Awareness And Knowledge of Mobile Authentication Service in Detecting Fake Pharmaceutical Product in South-East, Nigeria

NJOKU, Chinwe Celine
Department of Linguistics and Communication Studies,
University of Port Harcourt, Rivers State
chinweceline@gmail.com

IHEJIRIKA Walter Chikwendu (PhD)
Department of Linguistics and Communication Studies,
University of Port Harcourt, Rivers State
walter.ihejirika@uniport.edu.ng

OHIAGU, Obiageli Pauline, (Ph.D)
Department of Linguistics and Communication Studies,
University of Port Harcourt, Rivers State
obiageli.ohiagu@uniport.edu.ng

DOI: 10.56201/rjmcit.v10.no4.2024.pg109.131

Abstract
Health communication campaigns are often deployed to disseminate information to the public on important health matters. One of such health matters is the issue of counterfeit pharmaceutical products. The study examined the knowledge, attitude, and practices of residents in South-East Nigeria on the Mobile Authentication Service (MAS) in detecting counterfeit pharmaceutical products. Specific objectives also sought to identify media-related sources of awareness on the mobile authentication service in South East Nigeria. The study was anchored on the diffusion of innovations theory, Social cognitive theory and Health belief model and adopted the survey research design. The sample size for the study was 384. The sampling techniques used were purposive, cluster and accidental sampling technique. Findings from the study showed that South-East residents have a high level of knowledge on counterfeit pharmaceutical products though they do not understand all of its dimensions. The media-related sources of awareness on the Mobile Authentication service for South- East residents were the Internet, which was the major source. Mainstream channels of communication such as radio and television negligibly served as sources of information and awareness. The level of knowledge South East residents have of the Mobile Authentication device is low. South East residents had positive attitude towards the Mobile Authentication service of NAFDAC. South East residents in the use of the Mobile Authentication Service, put into practice the use of the service in detecting counterfeit pharmaceutical products. Though not used frequently, the steps in utilizing the service were put in practice and respondents agreed to sourcing for help in utilizing the service. The study recommended that The National Agency for Food and Drug Administration must improve on its campaign on the Mobile

Authentication Service so as to boost the level of knowledge South East residents have of the service.

Keywords: *Awareness, Knowledge, Mobile, Authentication, Services, Detecting, Fake, Pharmaceutical Product*

Introduction

To develop means to grow, become advanced, to become elaborate, stronger and complete. Development involves a gradual advancement and a series of changes that leads to progress in the society. At the core of development communication is the notion that communication plays an integral part in engendering development. Development communication entails deploying communication means and strategies in attempts to provide solutions to social problems especially in developing societies. In achieving positive social change, there is a deliberate effort to apply processes, strategies and methods that stimulate information exchange which in turn promote specific positive social behaviours. Human existence revolves around communication. Human beings communicate all the time. Communication has to do with the transfer of information from one person or group of persons to another.

Communication campaigns facilitate the transfer of knowledge to a specified audience with the aim of expunging undesirable attributes, behaviours and vices which hinder socially acceptable behaviour. Imoh (2003) noted that development communication was introduced as an integrated approach to rural development wherein communication support was provided to communities on issues pertaining to education, health, agriculture, population, gender equality, and nutrition programmes. In this instance, there is a systematic application of strategies, processes, and core communication principles to bring about positive social changes in education, agriculture, health, and women empowerment. In order to raise the standard of life of the people, especially those in underdeveloped countries, the government and society have made concerted efforts to ensure that knowledge and information on standard and contemporary practices is made available to the target audience. To illustrate, farmers have to be adequately informed about contemporary methods and practices that improve agricultural production. In education, development efforts are geared towards providing relevant knowledge and skills to promote quality education. This mainly involves improved teaching methods and the use of Information and Communication Technology aimed at revolutionizing the learning process. Communication also plays a role in mobilizing citizens for political participation, women empowerment, and for the various aspects of health promotion.

The impact of counterfeit drugs is felt greatly as it poses a great risk to health and in several instances has resulted in death. (Buowari 2012, p.2) states that counterfeit drugs “pose as a public health risk because their content can be dangerous or they can lack active ingredients. Their use can result in treatment failure example in the case of anti-malarial that contains insufficient active ingredients”. Therapeutic failure often results from the consumption of counterfeit medicines because the medicine may lack active ingredients, may contain useless mixtures and may also have expired. A patient therefore may not get well after spending adequate

time receiving medical care. Consumption of counterfeit drugs also results in damage to vital organs of the body such as the liver, kidneys and the heart. The failure of these vital organs is usually a cause for fear and may result in terminal illnesses. Besides therapeutic failure and damage to vital body organs, consumption of counterfeit medicines is also responsible for the death of many innocent individuals.

There is an avalanche of data to back this assertion up globally. In 2005, in Canada, It was reported that an accredited pharmacy had dispensed counterfeit Norvasc, a popular blood pressure medicine. It resulted in the death of 11 people. In the United States, in 2008, there was a case of counterfeit blood thinner heparin. The active ingredient for the medicine was replaced with a cheaper substance. This was responsible for the death of about 81 people. In the United Kingdom, in 2013, Richard Taylor was sentenced to 11 years imprisonment for introducing counterfeit cancer medication to the supply chain which led to the loss of lives of some cancer patients. However, the one most familiar in this clime is that which happened in Nigeria in 2008. "My pikin", a teething problem remedy was contaminated by the use of dielthylene glycol as a solvent. This resulted in children who consumed the medicine to develop kidney injury and later death (Aminu, et al, 2017). The public health risks associated with counterfeit medicines are numerous but three of these as highlighted above stand out namely therapeutic failure, damage to vital organs, and death. Besides public health implications, there is also the economic impact of counterfeited medicines, economic losses as a result of drug counterfeiting is enormous. Many pharmaceutical companies lose large amounts of money because their products are being counterfeited and sold at cheaper rates. Drug therapy has financial implications both on the individual and the national economy. When the wrong drug or counterfeit is used, it is waste and when excess of underdoes of the right drug is used, it is also wasteful (Buoawari 2012).

Generally, counterfeited medicines impact negatively on the health of citizens. The impact also stretches beyond health and has economic implications as has been clearly enunciated. These impacts have necessitated a full-blown war on counterfeited pharmaceutical products. For instance, the world health organisation in 2013, inaugurated a global surveillance and monitoring system in West Africa. More than 550 regulatory personnel drawn from a collaboration of 141 countries were educated on how to operate the system.

In Nigeria, the proliferation of counterfeit pharmaceutical products led to the establishment of parastatals appended to the Federal Ministry of Health and saddled with the responsibility of combatting the scourge of fake drugs. The National Agency for Food and Drug Administration was established on January 1 1994 in response to the resolution of the World Health Assembly in 1988 that in order to combat the threat posed by fake drugs, countries should initiate a programme for the prevention and detection of counterfeit pharmaceutical products. From this time, the agency has engaged in various activities, deploying different strategies in combatting counterfeit pharmaceutical products (Ogbeide & Ogunnaike, 2017).

