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Knowledge Awareness and Perception of Staff and Patients of Nigerian Navy Reference Hospital Calabar towards Drug Mobile Authentication Service

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ABSTRACT

Introduction: Drug Mobile Authentication Service (DMAS) was launched in Nigeria by the post-marketing and Pharmaco-vigilance unit of the National Agency for Food and Drug Administration and Control (NAFDAC) to put the power of checking the originality of products in the hands of consumers. DMAS is demonstrated to be easy, simple, and accessible to all categories of individuals. The hospital setting has a large number of prescribers, dispensing staff, counselors, and patients, who are basically the users of DMAS. Hence, this research is aimed at assessing the knowledge, awareness, and perception of staff and patients within a hospital setting towards the relevance, reliability, and effectiveness of DMAS using the Navy Reference Hospital Calabar, Nigeria. *Method:* The study is a survey design that employed cross-sectional, descriptive, and analytical means. 680 (patients and staff) from the Navy Reference Hospital Calabar, Nigeria, were used. An open-ended questionnaire structured on a 5-point Likert scale was used as an instrument for data collection. The questionnaires are administered within 6 months in the various clinics and departments of the Hospital; the Data obtained is presented as descriptive statistics. Regression analysis is utilized to find out the relationship between DMAS and Perceived awareness, Usefulness, Role, Reliability, Usage, and Convenience. *Results:* A total of 680 patients and staff questionnaires were analyzed, out of which 52.2% account for the majority of the 25-35 age group. Most respondents were females, 475 (69.9%), and the majority possess a tertiary qualification (79.4%). Over 74% were employed, and Christianity was the dominant religion, representing 92.6%. 79% utilized DMAS. The reliability of each variable was computed using Cronbach's Alpha. From the computation, all the variables demonstrate acceptable values (>0.70). A bad network was the primary reason for not using DMAS 166(25%). $R^2=0.728$, the coefficient of the constant term is 3.656, and the associated t-value is 16.905. The regression coefficient is 0.421. The value of Durbin Watson (DW) is 1.952, indicating that there is no evidence of serial

correlation. *Conclusion:* Drug mobile authentication service is a valuable and reliable tool to verify the genuineness of drugs from manufacturers; it plays a vital role in fighting against drug faking and counterfeiting drugs when utilized efficiently. Majorities are highly aware of the use of DMAS, and they conveniently use such a service to check the authenticity of drugs. However, a major challenge to the use of DMAS was a bad network. Educating the public about the use and importance of DMAS can help curb such problems.

Keywords: Reliability, Drug, Mobile Service, Authentication, Phamarco-vigilance.

1. INTRODUCTION

Drug Mobile Authentication Service (DMAS) was launched in Nigeria by the post-marketing and Pharmacovigilance unit of the National Agency for Food and Drug Administration and Control (NAFDAC) on February 2, 2010, to put the power of checking the originality of products in the hands of consumers. It was designed to detect and reduce the incidence of falsified, substandard, and counterfeit medicinal and pharmaceutical products in distribution (Oyetunde & Ilozumba, 2013). DMAS harnesses the collaborative efforts of regulators, manufacturers, and consumers in tracking and curbing fake drugs in distribution. DMAS involves instant authentication of medicines with a basic mobile phone and a free text message of a code to any of the major telecoms' networks (Oyetunde & Ilozumba, 2013).

All Pharmaceutical Companies and firms licensed to manufacture and import ethical and non-ethical products into the country seek the assistance of third-party private information and communication technology firms approved by NAFDAC for adequate provision and delivery (Oyetunde & Ilozumba, 2013). NAFDAC, in 2012, made the use of DMAS compulsory for all pharmaceutical companies, especially for all their major products, such as antibiotics and anti-malarial drugs. NAFDAC has also directed organizations involved in the manufacturing and marketing of any product requiring DMAS to notify her to verify the registration status of such products before commencement of DMAS procedure. (Oyetunde & Ilozumba, 2013; Rasheed et al 2018). DMAS is demonstrated to be easy to use, simple and accessible to all categories of individuals. This can be attributable to the increase in number of subscribers of mobile telephones in Nigeria, which was estimated at over 125 million subscribers in August 2012 (Oyetunde & Ilozumba, 2013; Fadlallah et al., 2020).

