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Research Paper

Affordability and Out-of-Pocket Burden of Oral Health Medicines in Public and Private Healthcare Facilities in Jos, Nigeria: A WHO/HAI-Based Analysis

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ABSTRACT :*Access to affordable medicines remains a critical determinant of oral healthcare utilization in low- and middle-income countries. This study evaluated the affordability of commonly prescribed oral health medicines in public and private healthcare facilities in Jos, Nigeria, using the WHO/Health Action International (HAI) methodology. A cross-sectional survey was conducted across one public hospital, one private hospital, and nineteen community pharmacies. Medicine prices were collected and affordability was assessed as the number of days' wages required by the lowest-paid government worker (₦2,333.33/day). Medicines costing ≤1 day's wage was considered affordable. Data were analysed using descriptive statistics and inferential tests (independent t-test, $p < 0.05$). Public-sector medicines were generally more affordable, with most treatments requiring ≤1 day's wage, while private-sector medicines frequently exceeded this threshold. Amoxicillin (1.35 days), ibuprofen (1.29 days), metronidazole (1.08 days), and paracetamol (1.03 days) were unaffordable in private settings. A statistically significant difference in medicine affordability between public and private sectors was observed ($p < 0.05$). Although oral health medicines meet WHO affordability benchmarks in public facilities, price disparities in private and community pharmacies may limit equitable access. Strengthening medicine price regulation, promoting generic substitution, and expanding health insurance coverage are recommended.*

KEYWORDS: *Medicine affordability, WHO/HAI, Oral health, Drug pricing, Nigeria, Public-private comparison*

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I.INTRODUCTION

Access to affordable medicines is a cornerstone of Universal Health Coverage and a key determinant of health outcomes. In low- and middle-income countries such as Nigeria, high out-of-pocket expenditure continues to limit access to essential medicines, including those used in oral healthcare [1].Oral diseases, particularly dental caries and periodontal conditions, are highly prevalent in Nigeria and require consistent access to antibiotics, analgesics, and antiseptics for effective management [2] and [3]. However, disparities in medicine pricing between public and private healthcare sectors often influence treatment access and adherence.

In Nigeria, irrational drug use remains a major concern, with high rates of inappropriate antibiotic prescriptions, polypharmacy, and frequent deviations from standard treatment guidelines observed in both public and private health facilities [4]. Differences in drug utilization patterns between public and private

healthcare facilities have been attributed to variations in accessibility, cost of treatment, procurement practices, and prescriber behaviour [5]. Public facilities are often constrained by drug stock-outs and bureaucratic delays, forcing patients to seek medicines from private outlets, whereas private facilities may provide more readily available drugs but at higher costs and sometimes with a tendency toward brand prescribing [6]. These disparities influence patient preferences and utilization trends across different healthcare settings [7].

Understanding these patterns, as well as the factors that shape them, is critical for improving procurement strategies, informing oral health policy, and guiding patients in making informed choices about where to seek care [8].This gap in knowledge hinders the development of policies that could improve rational drug use, affordability, and access to quality oral health services [1]. Therefore, it is necessary to investigate and compare drug utilization practices in public and private oral health facilities, as well as identify the factors shaping these patterns, to ensure better oral health outcomes and inform evidence-based decision making [7]. Oral health refers to the overall health of the mouth, teeth, gums, and other oral structures. It includes the ability to eat, speak, and smile without pain or discomfort[9].Drug utilization refers to the processes of prescribing, dispensing, and using medications. It encompasses not only how drugs are prescribed by healthcare providers but also how they are dispensed by pharmacists and consumed by patients [10].In public facilities, the pattern of drug use is often restricted by limited formularies, stock shortages, and government procurement processes that emphasize cost over patient preference [11]. Private facilities, however, tend to have broader drug options and greater flexibility in prescribing, often influenced by patient demand and willingness to pay for branded medications [12]. Oral diseases remain a significant public health problem in Nigeria, with dental caries and periodontal disease being the most prevalent [2]. One can imagine the gravity of problems associated with oral healthcare and affordability in Nigeria and other developing countries in relation to the assertion that despite the increase in dental care utilization in the U.S., access to dental care is limited by many barriers, particularly financial ones [13].