NAFDAC began by tracing, arresting, and prosecuting manufacturers, distributors and retailers of counterfeit pharmaceutical products. Subsequently, the agency adopted the use of NAFDAC registration numbers and placed these on the packages of pharmaceutical products for consumers to be able to detect counterfeit drugs. This was easy for counterfeiters to affix fake NAFDAC registration numbers on counterfeited pharmaceutical products. The Agency then resorted to the use of technology in combatting counterfeited pharmaceutical products. Some of

the anti-counterfeiting technologies engaged by the agency include TRUSCAN, Black Eye and Radio Frequency Identification (RFI) anti-counterfeiting cutting-edge technologies; there were still some difficulty in combatting counterfeited pharmaceutical products because the power of detecting them was not in the hands of consumers rather with the agency and its personnel. Armed with this knowledge, NAFDAC, launched a consumer-centred anti-counterfeiting method leveraging on GSM technology. The agency launched the Mobile Authentication Service. As noted by (Eronmhosele 2015, p.14) captures succinctly what it encompasses thus: This cutting-edge technology enables a consumer to determine whether a drug is fake or genuine through a mobile phone by typing a unique number hidden under a scratch-off panel that comes with the pack of every Mobile Authentication Service (MAS)-enabled drug product and sending an SMS to a code number and in a few seconds, the consumer receives an SMS confirming whether the drug has been approved by NAFDAC or not.

Mobile Authentication Service puts the capacity to detect fake pharmaceutical products in the hands of the consumer. The consumer, through a mobile phone checks whether a product is fake by having direct contact with the drug manufacturer. The first step in the use of MAS is scratching the silver panel on the product which reveals a unique 12 digit pin. The second step is sending the unique 12 digit pin as a text message to the short code 38353. The third step is receiving an immediate response in SMS format which states if the product is authentic or counterfeit. The service is available to all GSM service providers in the country and it is free of charge to all subscribers. NAFDAC has through various platforms and communication campaigns created awareness on MAS.NAFDAC has an entrenched culture of undertaking public enlightenment campaigns to sensitize urban and rural dwellers alike on counterfeited pharmaceutical products. As pointed out by Akinyuli (2010), enlightenment campaign remains one of the most effective strategies in combatting product counterfeiting and creating effective regulation. Enlightenment programmes involve dialogue, education, and persuasion because this addresses the fundamental issue at stake which is behaviour change.

The aforementioned stretches this study away from pharmaceutical leanings and places it within the purview of communication. Health communication is a broad term used to denote communication activities undertaken with a view to influencing individuals and communities to adopt acceptable health practices. The aim is usually to improve health outcomes by disseminating and sharing health-related information. The Centre for Disease Control and Prevention (CDC, 2011, p.11) define health communication "as the study and use of communication strategies to inform and influence individual and community decisions that enhance health". It is essentially the deployment of communication and its resources to inform, influence, and motivate individuals, institutions, and the general public about health-related issues that are important. Health communication depends heavily on communication activities including interpersonal communication, public relations, public advocacy, community mobilisation and professional communication with the aim of informing, motivating target audiences, exchanging information and ultimately changing behaviours. Beyond the above, health communication approaches also support and sustain change. That is why health communication campaigns make provision for long-term programmes sustainability as well as the development of communication tools and steps that make it easy for individuals, communities and other audiences to adopt or sustain a recommended behaviour, practice, or policy change (Schiavo 2002).

Statement of the problem

Health communication campaigns are often deployed to disseminate information to the public on important health matters. One of such health matters is the issue of counterfeit pharmaceutical products. NAFDAC therefore undertook a unified singular advertisement on how to detect fake pharmaceutical products using MAS and carried out public enlightenment campaigns on the NAFDAC MAS Scheme. Adverts and public enlightenment campaigns were financed by MAS providers under the supervision and ultimate approval of the Agency. The enlightenment campaigns were on National television, radio stations, Social media and other communication platforms It is therefore fair to say that the Mobile Authentication service was given as much publicity enough to sensitise the nation on how it is used hence the need to find out what is the KAP analysis outcome on the use of Mobile Authentication Service Campaign in south East Nigeria? The choice of the south East was necessitated by the fact that the region has been known to be the epicentre for the production and distribution of counterfeit pharmaceutical products.

Aim and Objectives of the Study

The aim of this study is to examine awareness and knowledge as a framework to analyse the outcome of the use of the Mobile Authentication Service (MAS) campaign in South East Nigeria. The specific objectives are:

1. Identify the media-related sources of awareness on the Mobile Authentication Service (MAS) campaign in the South East.
2. To examine the knowledge level of residents in South East Nigeria on counterfeit pharmaceutical products.
3. Find out the knowledge level of residents in South East Nigeria in the utilization of Mobile Authentication Service (MAS) for detecting counterfeit pharmaceutical products.

Literature Review

Counterfeit drugs: A development challenge in Nigeria

The health and well-being of individuals or citizens in a country depend largely on the health care system of such country. The quality of life is mostly determined by the quality of health care available. This is affirmed by Odorume (2015) who argues that it takes a healthy person to work and attend to responsibilities, tasks and jobs and these tasks in turn result in the wealth and development of a nation. Oluwatuyi and Ileri (2014) are also of the opinion that good health is basic to human welfare and therefore a fundamental objective to development. As pointed out by Omotoso (2006), when the population of a country is healthy, there is a tendency that that population will be productive. A productive population undoubtedly leads to an active and growing economy.

Medical interventions have therefore become necessary in order to meet the challenge of failing health. This comes through the use of drugs which according to Buowari (2012) are used to cure or treat diseases, relieve symptoms, ease pain, prevent diseases, eliminate or reduce symptoms and also slow the disease process. Oluwatuyi and Ileri (2014) aver that the role of drugs in medical interventions could not be overemphasized because original drugs lead to improvement in the health sector and consequently to the overall development of a nation. It is ascertained that drugs serve as a basis for achieving the sustainable development goal for good health and well-being. This goal concerns access to safe health care services, safe, effective, quality and affordable

essential medicines. There, however, arises a problem with affordable and essential medicines. This leads us to the concept of fake drugs or what is also termed counterfeit drugs.

Technology and Anti Fake Drugs Campaign

There is sufficient empirical evidence that counterfeit drugs are inimical to human existence and that governments at all levels of the society across the world have been waging wars against their production, distribution and consumption. Predominantly, television, newspapers, radio stations, etc were earlier used to project commercials, public alert notices on banned products, phone-in programmes, talk shows, etc (Akunyili, 2005; Dike et al., 2014). However, these instruments do not allow for mass input or response to whatever they hear or experience. Importantly, they only describe fake drugs but have no mechanism for identifying them individually in different medical shops to deter consumers from buying them. Thus, the World Economic Forum (2010) advocated for the use of the New Media Technologies (NMTs), which are powerful forces for change and a fundamentally important way to create awareness, motivate and engage individuals in pro-health behaviours. In the words of Hauser (1998) the new media provides the 'discursive space in which individuals and groups congregate to discuss matters of mutual interest and, where possible, to reach a common judgement.

Etzo and Collender (2010) recorded that Celtel and AIDS Information Centre effectively employed this in Uganda to create AIDS awareness to 15000 mobile phone subscribers. Similarly, OurMed (2015) records that Ghana introduced mPedigree - a GSM network scheme in 2007 to provide pharmaceutical consumers and patients with the means to verify if the medicines they want to purchase are original through a free two-way SMS message. India initiated a similar service scheme as instrument for managing the phenomenal growth of her pharmaceutical industry as well as suppressing the counterfeit drug market (Chandu, 2011). Similarly, Iwokwagh (2013) noted that NAFDAC introduced a range of fake drugs detecting technologies such as Truscan, Mobile Authentication Service (MAS), using Short Message Service (SMS), Black eye, and Radio Frequency Identification (RFID) to assist NAFDAC then detect and stop fake and counterfeit drugs.

