Potential Drug Therapy Problems Associated with Self-Medication Among Students of a Nigerian Tertiary Educational Institution

*O, O. Ogunleye[1, 2] and O. J. Oguntokun[3]
[1]Department of Pharmacology, Therapeutics and Toxicology, Lagos State University College of Medicine, Ikeja, Lagos, Nigeria.
[2] Department of Medicine, Lagos State University Teaching Hospital, Ikeja, Lagos, Nigeria
[3]Department of Pharmacy, Abubakar Tafawa Balewa University Teaching Hospital, Bauchi, Nigeria.

Abstract

Background and Aim: Self-medication practice constitutes an important aspect of self-care, and it is highly prevalent globally. The potential drug therapy problems associated with the practice are yet to be widely studied. This study evaluated these potential problems among a category of students that have received lesser attention. **Methods:** A prospective cross-sectional study of self-medication practices and associated drug therapy problems among 400 students of Federal Polytechnic, Bauchi, north-Eastern Nigeria. Information obtained using a self-administered semi-structured questionnaire on self-medication practiced within preceding 3 months including presumed diagnosis, drugs used, dosing, duration, outcome and follow-up steps. Descriptive analysis carried out with summaries in percentages and proportions using SPPS version 22. **Results:** The overall prevalence of self-medication in the population was 73.25%, more in males (45.5%). The most diagnosis for which self-medication was practiced included presumed malaria (25.2%), Aches (Stomach/Back/Mensural) -16.0%, cold/catarrh (15.4%) and headache (13.0%) with evidence of incorrect knowledge of the symptoms of treated diseases. Analgesics were the mostly used class of drugs (33.6%) followed by the use of antibiotics in monotherapy or combinations with other classes of drugs (29.6%) with indications of inappropriate uses. Other drug therapy problems were incorrect dosing (39.1%), incorrect frequency (47.5%0 and incorrect duration of use (53.4%) and inappropriate steps taken following non-recovery. **Conclusions:** Self-medication practice is highly prevalent among the student population studied with indications of inappropriate uses including potentials for Antimicrobial Resistance (AMR). There is a need for the formulation and implementation of measures to achieve responsible self-medication in the population.

Keywords

Self-medication, Drug therapy problems, Students, Nigeria.

*****

INTRODUCTION

The concept of 'Self-care' entails a wide range of measures and activities individuals embark upon to enhance their health and well-being, prevent the occurrence of diseases and restore health following illness or injury [1] . It includes nutrition, lifestyle, self-medication, hygiene and other socio-economic and environmental activities[2]. Self-care is fast assuming more prominence and relevance globally and when appropriately practiced, it has great

potentials for significant cost reductions through disease prevention and reduced needs for professional care [3], [4].

Amongst the different aspects of self -care, self-medication constitutes a significant and commonly practiced aspect [5]. Self-medication is described as the selection and use of medicines by an individual (or a member of the individual's family) to treat a self -recognized or self-diagnosed symptoms or ailments[6]. There are several benefits associated with responsible self-medication practice including access to medication and relief of patients, opportunity to play active role in owns health care, reduced pressure on medical services and better use of physicians and pharmacists skills and time resources, increase the availability of health care to populations living in rural or remote areas and optimal use of scarce individual's and government resources due to health expenditure linked to treatment of minor health conditions [7]–[10]. These benefits potentially can translate into patient and consumer wellness and productivity, economic gains for employers, and cost savings to healthcare budgets [11]. The practice is however far from being completely safe and beneficial. There are a number of potential risks and disadvantages especially when practiced non-responsibly. Such includes incorrect diagnosis, delays in seeking appropriate medical advice and services when indicated, adverse drug reactions and potential drug interactions, polypharmacy, inappropriate choice of drugs, dosages, duration of use, risk of dependence and abuse and masking of a potentially severe disease condition [6][7], [12]–[14].