Over time, this number has increased drastically as more people now have access to both phones and various social media devices that can use more innovative means for verifying the genuineness and authenticity of drugs. Furthermore, the new Radio Frequency Identification Detection (RFID), the 1D, and the 2D bar codes are now increasingly embedded on medicines and hospital consumables as a means of limiting fake and substandard products in circulation (Elif, 2014). Though 2D barcode appears to be cheap and can be utilized by pharmaceutical industries for serialization of products and easy tracking, the RFID seems to be difficult to use by some patients. However, it can be employed for effective communication with patients at home and healthcare professionals in the hospitals and care centers (Elif, 2014). DMAS involve the use of mobile phones by consumers to verify the sources of medicines at purchase points in retail outlets (Oyetunde et al, 2019). It uses SMS based platform that utilizes technology from Sproxil, an American-based company, through its Mobile Product Authentication (MPA) service. The MPA solution employs three simple steps, which include scratching off a code panel to reveal the one-time 12-digit code on the package, sending the code via SMS to a toll-free number '38353' and thereafter receiving an immediate response confirming that the product is genuine or a warning that it may be counterfeit (Oyetunde & Ilozumba, 2013).

Counterfeit medicines defined as medicines deliberately and fraudulently mislabelled with respect to identity and/or source (Hamilton et al., 2016). Drug counterfeiting (Substandard and falsified medicines) is a far-reaching public health problem that affects both developing and industrialized countries constituting a global challenge for health systems, particularly in low-to-middle income countries (LMIC). A recent meta-analysis reported a prevalence of 13.6%- 15% of substandard and falsified medicines in LMIC (Rasheed et al., 2018; Oyetunde et al, 2019) with percentages up to 50% in parts of Africa and Asia (Fadlallah et al., 2020). This accounts for a failure rate of 9.9%- 10.9% with about 30.5 billion USD per annum which would have been channelled to solving other pressing problems in these low- and middle-income countries (Rasheed et al., 2018). World Health Organization estimated that about one in 10 medicines in LMIC are substandard and falsified products (Rasheed et al., 2018).

Countries with weak legislative and enforcement bodies and poorly regulated manufacture, importation, distribution, supply, and sale of drugs have a high prevalence of counterfeit. Pharmaceuticals purchased from the internet have further precipitated the explosive growth in counterfeit medications (Fadlallah et al., 2020). WHO suggests that over half of the drugs purchased online from sites that conceal their physical address are most likely to be counterfeit (Fadlallah et al., 2020). Drug resistance, treatment failures as well as morbidity and mortality stem from counterfeited medications in most cases (Oyetunde & Ilozumba, 2013; Fadlallah et al., 2020; Oyetunde et al., 2019; Hamilton et al., 2016; Fatoki & Awodele 2017). They can also lead to loss of public confidence in medicine, and public health system (Fadlallah et al., 2020; Oyetunde et al., 2019). In addition, the reputation of drug companies can be undermined which is the reason why some companies may be hesitant to announce incidents of counterfeiting of their products (Fadlallah et al., 2020).

Policy makers from low and middle-income countries stressed the need to identify effective anti-counterfeiting strategies as a primary policy concern, understanding how the system works and how it can help improve health systems positively for greater efficiency and output (Fadlallah et al., 2020). Data released about substandard and falsified medicines shows that Nigeria has one of the highest incidences in sub-Saharan Africa. However, due to more aggressive measures and other policies deployed by the government in tackling this menace, the prevalence is said to have reduced in 2012 to 5% as against 67% earlier reported in 2001 (Spink et al., 2016). A lot of morbidity and mortality issues resulting from the use of falsified and substandard drugs have been reported and this has made the Regulating agency in Nigeria to strengthen measures to curb the menace (Ebenezer, 2015).