Awareness

Awareness is seen as the ability of people to realize or know that something exists. It can also be defined as one's knowledge or understanding of a particular subject, situation or trend. Merriam–Webster (2022) describes awareness as understanding a lot about what is happening around someone and the person or persons paying attention to it either positively or negatively. Awareness is a situation where someone is informed of something. It is the act of knowing about the existence of something. Awareness can also be defined as the act of having perception or wide knowledge of the existence of something. The term awareness, according to Cambridge Dictionary (2020) is knowledge that something exists, or understanding of a situation or subject at the present time based on information or experience. The Macmillan Dictionary (2021) describes awareness as "knowledge or understanding of a subject, issue, or situation" or ...the ability to notice things.

NAFADAC, Counterfeit Drugs and Mobile Authentication Service

Developing countries have faced several problems that have persistently thwarted their development efforts. One of such problems have been providing adequate food and drug supply for a growing population (Ogbeide et al., 2013). The health care of any country has to be accorded priority in view of the fact that the United Nations acknowledges health care as a fundamental

human right for citizens. This could be attributed to the assertion by Eronmhosele (2015) that a healthy population is undeniably an economic asset because a healthy labour force is a crucial factor in economic development. Be that as it may, health care delivery especially in developing countries has been undone by several factors. One of such factors is counterfeit drugs. Eronmhosele (2015) asserts that over the years great efforts have been made to introduce good health care delivery system which includes the provision of quality, efficacious and affordable pharmaceutical drugs. However, this has been impossible due to the pervasive problem of counterfeit and substandard drugs. Ayodokun (2016) posits that in Nigeria, the problem of fake drugs proliferation has affected the plausibleness of the healthcare system leading to the unwholesome effect on the consumer resulting to illness, disability and death.

Oladosun et al. (2016) also aver that the problem of fake pharmaceutical products by counterfeiters and unregistered manufacturers constitutes a major threat to the health of the Nigeria population. To handle this menace, several efforts have been put in place by various governments with the goal of extinguishing counterfeit drugs and providing sustainable medicines. Eronmonsele (2015) advances the several health summits have been organized in Nigeria and consistently, Nigeria's National Health Policy has witnessed periodical reviews geared towards effecting changes that would accelerate and improve health care in Nigeria especially regarding the eradication of counterfeit drugs. Omotayo and Deleoye (2002) observe that in recognition of how important drug safety is and its role in achieving high level of health, the Nigerian government launched the National Policy on food, hygiene and safety. Ogbeide et al (2013) submits that the goal of the policy was for the attainment of food, drug, hygiene and safety practices which will promote health and minimize the problem of counterfeit medicine.

Theoretical framework

Health Belief Model (HBM)

Health Belief Model is an example of behaviour change theories. Health Belief Model can be applied to guide health promotion and disease prevention programme. It was first developed in the 1950s by social psychologists Hochbaum, Rosenstock and Kegels to understand the failure of people to adopt diseases prevention protocols while working in the United States Public Health Services. The thrust of the HBM centres around four main construct: perceived seriousness, perceived susceptibility, perceived benefits and perceived barriers (Guvenc, et al., 2013). The focus of Health Belief Model is to assess health behaviour of individuals through the examination of perceptions and attitudes someone may hold towards certain health practices and towards disease and negative outcomes of certain actions. The theory is useful in health promotion design, intervention and prevention programmes.

By this model's application to health issues, the model provides a framework for understanding how individuals make decisions about health-related behaviours, which is crucial in addressing the rampant issue of counterfeit drugs. Key constructs of the model can be applied to assess how individual perceive the risk of fake pharmaceutical and the effectiveness of MAS in mitigating this risk. For instance, understanding how much people feel at risk (perceived susceptibility) of encountering counterfeit drugs and how severe they believe the consequences (perceived severity) of using such drugs can inform the development of targeted educational campaigns. Similarly, the perceived benefits of using MAS, such as ensuring drug authenticity and

safety, versus perceived barriers, such as cost or lack of technological proficiency, can highlight areas needing intervention to enhance adoption rates.

Moreover, the model's constructs of self-efficacy to this KAP study. Self-efficacy relates to individuals' confidence in their ability to use MAS effectively, which is essential for the successful adoption of this technology. Evaluating self-efficacy can identify training needs and inform the design of user-friendly MAS interfaces. Cues to action, such as health campaigns, community outreach, and reminders, can serve as motivators for individuals to adopt MAS. By integrating this model into the study, researchers can gain a comprehensive understanding of the factors influencing the use of MAS and develop strategies to overcome barriers, ultimately contributing to reducing the prevalence of counterfeit pharmaceuticals and improving public health outcomes in South-east Nigeria

Empirical Review

In a study undertaken by Ude-Akpeh et al. (2019) entitled 'Curbing the menace of fake drug circulation in Nigeria: The media option', the authors lent support to the argument that the media can actively play a developmental role through sensitization on the menace of counterfeit drugs. The authors hinge their argument on the proposition that the surveillance function of the media gives them the responsibility to cover, analyse and report impending dangers that are threats to lives and properties of a given society. The aim of the study was to analyse the role of the broadcast media in curbing the circulation of substandard drugs in the health sector of Nigeria. To achieve this aim, three research questions were formulated which were: What is the role of the broadcast media in curbing the circulation of fake drugs? To what extent do broadcast media create awareness to curb the circulation of fake drugs? What strategies do broadcast media adopt in creating awareness on curbing circulation of fake drugs?

The study adopted the survey research design as it ensures better representation of the population of the study through sample. A sample size of 400 was drawn from the population which comprised audiences of NTA and FRCN aged 15 and above resident in Awka, Anambra State. Data were collected using the questionnaire as research instrument. Data were analysed quantitatively. Findings from the study revealed the broadcast media had done considerably well in curbing the menace of fake drug circulation. The mass media were seen as an important aid in addressing the problem of high risk of fake drugs in the Nigerian society. The study also showed that the mass media helped in creating awareness on curbing the circulation of fake drugs in the country. The study in its findings also revealed that the mass media had strategies in its bid to fight the circulation of fake drugs. Through specially produced programmes and partnerships with relevant specialized agencies. The study recommended that there is need to sustain ongoing programmes and devote more time to programmes on health especially regarding creating awareness on fake drugs. The study also recommended that in order to get feedback from the audience, interactive programmes should be designed to attract stakeholders, regulatory agencies and the government.

The similarity between knowledge and awareness is striking and this is where the relationship between this study and the present study lies. The media is responsible for providing the audience with the much need awareness on fake drugs circulation and the strategies and methods put in place to curb the menace by agencies of government saddled with such responsibility. While the study by Ude-Akpeh, Onyima and Job (2019) sought to investigate if the

media created awareness on fake drugs, the present study transcends awareness and captures the attitude and practice of the audience on the basis of the knowledge and awareness the audience have on MAS, a consumer-centred design for combatting the menace of fake drugs.

