

ORIGINAL ARTICLE

Knowledge, belief and practice of interventions to contain antimicrobial resistance among physicians in Sokoto, North-West Nigeria

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ABSTRACT

Background: Antimicrobial Resistance (AMR) continued to be a major public health problem worldwide. The present study assessed the knowledge, belief and practice of intervention to contain AMR among physicians in Sokoto State, North-West Nigeria.

Methodology: This is a cross-sectional study involving 105 physicians sampled for the current population of 400 physicians working across the State. A multi-stage sampling technique was used to select eligible participants for this study. Using self-administered questionnaire relevant data was obtained from the respondents. This study receives ethics approval from the Usmanu Danfodiyo University Teaching Hospital, Sokoto. Data analysis included mean, proportions, chi square test and independent sample t-Test.

Results: Overall, all the participants were knowledgeable about AMR. We found that 57.1% of the participants lack the up-to-date information on AMR. Majority of the participants (81.9%) had no training on AMR. Over 2/3rd (67.6%) use results of anti-microbial sensitivity test (AST) test to guide patients anti-microbial treatment and 69.5% of the respondents were aware of general interventions to contain AMR. Similarly, 73.3% of the respondents were not aware of the WHO Global strategy for the containment of AMR. Majority of participants agreed or strongly agreed AMR as worldwide and national problem but few considered AMR as problem in their own hospitals.

Conclusion: Majority of physicians lack knowledge on the WHO Global Strategy for the containment of AMR and up-to-date knowledge on AMR. Self-prescription by patients and poor awareness on WHO global strategy for the containment of AMR are areas of interventions for prevention and control of AMR.

Keywords: Antibiotics, healthcare workers, sensitivity test, WHO global strategy

INTRODUCTION

Antimicrobial Resistance (AMR) is a natural phenomenon in which microorganisms acquire genes that enable resistance to antimicrobial agents.¹ Consequently, lots of antibiotics are losing their ability to treat infectious diseases. This occurs in all microbes such as bacteria, viruses and parasites. Examples of AMR include multi-drug resistant and extensively drug resistant tuberculosis, multi-drug resistant malaria and methicillin resistant *staphylococcus aureus* (MRSA). Resistance genes can be shared between microbes either via vertical transmission or horizontal transmission. In vertical transmission, resistance gene is transferred from the parent microbe to its offspring when it replicates, while in horizontal transmission the transmitted resistance gene can be chromosomal or extrachromosomal such as plasmid. Plasmid transfer resistance between bacteria because they are extrachromosomal strands of deoxyribonucleic acid (DNA) that carry resistance genes.²

Antimicrobial Resistance (AMR) continued to be a major public health problem throughout the world.³ However, it is more serious in developing countries due to antibiotic use without medical guidance and inadequate regulation of antibiotics.^{4,5} The prevalence of methicillin resistant *staphylococcus aureus* (MRSA) among health care workers in Anambra State, Nigeria was found to be 30%.⁶ The problem of AMR is accelerated by proliferation of antimicrobial agents and their abundant use and misuse by humans in the form of irregular and inappropriate treatment by health care workers as well as self-medication by the patients.^{5,6,8} Furthermore, lacking are the proper legal frameworks that support quality and appropriate use of antimicrobials and implementing poor managerial mechanisms for proper selection, procurement, distribution, and use of these valuable medicines.¹

Antimicrobial resistance results in increased morbidity, loss of productivity, increased mortality, increased period of infectivity and cost of care.⁷ However, changes in

antimicrobial prescribing patterns will demand changes in physicians' behaviour towards the magnitude of AMR problem.⁸ Thus, information on physicians' knowledge, belief and practice on interventions to contain AMR will permit the development of more effective interventions on containment of AMR. Numerous surveys have been conducted to assess physicians' knowledge and beliefs about antimicrobial use and resistance in USA and Europe.^{9,10,11} However, these studies are scarce in our settings and extrapolations of the results from studies in developed world are not necessarily applicable to the situation in countries like Nigeria.

The World Health Assembly passed a resolution in support of the containment of AMR among these responses is the WHO Global Strategy (WHO-GS) for Containment of Antimicrobial Resistance. This WHO document contained interventions which are: reducing disease burden and spread of infection, improving access to appropriate antimicrobials, improving use of antimicrobials, strengthening health systems and surveillance capabilities, enforcing regulations and legislation, encouraging development of appropriate new drugs and vaccines.¹² The global strategy interventions target general public, patients, health care professionals, and hospital managers. Coordinated efforts to implement the WHO-GS at the country level have been limited, particularly in countries such as Nigeria.¹²

This study aimed at assessing the knowledge, belief and practice of interventions to contain AMR among physicians in selected health facilities in Sokoto State, North-West Nigeria.