The practice of self-medication has been studied among university students in different parts of the world and has been found to be highly prevalent. Behzadifar et al in a systematic review and meta-analysis of 89 studies on the prevalence of self-medication among University students from across Asia, South America, Africa, United States of America and Australia reported overall prevalence of 70.1% (95%CI: 64.3-75.4%) with female students self-medicating more than males odds ratio = 1.45 (95% CI%: 1.17-1.79) and a higher prevalence of 97.2% among medical students compared to 44.7% among non-medical students [15]. The higher prevalence among medical students is further corroborated by a study among a group of medical students in Pakistan that recorded 99% prevalence [16]. Documented evidence of self-medication among Nigerian University students have also shown a high prevalence consistent with records from other parts of the world. A study by Esan et al among undergraduates of a Nigerian private University

found a prevalence of 81.8% while Osemene et al in another study among student at a Nigerian public University that stratified the prevalence to age groups found a high prevalence among the 25-34 years age group (39.4%), 35-44 years (34.6%) and lower prevalence among the 15-24 years (17.2%) and $\geq$ 45years (8.8%). The study found self-medication to be higher in prevalence among female students and to vary with age, gender and level of study with the prevalence increasing with the year of study among undergraduates and the least among postgraduate students [17], [18].

While self-medication has been studied though not exhaustively among Nigerian students, available studies were mostly carried out among university students. Not much have been documented about self-medication among students of other categories of tertiary educational institutions. There is also paucity of information on the potential drug related problems associated with self-medication. This study therefore aimed at investigating the prevalence and practice of self-medication as well as its associated potential drug related problems among students of a Nigerian Polytechnic.

METHODOLOGY

2.1 Study Site

The study was carried out among students of Federal Polytechnic, Bauchi, Bauchi State, north-Eastern geo-political zone of Nigeria. There are sixty-eighty Polytechnics in Nigeria: 55 public and 13 privately owned. Thirty -four of the 55 public ones are owned by various state governments while the remaining 24 are owned by the federal government among which the study site belongs.

The institution had a student population of about 7500 as at the time of the study distributed among 5 schools and 19 departments. Various courses are offered leading to the award of both the ordinary national diploma (OND) and higher national diploma (HND) respectively.

2.2 Sample Size

The prevalence rate of 50% for self-medication was used to determine the sample size for this study [19]. The minimum sample size for this study using the Cochran formula was estimated as follows:

$$n = \frac{z^2 \, pq}{d^2}$$

Where n = minimum sample size z = 1.96 at 95% confidence interval obtained from standard statistical table of normal distribution p = estimated prevalence of non-adherence in a given population (50% or 0.5) q = precision i.e., prevalence of adherence in a given population (0.5) d = margin of

error (0.05). The minimum sample size was calculated to be 384; and rounded up to 400 to accommodate possible attrition

2.3 Study Design

This was a prospective cross-sectional survey of 400 students selected by convenient sampling among students who expressed willingness to participate in the study and gave informed verbal consent. There are many students' hostel around the school. The institution is largely non-residential and students resides in rented hostels around the institution. Trained data collectors approached the students in their respective hostels for participation until the desired sample size was obtained.

2.4 Survey Instrument

This was a self-administered structured questionnaire comprising both open and closed ended questions that obtained information on the major socio demographic variables of the participants, their knowledge of self-medication, knowledge of the presumed sickness and symptoms, knowledge of the medicine used, dosing, frequency, length of use, the outcome of the practice and follow-up steps taken.

2.5 Data Analysis and Interpretation

Data obtained was entered into a micro-computer running the statistical package for social sciences (SPSS version 22.0.1) software to validate and analyze entries. The researchers who are senior levels physician and pharmacist analyzed the responses of the participants for the correctness of their knowledge of the presumed diseases and conditions treated. Descriptive statistics were carried out with summaries in frequencies and proportions.

2.6. Ethical Approval

Ethical approval was obtained for the conduct of the study by the Abubakar Tafawa Balewa Teaching Hospital Ethical Committee before the commencement of the study. Potential participants were also approached with information about the study and verbal consent obtained before the questionnaire were administered.

RESULTS:

3.1 Socio-demographic features of the Respondents

The socio-demographic data of the respondents are detailed in Table 1. The age of the respondents ranged from 15 to 45 years, mostly in the 20-25 years age group (49.5%). There were 60.3% males, predominantly in the OND year 2 class (45.2%), 59% were Christians by religion and mostly single (81.5%) mostly from other ethnic groups different from the three major ethnic groups in Nigeria (55%)..

3.2. Prevalence of Self-Medication.

The overall prevalence of self-medication among the population studied was 73.25%. Table 2 summarized the prevalence of self-medication among the age groups, sex and class and year of study. Self-medication practice was most prevalent among the 21-25 age group (33.8%), males (45.5%) and the ordinary national diploma year 2 students (35.0%).