In another study carried out by Onuh et al. (20201) entitled "Assessment of Consumers' Awareness and Proposed Measures Against the Prevalence of Counterfeit drugs in Developing Countries", the authors lent support to the importance of studying the extent of awareness of the prevalence of fake drugs in developing countries. The main objective of the study was to analyse consumers' awareness, the principal contributors to counterfeit drugs and propose measures to curb this menace in developing countries. Data was allocated using an online questionnaire with 24 questions bordering on consumer awareness and measures taken by health professionals and communicators in combating the prevalence of counterfeit drugs, respondents were drawn from Ghana, Nigeria, South Africa, Laos, Kenya and Pakistan. Respondents from Zambia, Zimbabwe, Togo, Tanzania, Rewanda and DR. Congo partly participated in the study. Findings from the study showed that Nigeria had the highest awareness of counterfeit drugs with (149 responses) as against Kenya that had (24), Ghana (21), Parkistan (11), Laos (5) and South Africa (1). The level of awareness varied because of various factors . Nigeria that had the highest level of awareness was linked to large population and government intervention such as the NAFDAC MAS short code implemented in 2015 which allowed users to confirm authenticity at the point of purchase unlike Ghana consumers who relied surely on regulatory bodies to certify authenticity of all drugs whether locally manufactured or imported.

Methodology

The study adopted the survey research design. The reason for adopting survey was on the basis of examining the knowledge level, attitudes and practices of a specific audience with regard to a health issue. The population for this study is made up of all residents of the five South Eastern states in Nigeria aged 18 and above from Abia State, Anambra State, Ebonyi State, Enugu State, and Imo State. According to the National Bureau of Statistics, the projected population of the aforementioned states for 2021 are as follows: Abia State: 4,265,920; Anambra State: 4,805,600; Ebonyi State: 3,313,289; Enugu State: 5,125,050; and Imo State: 6,347,078. A summation of all these puts the population of the study at 23,856,937.

The sample size for the study was 384. It was arrived at using the predetermined sample size table projected by Krecjie and Morgan. Krejcie and Morgan recommend a sample size of 384 for a population beyond 1,000,000. The study used three sampling techniques namely, purposive sampling technique, random sampling technique and accidental sampling technique. The questionnaire was administered and retrieved by the researcher and with the assistance of three research assistants. Data obtained through the research instruments were collated, presented in frequency tables and analysed on a Four- point Likert scale using weighted mean score. Frequency tables are one of the basic tools for displaying descriptive statistic and are easy to interpret. The criterion, weighted mean score is established at 2.50. Weighted Mean (WMS) from 2.50 and above will be adjudged positive (accepted). WMS of 2.49 and below will be adjudged negative (unaccepted).

Results and Discussion

Objective one: Knowledge level of residents in South East Nigeria on counterfeit pharmaceutical products

Table 1 Knowledge Level of Respondents Understanding of Counterfeit Drugs

Options	Frequency	Percentage
Drugs that are sub-substandard	71	19
Expired drugs	76	21
Drugs not registered with NAFDAC	40	10
Imitated drugs	191	50
Total	378	100

Data on how respondents understand the concept of fake drugs is contained in table 4.5 above. The table indicates that respondents mostly believed that counterfeit drugs are drugs that are imitated. Other responses in order of frequency shows that respondents also understood counterfeit drugs to be drugs that were substandard expired and those not registered with NAFDAC.

Table 2 Knowledge Level of Residents in South East Nigeria on Counterfeit Pharmaceutical Products

Items	SA	A	D	SD	WS	WMS	Decision
Consuming fake drugs is dangerous	282	96	0	0	1404	**3.71**	**Accepted**
Fake drugs can be distinguished from authentic drugs	347	31	0	0	1481	**3.92**	**Accepted**
Government efforts and actions are enough to combat fake drugs	314	41	20	3	1422	**3.76**	**Accepted**

Data found in table 2 show that respondents know that consuming fake drug is dangerous with a result of 3.71. It equally shows that they are aware and can distinguish authentic drugs from fake drugs with a response of 3.92. A positive response result of 3.76, shows that respondents agree that government effort are enough to combat the scourge of fake drugs.

Table 3 Problems Respondents Associate with Consumption of Fake Drug

Items	SA	A	D	SD	WS	WMS	Decision
Consumption of fake drugs leads to treatment failure	176	138	56	8	1238	**3.2**	**Accepted**
Consumption of fake drugs leads to increase in cost of treatment	128	197	23	30	1179	**3.1**	**Accepted**
Consumption of fake drugs leads to damage of body organs	149	193	30	6	1241	**3.2**	**Accepted**
Overall Mean score						**3.16**	**Accepted**

In table 3 above, there weighted mean score of 3.2 on the first item which concerns fake drugs and treatment failure. The score is indicative of the fact that respondents agreed that treatment failure is one of the problems associated with consuming fake drugs. A decision score of 3.1 found in table 3 above is indicative of the fact that respondents agreed that consuming fake drugs has the propensity to increase the cost of treatment. Data also found in table 4.7 indicates that respondents are in agreement with the proposition that fake drugs cause damage to body organs. Overall, a decision score of 3.1 indicates that consumption of fake drugs causes an increase in treatment cost, leads to damage of body organs, and also leads to treatment failure. This can be summarized to imply that respondents grasp the full effect of consuming fake drugs.

Table 4: Respondents' Methods for Distinguishing Authentic Drugs from Fake Drugs

Options	Frequency	Percentage
Physical observation	25	6
Approved NAFDAC methods	343	91
Nothing	10	3
Total	392	100

Table 4 shows that respondents overwhelmingly used NAFDAC approved methods in distinguishing authentic drugs from fake drugs.

Objective two: Knowledge level of residents in South East Nigeria of Mobile Authentication Service (MAS) campaign of NAFDAC for detecting counterfeit pharmaceutical products

Table 5: Respondents' Response to Knowing about the Mobile Authentication Service

Options	Frequency	Percentage
Yes	257	77
No	121	23
Total	378	100

Table 5 shows that a fairly sizable number of respondents knew of the Mobile Authentication Service as campaigned by NAFDAC. This is indicative of respondents being knowledgeable about the service.

Table 6 Knowledge level of respondents on the Mobile Authentication Service in the South East

Items	SA	A	D	SD	WS	WMS	Result
How the Mobile Authentication service for detecting fake drugs works well known to me	149	108	85	36	1126	2.97	Accepted
I am familiar with the principle behind the Mobile Authentication Service	109	154	123	30	1092	2.88	Accepted
I am well acquainted with the various steps in utilising the Mobile Authentication Service	89	123	139	27	1030	2.72	Accepted
Overall Mean score						2.85	Accepted

Table 6 shows the level of knowledge respondents have of the Mobile Authentication Service. A response result of 2.97 indicates that respondents had a fairly good knowledge of the Mobile Authentication Service. Additionally, data point to respondents having a fair degree of familiarity with the principle behind the Mobile Authentication Service. Respondents were also barely acquainted with the utilisation of the Mobile Authentication Service with a response result of 2.72. Overall mean score of 2.85 attests to respondents having a fair degree of knowledge of the Mobile Authentication Service.

Objective three: Media-related sources of awareness of Mobile Authentication Service in South East Nigeria

Table 7: Communication Channels Respondents Learnt of Mobile Authentication Service

Options	Respondents	Percentage
Radio	33	8
Television	15	3
Newspaper	0	0
Flyers	10	2
Internet	217	57
Friends/family	28	7
None	75	23
Total	**378**	**100**

The internet was primarily responsible for respondents' knowledge and awareness of the Mobile Authentication Service. This is revealed in table 7 as 57% of respondents indicated that they knew of MAS through the Internet. Then radio, friends and family, Television provided knowledge for a negligible percentage of respondents.

