

Knowledge and attitude of physicians towards the cost of commonly prescribed medicines: a case study in three Nigerian tertiary healthcare facilities

RUNNING TITLE: Physicians' knowledge of cost of medicines

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CONFLICT OF INTEREST

The authors hereby declare no conflict of interest

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ABSTRACT

Background: One of the core principles of rational prescribing is consideration of the cost of the medicines prescribed especially in countries with high patient co-payments and low incomes such as Nigeria. Little is known about Nigerian physicians' knowledge about the cost of commonly prescribed medicines. **Objective:** The principal objective of the study was to assess the knowledge of Nigerian physicians about the cost of commonly prescribed medicines. **Methods:** Descriptive cross-sectional survey conducted among physicians in three tertiary institutions in Nigeria. Apart from socio-demographic and other information, questions about the estimated costs of branded and generic versions of 11 commonly prescribed medications were included in the questionnaire. **Results:** One hundred and seventy-nine (179; 95.7%) respondents agreed that costs of medicines were important when writing prescriptions even though only 7 (3.7%) of them had any formal training in the economics of healthcare. The median percentages of respondents with accurate estimated costs for generic and originator brands were 6.2% and 12% respectively. Respondents were more knowledgeable about the cost of medicines used for the treatment of infectious diseases (malaria, bacterial infections) than non-communicable diseases (diabetes mellitus, hypertension and dyslipidemia). **Conclusions:** The knowledge of Nigerian physicians in the three participating hospitals about the costs of commonly prescribed medicines was poor. This is despite their awareness about the importance of costs of medicines when prescribing.

HIGHLIGHTS

What is known about the topic?

Healthcare expenditure is escalating worldwide with the cost of medicines responsible for a major proportion of overall healthcare expenditure especially in lower- and middle-income countries (LMICs) where the costs of medicines can account for up to 70% of total healthcare expenditure. This is a major challenge in LMICs where the majority of the population pay “out of pocket” for their healthcare, and where the costs of care for patients with chronic non-communicable diseases (NCDs) can be potentially catastrophic. Little is currently known about physicians' knowledge of the cost of medicines in Nigeria, which needs to be addressed to help ensure that patients can afford the medicines they are prescribed. Otherwise, there will be concerns with long term adherence to the medicines prescribed especially for chronic diseases and the subsequent impact on their health.

What does the paper add to existing knowledge?

The results of this study revealed poor knowledge of the cost of prescribed medicines for common medical conditions among physicians in tertiary healthcare facilities in Nigeria. This is not surprising as only 7% of respondents had any formal training in health economics or “cost consciousness”. However, this is a concern since tertiary hospitals are the training hospitals for future physicians in Nigeria and lack of ‘cost consciousness’ here may well continue when physicians qualify and work in other settings in Nigeria. Respondents were though more knowledgeable about the cost of medicines for infectious diseases compared to NCDs such as hypertension and diabetes mellitus.

What insights does the paper provide for informing health care-related decision making?

The study re-enforces the need for inclusion of “cost consciousness”, health economics and health policy in undergraduate and postgraduate medical training curricula in Nigeria combined with regular updates. This will go a long way in ensuring the sustainable use of medicines especially for patients with NCDs in Nigeria.

MAIN PAPER

INTRODUCTION

Healthcare costs are increasing worldwide, with medicines responsible for an appreciable proportion of this increase with increasing expenditure in both infectious and non-infectious diseases (1). Typically, among Western countries, expenditure on medicines accounts for 10% to 17% of total healthcare expenditure (2). However, in low and middle-income countries (LMICs), expenditure on medicines can account for up to 70% of total health care expenditure, which can be potentially catastrophic when family members become ill (3). This can have appreciable implications regarding the affordability of medicines for common diseases such as hypertension and diabetes mellitus (DM) in LMICs (4,5) unless addressed via access schemes or measures to encourage the prescribing of low cost alternatives such as generics (6, 7). Currently, Nigeria only spends 3.7% of its GDP on health care (8), appreciably lower than 10% to 17% among Western countries (1). Healthcare in Nigeria is jointly funded by both the public and private sectors, with only 5% of the population covered by health insurance (9). Consequently, direct “out of pocket” payments constitute an appreciable proportion of overall healthcare expenditure in Nigeria, which places a considerable burden on patients and their families when patients become ill especially those with chronic non-communicable diseases (NCDs) (10). Hypertension and diabetes mellitus are an increasing concern in LMICs with the prevalence of hypertension typically over 40% among adults in sub-Saharan Africa (11,12). There are concerns about the optimal control of patients with these diseases in sub-Saharan Africa due to issues of availability and affordability of antihypertensive medicines as well as with adherence rates (13,14). Type 2 DM is also a growing concern across sub-Saharan Africa with increasing prevalence rates with changes in lifestyles (15). A recent meta-analysis of Nigerian studies found a significant increase in the age-adjusted prevalence of Type 2 DM, rising from 2% to 5.7% between 1990 and 2015, whilst the prevalence of hypertension was 28.8%, lower though than some African countries (11,16). Effective management of NCDs such as hypertension and DM are compromised by the inability of patients to pay for their medication leading to concerns with adherence and potentially poorer outcomes for patients (13, 17, 18). Encouragingly, we are beginning to see pharmaceutical companies improving access to medicines

for both infectious and NCDs by making them available at lower costs (6, 19, 20). In addition, there has been appreciable promotion of generic medicines to help lower costs for both patients and health care systems; however, there are concerns with the quality of generics among physicians in LMICs (21).