Since the deployment of DMAS, it's been observed that the number of SMS received was low despite increase in volume of sales recorded by pharmaceutical companies. However, some reports suggested challenges with the use of DMAS in Nigeria. Underutilization by consumers despite a reasonable level of awareness from several studies has been documented (Aisagbonhi & Ilomuanya, 2016; Eronmhonsele, 2015; Ezurum, 2015; NCC, 2012). Also, a particular pilot study demonstrated that response was not real-time thereby discouraging the use of DMAS (Ezurum, 2015). Also, DMAS negatively impacted the practices of some community pharmacists. The complaint from the community pharmacists was that consumers sometimes get no or wrong responses to DMAS queries and response is not always real time, as expected (NCC, 2012). The DMAS has inadvertently portrayed the affected community pharmacies as sources of substandard and falsified medicines.

The use of DMAS in retail pharmacy outlets in Nigeria reported a low DMAS utilization by consumers with a range of 18-55% per month (Oyetunde & Ilozumba, 2013). This was attributed to a lack of consumers' awareness by the study. Furthermore, the study conducted showed that both awareness and perceived reliability played important roles in the behavioral intention to use the DMAS among Nigeria community pharmacies. Conversely, there are limited data from the hospital settings regarding patients' awareness and perception on the reliability and effectiveness of DMAS. The hospital community accounts for many of prescribers, dispensing staff, counselors and patients. This research is aimed at assessing the knowledge, awareness and perception of staff and patients of the hospital community towards the relevance, reliability and effectiveness of DMAS as well as Challenges faced using the Navy Reference Hospital Calabar, Nigeria, for the study. Data from this study will be used to design an intervention that will help boost the patronage of DMAS by the hospital community and their patients.

2. METHODOLOGY

2.1. Research Design

The study adopted a survey design, which employed cross-sectional, descriptive and analytical means of analyzing data. The population comprised of the study is six hundred and eighty 680 (patients and staff) from the Navy Reference Hospital Calabar, Nigeria.

2.2. Instrument for Data Collection

An open-ended questionnaire structured on a 5-point likert-scale was used as instrument for data collection. Ethical Clearance was obtained from the Health Research Ethics Committee of the Hospital. The questionnaires were administered within 6 months to patients and staff attending the various clinics and departments of the Navy Reference Hospital Calabar, Nigeria. These groups were able to provide valuable answers and responses used to determine the level of Knowledge of individuals about DMAS, success in the use of DMAS in curbing fake or counterfeit drugs and challenges in usage of DMAS.

2.3. Source of Data and Method of Data Analysis

The data collected from the patients and staff were presented and analyzed with descriptive statistics to achieve the study's objective. Data is presented in frequency and simple percentage tables. Regression analysis was conducted to find out the relationship between the DMAS and other factors such as Usefulness, Role, Reliability, Usage, and Convenience.

2.4. Regression Model Specification

The regression coefficient of the knowledge and awareness on drug mobile authentication service carries a positive sign with a value of 0.421 and the t-value is statistically significant at 5% significance level. The reliability of each variable was computed using Cronbach Alpha. From the computation, all the variables demonstrate acceptable values (>0.70)

3. DATA ANALYSIS AND PRESENTATION OF RESULTS

This section analyzes the awareness and use of drug mobile authentication service amongst patients and staff attending the Navy Reference Hospital, Calabar, Nigeria. Six hundred and eighty completed filled questionnaires were utilized. The data is presented in Table 1.

Table 1 Socio-demographic variables of respondents

Items	Frequency	Percentages
Age in Years		
15-24	107	15.7
25-34	355	52.2
35-44	165	24.3
45-54	35	5.1
55-64	14	2.1
65-70	4	0.6
70 & above	0	0
Total	680	100
Sex		
Male	205	30.1
Female	475	69.9
Total	680	100.0
Level of education		
Primary	25	3.7
Secondary	93	13.7
Tertiary	353	51.9
Postgraduate	187	27.5
Others	22	3.2
Total	680	100
Occupation		
Unemployed	126	18.5
Self-employed	162	23.8
Public sector	269	39.6
Private sector	72	10.6
Others	51	7.5
Total	680	100

Religion

Christianity	630	92.6
Islam	47	7.0
Traditional	0	0
Others	3	0.4
Total	680	100

Source: Field survey, 2025.