3.3 Presumed Diseases and Conditions Treated by Self-medication

The most diagnosis and conditions for which self-medication was practiced included presumed malaria (25.2%), Aches (Stomach/Back/Mensural) - 16.0%, cold/catarrh (15.4%) and headache (13.0%). These with other conditions are as listed in Table 3.

3.4 Knowledge of the presumed sickness or condition

Only 339 participants responded to the questions assessing the knowledge of presumed disease or condition out of which the majority were found to have inadequate knowledge of the symptoms of disease treated 197 (58.1%) while 142 (41.9%) had adequate knowledge of the symptoms of the diseases treated.

3.5. Classes of Drugs and Combination of Drugs Used for Self-Medication

Drugs were used either as monotherapies or in different combinations by the respondents as shown in Table 4. The most used class of drug was the analgesics (33.6%) followed by a combination of antibiotics and analgesics (10.0%) and antimalaria (7.85). Worthy of note is the use of combinations of antimalaria + analgesic +antibiotics (6.5%) and that of analgesic+ antimalaria +antibiotics +cold remedies in 3.1%.

3.6. Identified Drug Therapy Problems (DTP) Associated with the Self-Medication Practice

Table 5 outlines some identified drug therapy problems with self-medication among the participants. These included incorrect dosing identified in 39.1% of the total drug uses, incorrect frequencies in 47.5% and incorrect duration of use (short or prolonged) in 53.4%. There was problem of recur by a significant proportion of the respondents as outlined in the table.

3.7. General Outcomes of Self -medication and follow-up Actions by Participants

Only 290 of the participants indicated the outcome of their last self-medication practice out of which 223(76.9%) claimed recovery while 67(23.1%) did not recover (Table6). The follow-up actions taken by the 67 that indicated non-recovery are as listed with the most (47.8%) seeking care in a hospital while 16.45 each either continued the same drugs or consulted a pharmacy.

Table1: Socio-demographic data of the respondents

Frequency	Percentage (%)	
Age Groups		
15 – 20	109	27.3
20-25	198	49.5
26-30	73	18.3
31-35	6	1.5
36-40	13	3.0
41-45	1	0.3
Total	400	100
Sex		
Male	241	60.3
Female	159	39.8
Total	400	100
Marital status		
Single	326	81.5
Married	64	16
Divorced	5	1.3
Separated	5	1.3
Total	400	100
Class and Year of Study		
OND 1	142	35.5
OND 2	182	45.5
HND 1	38	9.5
HND 2	38	9.5
Religion		
Christianity	236	59
Islam	163	38.2
Traditional	4	1.0
Others	7	1.8
Total	400	100
Ethnicity		
Hausa	108	27
Igbo	29	7.3
Yoruba	43	10.8
Others	220	55
Total	400	100

Table2: Prevalence of self-medication among age groups, sex, and class of study.

Parameters	Practiced Self-Medication (F/%) (Frequency/% of Total)	Nil Self-Medication(F/%) (Frequency/% of Total
Age Groups		
15- 20	80 (20.0)	29 (7.3)
21-25	135 (33.8)	50 (12.5)
26-30	60 (15.0)	26 (6.5)
31-35	4 (1.0)	2 (0.5)
36-40	13 (3.6)	0 (0.0)
41-45	1(0.3)	0 (0.0)
Sex		
Male	182 (45.5)	60(15.0)
Female	111 (27.8)	47(11.8)
Year/Class of Study		
OND 1	104 (26.0)	38(9.5)
OND 2	140 (35.0)	44(11.0)
HND 1	27 (6.8)	15(3.8)
HND 2	23 (5.8)	8(2.0)

Table 3: Presumed diseases and Conditions Treated by Self-medication

Presumed Disease/Condition	Frequency	%
Malaria	115	25.2
Stomachache/backache/menstrual pain	73	16.0
Cold/catarrh	70	15.4
Headache	59	13.0
Others	57	12.5
Typhoid fever	43	9.4
Peptic Ulcer	17	3.7
Asthma	6	1.3
Pile	6	1.3
Hypertension	4	0.9
Sexually Transmitted Disease	4	0.9
Diabetes	2	0.4
Total	456	100

Others include fever, dysentery, wound, diarrhea, pimples, itching.