One of the core components of rational prescribing are cost considerations along with the effectiveness and safety of different treatment approaches (22, 23). While considerable emphasis is currently placed on knowledge about the safety and efficacy of medicines during undergraduate and postgraduate medical training in Nigeria, little attention is currently being paid to issues relating to cost awareness. This is a serious deficiency, especially in LMICs with a high proportion of “out of pocket” payment (9, 24). This is despite the World Health Organization (WHO)’s guideline on rational prescribing having cost considerations as a key consideration (23).

We acknowledge that the knowledge of physicians regarding the cost of medicines has been explored in a number of studies emanating from Europe and North America. For instance, Schutte et al investigated the attitude of medical students and physicians regarding the costs of medicines in the Netherlands while De Marco found that dermatologists in North Carolina had poor knowledge about the cost of medicines they regularly prescribed (25,26). In addition, a Canadian study evaluating the opinion of family physicians about the costs of medicines showed that residents overestimated the costs of inexpensive medicines and underestimated those of expensive ones (27). However, there are only a few studies from LMICs regarding physicians’ knowledge of the costs of prescribed medicines. Billa et al investigated physicians’ awareness of medicine costs in India, while a recent paper from South Africa evaluated healthcare professionals’ knowledge of the costs of medicines (28,29). Whilst many drug utilization studies conducted in Nigeria have also focused on the costs of medicines (30-32), the authors are not aware of any Nigerian study that has been published assessing physicians’ knowledge and attitude towards the costs of commonly prescribed medications. We believe that having this baseline information will assist with future interventions towards improving rational prescribing of medicines in Nigeria. Consequently, the main objective of this study was to assess physicians’ knowledge of the cost of prescribed medicines for common medical conditions in selected tertiary healthcare facilities in Nigeria. The findings of this study will be used to guide future initiatives and interventions towards improving patient care in Nigeria and other African countries.

METHODS

STUDY DESIGN: The study was a questionnaire-based descriptive cross-sectional survey conducted among physicians in three Nigerian tertiary healthcare facilities between January and April 2017.

STUDY SETTINGS: The study was conducted among physicians in three tertiary institutions in Nigeria located in the North-Central and South-Western region of the country. Nigeria is divided into six geo-political zones, 36 federating states and the Federal Capital Territory. Healthcare services are provided by both private and public healthcare facilities. The public healthcare system has three sub-divisions or levels: primary, secondary and tertiary. The primary level comprises comprehensive health centres while the secondary level comprises general hospitals. The tertiary healthcare level comprises mainly of University Teaching Hospitals, Federal Medical Centres and other specialized hospitals.

The selected tertiary healthcare facilities were the 650- bed capacity University of Ilorin Teaching Hospital, located in Ilorin, North-Central Nigeria, Ekiti State University Teaching Hospital, Ado-Ekiti with three hundred bed spaces, and the 350-bed capacity Federal Teaching Hospital, Ido-Ekiti, both located within the

South-Western region of the country. The University of Ilorin Teaching Hospital provides primary, secondary and tertiary level care for the 3.2 million inhabitants of Kwara State (33) and the neighbouring states of Niger and Kogi. The provision of primary care by the facility is through the Departments of Family Medicine and Community Medicine. The state government-owned Ekiti State University Teaching Hospital (EKSUTH), Ado-Ekiti and Federal Teaching Hospital, Ido-Ekiti (FETHI) both serve the healthcare needs of the 3.2 million inhabitants of Ekiti State (33) and clients from neighbouring Osun, Ondo and Kogi states. They provide similar level of services as University of Ilorin Teaching Hospital (UIITH).

These three facilities are affiliated with medical colleges for undergraduate and postgraduate training of physicians and other healthcare professionals. Overall, general, medical, paediatric, gynaecology and surgical outpatient clinics as well as in-patient facilities are well established in these centres providing a range of services to patients.

The availability of hospital formularies or essential medicines list is one of the proven mechanisms of promoting rational and cost-effective prescription and use of medicines in hospital settings. Two of the participating institutions had hospital formularies which are upgraded every four years; however, adherence to these formularies is not enforced at all. We included only tertiary level healthcare facilities in this initial study since any concerns regarding physician knowledge of the costs of the medicines prescribed identified in these centres will have appreciable consequences for patient care across Nigeria when the undergraduates qualify and subsequently practice across Nigeria.

SAMPLE SELECTION: The study included consenting physicians from all cadres working in the clinical departments of selected healthcare facilities. Physician cadres included medical officers, junior and senior registrars, and consultants. Interns were excluded from the survey because of their limited experience with prescribing.

A total sample of 196 respondents was arrived at based on the following assumptions: margin of error (5%) confidence interval (10%), population of respondents (700) and a response rate of 50%. Another 10% (20 respondents) was added to cater for attrition or non-responses making a total of 216. The sample size was calculated using the online statistical software Raosoft®.