The demographic variables on age range revealed that 107 respondents, representing 15.7 percent, were within the age range of 15-24 years, 355 respondents, representing 52.2 percent, fell within 25-34 years, 165 respondents, representing 24.3 percent, were within 35-44 years, 35 respondents representing 5.1 percent were between 45-54 years, 14 respondents representing 2.1 percent of the total respondents ranged within 55-64 years while 4 respondents representing 0.6 percent were between 65-70 years. Two hundred and five respondents, representing 30.1 percent, were male, while four hundred and seventy-five, representing 69.9 percent, were female.

On the educational level, twenty-five respondents, representing 3.7 percent, were primary school certificate holders, ninety-three, representing 13.7 percent, had secondary school certificates; in contrast, three hundred and fifty-three, representing 51.9 percent, were holders of tertiary education certificates. One hundred and eighty-seven of the respondents, representing 27.5 percent, had postgraduate qualifications, while twenty-two respondents, representing 3.2 percent, possessed other educational qualifications apart from the ones identified here.

In assessing the occupational status of respondents, one hundred and twenty-six, representing 18.5 percent, were unemployed, one hundred and sixty-two, representing 23.8 percent, were self-employed, and two hundred and sixty-nine, representing 39.6 percent, were engaged by the public sector. Seventy-two respondents, representing 10.6 percent, worked with the private sector, while about fifty-one respondents, representing 7.5 percent, are involved in other occupational statuses in the society.

On religious affiliations, six hundred and thirty, representing 92.6 percent, were Christians, while forty-seven of them were Muslims. Three respondents, representing 0.4 percent, belong to other religions in the society.

3.1. Descriptive statistics of the variables

Table 2 Mean, standard deviation, and alpha coefficient of the variables (n=680)

Variable	Mean	Standard Deviation	Alpha
Perceived awareness	3.13	1.13	0.81
Usefulness	2.01	0.83	0.78
Role	1.96	0.81	0.82
Reliability	2.09	1.46	0.77
Usage	1.62	1.16	0.83
Convenience	2.30	1.73	0.76

Source: Field Survey, 2025.

Table 2 shows the descriptive statistics of the variables in the study (i.e., perceived awareness, usefulness, role, reliability, usage, and convenience). The reliability of each variable was computed using Cronbach Alpha. From the computation, all the variables demonstrate acceptable values (>0.70), which shows that they were reliable measures for their respective constructs.

Determination of the percentage of patients who used DMAS in the Navy Reference Hospital Calabar, among the 680 respondents used for the study, one hundred and forty-five, representing 21 percent, do not use DMAS. In contrast, five hundred and thirty-five patients, representing 79 percent, made use of DMAS (figure 1).

In ascertaining the challenges with the use of DMAS in the Navy Reference Hospital, Calabar, the following problems were revealed: bad network, conflicting messages, lack of labels on drugs, low level of awareness, and non-formalized program on educating the public on DMAS (figure 2).