Table 4: Classes of drugs and Combinations of Drugs used for Self-medication

Class	Frequency	Percentage
Analgesic	108	33.6
Antibiotics +analgesic	32	10.0
Antimalaria	25	7.8
Cold/catarrh remedies	22	6.9
Antimalaria+ analgesic	22	6.9
Antimalaria + analgesic +antibiotics	21	6.5
Antibiotics + cold/catarrh remedies	17	5.3
Antibiotics	15	4.7
Others	15	4.7
Vitamins / Hematinic	13	4.0
Herbal	11	3.4
Antiulcer	10	3.1
Analgesic+ antimalaria +antibiotics +cold remedies	10	3.1
Total	321	100

Others included antiasthma, anti-hypertensive, antidiabetic drugs

Table 5. Drug therapy problems associated with self-medication in the studied population.

	Frequency	Percentage
Dosing		
Correct dose	180	53.7
Incorrect dose	131	39.1
Dose not indicated	24	7.2
Total	335	100
Frequency of dosing		
Correct Frequency	161	48.1
Incorrect Frequency	159	47.5
Frequency not indicated	15	4.4
Total	335	100
Duration of use		
Correct duration	127	38.0
Incorrect duration	179	53.4
Duration not indicated	29	8.6
Total	335	100

Table 6: General outcomes of self-medication among the respondents

	Frequency	Percentages
Recovery status		
Recovered	223	76.9
Did not recover	67	23.1
Total	290	100
Actions taken following non-recovery		
Went to hospital	32	47.8
Continued the drug	11	16.4
Went to pharmacy	11	16.4
Changed to another drug	8	11.9
Went to patent medicine store	4	6.0
Stopped the drug	1	1.5
Total	67	100

DISCUSSION

The overall prevalence of self-medication in this study was 73.25%. This is high and is consistent with findings of highly prevalent practice of self-medication among different groups of people including students of tertiary educational institutions especially universities that have been studied in the past. Behzadifar et al in a systematic review and meta-analysis of 89 studies on self-medication among university students found a prevalence of 70.1% (95%CI: 1.17-1.79)[15]. Similarly, Hussein et al found a prevalence of 86% among a set of Pharmacy students in a University in United Arab Emirates [20]. Contrary to the findings of Behzadifar et al that female students self-medicate more often than their males' counterparts (odds ratio = 1.45 (95% CI%: 1.17-1.79), our study found that the practice is more prevalent among the males' students of the institution studied (45.5% vrs 27.8%) which is similar to the findings of more males self-medicating with antibiotics among students of a Tanzanian University [21] . A possible explanation for this difference could be the demographic structures of the participants in these studies with more males' respondents that females. However, there might be other reasons that are not immediately obvious. The age range with the most self-medication practice in our study was the 21-25 age group (33.8%). This is similar to the findings of Kanwal et al of 22-25 years age group among groups of medical students from four Universities in Pakistan[16]. A Nigerian study on self-medication among university students also found the practice to be rare among the 15-24 years $\geq$45 years age groups[18].

The knowledge of the disease or condition treated was mostly poor among the students with 58.1% displaying inadequate and incorrect knowledge. This is largely a driver of the problems associated with self-medication. Presumed malaria was the most frequently self-diagnosed and treated illness among this student, followed by general aches and pain inclusive of stomach, back and mensural pains, cold and catarrh and headache. This pattern is not surprising as most acute febrile illnesses as well as non-specific constitutional symptoms are presumptively diagnosed and self-treated as either malaria or typhoid fever in the sub-Sharan African countries[22]–[26].

The pattern of drugs used for self-medication revealed analgesics as the most frequently used medication (33.6%). This is consistent with findings documented in the body of literature [10], [13], [27]. Of note and concern is the frequent use of antibiotics among these population. Antibiotics was used either as monotherapy (4.7%) or in various combinations with analgesic, antimalaria, cold and catarrh relief drugs with a frequency of use of 29.6% ranking next to the use of analgesics as monotherapy. Among ambulatory patients, self-limiting arboviral infections and viral upper respiratory infections are common which unfortunately is treated by antibiotics aided by poor knowledge of the implications and unhindered access to prescription only medicines in this part of the world, constituting a major driver for antimicrobial resistances (AMR) [28]–[31].

