

Original Article

Knowledge, attitude, and practice toward antibiotic use among the general public in a resource-poor setting: A case of Aden-Yemen

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Abstract

Introduction: Antibiotic overuse and misuse can cause serious health issues. These problems have contributed to a rise in bacterial resistance. Hence, our study aims to highlight the existing knowledge and attitudes toward antibiotic usage among the general public in Aden-Yemen.

Methodology: A cross-sectional descriptive study of knowledge, attitude, and practice of the general public was conducted in different areas of Aden city–Yemen. The study conveniently selected a sample of 400 general public working in different areas in Aden. Descriptive statistics were used for data analysis.

Results: A total of 400 participants were involved in the study. Nearly 88.8% administered antibiotics in all cases of fever, 58.3% thought that antibiotics could cure infections caused by the virus, and 65.5% disagree that antibiotics should be stopped as soon as the complaint disappears. More than 77.5% thought that antibiotics in cases of the common cold are not necessary. However, 46.5% incorrectly thought that "early use of antibiotics in patients with cough, running nose, and sore throat would be cured quickly". Concerning knowledge of antibiotic resistance, 81.5% correctly answered that "overuse of antibiotics increases the risk of resistance. Most respondents reported that physicians were their primary source of information regarding antibiotic use. The most noted among respondents was that 62.7% had antibiotics for treatment without prescription in the last six months.

Conclusions: Respondents have adequate knowledge and moderate attitude toward antibiotic use. However, self-medication was common practice among the general public of Aden. Therefore, they had a misunderstanding, misconception, and irrational use of antibiotics.

Key words: Antibiotics use; knowledge; attitude; practice; self-medication; Yemen.

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Introduction

The discovery of antibiotics was a major scientific revolution in the medical field that contributed to controlling and managing infectious diseases. The antibiotic's preventive and curable use helped improve patient health [1]. However, developing resistant microorganisms seriously reduces their effectiveness [2]. This problem leads to several other health circumstances, such as prolongation of the therapy duration, increased hospitalization period, increased mortality, use of other drugs, additional laboratory tests, and increased cost of treatment [3]. In 2010, a study conducted in India, Pakistan, and the UK reported the emergence of a resistant bacterium to nearly all antibiotics [4]. The worldwide surveillance carried out

by the World Health Organization (WHO) described antimicrobial resistance in several parts of the world [5]. Many cases have reported bacterial resistance to the last therapeutic options to combat infectious diseases such as colistin resistance that has been reported in different parts of the world [6,7].

Several factors lead to the emergence of antibiotic-resistant. The most important factor is the prevalent and irrational antimicrobial use. The irrational use of antibiotics results from several relevant factors: physician prescription patterns and knowledge, unreliable diagnosis, patient insistence, poor patient-health workers interaction, and sociocultural, economic, and healthcare regulatory policy [8]. Additionally, patients' knowledge, idea, and attitudes,

anticipation, past practice with antibiotics, self-medication, irregular use, and prescribing antibiotics for viral infections have been contributing factors to the prevalence and appearance of antibiotic-resistant microorganisms [2]. Antibiotics are the most frequently self-medicated drugs in many countries globally. It is assumed that about 66.66% of all oral antibiotics consumed globally are used without a prescription [9]. A meta-analysis study based on 35 public surveys from five continents reviewed the use of antimicrobials without prescription from 1970 to 2009; this study indicated that self-medication with antibiotics varied from 3% to 100% [10]. Consequently, the rational use of antibiotics requires several interventions, including knowledgeable and engaged healthcare practitioners and the public.

According to the WHO, three leading practices were recognized for public contribution: improve the approach to medical services, control the use of antimicrobials, advise the patients to complete the course of treatment, and not share out leftover medication with other people or keep them for future needs. Furthermore, the WHO insists on starting educational programs for patients and the general population involving the rational utilization of antibiotics to reduce the prevalence of resistance [11]. Although enhancing public knowledge and altering their attitudes toward antibiotic utilization will be a vital initial policy to preserve antibiotic efficiency. However, there are extensive dissimilarities in antibiotic use worldwide, and educational programs should be designed according to the understanding of the public knowledge, attitudes, and behaviors toward antibiotic use in each country. Several studies have examined the general population's antibiotic use, knowledge, attitudes, and behaviors [12,13]. There is an association between the patients' knowledge about antibiotics and their attitude toward using antibiotics [14,15]. The higher the patients' perceptions towards antibiotics, the better their practice of antibiotics will be reflected in their self-medicating behavior. Therefore, the random use of antibiotics could be reduced by realizing the public's knowledge and awareness of the rational use of antibiotics.