A systematic sampling technique was used for this study. The names of all physicians (excluding medical interns) working in the clinical departments of each hospital were compiled from the departmental duty rosters, and participants were subsequently selected using a systematic sampling technique. The sampling interval of “3” was arrived at through picking of envelopes, with the selection of potential participants starting from the third name on the lists.

DATA COLLECTION

The questionnaires were distributed to selected physicians during one of the departmental weekly compulsory academic programmes to ensure maximum participation. A time frame of 30 minutes was allowed for the completion of the forms. The chief resident of the participating department was in charge of the distribution and collection of the completed forms.

STUDY INSTRUMENT: A semi-structured self-administered questionnaire was developed by the principal investigator (JF) using information from three previous studies (27-29). The questionnaire was subsequently pre-tested among ten physicians who were employed in a secondary-level healthcare facility.

with a similar staffing structure to the tertiary facilities. Necessary adjustments were subsequently made to the questionnaire based on the feedback to enhance its robustness. Apart from socio-demographic information, questions on the sources of drug information, whether the cost of medicines were considered before prescribing, and physicians' preference for originator brand medicines or for their generic equivalents were also asked. Questions were also asked whether respondents usually ascertain the cost of medicines for common medical conditions before prescribing. Respondents were also asked to estimate the cost of an originator brand and generic versions of eleven (11) commonly prescribed medicines. The list of commonly prescribed medicines was derived based on taking into consideration the findings from several drug utilization studies in Nigeria combined with the opinion of physicians regarding common medical conditions seen in their daily clinical practice (34-38). The selected medicines for infectious diseases were artemether/lumefantrine and sulfadoxine/pyrimethamine for malaria as well as amoxicillin/clavulanic acid, ciprofloxacin, ceftriaxone and ampicillin/cloxacillin for respiratory tract and other infections. Medicines for NCDs included lisinopril and amlodipine for hypertension and metformin for Type 2 diabetes mellitus. The inhaler form of salbutamol was selected for bronchial asthma (Appendix A). The cost of the medicines used as a standard for the study was calculated by finding the mean of their prices (charged to patients) in the hospital pharmacies of the three institutions combined with two selected private pharmacies located outside each of the hospital premises (prices of medicines charged to patients). There is no national policy on generic substitution of prescribed medicines in Nigeria though medicines are substituted in many pharmacies located within and outside the hospitals. Two out of five pharmacies located close to each of the participating facilities were selected through random sampling (picking of envelopes). We included pharmacies located outside the healthcare facilities since most outpatients prefer to procure their medicines from these sources. The reasons for this include appreciable out of stock issues and the unduly complicated process of paying for and collecting medicines in the hospital. Participant prices that were within 25% above and below the mean price were considered accurate based on the classification used in previous studies (27, 39-41).

ETHICAL CONSIDERATION: Ethical clearance for the study was obtained from the Ethics and Research Committee of the Ekiti State University Teaching Hospital before the commencement of the study. The study was exempted from ethical clearance because of its non-interventional nature by the other participating centres based on the ethical clearance obtained by the primary researcher (JF).

DATA MANAGEMENT: Obtained data was coded and analyzed using IBM SPSS Statistics for Windows, Version 19.0. (Armonk, NY: IBM Corp). Analysis using descriptive statistics was performed to obtain the general characteristics of the study participants. Chi square was used to determine the level of significance of groups of categorical variables. P values <0.05 were considered significant.

RESULTS

Demographic characteristics

A total of 187 questionnaires were returned giving a response rate of 86.6%. The majority (154; 82.4%) of the respondents were males, with registrars (114; 61%) forming the bulk of respondents according to their professional status. With respect to their specialty, physicians working in Internal Medicine (64; 34.2%), Family Medicine (37; 19.8%) and Surgery (33; 17.6%) comprised the largest groups (Figure 1).

Insert Figure 1

Sources of drug information

The common sources of drug information used by the respondents when deciding on different treatment options were textbooks (129; 69%), the British National Formulary (103; 55.1%), pharmaceutical sales representatives (95; 50.8%), drug package inserts (77; 41.2%), the internet (74; 39.6%) and medical journals (66; 35.3%). Hypertension (143; 76.5%) and malaria (136; 72.7%) were the most common medical conditions seen by the physicians. Figure 2 illustrates the variety of medical conditions seen by respondents.

Insert Figure 2

Attitude towards cost consideration

One hundred and seventy-nine (179; 95.7%) respondents agreed that cost considerations were important when writing prescriptions. The vast majority of respondents (172; 92%) would also consider the socio-economic status of the patient before prescribing while 161 (86.1%) would change their choice of medicines prescribed based on the socio-economic status of patients. Many respondents (160; 85.6%) have made attempts to find out the cost of some medicines they prescribed at some time in the past; however, only 129 (69%) had done so in the preceding 6 months.

When asked about exposure to formal training in “cost consciousness” at either undergraduate or postgraduate level, only seven (3.7%) respondents answered in the affirmative. However, a large majority (153; 81.8%) of the respondents were of the opinion that training in cost awareness and the economics of healthcare in general should be made part of future undergraduate and postgraduate medical education.