A number of drug related problems were found to be associated with self-medication among this group of students ranging from incorrect dose (39.1%), incorrect frequency of use (47.5%) and inappropriate duration of use (53.4%) as well as delays in seeking appropriate care for ailments as seen in a group of these students who did not experience resolution of their sicknesses. These problems are well established consequences of self-medication practice requiring attention [6], [7], [16].

The majority of respondents (76.9%) noted they recovered from their ailments following self-medication while 23.1% did not recover. Among those who failed to recover, 47.8% went to the

hospital but it is noteworthy that a good proportion continued the practice of self-medication either with the same drug that has failed to offer relief in 16.4% or another drug in 11.9%. This alongside the findings of others patronizing patent medicine vendors underscores the need to educate the population on safe and responsible self-medication. The finding of 16.4% of respondents who failed to recover going to the pharmacy suggests some confidence the population has in pharmacy consultations and also underscores the potential roles of pharmacists in providing supports for responsible self-medication. There exists currently substantial focus on pharmacy assisted self-care in many parts of the world [2], [4], [32], [33]. For example, a mainstay of the focus of recent health policy documents in the United Kingdom includes the need to reduce the financial burden attributable to minor ailments presentation at the General Practices (GPs) and for extended pharmacists' roles through professional developments to achieve a shift from GP led to community pharmacy led patient self-care of minor ailments [33]. This should be given serious attention alongside patient's education and other measures to ensure responsible self-medication in Nigeria.

CONCLUSION

Self-medication practice is highly prevalent among the student population studied with indications of inappropriate self-diagnoses, choices and use of drugs including inappropriate antibiotics consumption with the potentials of worsening the highly prevalent AMR in the part of the world to which the population studied belongs. There is a need for the formulation and implementation of measures to achieve responsible self-medication in the population.

Conflict of Interest:

The authors declare there is no conflict of interest in the conduct of this research

REFERENCES

[1] P. S. Austen El-Osta, David Webber, Shamini Gnani , Ricky Banarsee , David Mummery , Azeem Majeed, "The self-care matrix: a unifying framework for self-care," *SelfCare*, vol. 10, no. 3, pp. 38–56, 2019.

[2] S. J. Wertheimer AI, "A discussion paper on self-care and its implications for pharmacists.," *Pharm World Sci.*, vol. 30, no. 4, pp. 309–15, doi: doi: 10.1007/s11096-007-9187-y. Epub 2008 Jan 18. PMID: 18202902.

[3] George Yiangou, "Valuing Self-Care," *SelfCare*, vol. 2, no. 2, pp. 41–54, 2011, [Online]. Available:

https://selfcarejournal.com/wp-content/uploads/2015/09/Yiangou-2.2-41-54.pdf.

[4] B. R. Nelson EC, Meyer G, "Self-care: the new principal care.," *J Ambul Care Manag.*, vol. 37, no. 3, pp. 219–25, doi: doi: 10.1097/JAC.0000000000000036. PMID: 24887523.

[5] S. J. Lifshitz A, Arrieta O, Burgos R, Campillo C, Celis MÁ, Llata M, Domínguez J, Halabe J, Islas S, Jasso L, Moreno M, Plancarte R, Reyes-Sánchez A, Ruiz-Argüelles G, Soda A, Verástegui E, "Self-medication and self-prescription.," *Gac Med Mex.*, vol. 156, no. 6, pp. 600–602, 2020, doi: doi: 10.24875/GMM.M21000456. PMID: 33877115.

[6] Ruiz ME., "Risks of self-medication practices.," *Curr Drug Saf.*, vol. 5, no. 4, pp. 315–23, doi: doi: 10.2174/157488610792245966. PMID: 20615179.

[7] F. G. 2001;24(14):1027-37. Hughes CM, McElnay JC, "Benefits and risks of self-medication.," *Drug Saf.*, vol. 24, no. 14, pp. 1027–37, 2001, doi: doi: 10.2165/00002018-200124140-00002. PMID: 11735659.

[8] M. A. Clavijo HA, Baquero JA, Ulloa S, "Self-medication during pregnancy.," *World Heal. Forum.*, vol. 16, no. 4, pp. 403–4, 1995.