Table 8 Channels for Creating Awareness on Mobile Authentication Service were Adequate

Options	Frequency	Weighted Score	WMS	Decision
Strongly Agree	145	580	**2.9**	**Accepted**
Agree	103	309		
Disagree	91	182		
Strongly Disagree	39	39		
Total	**378**	**1110**		

Table 8 shows an accepted response result. This indicates that the channels for awareness on the MAS were seen to be adequate by respondents. This implies that television, radio, The Internet as used by NAFDAC were sufficient and therefore served the purpose of creating awareness on MAS.

Table 9 Channels Respondents feel are most effective for Creating Awareness on MAS

Options	Frequency	Percentage
Radio	33	8
Television	15	3
Newspaper	0	0
Flyers	10	2
Internet	306	84
Friends/family	14	3
Total	**378**	**100**

The Internet was accepted by most respondents (84%) as the most potent medium for propagating awareness on the Mobile Authentication Service.

Discussion of findings

Research question one: What is the knowledge level of residents in South East, Nigeria on counterfeit pharmaceutical products?

Items 5, 6, 7, 8, 9 and 10 on the questionnaire were designed to elicit the answer to this research question, Data to this effect were presented in Table 4.5, 4.6, 4.7 and 4.8. The items sought to test respondents' knowledge of what constitutes counterfeit drugs, the dangers involved in consuming counterfeit drugs, distinguishing between authentic and fake drugs, and the possibility of government combatting fake drugs.

Data presented in table 4.5 provide an insight on respondents' understanding of what constitutes fake drugs. The opinion of most respondents was that fake drugs refer to imitated drugs. Some respondents also indicated that fake drugs are drugs that have expired and those that are substandard. Few of them believed that drugs not registered with NAFDAC were substandard. These responses indicate that South-East residents have good knowledge of what constitutes counterfeit pharmaceutical products.

Besides having knowledge of what constitutes fake drugs, data obtained highlight the depth of knowledge respondents have of the impact of consuming counterfeit pharmaceutical products. A positive response result of 3.74 found in table 4.7 indicated that respondents understood the dangers associated with consuming fake pharmaceutical products. This was further substantiated with data found in table 4.8 which specifies the problems associated with consuming fake pharmaceutical products. A significant percentage of respondents were of the opinion that consuming counterfeit pharmaceutical products results in damage to vital body organs. Treatment failure was also one of the problems respondents associated with consuming counterfeit pharmaceutical products. In all, there was an agreement that consuming counterfeit pharmaceutical products results in an increased cost of treatment, treatment failure and damage to vital organs of the body. This was also proof that respondents had knowledge of the effects associated with consuming counterfeit pharmaceutical drugs.

Knowledge of respondents on counterfeit drugs was also tested along the line of distinguishing between authentic and fake items. Respondents, as data in table 4.9 point out, unanimously agreed that authentic drugs can be distinguished from counterfeit drugs. This was proven in table 4.9 as data contained therein reveal that a significant percentage of respondents averred that approved NAFDAC methods could be used to distinguish between authentic and fake

drugs. In table 4.7, respondents averred that government efforts and actions are enough to combat fake drugs.

Aggregating data obtained on the knowledge level of South-East residents on counterfeit pharmaceutical products using parameters such as what it is, its effects or dangers, it is deducible that South-East residents have a high level of knowledge on counterfeit pharmaceutical products. It is necessary to bring in extant literature and establish the nexus with this finding. The health and well-being of individuals or citizens in a country depend largely on the health care system of such country. The quality of life is mostly determined by the quality of health care available. This is affirmed by Odorume (2015) who argues that it takes a healthy person to work and attend to responsibilities, tasks and jobs and these tasks in turn result in the wealth and development of a nation. Medical interventions have therefore become necessary in order to meet the challenge of failing health.

This comes through the use of drugs which according to Buowari (2012) are used to cure or treat diseases, relieve symptoms, ease pain, prevent diseases, eliminate or reduce symptoms and also slow the disease process. It is ascertained that drugs serve as a basis for achieving the sustainable development goal for good health and well-being. This goal concerns access to safe health care services as well as safe, effective, quality and affordable essential medicines. However, there, arises a problem with affordable and essential medicines just as data generated from the research shows that counterfeit drugs consumption leads to increase in cost of treatment because the sickness will be prolonged and more resources will be spent trying out various pharmaceutical products, This leads us to the concept of fake drugs or what is also termed counterfeit drugs. Data obtained from the World Health Organisation suggests that one in ten medicines in middle and low income countries is substandard or falsified. Akinyadenu (2013) infers that these products will likely include incorrect ingredients, misstated amount of active ingredients, or products manufactured under circumstances without quality control.

In Nigeria, Akinyenadu (2013) specifically highlights that counterfeit drugs comprise those drugs prepared without active ingredients, toxic preparations, expired drugs that are relabelled, drugs issued without complete manufacturing information, and drugs not registered with the National Agency for Food and Drug Administration and Control. Oluwatuyi and Ileri (2014) are of the view that counterfeit drug is a medication or pharmaceutical product produced and distributed with the intent to deceptively represent its origin, authenticity or effectiveness. A counterfeit drug contains inappropriate quantity or none of active ingredients, may contain ingredients not indicated on the label or packaging, or may be supplied with inaccurate, fake and misleading packaging with the aim of deceiving consumers. Aminu et al. (2017) point out that falsified medicines have been fraudulently fabricated and distributed which have failed to meet the quality criterion of the said medicine. The salient points raised have clearly identified what can be regarded as counterfeit or fake drugs. The finding of this study in this regard confirms that the idea of what constitutes fake drugs is well-known to residents in the South East as 50% of the respondents identified fake drug as imitated drugs.

The knowledge of respondents was also tested along the line of damage caused by consuming counterfeit pharmaceutical products. The literature also has its contribution to this. Vorrath and Voss (2019) assert that the damage caused by substandard and counterfeit drugs is multi-faceted. Akinyandenu (2013) stresses that the problem of counterfeit drugs has embarrassed

the Nigerian health care providers and denied the confidence of the public in the nation's health care delivery system. Obviously, counterfeit drugs pose a great public health risk for the public. However, besides posing a great risk to public health, the intake of counterfeit medicines also poses other problems. Counterfeit drugs are responsible for a lot of health risks and death. Adjei (2015) avers that the obvious public health risk of using counterfeit drugs is that users' health may worsen and as a result of taking inappropriate pharmaceuticals or medicines laced with poisonous or carcinogenic substances, Blackstone et al. (2014) observe that patients who may consume counterfeit drug with no active ingredient will definitely fail to get better.

As put by Akinyandenu (2013), the use of fake drugs has led to treatment failures. Those with health challenges who resort to medical interventions are left in difficult situations because counterfeit drugs have not solved their problem. Buowari (2012) describes this as treatment failures. He observes that therapeutic failure may be associated with the use of fake drugs containing insufficient or no active ingredients Adjei (2015) also suggests that one of the health implications of counterfeit medicines is the presence of substances that are poisonous and harmful to health. Heavy metals such as mercury, aluminum, lead, boric acid and polychlorinated bipheryl are found in fake drugs and these substances cause illnesses such as cancer and may have a debilitating effect on an individual's neurological, urinary, cardiac and intestinal systems (Adjei 2015). Blackstone et al (2014) assert that counterfeit drug have no active ingredient and may have any number of harmful ingredients, including bacteria-laced water, toxic yellow paint, floor wax, coloured dye, powdered cement, boricacid, and antifreeze.