Estimated cost of prescribed medicines

Table 1 shows the mean estimated cost of generic and originator brands of the selected medicines. The proportion of respondents that were accurate with their estimations, as well as those who underestimated and overestimated the cost of the selected medicines, are also highlighted in the Table. The median percentages of respondents with accurate estimated costs for generic and originator brands were 6.2% and 12% respectively. On average, 71.3% and 70.3% of respondents had no real knowledge of the cost of commonly prescribed generic and originator brand medicines respectively. Among those that estimated the costs, 12.7% and 15.8% underestimated these while 8.7% and 2.9% overestimated those for generic medicines and their originator brands respectively. The estimated cost of originator brand of artemether-lumefantrine (Co-artem®) was correctly given by 92 (49.2%) of respondents while only 21 (11.2%) and 13 (7%) gave the correct estimate for common originator brand antibiotics amoxicillin/clavulanic acid (Augmentin®) and ciprofloxacin (Ciprotab®). Fewer respondents were able to correctly estimate the prices of medicines used for systemic hypertension and diabetes mellitus despite their increasing prevalence in Nigeria and other sub-Saharan African countries. Only six (3.2%) and two (1.1%) respondents estimated correctly the cost of the originator brand anti-hypertensive medicines, amlodipine (Norvasc®) and lisinopril (Zestril®) respectively. The estimated costs for other selected medicines are also as shown in Table 1.

Insert Table 1

Table 1 shows the proportion of correctly estimated costs of generic medicines and their originator brands with their respective statistical significance (P value). There were statistically significant differences in the proportion of physicians who correctly estimated the originator brands and their generic equivalents for artemether-lumefantrine, sulfadoxine-pyrimethamine, ciprofloxacin and lisinopril (P value of <0.0001, <0.0001, 0.02 and 0.03 respectively).

DISCUSSION

We believe this is the first study in Nigeria to assess the knowledge of physicians working in three tertiary healthcare facilities about the cost of commonly prescribed medicines. Overall, respondents had poor knowledge of the costs of commonly prescribed medicines with only 6.2% and 12% of them giving correct price estimates for generic and originator brands of target medicines respectively. This is a concern especially as studies have shown that the affordability of medicines especially for chronic NCDs such as hypertension and diabetes mellitus remains one of the major therapeutic issues in sub-Saharan Africa (4, 5).

A vital component of the prescription writing process according to the WHO and the Essential Medicines Program is the consideration of the cost of medicines, which is especially important in countries with high levels of “out of pocket” payments. The majority (95.7%) of respondents in this study agreed that cost consideration is a key consideration when writing prescriptions in accordance with WHO philosophy (23). In view of this, many physicians would consider the socio-economic status of patients before prescribing medicines. Similar observations were reported in a study conducted in India, where cost considerations were important to 97% and 72% of physicians working in government and private hospitals respectively (36). However, there was a considerable disconnect between the consideration of socio-economic class of patients by prescribers in this study and their actual knowledge of cost of commonly prescribed medications. Overall, over 70% of the participants had no idea of the costs of selected commonly prescribed medicines while only 12% and 6.2% correctly estimated the costs of originator brands and their generic equivalents. This may indicate that assessing correctly the socio-economic status of patients was not necessarily followed up by cost considerations during the prescribing process, which is a concern that needs to be addressed. Similar findings have been seen in high income countries. Schutte et al in the Netherlands found physicians estimated costs correctly in only 13.7% and 5.4% of occasions for originator brand and generic medicines respectively (25). A study conducted in Canada among Family Medicine residents also found that only about 25% estimated the cost of ciprofloxacin and enalapril to within 25% of their actual cost, whilst only approximately a third of the price estimates were within 25% of the actual cost in a study among general practitioners in the UK (27, 43). This widespread poor level of knowledge of medicine costs among physicians may well be due to the absence of modules in cost consciousness in undergraduate and postgraduate medical training, which is a key consideration in Nigeria. Another likely cause for the physicians’ poor knowledge of cost of medicines especially in studies conducted in Europe may be the availability of universal healthcare with decisions about cost of medicines being taken by the government centrally.

Very few physicians in our study had access to data on medicine costs, which could have impacted positively on their prescribing practice. Currently, prices of medicines are not included in the existing drug formularies in Nigerian hospitals, which urgently needs to be address. Our findings are similar to those from an American study where only 33% of physicians’ respondents stated they had routine access to the medicine cost data (42). This hypothesis was also echoed by healthcare practitioners in a South African study with 92.2% of respondents requesting for data on the costs of prescribed medicines (29).

Regarding knowledge of the cost of specific medicines, the highest proportion of correct estimates was seen for the originator brand of the anti-malaria medicine artemether-lumefantrine (Coartem®). This is perhaps not surprising as many of the responding physicians would have had reason to purchase anti-malarial

medicines for self-treatment or for treatment of family members because of the endemic nature of malaria in Nigeria. On the other hand, the poor knowledge of costs of medicines for NCDs such as diabetes mellitus, hypertension, and dyslipidaemia is a concern due to their increasing prevalence in Nigeria and issues of adherence compromised by issues of affordability (4, 12, 15, 18).

Consequently, there is a need for targeted interventions to address the poor knowledge of medication costs for commonly diagnosed medical conditions among physicians in Nigeria. This might be achieved by making available to physicians the cost of medicines in the hospital medicine formulary in an easy to use format. The effect of information and communication technology (ICT) in providing medicine cost information to prescribers has been explored in a recent study (43) and this approach will be useful in our context. We will be following this up among educators and others starting in the tertiary hospitals in Nigeria to help improve the future use of medicines in Nigeria. In addition, seeking to build up Drug and Therapeutic Committees (DTC) in hospitals to also help with the training of qualified physicians regarding the costs of medicines they prescribe where this is an issue (44).