METHODOLOGY

The study was conducted among physicians practising in tertiary health facilities in Sokoto State. A cross-sectional descriptive study method was used and 105 physicians were recruited as a proportionate sample for the current population of 400 physicians working across the State. A multi-stage sampling technique was used to select eligible participants for this study. A semi-structured

self-administered questionnaire on the knowledge, believe and practice of interventions to contain AMR was used. Data analysis was performed using the Statistical Package for Social Sciences [SPSS] for windows version 21.0. The choice of statistical test was guided by the normality of the data distribution. Normally distributed data were summarized using mean and standard deviations, while proportions and percentages were used to summarize categorical data. Ethical clearance was obtained from the Ethics Committee of the Specialist Hospital and Usmanu Danfodiyo University Teaching Hospital, Sokoto (UDUTH/HREC/2014/No.244).

RESULTS

Participants' Profiles and Sources of Information on AMR

Table 1 presented the participants profile and sources of information on AMR. From the table, a total of 105 physicians participated in this study; of which 97 (92.4%) were general practitioners. The mean service years was 4.5 (SD \pm 4.0). Participants' most common current sources of information about AMR were from relevant books 40%, sources such as university courses and trainings workshops 53.3% and internet, 6.7%. However, 57.1% of the participants lack the up-to-date information on AMR.

Majority of the participants (81.9%) had no training on AMR while only 18.1% had the training. Participants' use of antimicrobial susceptibility test (AST) result, training status on AMR and working departments are illustrated in Table 1. Of the study participants, 67.6% replied that they hardly wait for the results of AST test before commencing anti-microbial treatment of their patients.

Physicians' Rating of the Scope of AMR Problem

About 68% and 53% of the Physicians agreed that AMR is a problem worldwide and in

their hospitals respectively while 52% strongly agreed that AMR is a problem in Nigeria (Table 2).

Table 1. Physicians' profiles

Characteristics	No. (%)
Hospital of Practice	72 (68.6)
UDUTH	23 (21.9)
Specialist Hospital Sokoto	10 (9.5)
Others	
Highest Qualifications	8 (7.6)
Fellowship (FWCS/P, DS)	97 (92.4)
MBBS/BDS	
Departments / Subspecialty	21 (20.0)
Surgery	29 (27.6)
Medicine	25 (23.8)
Pediatrics	8 (7.6)
Obstetrics and gynecology	22 (21.0)
Others	
Years of Service	4.53
Mean (SD) years	(4.0)
Training Attended on AMR	19(18.1)
Yes	86(81.9)
No	
Using AST Results	
Yes	33(31.4)
No	72(67.6)
Source of Information	42(40.0)
Books	7(6.7)
Internet	56(53.3)
School course/workshops	
Lack of up to-date information	60(57.1)

Usmanu Danfodiyo University Teaching Hospital (UDUTH), Bachelor of Medicine and Bachelor of Surgery/ Bachelor of Dental Surgery (MBBS/BDS), Fellow West African College of Surgeon/Physician (FWCS/P), Dental Surgeon (DS), Anti-microbial Resistance (AMR), Anti-microbial Susceptibility Test (AST)

Table 2. Percentage of physicians' rating of the scope of AMR problem

Scope of AMR	Strongly agree	Agree	Disagree	Strongly disagree	Don't know
AMR is a worldwide problem	28(26.7)	71(67.6)	4(3.8)	1(1.0)	1 (1.0)
AMR is a problem in Nigeria	55(52.4)	45(42.9)	2(1.9)	3(2.9)	
AMR is a problem in your hospital	24(22.9)	56(53.3)	7(6.7)	1(1.0)	17(16.2)

AMR: Anti-microbial Resistance

Knowledge on Causes and Prevalence of Antimicrobial Resistance

The most important perceived contributing factors to the development of antimicrobial resistance according to the study participants were: bacterial mutations (96.2%), widespread/overuse of antibiotics (95.2%), patient poor adherence to prescribed antibiotics (95.2%) and poor infection control in hospitals (90.5%), see Table 3. Similarly, assessment of respondents' knowledge on local factors that lead to the spread of AMR was also augmented with open ended question. The most important local factors

identified were: self-prescription by patients (97.1%), prescribers' poor awareness on AMR was responded by 87.6% and lack of access to local anti-biogram data was affirmed to by 68.6%. Participants were also asked to identify some of the common drug resistant bacteria in hospitals from local to global levels by open questions. Methicillin resistant *staphylococcus aureus* (MRSA) was rated 86.7%, multidrug resistant tuberculosis (MDR-TB) 84.8%, vancomycin resistant *staphylococcus aureus* (VRSA) 61.9% while *pseudomonas aeruginosa* was rated 33.3% (Table 3).