Another implication of counterfeit medicines is vividly described by Aminu et al (2017) who aver that consumption of counterfeit medicines especially antibiotics, anti-malarial and antimicrobials usually results in sub-therapeutic blood concentration of such medicines leading to drug resistance and ultimately treatment failure. This implies that even when patients are subsequently treated with genuine medicines, the response is often negative or non-existent due to resistance caused by previous consumption of fake drugs. Consumption of counterfeit drugs also leads to what Buowari (2012) describes as end organ damage. As has been pointed out by Akinyandenu (2013), proliferation of counterfeit drugs has led to organ dysfunction and damage and also worsening chronic disease conditions. Counterfeit drugs pose a great deal of danger to vital organs in humans.

Due to the fact that counterfeit drugs contain poisonous substances and in other instances expired substances and these substances can cause damage to the kidney, liver, lungs and even to the brain. Buowari (2012) asserts that consumption of fake drugs often results in severe damage to the liver, kidneys, heart and the central nervous system. This is attributable to the fact that the liver is responsible for breaking down drugs and the kidney functions to eliminate same. These poisons, when ingested tend to do a lot of damage to these vital organs. There are a lot of incidents which have demonstrated that counterfeited have led to organ damage. Though this has been prevalent in the developing countries of Africa, cases still exist in civilized western society.

Besides the public health implications posed by counterfeited drugs, there is an economic implication as well. Respondents were aware of this as some indicated that consuming fake drugs led to increase in cost of treatment. Aminu et al (2017) argue that besides the clinical and public health consequences associated with counterfeit medicines, there is also a substantial economic

problem for patients, pharmaceutical companies and the government as well. The economic consequences of fake drugs will be approached from the aforementioned perspectives.

First, for the patient, Buowari (2012) avers that the finances of the patient are greatly affected because there is an increased cost of therapy. Man hours are also lost due to the ill health of the patient especially for an illness that would have been resolved with genuine medicine.

Vorrath and Voss (2019) also suggest that there is a financial damage done to patients when they consume counterfeit drugs. The chances are quite high that patients would spend more financially after consuming fake drugs. This is because with fake drugs, there is poor therapeutic response which will likely lead to a repetition of the course of treatment, It may lead to undertaking more laboratory tests and consulting more physicians as well as the financial implication of replacing damaged organs as identified by the respondents response of 3.2 mean score in table 4.8. Beargie et al. (2019) also opine that counterfeit drugs prolong treatments thus results in avertable costs through the extension of length of hospitalization, cost of extra medical care and productivity losses. The consideration of extant literature aligns with the finding that respondents had a high level of knowledge on counterfeit pharmaceutical products. Their knowledge which was tested bordered on what constitutes counterfeit drugs, the effects of consumption and how it affects the finances of patients.

Research question two: What is the knowledge level of residents in South East, Nigeria of Mobile Authentication Service (MAS) campaign of NAFDAC for detecting counterfeit pharmaceutical products?

Items 11,12,13,14 and 15 on the questionnaire were designed to elicit the answer to this research question, Data to this effect were presented in Table 4.9 and 4.10.

The Mobile Authentication Service has been in use for a few years. This research question, therefore sought to examine how much knowledge South-East residents have of the service. The questionnaire items probed respondents' knowledge of the Mobile Authentication Service as it relates to identifying or detecting counterfeit pharmaceutical products. As data in table 4.9 indicate, a good number of respondents (67%) responded with 'Yes' when asked if they know about the Mobile Authentication Service. This is indicative of respondents being knowledgeable about the service.

Table 4.10 points out the level of knowledge respondents have of the Mobile Authentication Service. Result of 2.97 indicated that respondents had a fairly good knowledge of the Mobile Authentication Service. Additionally, data point to respondents having a fair degree of familiarity with the principle behind the Mobile Authentication Service. Respondents were also acquainted with the utilisation of the Mobile Authentication Service. This was attested to by a weighted mean score of 2.72. Overall mean score of 2.85 attests to respondents having a fair degree of knowledge of the Mobile Authentication Service.

In an unambiguous answer to the research question, the level of knowledge South East residents have of the Mobile Authentication service was fairly high. The relationship between this finding and the diffusion of innovations theory is also very explicit. Given the respective stages in Rogers' diffusion of innovation theory, Sahin (2006) asserts that the knowledge stage is where the innovation-decision process begins and that it is at this stage that an individual learns about the existence of an innovation and seeks information regarding the innovation. Along the same line, the thoughts of Rogers (2003) echo that it is at the knowledge stage that an individual attempts to

examine what the innovation is and how and why it works. This is further strengthened by Veghaard (2018) who asserts that knowledge plays an important part in the diffusion of innovations process because it represents a key stage in the innovation-decision period. Scott and Maguire (2017) opine that "beginning with initial knowledge and awareness, adopters must first learn about the innovation, they need to know its elements as well as how and why it works" (p.21).

There are three types of knowledge that fall within the knowledge stage in the innovation-decision process. The first is awareness knowledge. Sahin (2006) describes awareness knowledge as the knowledge of the innovation's existence and stresses that it is the type of knowledge which strives to motivate an individual to explore and learn about the innovation and subsequently adopt same. The second type of knowledge is described as the how-to-knowledge. Rogers (2003) avers that the how-to- knowledge is an essential variable in the innovation-decision process. The how-to-knowledge contains information about how to use an innovation appropriately (Sahin 2006). It is pertinent to note that an individual must have sufficient level of how-to knowledge before following an innovation. This tends to increase the adoption chance of such innovation. How-to knowledge is absolutely critical for innovations that are somewhat complex (Sahin 2016). The third type of knowledge is referred to as the principles knowledge. Sahin (2016) refers to this as including the functioning principles describing how and why innovation works.

As observed in the finding, South East residents reflected the different types of knowledge mentioned and elaborated in the diffusion of innovations theory. In addition to a good number of respondents answering in the affirmative about knowing the Mobile Authentication Service, data revealed that the awareness knowledge, the how-to knowledge and the principles knowledge can be extrapolated from the data. First, a decision coefficient of 2.97 is indicative of respondents having the awareness knowledge. Second, a weighted mean score of 2.88 attests to respondents having the principles knowledge wherein respondents attested to understanding the principle behind the Mobile Authentication Service. Third, a weighted mean score of 2.72 testified to respondents having the how-to knowledge. This implies that they could utilise the Mobile Authentication Service.

The Health-Belief Model (HBM) can also be applied to this finding. The application of health-belief model to the finding is captured in Schiavo (2002) who notes that the major contribution of the HBM to the health communication field is its emphasis on the importance of knowledge, a necessary but *not* sufficient step to change. Knowledge is paramount because without knowledge, attitude and practice are non-existent. The emphasis on knowledge by the Health-belief model establishes its connection to this finding. Besides its connection to the theoretical underpinnings of the diffusion of innovations theory and health-belief model, concepts reviewed are reflected in this finding. The essence of communication campaigns is to provide information and create awareness on a particular issue to which it is intended. Researches are often undertaken to determine if communication from health promotion campaigns have been effective in creating awareness and bringing about the desired behavioural and attitudinal change.