[9] H. D. Volmer D, Lilja J, "How well informed are pharmacy customers in Estonia about minor illnesses and over-the-counter medicines.," *Med. (Kaunas).*, vol. 43, no. 1, pp. 70–8, 2007.

[10] K. E.-I. G Arikpo, M Eja, "Self Medication in Rural Africa: The Nigerian Experience.," *Internet J. Heal.*, vol. 11, no. 1, 2009.

[11] World Health Organization., "World Health Organization. (1998). The Role of the pharmacist in self-care and self-medication : report of the 4th WHO Consultative Group on the Role of the Pharmacist, The Hague, The Netherlands, 26-28 August 1998.," 1998.

[12] M. S. Hamel, M. J., Odhacha, A., Roberts, J. M. & Deming, "Malaria control in Bungoma District, Kenya: a survey of home treatment of children with fever, bednet use and attendance at antenatal clinics.," 2001.

[13] V. Durgawale, P., Phalke, D. and Phalke, "Self-Medication Practices in Rural Maharashtra," *Indian J. Community Med.*, vol. 31, pp. 34–35, 2006, doi: Durgawale, P., Phalke, D. and Phalke, V. (2006) Self-Medication Practices in Rural Maharashtra. Indian Journal of Community Medicine, 31, 34-35. http://dx.doi.org/10.4103/0970-0218.54933.

[14] A. F. S. and A. A. S. Sarahroodi, A. Arzi, "Antibiotics Self-Medication among Southern Iranian University Students.," *Int. J. Pharmacol.*, vol. 6, pp. 48–52, 2010, doi: https://dx.doi.org/10.3923/ijp.2010.48.52.

[15] B. N. Behzadifar M, Behzadifar M, Aryankhesal A, Ravaghi H, Baradaran HR, Sajadi HS, Khaksarian M, "Prevalence of self-medication in university students: systematic review and meta-analysis.," *East Mediterr Heal. J.*, vol. 2, no. 7, pp. 846–857, doi: doi: 10.26719/emhj.20.052. PMID: 32794171.

[16] Y. M. Kanwal ZG, Fatima N, Azhar S, Chohan O, Jabeen M, "Implications of self-medication among

medical students-A dilemma.," *J Pak Med Assoc.*, vol. 68, no. 9, pp. 1363–1367.

[17] C. O. F. Deborah Tolulope Esan , Ayodeji Akinwande Fasoro Opeoluwa Esther Odesanya, Theophilus Olaide Esan, Elizabeth Funmilayo Ojo, "Assessment of Self-Medication Practices and Its AssociatedFactors among Undergraduates of a Private University in Nigeria (13) (PDF) Assessment of Self-Medication Practices and Its Associated Factors among Undergraduates of a Private University in Nigeria," *J. Environ. Public Heal. 2018(3/4)1-7 Follow J.*, vol. 3, no. 4, pp. 1–7, 2018, doi: DOI: 10.1155/2018/5439079.

[18] A. L. KP Osemene, "A Study of the Prevalence of Self-Medication Practiceamong University Students in Southwestern Nigeria," *Trop. J. Pharm. Res.*, vol. 11, no. 4, pp. 683–689, [Online]. Available: http://www.tjpr.orghttp//dx.doi.org/10.4314/tjpr.v 11i4.21.

[19] B. T. W. B. 58(2):127-31. Banerjee I, "Self-medication practice among undergraduate medical students in a tertiary care medical college," *J Postgr. Med.*, vol. 58, no. 2, pp. 127–31, doi: doi: 10.4103/0022-3859.97175. PMID: 22718057.

[20] S. I. Sharif and R. W. Osama Hussein Mohamed Ibrahim, Laila Mouslli, "Evaluation of Self-Medication Among Pharmacy Students," *Am. J. Pharmacol. Toxicol.*, vol. 7, no. 4, pp. 135–140, 2012.

[21] M. K. Chuwa BB, Njau LA, "Prevalence and factors associated with self-medication with antibiotics among University students in Moshi Kilimanjaro Tanzania.," *E. Afr Heal. Sci.*, vol. 21, no. 2, pp. 633-639., doi: doi: 10.4314/has.v21i2.19. PMID: 34795717; PMCID: PMC8568219.