STUDY LIMITATIONS

We are aware of a number of limitations with this study. Firstly, this study assessed physician's knowledge of medication costs which can be a fraction of total direct medical costs albeit a very important one in LMICs with high patient co-payments such as Nigeria. The remaining components of direct costs as well as indirect costs were not assessed, which could have a bearing on overall accessibility and affordability of healthcare. The study was also conducted among physicians working in only three public tertiary health care facilities in two geo-political regions of Nigeria; consequently, our findings may not be nationally representative. The use of systematic sampling for the study may have introduced some level of bias or skewness; however, residents comprise the largest proportion of physicians working in tertiary healthcare facilities in Nigeria and this is reflected in this study. The ability to accurately remember the exact cost of medicines is also an important point to consider. To reduce this effect, we adopted a previously validated method using $\pm 25\%$ of exact cost as signifying a correct estimate. The fact that we did not compare the knowledge of the different cadres of physicians regarding the cost of prescribed medicines was another limitation. However, most physician respondents in this study were from Internal Medicine and Family Medicine, which are core specialties where the selected medicines are frequently prescribed.

Further, only a limited number of consultants participated in the survey; however, their poor response rate should not negatively impact on the interpretation of our results. This is because junior and middle cadre doctors, who were the majority of responders in this study, are typically the first point of contact with patients and usually prescribe for patients before any review by the supervising consultant. Despite these limitations, we believe our findings are robust and provide guidance to the future in Nigeria and other similar countries to improve future medicine use.

CONCLUSION

The knowledge of physicians working in three Nigerian tertiary healthcare facilities about the cost of commonly prescribed medicines was poor. This is despite their awareness about the importance of cost consciousness especially in settings where majority of patients pay "out of pocket". There is a need to incorporate "cost consciousness" into the training of physicians in Nigeria. Making available information on the costs of medicines as well as other economic issues to

prescribers may assist them in making more rational and cost-effective prescribing decisions in the future. This is especially important in patients with NCDs to reduce subsequent morbidity and mortality arising from non-adherence to medicines.

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REFERENCES

1. OECD. Health at a Glance 2017. 2017. Available from www.oecd.org > Health > Health policies and data. Accessed on June March 1, 2019.
2. Papanicolas I, Woskie LR, Jha AK. Health Care Spending in the United States and Other High-Income Countries. *JAMA*. 2018;319(10):1024. doi:10.1001/jama.2018.1150
3. Ofori-Asenso R, Agyeman A. Irrational Use of Medicines—A Summary of Key Concepts. *Pharmacy*. 2016;4(4):35. doi:10.3390/pharmacy4040035
4. Attaei MW, Khatib R, McKee M, et al. Availability and affordability of blood pressure-lowering medicines and the effect on blood pressure control in high-income, middle-income, and low-income countries: an analysis of the PURE study data. *The Lancet Public Health*. 2017; 2: e411-e19.
5. Chow CK, Ramasundarahettige C, Hu W, et al. Availability and affordability of essential medicines for diabetes across high-income, middle-income, and low-income countries: a prospective epidemiological study. *The Lancet Diabetes & Endocrinology*. 2018;6(10):798-808. doi:10.1016/S2213-8587(18)30233-X
6. Sandoz - A Novartis Division. Kenya is first country to launch 'Novartis Access', expanding affordable treatment options against chronic diseases. 2015. Available from www.novartisaccess.com. Accessed on March 10, 2019
7. Cameron A, Mantel-Teeuwisse AK, Leufkens HGM, Laing RO. Switching from Originator Brand Medicines to Generic Equivalents in Selected Developing Countries: How Much Could Be Saved? *Value in Health*. 2012;15(5):664-673. doi: 10.1016/j.jval.2012.04.004
8. Nigeria - Health Expenditure Index Mundi, 2014. Available from www.indexmundi.com/facts/nigeria/health-expenditure . Accessed March 1, 2019.
9. Onoka CA, Onwujekwe OE, Uzochukwu BS, Ezumah NN. Promoting universal financial protection: constraints and enabling factors in scaling-up coverage with social health insurance in Nigeria. *Health Res Policy Sys*. 2013;11(1):20. doi:10.1186/1478-4505-11-20
10. Olakunde B. Public health care financing in Nigeria: Which way forward? *Ann Nigerian Med*. 2012;6(1):4. doi:10.4103/0331-3131.100199