As a way of reminder, Kaliyaperumal (2004), posits that the three topics that a KAP study measures are Knowledge, Attitude and Practice. It is known that the triad of knowledge, attitudes and practices in combination governs all aspects of life in human societies, and all three pillars together make up the dynamic system of life itself. Launiala (2009) submits that in KAP surveys, the knowledge part is normally used to assess the extent of community knowledge about health-

related concepts related to local, national and/or international public health programmes. Knowledge is the acquisition, retention, and use of information or skills (Badran, 1995). Gurnucio (2011) advances that knowledge is a set of understandings, knowledge and of "science." It is also one's capacity for imagining, one's way of perceiving. Knowledge of a health behaviour considered to be beneficial, however, does not automatically mean that this behaviour will be followed.

Cognition through which knowledge is acquired is a process of understanding and is distinguished from the experience of feeling. Knowledge accrues from both education and experience. Knowledge in health communication refers to the comprehension of diseases, health intervention programmes and policies, and self-care practices necessary for optimizing health intervention programmes. Knowledge means understanding, awareness of a body of idea gained either by learning or experience. This is practically demonstrated in the data presented as respondents affirmatively agreed to know how the Mobile Authentication is utilised. The narrow focus on knowledge can further be explained by the definition of knowledge and the agreement on whose knowledge counts.

Pelto and Pelto (1997) have pointed out that knowledge is based on scientific facts and universal truths (refers to "knowing" about medical information. The medical information as applicable is the utilisation of the Mobile Authentication service for detecting counterfeit pharmaceutical products. This buttressed by the submission of Agbedia (2013) that knowledge is usually assessed in order to see how far community knowledge corresponds to biomedical concepts. Typical questions include knowledge about causes and symptoms of the illness under investigation, method of applying contraceptives, detecting counterfeit pharmaceutical products, how to avoid overdose of medicines. Obviously, People reported knowledge which deviates from biomedical concepts is usually termed as 'beliefs'. This has come to be deeply entrenched in the mind of the individual. In applying this to the aforementioned finding, it is also clear that respondents had knowledge of the Mobile Authentication Service and the utilisation of the service.

Research question three: What are the media-related sources of awareness on the Mobile Authentication Service (MAS) in the South East, Nigeria?

This research question was addressed using items 15, 16, and 17 on the questionnaire. These items were designed to investigate channels of communication through which respondents got to learn of the Mobile Authentication Service and if the said channels were deemed adequate by respondents. Data to this effect were presented in Table 4.11, 4.12 and 4.13. The Internet was primarily responsible for respondents' knowledge and awareness of the Mobile Authentication Service. This is revealed in table 4.11 as 57% of respondents indicated that they knew of MAS through the Internet, Radio had 8%, Flyers had 2%, Newspaper had 0%, friends and family was 7%, Television had 3% and 23% had not heard of it.

Table 4.12 displays an accepted decision of 2.9, and this indicates that the channels for awareness on the MAS were seen to be adequate by respondents. This implies that television, radio and the Internet as used by NAFDAC were sufficient and therefore served the purpose of creating awareness on MAS. The Internet was accepted by most respondents as the most potent medium for propagating awareness on the Mobile Authentication Service. In concrete terms, the media-related sources of awareness on the Mobile Authentication service for South- East residents were

primarily the Internet. Mainstream channels of communication such as radio and television also served as sources of information and awareness.

It is important to factor in one of the theories that served as a framework for this thesis to establish the nexus therein. This brings to the front burner the diffusion of innovations theory. Rogers diffusion of innovations theory has as its second and also crucial element communication channels. Starting with communication, Rogers (2003) sees the concept as a process in which participants create and share information with one another in attempts to arrive at mutual understanding. Given what communication is, it is inevitable that it occurs through channels between the sender and the receiver. The source or sender refers to the individual or institution responsible for the message. The receiver is one whom the message gets to or is targeted. As postulated by Zhag et al., (2015), communication channels in diffusion of innovations refer to the medium through which people obtain information about the innovation and perceive its usefulness this can broadly involve the mass media and interpersonal communication. As the finding reveals, a good number of respondents have access to the Internet. Thus, through the Internet, a potent communication channel, messages from NAFDAC on the Mobile Authentication Service were channelled.

Singhal (2009) restates the place of communication by asserting that diffusion of innovations theory is of interest to communication scholars because at its core is a communication process because an innovation is made through communication channels. Thus, it is impossible for diffusion to occur or individuals to find out about an innovation without it being communicated. NAFDAC in its communication campaign on sensitizing citizens on the use of the Mobile Authentication Service has used a plethora of communication channels. The Internet was indicated to be the one through which most respondents got to know about the mobile Authentication Service. Mainstream channels such as radio, television and the newspaper were not left. While the newspaper was not seen as one of the channels respondents heard of the Mobile Authentication Service from, it remains a channel nonetheless. Attention must also be paid to the place of interpersonal communication through friends and family. Although only 7% used agreed to interpersonal communication, it should be noted that it also served a purpose.

Reed et al., (1999) aver that communication channels through which diffusion may occur can be broadly classified to two categories namely networks and mass communication. Social networks mainly refer to interpersonal communication which occur at the personal level, regional and national level and mostly involve direct contact. Mass communication channels include television, radio, the Internet and print media channels such as newspapers and books. Evidently, both networks and mass channels were seen to serve as channels through which the innovation on Mobile Authentication Service was deployed. There is a wide margin between the number of respondents who heard of Mobile Authentication Service through the Internet than through other sources is worthy of note, contemporary communicators should note that the new media have come to stay and is gradually becoming the major source of communication and as such should key into it and use it maximally in formation of policies and in this case enhancement of health education.

Rogers (2003) refers to communication channels as either mass communication or interpersonal communication. He asserts that diffusion is a very social process that involves interpersonal relations, thus making interpersonal channels more powerful to create or change strong attitudes held by an individual. Rogers (2003) further classifies or categorises

communication channels as localite channels or cosmopolitan channels that communicate between an individual of the social system and outside sources. Inter-personal sources can either be local or cosmopolite while all mass media channels are cosmopolite. On the basis of the characteristics of communication channels, mass media channels are more significant at the knowledge stage while localite channels and interpersonal channels are more significant at the persuasion stage. Summing up communication channels in the diffusion process,

Signhal (2009) asserts that since innovation is made known through communication channels, mass media and mass communication are involved in the process in that they contribute to awareness about the new idea. Interpersonal communication is said to be absolutely significant to the diffusion process in the sense that the decision to adopt an innovation depends largely on discussions and interactions with peers (friends and family) who likely must have evaluated and made a decision about adopting an innovation but the finding of this study which showed that only 7% of the respondents heard of the campaign through interpersonal sources shows that this is no longer entirely true in the present contemporary society. Signhal (2009) however argues that with the emergence of the internet and smart phones the lines between interpersonal and mass communication is blurred because potential innovators are just likely to find out about an innovation via a computer-mediated format and to evaluate it the same way through chat rooms and online reviews.

The finding on channels of communication that create awareness correlated with extant literature. Specifically, the Internet was seen as the most potent medium of communication. It was also the source of information for most respondents on the Mobile Authentication Service. This explicitly agrees with Singhal (2009) that the Internet has become an important channel for diffusion of innovations to occur. Reference can also be made to previous studies reviewed in section 2.3 with regard to this finding. In a study undertaken by Ude-Akpeh et al., (2019) entitled 'Curbing the menace of fake drug circulation in Nigeria: The media option', the authors lent support to the argument that the media can actively play a developmental role through sensitization on the menace of counterfeit drugs.