The situation is somewhat worse in developing countries due to lower medical access and poor health policy. In a study conducted in 2015 to prospect the antibiotic prescribing patterns at outpatient departments in Aden (Yemen) hospitals, the number of prescriptions, including antibiotics, was 84.2%, far from the typical values stated by WHO [16]. The present study aims to highlight the existing knowledge

and attitudes toward antibiotic usage among the general public in Aden-Yemen. The current study's findings will help develop awareness programs to raise the knowledge and proper use of antibiotics.

Methodology

Study design and sampling

A cross-sectional descriptive study of the general public's knowledge, attitude, and practice (KAP) was conducted in different areas of the southern port city of Aden-Yemen between November 2019 and January 2020. The Raosoft sample size calculator (<http://www.raosoft.com/samplesize.html>) was used to estimate the sample size with a margin of error of 5%, a confidence interval of 95%, and a 50% response rate, and a 20% non-response rate. The estimated sample size was at least 377. We conveniently selected a sample of 400 general public working in different areas in Aden. Individuals were excluded from the study if they were under 18 years old and unwilling to participate.

Study tool and data collection

The questionnaire comprises four sections dealing with participants' demographics, knowledge, attitudes, and practices regarding antibiotics in Yemen [17,18]. It was pretested and validated in a study targeting the general public in Pakistan [19]. It was initially adopted in English and then translated into local Arabic. The Arabic version of the questionnaire was pre-tested on 20 individuals to identify unclear or difficult questions and ensure relevant content and length adequacy. After minor changes, the questionnaire was completed and distributed to the target group. Ten pharmacy students conveniently distributed the final questionnaire to the general public, who also collected responses from respondents.

Ethics approval

The study protocol was approved by the Ethics Research Committee of the Faculty of Medicine and Health Sciences at the University of Aden. All participants who agreed to participate in the study gave written consent after determining the objectives, meaning, and benefits of the research, and that participation was voluntary.

Data analysis

The data was entered and analyzed using IBM SPSS statistics version 26.0 for windows (IBM Corp., Armonk, NY, USA). Completed questionnaire data were evaluated according to different criteria. Data

were described using mean (SD), and categorical variables, such as socio-demographic data, knowledge, attitudes, and practice were reported as frequency and percentage.

Results

General characteristics of respondents

A total of 400 questionnaires were completed by eligible and consenting participants living in Aden city. More than half (53.5%) of respondents were females, and the mean age was 33.1, ranging between 18 and 79. Concerning the educational status of the respondents, 70.5% had a college/university degree and were primarily distributed in the central town (83.3%). 60.5% of respondents were single, and 60.3% of participants had an income of more than 50000YR. The number of children and the number of people in respondents' households were 2.44 and 6.68, respectively (Table 1).

Knowledge of antibiotic use

The responses to the knowledge-based questions, adapted from the Euro-barometer survey, are represented in Table 2. In the term of knowledge on antibiotic use, the majority of respondents (88.8%) correctly recognized the statement that stated that antibiotics should be administered in all cases of fever; 70.8% disagree that antibiotics they use do not cause side effects, and 58.3% correctly thought that antibiotics could cure infections caused by the virus. Slightly more than half of the respondents were correct when asked if "Antibiotics and anti-inflammatory drugs are the same drug", and 65.5% disagreed that antibiotic should be stopped as soon as the complaint disappear. More than three-quarters (77.5%) thought that antibiotics in cases of the common cold are unnecessary. However, 46.5% incorrectly believed that

Table 1. Demographic Characters of the participants.