11. Lloyd-Sherlock P, Beard J, Minicuci N, Ebrahim S, Chatterji S. Hypertension among older adults in low- and middle-income countries: prevalence, awareness and control. *International Journal of Epidemiology*. 2014;43(1):116-128. doi:10.1093/ije/dyt215
12. Adelaye D, Basquill C, Aderemi AV, Thompson JY, Obi FA. An estimate of the prevalence of hypertension in Nigeria: a systematic review and meta-analysis. *Journal of Hypertension*. 2015;33(2):230-242. doi:10.1097/HJH.0000000000000413
13. Nielsen JØ, Shrestha AD, Neupane D, Kallestrup P. Non-adherence to anti-hypertensive medication in low- and middle-income countries: a systematic review and meta-analysis of 92443 subjects. *J Hum Hypertens*. 2017;31(1):14-21. doi:10.1038/jhh.2016.31
14. Rweogerera GM. Adherence to anti-diabetic drugs among patients with Type 2 diabetes mellitus at Muhimbili National Hospital, Dar es Salaam, Tanzania- A cross-sectional study. *The Pan African Medical Journal*. 2014; 17: 252.
15. Trends in obesity and diabetes across Africa from 1980 to 2014: an analysis of pooled population-based studies. *International Journal of Epidemiology*. 2017; 46: 1421-32.
16. Adelaye D, Ige JO, Aderemi AV, et al. Estimating the prevalence, hospitalisation and mortality from type 2 diabetes mellitus in Nigeria: a systematic review and meta-analysis. *BMJ Open*. 2017; 7: e015424.
17. Nashilongo MM, Singu B, Kalemeera F, et al. Assessing Adherence to Antihypertensive Therapy in Primary Health Care in Namibia: Findings and Implications. *Cardiovasc Drugs Ther*. 2017;31(5-6):565-578. doi:10.1007/s10557-017-6756-8
18. Macquart de Terline D, Kane A, Kramoh KE, et al. Factors associated with poor adherence to medication among hypertensive patients in twelve low and middle income Sub-Saharan countries. *PLoS One*. 2019;14(7):e0219266. doi:10.1371/journal.pone.021926619.
19. Medicines Brief. SA signs deal with Janssen to lower price of TB medicine. *Medical Brief*, 2018.
20. Kaplan WA, Ritz LS, Vitello M, et al. Policies to promote use of generic medicines in low and middle- income countries: a review of published literature, 2000-2010. *Health Policy*. 2012; 106: 211-24.
21. Fadare JO, Adeoti AO, Desalu OO, et al. The prescribing of generic medicines in Nigeria: knowledge, perceptions and attitudes of physicians. *Expert Review of Pharmacoeconomics & Outcomes Research*. 2016;16(5):639-650. doi:10.1586/14737167.2016.1120673
22. Hogerzeil H. Promoting rational prescribing: an international perspective. *British Journal of Clinical Pharmacology*. 1995;39(1):1-6. doi:10.1111/j.1365-2125.1995.tb04402.x
23. Vries TPGM de, World Health Organization. *Guide to Good Prescribing: A Practical Manual*. WHO; 1995.

24. Fadare J, Adeoti A, Aina F, Solomon O, Ijalana J. The influence of health insurance scheme on the drug prescribing pattern in a Nigerian tertiary healthcare facility. *Niger Med J*. 2015;56(5):344. doi:10.4103/0300-1652.170378
25. Schutte T, Tichelaar J, Nanayakkara P, Richir M, van Agtmael M. Students and Doctors are Unaware of the Cost of Drugs they Frequently Prescribe. *Basic Clin Pharmacol Toxicol*. 2017;120(3):278-283. doi:10.1111/bcpt.12678
26. DeMarco SS, Paul R, Kilpatrick RJ. Information system technologies' role in augmenting dermatologists' knowledge of prescription medication costs. *International Journal of Medical Informatics*. 2015;84(12):1076-1084. doi:10.1016/j.ijmedinf.2015.06.009
27. Allan GM, Innes G. Family practice residents' awareness of medical care costs in British Columbia. *Family Medicine*. 2002; 34: 104-9.
28. Billa G, Thakkar K, Jaiswar S, et al. A cross-sectional study to evaluate the awareness and attitudes of physicians towards reducing the cost of prescription drugs, Mumbai. *Applied Health Economics and Health Policy*. 2014; 12: 125-37.
29. Nethathe GD, Tshukutsoane S, Denny KJ. Cost awareness among healthcare professionals at a South African hospital: A cross-sectional survey. *S Afr Med J*. 2017;107(11):1010. doi:10.7196/SAMJ.2017.v107i11.12513
30. Enwere OO, Falade CO, Salako BL. Drug prescribing pattern at the medical outpatient clinic of a tertiary hospital in southwestern Nigeria. *Pharmacoepidem Drug Safe*. 2007;16(11):1244-1249. doi:10.1002/pds.1475
31. Fadare J, Olamoyegun M, Gbadegehin B. Medication Adherence and Direct Treatment Cost among Diabetes Patients Attending a Tertiary Healthcare Facility in Ogbomosho, Nigeria. *Mal Med J*. 2015;27(2):65. doi:10.4314/mmj.v27i2.7
32. Ezenduka C. The Utilization Pattern and Costs Analysis of Psychotropic Drugs at a Neuropsychiatric Hospital in Nigeria. *BJPR*. 2014;4(3):325-337. doi:10.9734/BJPR/2014/5988
33. National Bureau of Statistics. Demographic Statistics Bulletin 2017. Available from [https://nigerianstat.gov.ng/elibrary?queries\[search\]=demographic%20statistics%20bulletin](https://nigerianstat.gov.ng/elibrary?queries[search]=demographic%20statistics%20bulletin). Accessed on February 6, 2020
34. Fadare J, Agboola SM, Opeke OA, Alabi RA. Prescription pattern and prevalence of potentially inappropriate medications among elderly patients in a Nigerian rural tertiary hospital. *TCRM*. March 2013:115. doi:10.2147/TCRM.S40120
35. Adebusoye LA, Ladipo MM, Owoaje ET, Ogunbode AM. Morbidity pattern amongst elderly patients presenting at a primary care clinic in Nigeria. *Afr j prim health care fam med*. 2011;3(1). doi:10.4102/phcfm.v3i1.211
36. Tamuno I, Fadare J. Drug Prescription Pattern in a Nigerian Tertiary Hospital. *Trop J Pharm Res*. 2012;11(1):146-152. doi:10.4314/tjpr.v11i1.19