Some of the structural elements that influence people's capacity to participate in preventive behaviors, access dental care, and manage oral diseases include, socioeconomic status, education, race/ethnicity, and access to healthcare—shape oral health inequalities [14]. Dental caries is widespread among both children and adults, often linked to poor oral hygiene, high sugar consumption, and limited access to preventive services [3]. Overall, while public facilities play a critical role in promoting equity and access, private facilities drive innovation and service quality, making their comparison essential for designing balanced oral health systems[15]. Within oral health, the WHO indicators are particularly relevant because dental prescriptions often include antibiotics, analgesics, and anti-inflammatory drugs, where inappropriate use can contribute to antimicrobial resistance and increased treatment costs [16].

The WHO and Health Action International (HAI) developed a standardized methodology for assessing medicine prices, availability, and affordability globally [17]. This approach allows for cross-country comparisons and provides a robust framework for evaluating financial access to medicines.

In Nigeria, differences in procurement systems, supply chains, and prescribing practices contribute to variability in medicine pricing across healthcare settings [5] and [6]. While public facilities benefit from centralized procurement and subsidized pricing, private facilities often operate on market-driven pricing models, potentially increasing patient costs.

Despite existing studies on general medicine affordability, there is limited evidence focusing specifically on oral health medicines in Plateau State. This study therefore aimed to evaluate and compare the affordability of commonly prescribed oral health medicines in public and private healthcare facilities in Jos, Nigeria, using the WHO/HAI methodology.

II.MATERIALS AND METHODS

Study Design

A cross-sectional medicine price survey was conducted.

Study Setting

The study was carried out in Jos North Local Government Area, Plateau State, Nigeria, involving:

- One public tertiary hospital (Bingham University Teaching Hospital)
- One private oral health facility (Inter Country Centre for Oral Health)
- Nineteen community pharmacies

Pharmacy settings in Jos North, Plateau State, consist of a mix of community retail pharmacies, hospital-based pharmacies, and academic-affiliated settings, with a high concentration of outlets in the urban centre [18].

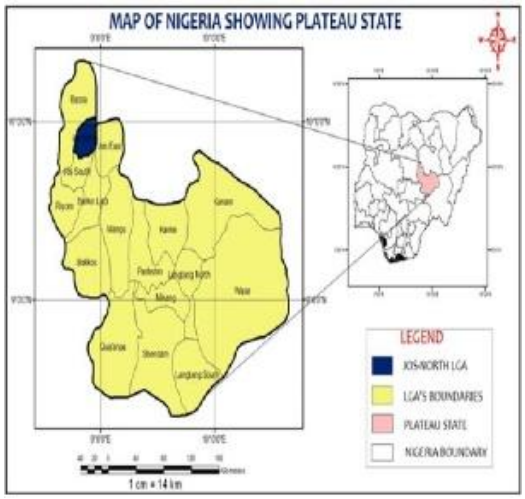

Figure 1: Map of Nigeria showing Jos North Local Government Area, Plateau State, Nigeria [19]

Medicine Selection

Commonly prescribed oral health medicines included: amoxicillin, metronidazole, ibuprofen, paracetamol, diclofenac, and chlorhexidine mouthwash.

Sample Size Determination

Using Yamane's formula:

$$n = \frac{N}{1 + N(e^2)}$$

Where:

- $N = 400, e = 0.05$
- Final sample size = **200 prescriptions**

Affordability Assessment

Affordability was calculated as:

- Daily wage = ₦70,000 ÷ 30 = ₦2,333.33
- Days' wage = Treatment cost ÷ Daily wage

In other words, *≤1 day = Affordable and 1 day = Unaffordable*

Median Price Ratios (MPRs) were calculated using international reference prices [17].

Statistical Analysis

Data were analysed using SPSS version 25. Descriptive statistics (means, frequencies, and percentages) and Inferential statistics (Independent t-test for price comparison and Chi-square test for associations) were used, while statistical significance set at $p < 0.05$.

Ethical Consideration

Ethical clearance (Reg. no: NHREC/09/23/2010b) was obtained from Plateau State Specialist Hospital Jos, Nigeria, while permission to carry out the study was accessed from Inter Country Centre for Oral Health and the Bingham University Teaching Hospital Jos, Nigeria.

