R^2 = 0.462$).

The R^2 value of 0.462 suggests that approximately 46.2% of the variation in the prescription rate of generic names can be explained by the changes observed over the years. However, the use of the term "statistically insignificant" implies that this increase is not significant enough to confidently conclude that it represents a meaningful change. In other words, the observed increase could be due to random variability in the data. While there is a slight increase in the use of generic names, the statistical insignificance suggests caution in interpreting this change as a real trend. It might be within the expected variability of prescription practices. There might be specific factors, policies, or changes in medical practice that might contribute to this increase. The study indicates a predominant use of generic names in drug prescriptions, with a slight increase over the years. However, the statistical insignificance suggests the need for careful interpretation, and further investigation into potential contributing factors could enhance the understanding of this trend.

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Summary

The study analyzed antibiotic utilization patterns from 2018 to 2022 at Diette Koki Memorial Hospital, Bayelsa State, Nigeria on 15,108 drugs in 3692 prescriptions containing antibiotics. With a total of 640, 383, 1245, 522, and 902 prescriptions extracted from the records in the years 2018, 2019, 2020, 2021, and 2022 respectively, an average of 4.09 +/_2.08 drugs per prescription of which 3.14 +/-2.51 drugs being prescribed using their generic names. The study reported an insignificant decrease in the number of drugs usually contained per prescription though (R^2 = 0.300), and an insignificant increase in the percentage of drugs prescribed in their generic names (R^2 = 0.462).

Conclusion

The analysis of antibiotic prescription patterns from 2018 to 2022 at Diette Koki Memorial Hospital underscores critical discrepancies between established guidelines and actual prescribing practices. The findings reveal prevalent deviations in generic prescription rates. The escalation in antibiotic resistance, as emphasized by global health experts **[5,6]**, emphasizes the urgency of optimizing antibiotic prescribing practices. This study accentuates the imperative need for tailored interventions to improve antibiotic stewardship and align prescribing practices with global guidelines to combat the looming threat of antimicrobial resistance.

Recommendations

The following recommendations are hereby made due to the observation recorded in this study

1. Implementation of Antibiotic Stewardship Programs: Diette Koki Memorial Hospital should establish comprehensive antibiotic stewardship programs (ASPs) to enhance prescribing practices **[2]**. These programs would encompass education, guidelines, and feedback mechanisms to promote judicious antibiotic usage.
2. Utilization of Electronic Decision Support Systems: Integration of electronic decision support systems (DSS) within the hospital's healthcare infrastructure can aid healthcare practitioners in adhering to standardized antibiotic prescribing guidelines **[4]**.
3. Regular Training and Education: Continuous training programs on updated antibiotic guidelines and resistance patterns should be conducted for healthcare providers **[3]**. This initiative would ensure that practitioners are well-informed and equipped to make prudent antibiotic choices.
4. Surveillance and Monitoring: The establishment of robust surveillance mechanisms to monitor antibiotic prescriptions and resistance patterns will facilitate ongoing assessment and refinement of prescribing practices **[1]**.

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