The authors hinge their argument on the proposition that the surveillance function of the media gives them the responsibility to cover, analyse and report impending dangers that are threats to lives and properties of a given society. Findings from their study revealed that the broadcast media had done considerably well in curbing the menace of fake drug circulation. The mass media were seen as important aids in addressing the problem of high risk of fake drugs in the Nigerian society. The study also showed that the mass media helped in creating awareness on curbing the circulation of fake drugs in the country by relevant specialized agencies. Obviously, there is a relationship between the findings from the above study and the present. The media are seen as sources of awareness on fake drugs and in the case of the present study, the media especially the internet constitute a source of awareness on the Mobile Authentication Service.

Conclusion

The problem of fake drugs has continued almost unabated for decades now. Though it is seen to be a global problem, evidence points to the fact that developing nations of the world are seen to suffer more from the scourge of counterfeit pharmaceutical products than developed nations. The consequences of consuming these counterfeited pharmaceutical products have been dire. Statistics have shown that consuming fake drugs has led to the death of thousands of people worldwide.

Counterfeit drugs not only take income from consumers, by having them pay for products that have little or no medical value, but they can also lead to unresolved health problems.

In handling the menace of counterfeit pharmaceutical drugs, there have been several challenges. With the advent of technology, however, it appeared there is a chance that the manufacture, circulation and consumption of fake drugs will reduce drastically. Technological innovations have been deployed by NAFDAC to support consumers in avoiding the consumption of fake drugs. The Mobile Authentication Service is one of the technological services introduced by NAFDAC to tackle the scourge of fake drugs. In 2010, NAFDAC deployed the Mobile Authentication Service scheme as one of the anti-counterfeit strategies to detect substandard and falsified medical products. The scheme uses scratch codes and Short Messaging Service (SMS) to empower consumers to verify the authenticity of medicines at the point of purchase thus putting the power of detecting counterfeit in the hands of consumers. This study was focused on the Mobile Authentication Service.

Based on the findings of this study, conclusions can be drawn using the dichotomy of theory and practice. The diffusion of innovations theory came into full glare as the study had at its core knowledge both of what constitutes counterfeit pharmaceutical products and also knowledge of the Mobile Authentication Service. Knowledge is a key factor in the innovation-decision process. Diffusion of innovations is applicable and demonstrable in the study especially within the realm of knowledge. With respect to attitude and practice, the study goes on to conclude that the theoretical foundations of the diffusion of innovations are potent. As South East residents have come to know about the Mobile Authentication Service, which is an innovation, the actual use of the service represents the implementation and confirmation stage of the innovation-decision process.

Recommendations

The following recommendations have been made based on the findings of the study.

1. There is need to increase the level of knowledge of South East residents on counterfeit drugs to further improve their understanding of the variants of fake drugs. Such can be done through the extensive use of the mass media, social media and interpersonal communication in order to ensure that all are knowledgeable about fake drugs and all the conditions that make a drug be regarded as fake.
2. The National Agency for Food and Drug Administration and Control must improve o its campaign on the Mobile Authentication Service so as to boost the level of knowledge South Eat residents have of the service.
3. The National Agency on Food and Drug Administration and Control, Non-Governmental organisations, pharmaceutical companies and other stakeholders in the pharmaceutical industry must endeavour to utilize maximally all available communication channels in order to improve the level the awareness on the Mobile Authentication Service.

References

Agbedia, C. (2013). Knowledge, attitude and practice (KAP) of sandwich under graduate students of Delta State University, Abraka, Nigerian on condom use in the prevention of sexually transmitted infections, and unwanted pregnancy. *Journal of Humanities and Social Sciences*, 11 (4), 12-26.

Akinyadenu, O. (2013). Counterfeit drugs in Nigeria: A threat to public health. *African Journal of Pharmacy and Pharmacology*, 7(36), 2571-2576.

Akunyili, D. (2010). "Selling the Nigerian Brand in 2010", Daily Sun, Wednesday, January 23.
Akunyili, D. 2010. "Selling the Nigerian Brand i
Aminu, N., & Gwarzo, M. S. (2017). The imminent threats of counterfeit drugs to quality health care delivery in Africa: Updates on consequences and way forward. *Asian Journal of Pharmaceutical and Clinical Research, 10*(7), 63 67.

Ayodokun, O. J. (2016). The use of mobile phone to check for the authenticity of pharmaceutical products in Nigeria a case study of mobile authentication service (MAS). http://www.ifra-nigeria.org.

Badran, I. G. (1995). Knowledge, attitude and practice the three pillars of excellence and wisdom: A place in the medical profession. *EMHJ - Eastern Mediterranean Health Journal, 1 (1), 8-16*.

Blackstone, E. A., Fuhr, J. P. Jr, Pociask, S. (2014). The health and economic effects of counterfeit drugs. *American Health Drug Benefits,7*(4), 216 -24.

Buowari, Y.D. (2012). Indications for caesarean section at a Nigerian district hospital. *Nigerian Health Journal*, 12, 43-46.

Imoh, G. (2003) Communication factors that influence mother's decision to complete childhood immunization in rural Nigeria: *Global Journal of Arts Humanities and Social Sciences*, 7, 7-17.

Kaliyaperumal, K., Expert, I. E. (2004). *Guideline for conducting a knowledge, attitude and practice.* Rotary Aravid International Eye Bank.

Launiala, A. (2009). How much can a KAP survey tell us about peoples Knowledge attitude and practices? Some observations from medical anthropology research on malaria in pregnancy in Malawi. *Anthropology Matters Journal*, 11(1).

Ogbeide, O. & Ogunnaike, O. O. (2008). Safeguarding the health of Nigeria: Challenges and suggestions for NAFDAC,1992 –2008. *International Journal of Current Research* 5(5),1034 -1038

Oladosu, J., Taiwo, D., & Oyeleye, C. A. (2016). *Consumer verification system for authentic product: Case study of manufactured product*. OcRI.

Oluwatuyi, O., & Ileri, O. N. (2014). Fake drugs syndrome and implications on national development. *Research Journal in Organizational Psychology & Educational Studies*, 3, 393 – 402.

Omotoso, F. (2006). Corruption, Private Accumulation and Problem of Development in Nigeria. *The Social Sciences*, (1) 335 -343.

Pelto, P., & Pelto, G. (1997). Studying knowledge, culture, and behaviour in applied medical anthropology. *Medical Anthropology Quarterly*, 11(2), 147-163.

Reed H., Rona B. and Casterline. J. (Eds). 1999. The role of diffusion processes in fertility change in developing countries: Report of a workshop. Washington, D.C. :National Academy PressRenne.

Rogers, E.M. (2003). *Diffusion of innovations*. Free Press. New York.

Sahin, I. (2006) Detailed review of Rogers' diffusion of innovations theory and educational technology-related studies based on Rogers' theory. *The Turkish Online Journal of Educational Technology*, 5, 14-23.

Ude-Akpeh, C.E., Ezeoke, C.B. (2017). Knowledge, attitude and practice (KAP) study of diffusion of food alert campaign in Anambra State. *Internationl Journal of Buisness and Management invention*, 5(3), 35-49.

Vorrath, J., & Voss, M. (2019). The hidden dangers of falsified and substandard medicines: Developing countries are most affected by the illegal trade. Stiftung Wissenschaft und Politik (SWP), German Institute for International and Security Affairs.

Zhang, X,.,Yu, P., Yan, J. (2015) Using diffusion of innovation theory to understand the factors impacting patient acceptance and use of consumer e-health innovations: A case study in a primary care clinic. *BMC Health Services Resources*.15(71),1–15.