[22] I. O. Ajayi, C. O. Falade, and O. O. Kale, "An assessment of accuracy of mothers' presumptive diagnosis of fever at home in southwest Nigeria: evidence for switch to parasite-based diagnostic test.," *East Afr. J. Public Health*, vol. 6, no. 3, pp. 229–234, Dec. 2009.

[23] V. D'Acremont, C. Lengeler, and B. Genton, "Reduction in the proportion of fevers associated with Plasmodium falciparum parasitaemia in Africa: a systematic review.," *Malar. J.*, vol. 9, p. 240, Aug. 2010, doi: 10.1186/1475-2875-9-240.

[24] S. Serafini, S. Regard, I. Mahounde Bakari, J.-J. Massing, and D. Massenet, "[Presumptive clinical diagnosis of malaria in children in a hospital in the North Region (Cameroon)].," *Bull. Soc. Pathol. Exot.*, vol. 104, no. 5, pp. 371–373, Dec. 2011, doi: 10.1007/s13149-011-0177-x.

[25] R. Ansumana *et al.*, "Presumptive self-diagnosis of malaria and other febrile illnesses in Sierra Leone.," *Pan Afr. Med. J.*, vol. 15, p. 34, 2013, doi: 10.11604/pamj.2013.15.34.2291.

[26] C. J. Maze MJ, Bassat Q, Feasey NA, Mandomando I, Musicha P, "The epidemiology of febrile illness in sub-Saharan Africa: implications for diagnosis and management.," *Clin Microbiol Infect.*, vol. 24, no. 8, pp. 808–814, doi: doi: 10.1016/j.cmi.2018.02.011.

[27] A. A. Zeru N, Fetene D, Geberu DM, Melesse AW, "Self-Medication Practice and Associated Factors Among University of Gondar College of Medicine and Health Sciences Students: A Cross-Sectional Study.," *Patient Prefer Adherence.*, vol. 14, pp. 1779–1790, doi: doi: 10.2147/PPA.S274634. PMID: 33061320; PMCID: PMC7535137.

[28] E. Aditi Sriram, J. C. Kalanxhi, Geetanjali Kapoor, N. Ruchita Balasubramanian, Sehr Brar, K. Criscuolo, Alisa Hamilton, Eili Klein, R. Tseng, Thomas Van Boeckel, and Laxminarayan, "State of the world's antibiotics 2021: A global analysis of antimicrobial resistance and its drivers.," 2021. [Online]. Available: https://cddep.org/blog/posts/the-state-of-the-worlds-antibiotics-report-in-2021/.

[29] K. Van Nguyen *et al.*, "Antibiotic use and resistance in emerging economies: A situation analysis for Viet Nam," *BMC Public Health*, 2013, doi: 10.1186/1471-2458-13-1158.

[30] I. N. Okeke *et al.*, "Antimicrobial resistance in developing countries. Part II: Strategies for containment," *Lancet Infectious Diseases*. 2005, doi: 10.1016/S1473-3099(05)70217-6.

[31] A. Egwuenu *et al.*, "Antimicrobial use and resistance in Nigeria: situation analysis and recommendations, 2017," *Pan African Med. J. Conf. Proc.*, 2018, doi: 10.11604/pamj.cp.2018.8.2.701.

[32] M. V. Bell J, Dziekan G, Pollack C, "Self-Care in the Twenty First Century: A Vital Role for the Pharmacist.," *Adv Ther.*, vol. 33, no. 10, pp. 1691-1703., doi: doi: 10.1007/s12325-016-0395-5. Epub 2016 Aug 17. PMID: 27535290; PMCID: PMC5055554.

[33] S. D. Paudyal V, Hansford D, Cunningham S, "Pharmacy assisted patient self-care of minor ailments: a chronological review of UK health policy documents and key events 1997-2010.," *Health Policy (New. York).*, vol. 101, no. 3, pp. 253–9, doi: doi: 10.1016/j.healthpol.2011.05.010. Epub 2011 Jun 15. PMID: 21680043.

*Corresponding Author:
Dr O. O. Ogunleye
Department of Pharmacology, Therapeutics and Toxicology
Lagos State University College of Medicine
1-5, Oba Akinjobi Street, Ikeja GRA, Lagos, Nigeria
E mail: olayinka.ogunleye@lasucom.edu.ng, yinkabode@yahoo.com
Tel: +2348053357057, +2348093344588