Characteristics	N (%)
Age (years): Mean ± Std Dev	
33.01 ± 11.1	minimum 18 and maximum 79 years
Gender	
Male	186 (46.5)
Female	214 (53.5)
Educational Status	
Primary school or below	22 (5.5)
Secondary School	37 (9.3)
High School / Secondary Technical college	39 (9.8)
College / University	282 (70.5)
Postgraduate studies or above	20 (5.0)
Living area	
Central town	333 (83.3)
Village	67 (16.8)
Marital Status	
Single	242 (60.5)
Married	140 (35.0)
Divorced	5 (1.3)
Widowed	2 (0.5)
Missing	11 (2.8)
Income of your household	
Below 15000 YER	37 (9.3%)
15001-30000 YER	50 (12.5%)
30001-50000 YER	70 (17.5%)
Above 50000 YER	241 (60.3%)

early use of antibiotics in patients with cough, running nose, and sore throat would be cured quickly. Concerning knowledge of antibiotic resistance, 81.5% correctly answered that "overuse of antibiotics increases the risk of resistance, and 69.3% thought that it is dangerous to humans if pathogens become resistant to antibiotics.

When respondents were asked whether the nine drugs listed were antibiotics or not, 75.5% correctly answered that Amoxicillin is an antibiotic, and 94% thought that Ambroxol is not. However, the most important finding is that 67%, 54.3%, and 51.5%, of

Table 2. Respondents' knowledge toward antibiotics use.

Your opinion on the following questions	Disagree	Agree	Not known
Antibiotics and anti-inflammatory drugs are the same drug.	215 (53.8%)	135 (33.8%)	50 (12.5%)
Antibiotics could cure the infections caused by virus.	233 (58.3%)	126 (31.5%)	41 (10.3%)
Antibiotic should be administered in all cases, once a person has fever.	355 (88.8%)	29 (7.2%)	16 (4.0%)
Antibiotics do not have side effects.	283 (70.8%)	92 (23.0%)	25 (6.3%)
Scientists can always produce new antibiotics.	89 (22.3%)	228 (57.0%)	83 (20.8%)
If a person suffers from a cough, running nose, and a sore throat, he/she will be cured more quickly if he/she receives antibiotic as early as possible.	193 (48.3%)	186 (46.5%)	21 (5.3%)
Antibiotics should be withdrawn as soon as the symptoms disappear.	262 (65.5%)	131 (32.8%)	7 (1.8%)
Overuse of antibiotics increases the risk of antibiotic resistance.	48 (12.0%)	326 (81.5%)	26 (6.5%)
Antibiotics should only be obtained with a doctor's prescription.	46 (11.5%)	341 (85.3%)	12 (3.0%)
In most cases, it is not necessary to treat a common cold with antibiotics.	57 (14.2%)	310 (77.5%)	33 (8.3%)
Administration of multiple antibiotics has better efficacy than that of single one.	289 (72.3%)	91 (22.8%)	20 (5.0%)
Taking antibiotics in advance can protect a person from a common cold.	312 (78.0%)	62 (15.5%)	26 (6.5%)
The more expensive the antibiotic, the more effective it will be.	239 (59.8%)	131 (32.8%)	30 (7.5%)
It is dangerous to a person if pathogens become resistant to antibiotics.	49 (12.3%)	277 (69.3%)	74 (18.5%)

respondents, stated that Cephadrine, Norfloxacin, and Roxithromycin are not antibiotics, respectively. In addition, most respondents reported that physicians were their primary source of information regarding antibiotic use (77%), followed by pharmacists (65.3%), and the internet (32%). The results are represented in Table 3.

Attitudes toward antibiotic use

The respondents showed positive attitudes toward antibiotic use. Among the most important results on attitude, 70.5% of respondents disagree that they will be dissatisfied if the physician s their antibiotic request. A total of 52. 6% of respondents agreed that they need to be further informed about rational antibiotic use, and 75.2% believe antibiotics should not be used to prevent the common cold. Additionally, 42.5% thought they had appropriate knowledge of antibiotic use. However, 57.8% of respondents were uncertain that they have little understanding of bacterial resistance, and nearly half of the respondents, 49%, were unsure about complying with physician advice regarding antibiotic use. Table 4 shows the related data.

The practice of antibiotic use

In Table 5 the majority of the respondents, 69%, visited a physician in the last six months; among those, 27.5% had one visit. The most noted among respondents was that 62.7% had antibiotics for treatment without prescription in the last six months

Table 3. Respondents’ knowledge of which is an antibiotic.