Table 3. Knowledge of AMR and its perceived causes

Variable	Response		
	Yes N (%)	No N (%)	I don't know N (%)
Cause of AMR			
Widespread/overuse of Antibiotics	100(95.2)	5(4.8)	9(8.6)
Usage of broad spectrum antibiotics	64(61.0)	32(30.5)	17(16.2)
Bacterial mutations	101(96.2)	4(3.8)	5(4.8)
Poor hand washing practice	61(58.1)	27(25.7)	1(1.0)
Poor infection control in hospitals	95(90.5)	5(4.8)	4(3.8)
Patient Poor adherence to antibiotics	100(95.2)	4(3.8)	
Substandard quality of antibiotics	98(93.3)	3(2.9)	
Example of AMR bacteria			
MRSA	91(86.7)	4(3.8)	10(9.5)
VRSA	65(61.9)	9(8.6)	31(29.5)
<i>Pseudomonas aeruginosa</i>	35(33.3)	13(12.4)	57(54.3)
MDR-TB	89(84.8)	2(1.9)	14(13.3)
Local factors for development of AMR			
Self-prescription by patients	102(97.1)	3(2.9)	22(21.0)
Lack of access to local anti-biogram data	72(68.6)	11(10.5)	5(4.8)
Prescribers poor awareness on AMR	92(87.6)	8(7.6)	

Methicillin resistant *staphylococcus aureus* (MRSA), Vancomycin resistant *staphylococcus aureus* (VRSA), Multidrug resistant tuberculosis (MDR-TB), Anti-microbial Resistance (AMR)

Physicians' Beliefs on Causes of Avoidable Widespread/ Overuse of Antibiotics

According to participants, the leading factors were: treatment failure, patient push, and critically ill or immune compromised patients. Respondents were also asked to rate

bacterial infections in which avoidable use of antibiotics are common. Diarrheal diseases was rated 84.8%, unknown febrile illness 81.9%, upper respiratory tract infection 81% and urinary tract infection 36.2% (Table 4).

Table 4. Physicians' beliefs on causes of avoidable widespread / overuse of antibiotics

Variable	Yes N (%)	No N (%)	I don't know N (%)
Reasons for avoidable use of antibiotics			
Patients push	74(70.5)	17(16.2)	14(13.3)
Treatment failure	86(81.9)	14(13.3)	5(4.8)
Critical ill or immune compromise patients	67(63.8)	26(24.8)	12(11.4)
Hospital profit	40(38.1)	41(39.0)	24(22.9)
Examples of diseases/infectious where avoidable use of antibiotics is common			
URTI	85(81.0)	20(19.0)	
Febrile illness (unknown origin/cause)	86(81.9)	17(16.2)	2(1.9)
UTI	38(36.2)	62(59.0)	5(4.8)
Diarrheal diseases	89(84.8)	16(15.2)	

Upper respiratory tract infection (URTI), Urinary tract infection (UTI)

Physicians' Knowledge on Interventions to Contain AMR

About 69.5% of the respondents were aware of general interventions to contain AMR while 27.6% were not aware. Their major source of knowledge was university courses / Training (32.4%). Similarly, 73.3% of the respondents were not aware of the WHO Global Strategy for the Containment of AMR, while, only 19% were aware of the strategy and their major source of knowledge is the internet (11.4%), see Table 5.

Beliefs on Potential Interventions for Antimicrobial Resistance

Antimicrobial usage policy, education on antimicrobial therapy for prescribers, institutional guidelines for antimicrobial use and established microbiology diagnostic services were considered strong interventions for antimicrobial resistance. However, reduction of antibiotic use for outpatient setting was considered not a strong intervention (Table 6).