37. Nduka SO, Edebeatu C, Isidienu CP, Amorha KC. Prescribing practices for pediatric out-patients: A case study of two teaching hospitals in Nigeria. *Trop J Pharm Res.* 2017;16(3):705. doi:10.4314/tjpr.v16i3.28
38. Akunne OO, Godman B, Adedapo AD, Truter I, Fadare J. Statin prescribing among hypertensive patients in southwest Nigeria: findings and implications for the future. *Journal of Comparative Effectiveness Research.* 2016;5(3):281-288. doi:10.2217/ce.15.65
39. Conti G, Dell'Utri D, Pelaia P, et al. Do we know the costs of what we prescribe? A study on awareness of the cost of drugs and devices among ICU staff. *Intensive Care Medicine.* 1998; 24: 1194-8.
40. Innes G, Grafstein E, McGrogan J. Do emergency physicians know the costs of medical care? *CJEM.* 2000;2(02):95-102. doi:10.1017/S148180350000467X
41. Schilling UM. Cost awareness among Swedish physicians working at the emergency department: *European Journal of Emergency Medicine.* 2009;16(3):131-134. doi:10.1097/MEJ.0b013e32831cf605
42. Reichert S, Simon T, Halm EA. Physicians' Attitudes About Prescribing and Knowledge of the Costs of Common Medications. *Arch Intern Med.* 2000;160(18):2799. doi:10.1001/archinte.160.18.2799
43. Tseng C-W, Lin GA, Davis J, et al. Giving formulary and drug cost information to providers and impact on medication cost and use: a longitudinal non-randomized study. *BMC Health Serv Res.* 2016;16(1):499. doi:10.1186/s12913-016-1752-4
44. Fadare JO, Ogunleye O, Obiako R, et al. Drug and therapeutics committees in Nigeria: evaluation of scope and functionality. *Expert Review of Clinical Pharmacology.* 2018;11(12):1255-1262. doi:10.1080/17512433.2018.1549488

Table 1: Mean costs of selected medicines with proportions of correct, under-estimated and over-estimated costs.

Drug	Mean cost \pm 25% (Nigerian Naira)	Mean cost by respondents (Nigerian Naira)	Correct cost estimate (N/%)	No idea of cost (N/%)	Underestimated (N/%)	Overestimation (N/%)	Statistical significance (P value)
Artemether-Lumefantrine (generic)	570.6 \pm 142.6	150*	32 (17.7)	91 (48.7)	43 (23)	21 (11.2)	<0.0001*
Artemether-Lumefantrine (branded)	720 \pm 180	700*	92 (49.2)	70 (37.4)	8 (4.3)	17 (9.1)	
Sulfadoxine-Pyrimethamine (generic)	45 \pm 11.3	64.5	0	112 (59.9)	1 (0.5)	74 (39.6)	<0.0001*
Sulfadoxine-Pyrimethamine (branded)	200 \pm 50	117.7	44 (23.5)	105 (56.1)	11 (5.9)	27 (14.4)	
Amoxicillin-Clavulanic acid (generic)	1400 \pm 350	451.2	21 (11.2)	107 (57.2)	46 (24.6)	9 (4.8)	0.51
Amoxicillin-Clavulanic acid (branded)	3220 \pm 805	1200*	25 (13.4)	82 (43.9)	84 (44.9)	0	
Ciprofloxacin (generic)	700 \pm 175	187.4	13 (7.0)	107 (57.2)	66 (35.3)	1 (0.5)	0.02*
Ciprofloxacin (branded)	1000 \pm 250	312.6	27 (14.4)	94 (50.3)	65 (34.8)	1 (0.5)	
Ceftriaxone (generic)	588 \pm 147	250*	27 (14.4)	93 (49.7)	23 (12.3)	44 (23.5)	0.26

Ceftriaxone (branded)	2823 ±705.8	1500*	35 (18.7)	78 (41.7)	73 (39)	1 (0.5)	
Ampicillin-Cloxacillin (generic)	425 ±106.3	95.3	6 (3.2)	131 (70.1)	41 (21.9)	9 (4.8)	0.43
Ampicillin-Cloxacillin (branded)	1120 ± 280	222	9 (4.8)	130 (69.5)	44 (23.5)	4 (2.1)	
Lisinopril (generic)	466 ± 116.5	69.2	9 (4.8)	164 (87.7)	9 (4.8)	5 (2.7)	0.03*
Lisinopril (branded)	3500 ± 875	106.9	2 (1.1)	185 (98.5)	0	0	
Amlodipine (generic)	456 ±114	68.3	9 (4.8)	164 (87.7)	6 (3.2)	8 (4.3)	0.43
Amlodipine (branded)	1275 ± 318.7	158.8	6 (3.2)	166 (88.8)	10 (5.3)	5 (2.7)	
Atovarstatin (generic)	480 ±120	78.8	2 (1.1)	177 (94.7)	0	8 (4.3)	0.44
Atovarstatin (branded)	3960 ± 990	169.5	4 (2.1)	177 (94.7)	5 (2.7)	1 (0.5)	
Metformin (generic)	1374 ± 343.5	33.4	0	170 (90.9)	17 (9.1)	0	