Which of the following drugs are antibiotics?	Yes	No
Amoxicillin	302 (75.5%)	81 (20.3%)
Paracetamol	66 (16.5%)	317 (79.3%)
Aspirin	79 (19.8%)	304 (76.0%)
Roxithromycin	177 (44.3%)	206 (51.5%)
Cephadrine	115 (28.7%)	268 (67.0%)
Diocetahedral smectite	25 (6.3%)	358 (89.5%)
Norfloxacin	166 (41.5%)	217 (54.3%)
Compound Liquorices	78 (19.5%)	305 (76.3%)
Ambroxol	7 (1.8%)	376 (94.0%)
Sources of information you have about judicious antibiotic use.		
Physician	308 (77.0%)	75 (18.8%)
Pharmacist	261 (65.3%)	122 (30.5%)
Friends or family	76 (19.0%)	307 (76.8%)
Internet	128 (32.0%)	255 (63.7%)
Television	28 (7.0%)	355 (88.8%)
Newspaper	12 (3.0%)	371 (92.8%)
Lecture	82 (20.5%)	301 (75.3%)
Broadcast	14 (3.5%)	369 (92.3%)
Others	17 (4.3%)	364 (91.0%)

(Table 6). Among those who practiced self-medication with antibiotics, 54.8% would take their antibiotic from a retail pharmacy.

The causes of the last three visits in the last six months were presented in Table 7, in which sore throat, fever, and cough were the most common causes, respectively. With respect to other questions about the practice, 17.3% of the respondents would often request antibiotics directly from the physician if they strongly wished to receive them. However, the majority of

Table 4. Respondents’ attitudes toward antibiotics use.

Item	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
I have little knowledge of bacterial resistance	28 (7.0%)	54 (13.5%)	231 (57.8 %)	40 (10.0%)	46 (11.5%)
I believe antibiotics are used too much in our country	8 (2.0%)	12 (3.0%)	171 (42.8%)	181 (45.3%)	28 (7.0%)
A person should be further informed about judicious use of antibiotics	9 (2.3%)	24 (6.0%)	157 (39.3%)	185 (46.3%)	25 (6.3%)
I could decide which antibiotics I should receive according to my condition	91 (22.8%)	121 (30.3%)	116 (29.0%)	42 (10.5%)	30 (7.5%)
I should take antibiotics in prevention, once others around me catch cold	175 (43.8%)	126 (31.5%)	66 (16.5%)	22 (5.5%)	11 (2.8%)
The physician should confirm the cause of illness according to physical or laboratory examination before prescribing antibiotics for me	11 (2.8%)	23 (5.8%)	134 (33.5%)	210 (52.5%)	22 (5.5%)
If I get sick, I prefer to receive intravenous infusion of antibiotics instead of oral administration	52 (13.0%)	132 (33.0%)	104 (26.0%)	45 (11.3%)	66 (16.5%)
I prefer to choose more expensive antibiotics	79 (19.8%)	176 (44.0%)	88 (22.0%)	30 (7.5%)	27 (6.8%)
I should be in compliance with physician advice and it's not appropriate to make further request	16 (4.0%)	36 (9.0%)	196 (49.0%)	136 (34.0%)	16 (4.0%)
In case I wish to receive antibiotics, I will be dissatisfied if the physician refused my request for antibiotics	120 (30.0%)	162 (40.5%)	65 (16.3%)	28 (7.0 %)	25 (6.3%)
I think that my knowledge on appropriate use of antibiotics has been enough	32 (8.0%)	138 (34.5%)	123 (30.8%)	26 (6.5%)	81 (20.3%)
prefer to use broad spectrum antibiotics such as Cefixime, etc., because they could kill a variety of bacteria	58 (14.5%)	94 (23.5%)	96 (24.0%)	30 (7.5%)	122 (30.5%)

Table 5. Number of times did respondents visit a physician in last six months.

Times	Frequency	Percentage
0	124	31.0
1	110	27.5
2	82	20.5
3	36	9.0
4	12	3.0
5	8	2.0
6	4	1.0
7	1	0.3
8	4	1
12	1	0.3
14	2	0.5

respondents, 22%, always followed all physicians' instructions; 41.3% of respondents never kept antibiotics at home for future needs. Furthermore, 61.8% of respondents never took antibiotics with higher dosages than in the instructions in terms of efficacy. Additional information can be found in Table 8.