Table 5. Physicians' knowledge on interventions to contain AMR

Intervention	Yes (%)	No (%)	Don't know
General intervention	73(69.5)	29(27.6)	3(2.9)
WHO Global strategy for containment of AMR	20(19.0)	77(73.3)	8(7.6)

Table 6. Beliefs on potential interventions to combat AMR resistance

Variables	Strongly agree (%)	Agree (%)	Disagree (%)	Strongly disagree	Don't know
Antimicrobial usage policy	64(61)	41(39)		-	-
Reduction of antibiotic use for outpatient setting	12(11.4)	58(55.2)	35(33.4)	-	-
Established NAMR surveillance	54(51.4)	51(48.6)		-	-
Established HICC	54(51.4)	49(46.7)	2(1.9)	-	-
Institutional guidelines for anti-microbial use	60(57.1)	45(42.9)		-	-
Education on anti-microbial therapy for prescribers	62(59.0)	41(39.0)	2(1.9)	-	-
Established microbiology diagnostic services	55(52.4)	47(44.8)	3(2.9)	-	-

National anti-microbial resistance (NAMR), Hospital Infection Control Committee (HICC)

DISCUSSION

Physicians are the major stakeholders in the prevention and control of antimicrobial resistance through their wise prescription of antibiotics, controlling transmission of drug resistant bacteria and promoting appropriate awareness. Hence, the current study demonstrated the knowledge, belief and practice of interventions to contain AMR in selected hospitals in Sokoto State, North-West Nigeria.

Regarding the scope of AMR problem, majority of the physicians strongly agreed or agreed AMR as global and national public health problems but, few of the respondents recognized AMR as a problem in their hospitals. These findings are similar to those from other studies.^{1,13,14,15} This is in contrast to findings from studies conducted in Spain, Brazil, Peru where 90% of physicians perceived AMR as global and national problem.^{13,16,17}

Majority of physicians are aware of the existence of antibiotic resistant bacteria. For instance, 86.7% of physicians had information with regards to MRSA. This is however, higher than physicians' knowledge of MRSA documented in Ethiopia.⁵ Although, MDR-TB is not a hospital pathogen, majority of the physicians (84.8%) mentioned it as one of the most prevalent resistant bacteria in the

hospitals. The gaps in knowledge on local antibiotic resistance can be attributable to the gross unavailability of bacteriological culture and susceptibility testing in most hospitals.¹⁴ Also, only 18.1% of physicians had training on antimicrobial stewardship education.

The leading causes of AMR were: bacterial mutations, patients' poor adherence to prescribed antibiotics, over use of antibiotics and substandard quality of antibiotics. Similarly, a study conducted in Scotland, France and Spain stated that too many antibiotic prescriptions, too many broad-spectrum antibiotics and inappropriate duration of antibiotic treatment were the leading factors.^{17,18} Poor hand washing was, however, not well recognized in this study as contributing factors to AMR in hospital settings similar to other studies.^{17,18} Therefore, emphasis on proper hand washing and infection control measures must be implemented.

This study revealed that the most important local factors for spread and development of AMR were self-antibiotic prescription and prescribers' poor awareness on AMR. Furthermore, lack of access to antimicrobial susceptibility testing was mentioned as local factors. Some other studies also supported this findings.^{4,19}

Regarding potential interventions to combat AMR, majority of participants believed in the following measures: antimicrobial usage policy, education on antimicrobial therapy for prescribers and institutional guidelines for antimicrobial use. However, only 55.2% of the physicians were in support of reduction of antibiotic use for outpatient setting. These findings were not in agreement with a previous study on beliefs of physicians.²⁰

Regarding physicians' beliefs towards the pushing factors for frequent prescription of antibiotics, treatment failure and patient push were the most driving factors. This is consistent with the findings in Ethiopia.⁸ Critically ill/immune compromised patients was also mentioned by 63.8% of respondents.¹⁴ Majority of physicians (84.8%) believed that diarrhoeal diseases was the leading factor for excessive antibiotic prescriptions.

On physicians' knowledge on interventions to contain AMR, about 69.5% of the physicians were knowledgeable about general interventions to combat AMR but only 19% of physicians knew about WHO global strategy for the containment of AMR.

CONCLUSION

This study revealed important information on knowledge, beliefs and practice of interventions to contain AMR by physicians that would be implemented in a resource-poor country like Nigeria. In this survey, physicians working in government hospitals had information gap on WHO global strategy for the containment of antimicrobial resistance. Hence, there is a need to formulate antimicrobial usage policies, programmes and training, in order to educate all physicians on the WHO Global Strategy and to monitor or evaluate these programmes periodically. According to the physicians' response, self-drug prescription by patients, poor awareness on AMR and unavailability of local anti-bio-gram data are issues of great concern.

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