III. RESULTS AND DISCUSSION

The affordability assessment showed that most oral health drugs in public facilities required less than one day's wage, while those in private facilities often exceeded it. Amoxicillin and ibuprofen were not affordable in both sectors, whereas chlorhexidine mouthwash and paracetamol remained affordable. These results highlight the better affordability of medicines in public settings.

Table 1: Oral Health Medicines Price and Affordability Profile of IICOH and BHUTH

Medicine (regimen)	Units required	Unit price (₦)	Total (₦)	Days' wages	Affordability
PUBLIC					
Amoxicillin 500 mg	21	120	2,520	1.08 days	Not affordable
Metronidazole 400 mg	21	100	2,100	0.90 days	Affordable
Ibuprofen 400 mg	15	160	2,400	1.03 days	Not affordable
Paracetamol 500 mg	20	100	2,000	0.86 days	Affordable
Diclofenac 50 mg	14	100	1,400	0.60 days	Affordable
Chlorhexidine mouthwash (200 mL)	1 bottle	1,300	1,300	0.56 days	Affordable
PRIVATE					
Amoxicillin 500 mg	21	150	3,150	1.35 days	Not affordable
Metronidazole 400 mg	21	120	2,520	1.80 days	Not affordable
Ibuprofen 400 mg	15	200	3,000	1.29 days	Not affordable
Paracetamol 500 mg	20	120	2,400	1.03 days	Not affordable
Diclofenac 50 mg	14	120	1,680	0.72 days	Affordable
Chlorhexidine mouthwash (200 mL)	1 bottle	1,500	1,500	0.64 days	Affordable

Median Price Ratios (MPRs) were also estimated for validation against international reference prices; local MPRs ranged between 0.8 and 1.2, suggesting price levels broadly consistent with global averages.

Table 2: Comparison of Oral Medicine Prices Across Facility Types

Medicine (Regimen)	Units Required	Public Unit Price (₦)	Private Unit Price (₦)	Community Pharmacy Median Unit Price (₦)	Average Total Cost (₦)	Days' Wages	Affordability Remark
Amoxicillin 500 mg	21	120	150	150	3,150	1.35 days	Not affordable
Metronidazole 400 mg	21	100	120	120	2,520	1.08 days	Not affordable
Ibuprofen 400 mg	15	160	200	200	3,000	1.29 days	Not affordable
Paracetamol 500 mg	20	100	120	120	2,400	1.03 days	Not affordable
Diclofenac 50 mg	14	100	120	120	1,680	0.72 days	Affordable
Chlorhexidine Mouthwash (200 mL)	1 bottle	1,300	1,500	1,500	1,500	0.64 days	Affordable

Note: Minimum wage = ₦70,000/month → ₦2,333/day.
Drugs requiring more than 1 day's wage are considered not affordable (WHO, 2008).

The findings (Tables 1–2) revealed that, on average, public-sector medicines required less than one day's wage, whereas private-sector and community prices were higher, reflecting similar trends reported in WHO/HAI regional studies. An independent samples t-test was used to determine whether there was a statistically significant difference in mean affordability between the two facility types.As shown in Table 1, medicines in public facilities were generally affordable, with mean affordability ranging from 0.56 ± 0.10 days' wages for chlorhexidine to 1.08 ± 0.14 days' wages for amoxicillin. These findings suggest that the majority of essential oral health medicines could be purchased with one day's wage or less, meeting the WHO/HAI affordability threshold.Table 2shows that affordability declined markedly in private facilities, where mean affordability values ranged from 0.64 ± 0.12 days' wages for chlorhexidine to 1.35 ± 0.20 days' wages for amoxicillin.