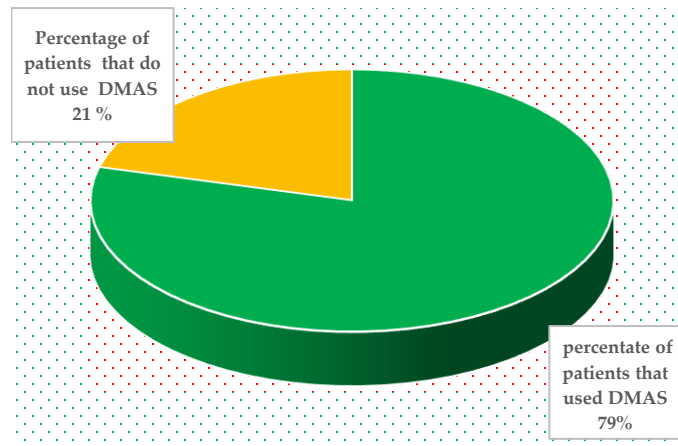


Figure 1 Pie chart showing the percentage of patients and staff that used DMAS

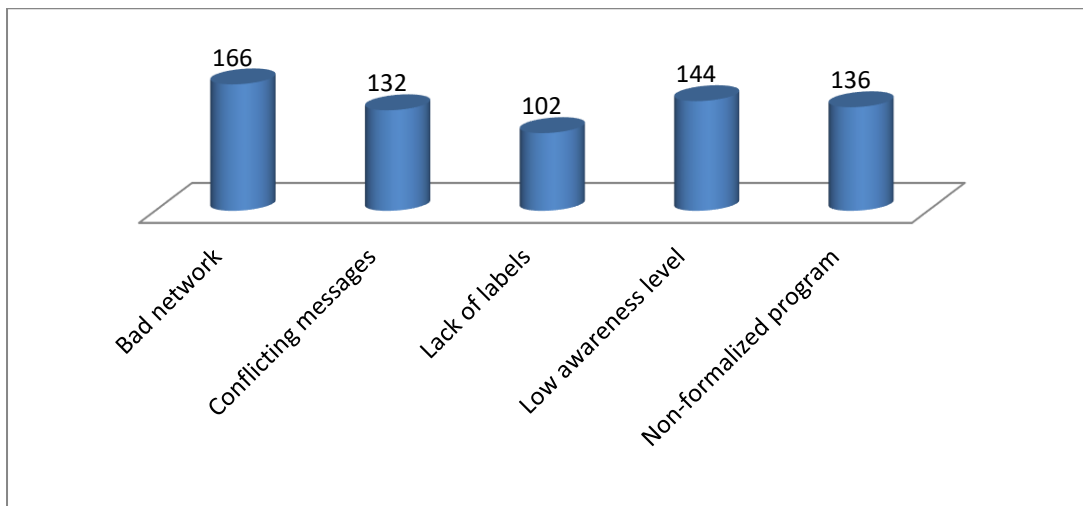


Figure 2. Bar charts showing the challenges of the use of DMAS

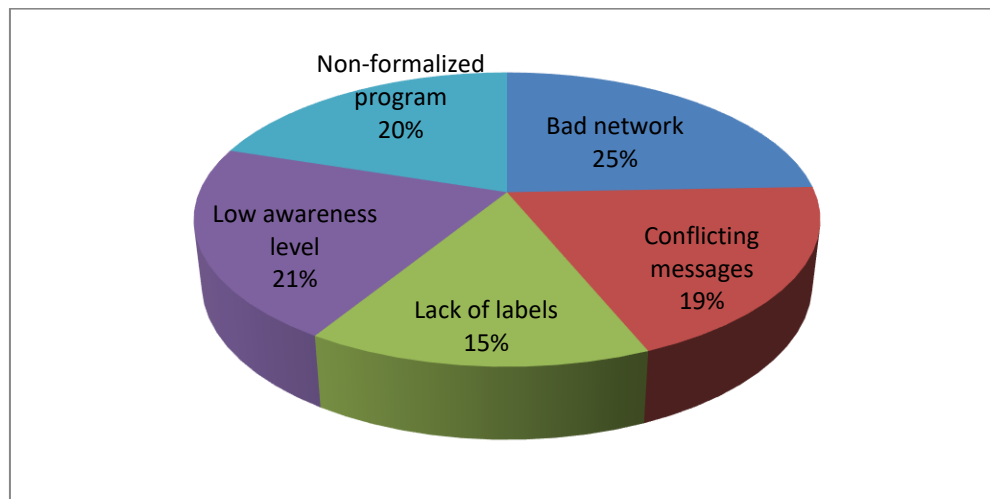


Figure 3. Pie charts showing the challenges of the use of DMAS

Among the 680 respondents used for the study, one hundred and sixty-six, representing 25 percent, attributed the challenges of the use of DMAS to a bad network that resulted in slow response time of messages, hundred and thirty-two representing 19 percent hinged their blames on conflicting messages, one hundred and two, representing 15 percent, thought believed that lack of labels on drugs is culpable, one hundred and forty-four representing 21 percent pointed to low level of awareness by drug consumers. In contrast, one hundred and thirty-six, representing 20 percent of the respondents, based their premises on the non-formalized program in educating the public on DMAS (figure 3).

Table 3 Regression results on awareness and use of drugs mobile authentication service among patients attending the Navy Reference Hospital, Calabar, Nigeria.

Dependent Variable: DMAS

Predictors: Awareness, Usefulness, Role, Reliability, Usage and Convenience.

Method: Least Squares

Sample: 1-680

No of observation: 680

variable	Coefficient	Std. Error	T	p-value
(Constant)	3.656	.216	16.905	0.00
Awareness	0.421	.090	4.667	0.02
Usefulness	2.141	.101	2.138	0.04
Role	3.034	.052	5.834	0.01
Reliability	2.078	.087	1.924	0.05
Usage	1.360	.082	1.886	0.06
Convenience	2.068	.049	4.220	0.03

Adjusted R²= 0.728; Durbin-Watson = 1.952; F-stat = 4.314.

Source: Statistical Result SPSS 23.

The results in Table 3 express the relationship between the dependent variable, DMAS (Drug Mobile Authentication Service), and a set of predictors (Convenience, Usefulness, Role, Usage, Awareness, and Reliability). Thus, from a careful examination of the regression result and related statistics (*Annexure 1*), the following facts emerged: The coefficient of the constant term is 3.656, and the associated t-value is 16.905. The constant term is statistically significant at the 5% level, implying that at the zero performance of all the independent variables (Convenience, Usefulness, Role, Usage, Awareness, and Reliability), the dependent variable will increase by 