Metformin (branded)	2671 ± 667.8	89.8	0	171 (91.4)	15 (8.0)	1 (0.5)	
Salbutamol (generic)	736 ±184	40.4	7 (3.7)	172 (92)	10 (5.3)	1 (0.5)	0.32
Salbutamol (branded)	935 ±233.8	78.6	4 (2.1)	168 (89.8)	9 (4.8)	3 (1.6)	

*1 Euro = 326.8 Nigerian Naira on the average during the study period

1 USD = 302.9 Nigerian Naira on the average during the study period

Source: <https://www.cbn.gov.ng > rates>

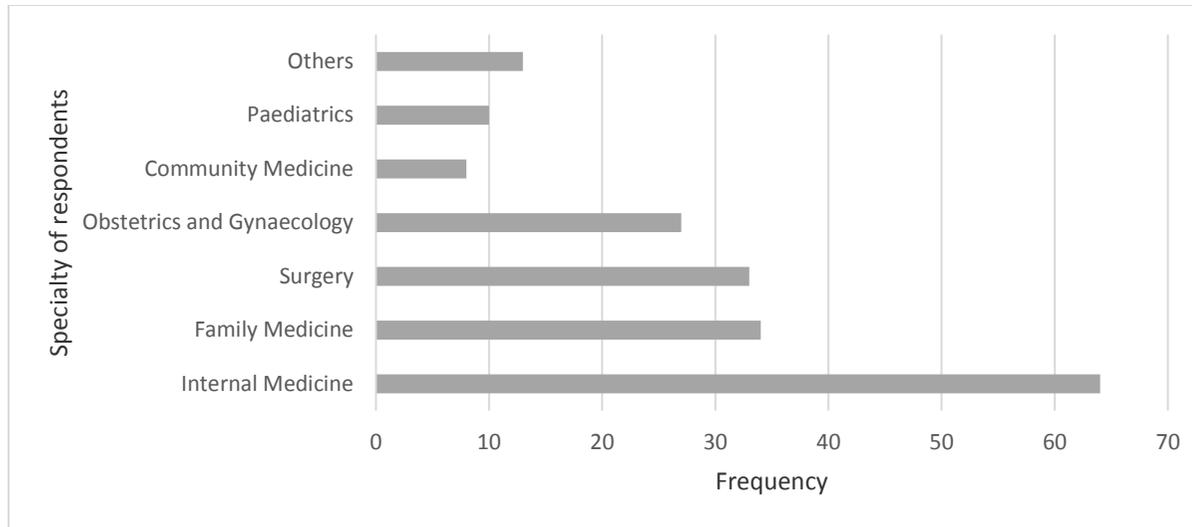


Figure 1: Distribution of respondents by specialty

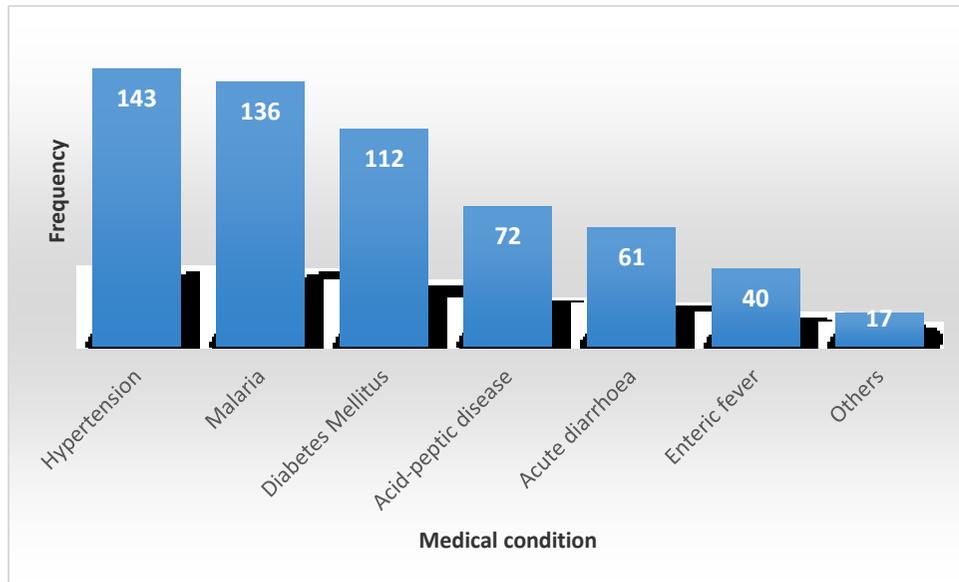


Figure 2: Common medical conditions seen by the respondents