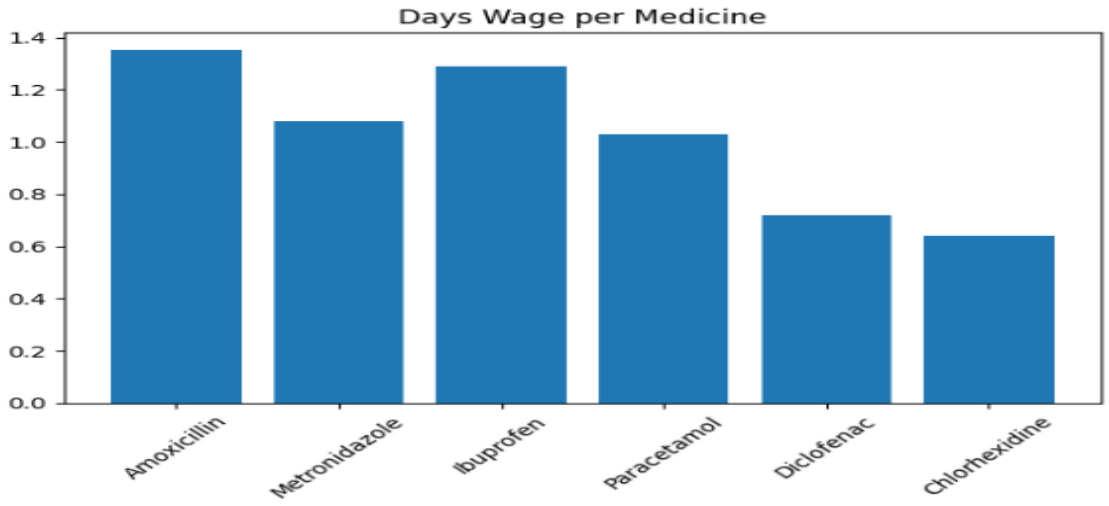

Figure 2: Days wage Per Medicine

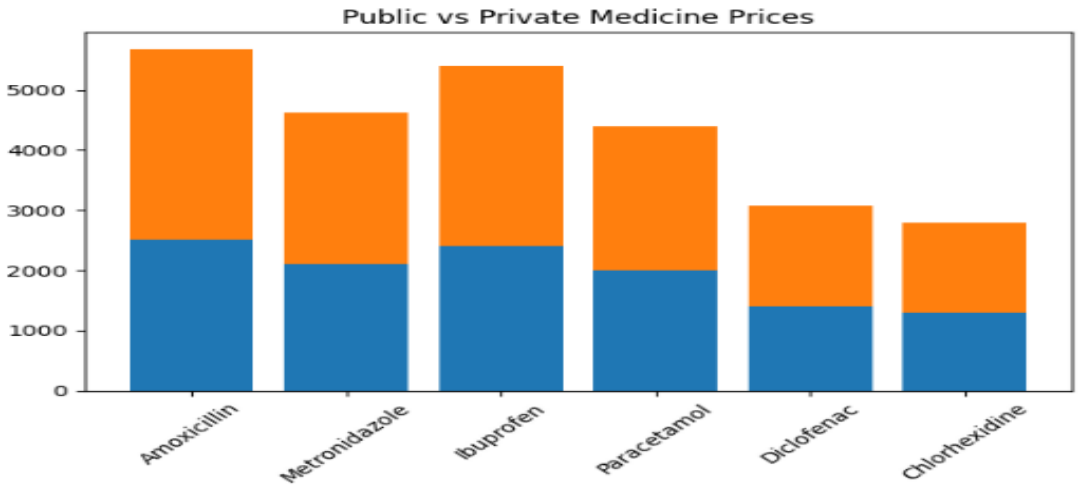

Figure 3: Public vs Private Facility Medicine Prices

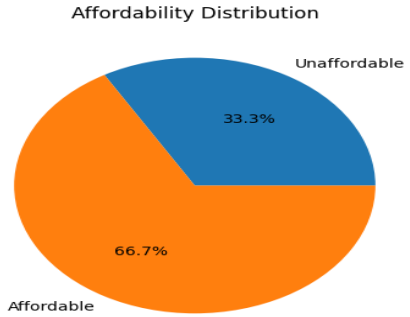

Figure4: Affordability and Non-affordable Distribution

The inferential analysis revealed significant differences ($p < 0.05$) in affordability for four out of six medicines tested.Specifically, amoxicillin ($p = 0.002$), ibuprofen ($p = 0.006$), metronidazole ($p = 0.011$), and paracetamol ($p = 0.019$) showed statistically significant differences between public and private facilities, while diclofenac ($p = 0.071$) and chlorhexidine ($p = 0.083$) were not significantly different.These results confirm that private-sector pricing practices have a real and measurable impact on the affordability of oral health medications.