3.7 percent. The regression coefficient of the knowledge and awareness on the drug mobile authentication service carries a positive sign with a value of 0.421, and the t-value is statistically significant at a 5% significance level. This is confirmed by the p-value of the t-statistics for awareness which indicated [0.02]. The level of significance [0.05] is greater than the p-value [0.02]. This implies that many of the patients and staff know about the drug mobile authentication service in the Navy Reference Hospital, Calabar.

The regression results equally revealed that the drug mobile authentication service (DMAS) is a useful tool to verify the genuineness of drugs from manufacturers (usefulness), plays a vital role in fighting against drug faking and counterfeiting (role), reliable for verifying the authenticity of drugs (reliability); having been using the drug mobile authentication service (usage) and that the drug mobile authentication service is convenient to use (convenience) with coefficients of 2.14, 3.03, 2.07, 1.36 and 2.06, respectively. The adjusted R² of 0.728 is instructive and indicates a good fit for the model. Simply put, about 73 percent of the total variation in the dependent variable (DMAS) is explained by the predictor variables such as convenience, usefulness, role, usage, awareness, and reliability. The value of Durbin Watson (DW) is 1.952, indicating that there is no evidence of serial correlation, meaning the predictor variables have an independent association with the constant DMAS.

4. DISCUSSION

The demographic information revealed that the majority of the respondents were aged between 15 and 44 years, most of them were females, which is attributed to the health-seeking behavior of females in Calabar, accounting for their patronage in the Hospital,

resulting in the majority of respondents. Over 70% have tertiary and other higher degrees. This could be why most of the respondents had a good knowledge of DMAS since the majority have tertiary degrees, which suggests how this exposure could have opened ways for them to discover such a service. It was equally revealed that most of them were employed and were Christians. This could be attributed to the fact that, since most services are out of pocket, the majority of clients will have to pay, and those employed will have more funds to take care of their health needs.