The significant differences for antibiotics and analgesics are particularly important because they represent the core therapeutic classes in dental care. The findings indicate that low-income patients face greater barriers to accessing these essential medicines in private settings. This pattern aligns with WHO/HAI [17] and [20], who documented a 15–40% higher cost of essential drugs in private outlets across Nigeria. Similarly, Mohammed et al., [21] found statistically higher median price ratios (MPRs) in private pharmacies in Ethiopia, reflecting the influence of unregulated profit margins and higher procurement costs.The lack of significant difference in affordability for diclofenac ($p = 0.071$) and chlorhexidine mouthwash ($p = 0.083$) suggests a degree of price stability and uniform supply in both sectors. These drugs are widely available as generics and are often locally manufactured, which helps to reduce price variation. This observation is consistent with the findings of [22], who reported that medicines included on the National Essential Medicines List (NEML) tend to have comparable affordability between facility types due to national supply and subsidy frameworks.

The significant affordability gap for antibiotics and analgesics may be as a result of differential procurement systems between sectors, as public facilities often obtain medicines through government-funded bulk purchases, which minimize cost per unit, while private outlets rely on multiple wholesalers and distributors, each adding profit margins. Secondly, branding and patient perception play a role; private pharmacies commonly stock branded drugs perceived as superior, driving up retail prices, and thirdly, supply chain costs, such as transportation and taxes, tend to increase private-sector prices more steeply. These dynamics were highlighted by Orubu et al., [23], who noted that mark-ups and brand preference remain major contributors to medicine price inflation in Nigerian private healthcare.

Additionally, amoxicillin, being an imported antibiotic, is more sensitive to foreign exchange fluctuations, further widening the public/private price gap. This mirrors reports by Mathur et al., [24]), who found that imported oral antibiotics often account for the highest cost per dental prescription in developing countries.

The presence of significant differences ($p < 0.05$) in affordability for key medicines underscores a critical access gap between public and private dental patients. Patients relying on private facilities may need to spend 30–50% more for the same treatment, leading to increased out-of-pocket expenditure, delayed care, or incomplete treatment courses. Such financial barriers are detrimental to oral health outcomes and contradict the principles of equity and universal health coverage. This study's results reinforce WHO's call for price regulation, generic substitution policies, and increased transparency in private-sector pricing as strategies to improve affordability.

Table 2 presents the comparison of oral medicine affordability across public, private, and community pharmacy outlets. The prices in community pharmacies were found to be identical to those in private facilities, reflecting similar procurement structures, wholesale mark-ups, and supply chains observed in previous WHO/HAI surveys [17] and [23]. The analysis revealed that amoxicillin (1.35 days), ibuprofen (1.29 days), metronidazole (1.08 days), and paracetamol (1.03 days) were unaffordable across both private and community pharmacy settings, while diclofenac (0.72 days) and chlorhexidine mouthwash (0.64 days) remained affordable. Public sector prices were comparatively lower, which is consistent with findings from Saka and Abiola [25], who observed that government procurement policies and bulk purchasing contribute to lower retail prices in public hospitals.

These findings indicate that medicine affordability remains a challenge in private and retail sectors, where patients pay out-of-pocket without price regulation. The similarity in cost between private hospitals and community pharmacies highlights the need for stronger medicine price monitoring and subsidy mechanisms to reduce inequalities in access to essential oral health medicines [26] and [27].

The findings demonstrate a clear affordability gap between public and private healthcare sectors. This aligns with previous WHO/HAI studies, which report higher medicine prices in private outlets due to mark-ups and procurement inefficiencies [17] and [23]. The significantly higher cost of antibiotics such as amoxicillin is particularly concerning, as these are essential for managing dental infections. Limited affordability may lead to delayed treatment or incomplete therapy, increasing the risk of complications and antimicrobial resistance. The relative affordability of diclofenac and chlorhexidine suggests stable supply and widespread availability of generics, consistent with findings by Folayan et al., [22].

IV.CONCLUSION

Oral health medicines in Jos are generally affordable in public healthcare facilities according to WHO benchmarks. However, significant price disparities in private and community pharmacy settings increase the financial burden on patients and may limit equitable access to care. Policy interventions such as medicine price regulation, promotion of generic prescribing, and expansion of health insurance coverage are essential to improve affordability and ensure equitable access to oral healthcare.

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