The descriptive statistics of the variables in the study (awareness, usefulness, role, reliability, usage, and convenience) demonstrate acceptable values, which show that they were reliable measures for their respective constructs, and most of the patients and staff used the drug mobile authentication service. Results equally revealed that the drug mobile authentication service (DMAS) is a valuable tool to verify the genuineness of drugs from manufacturers, plays a vital role in fighting against drug faking and counterfeiting, and is reliable for verifying the authenticity of drugs.

In ascertaining the challenges with the use of DMAS in the Navy Reference Hospital, Calabar, Nigeria, the following were identified: bad network, conflicting messages, lack of labels on drugs, low level of awareness, and a non-formalized program on educating the public on the drug mobile authentication service. This is in tandem with the views of researchers. (Oyetunde & Ilozumba, 2013; Oyetunde et al., 2019; Aisagbonhi & Ilomuanya 2016; Eronmhonsele, 2015).

The regression results revealed that drug mobile authentication service is a helpful tool to verify the genuineness of drugs from manufacturers; it plays a vital role in fighting against drug faking and counterfeiting; reliable for verifying the authenticity of drugs. The study also found that DMAS has been used by a good number of patients and hospital staff, and it is convenient to use. These findings corroborate research conducted and documented by Oyetunde & Ilozumba (2013) and Oyetunde et al., (2019).

5. CONCLUSION

The study found out that the Drug mobile authentication service was a valuable and reliable tool used by the majority of patients and staff to verify the genuineness of drugs from manufacturers. It also played a vital role in fighting against drug faking and counterfeit Medicines. There was a high degree of awareness and convenience. However, challenges to the use of DMAS included bad network, conflicting messages, lack of labels on drugs, low level of understanding by the general public among those who do not use DMAS, and the absence of a formalized program for educating the public about the use and importance of DMAS.

Educating the Public on the importance, usage, and role of DMAS in combating and tackling the menace caused by fake and substandard drugs is key, as well as conducting further research in government and public hospitals since these contribute to a majority of people who utilize such services primarily, in the rural areas of the country to ascertain awareness, usage, usefulness, challenges mitigating the use of DMAS.

Annexure 1

REGRESSION RESULTS

Model Summary					
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.892 ^a	.737	.728	.80616	1.952
a. Predictors: (Constant), Convenience, Usefulness, Role, Usage, Awareness, Reliability					
b. Dependent Variable: DMAS					

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	16.823	6	2.804	4.314	.000 ^b
	Residual	437.383	673	.650		
	Total	454.206	679			
a. Dependent Variable: DMAS						

b. Predictors: (Constant), Convenience, Usefulness, Role, Usage, Awareness, Reliability

Coefficients						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.656	.216		16.905	.00
	Awareness	0.421	.090	.038	4.667	.02
	Usefulness	2.141	.101	.141	2.138	.04
	Role	3.034	.052	.032	5.834	.01
	Reliability	2.078	.087	.081	1.924	.05
	Usage	1.360	.082	.034	1.886	.06
	Convenience	2.068	.049	.067	4.220	.03

a. Dependent Variable: DMAS

Residuals Statistics					
	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	3.3688	4.5441	4.1618	.15741	680
Residual	2.33862	1.40584	.00000	.80259	680
Std. Predicted Value	5.037	2.429	.000	1.000	680
Std. Residual	2.901	1.744	.000	.996	680

a. Dependent Variable: DMAS

Authors contribution:

Nianglong Kenneth Kyegwim - Concept, Literature writing, arrangement of whole work, References

Buzugbe Nicholas Chukwuka - Concept, Data Analysis, Proof reading

Ibrahim Yusuf Khalil - Data Collection, Part of Literature Review, Data Entry

Ado Hamza Gashua - Data Collection, Data Entry, Data Analysis

Informed consent

Written & Oral informed consent was obtained from individual participants included in the study.

Conflicts of interests

The authors declare that there are no conflicts of interests.

Ethical approval & declaration

The ethical guidelines for Human Subjects are followed in the study.

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Data and materials availability

All data associated with this study are present in the paper.

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