Discussion

In this study, respondents showed a high level of knowledge regarding antibiotic use. More than 65% of them demonstrated good knowledge; this was in line with other studies conducted in Hong Kong and Vietnam [12,20]. Although knowledge alone is insufficient to change behavior it plays a significant role in developing beliefs and attitudes about specific

Table 6. Frequency of self-medication practice in the last six months.

Item	Yes
Have you ever purchased antibiotics without physician prescriptions?	251 (62.7%)
Where do you usually purchase antibiotics without physician prescriptions?	
Retail pharmacy	217 (54.3%)
Online pharmacy	4 (1 %)
Bazar	31(7.8%)

behaviors, so adequate knowledge about antibiotic use increases public health awareness.

In Yemen, it is a prevalent misconception that antibiotics can treat inflammation, and the term “Inflammation” is widely used instead of “Infection”. In our study, 53.8% of respondents correctly thought antibiotics were anti-inflammation medications. The percentage was higher than respondents in Thailand and Hong Kong [12,21]; another study showed that 61.5% of the general population in Punjab, Pakistan provided the correct answer to this statement [19].

It has been known that antibiotics do not have any effect against viruses; however, they may help treat bacterial super-infections of underlying viral infections [22]. Thereupon, many populations around the world wrongly thought that antibiotics could kill viruses China (79%) [23], Kuwait (70.2%) [17], Sweden (73.2%) [24], Thailand (80.6%) [21], and USA (57%)

Table 7. Causes of the last 3 visits in the past half-year among respondents.

	Cough	Running nose	Sore throat	Fever	Rash	Diarrheal / vomit	Headache	Others
Last time	61 (15.3%)	43 (10.8%)	132 (33.0%)	76 (19.0%)	10 (2.5%)	33 (8.3%)	44 (11.0%)	37 (9.3%)
Penultimate time	33 (8.3%)	19 (4.8%)	72 (18.0%)	59 (14.8%)	7 (1.8%)	12 (3.0%)	32 (8.0%)	16 (4.0%)
Antepenultimate time	45 (11.3%)	25 (6.3%)	16 (15.0%)	43 (10.8%)	5 (1.3%)	14 (3.5%)	21 (5.3%)	25 (6.3%)

Table 8. Respondents’ practice toward antibiotics use.

Item	Never	Occasionally	Often	Most of the times	Always
In case you strongly wish to receive antibiotics, how often do you request them directly from the physician?	41 (10.3%)	37 (9.3%)	69 (17.3%)	22 (5.5%)	33 (8.3%)
How often do you follow all the physician’s instructions and advice?	7 (1.8%)	7 (1.8%)	40 (10%)	61 (15%)	88 (22%)
How often do you take antibiotics with dosage less than drug instruction in consideration of safety?	107 (26.8%)	35 (8.8%)	32 (8%)	13 (3.3%)	16 (4%)
How often do you store antibiotics at home in case of future need?	165 (41.3%)	76 (19%)	54 (13.5%)	27 (6.8%)	30 (7.5%)
How often do you take antibiotics with dosage more than drug instruction in consideration of efficacy?	247 (61.8%)	51 (12.8%)	24 (6%)	19 (4.8%)	11 (2.8%)
How often does the physician explain to you about your condition?	57 (14.3%)	113 (28.3%)	86 (21.5%)	54 (13.5%)	90 (22.5%)

[25]. Our findings in this regard, 58.3% of respondents gave a correct answer which is in line with the former study done among residents in Addis Ababa [26]. However, in line with previous studies [23,27] a good number still believed that early antibiotic use in patients who complain of cough, running nose, and sore throat could quickly be cured. One contributor to the misuse of antibiotics is the misconception that they can treat some conditions that do not require their use. Lack of awareness that the common cold, runny nose, and sore throat are caused by viruses, not bacteria, and do not need antibiotics to treat it. Such a misconception can lead to the disaster of bacterial resistance.

According to the WHO, patients stop the intake of antibiotics as soon as the complaint disappears may put the patient at risk of relapse with developing resistance to pathogenic bacteria. Thus, incomplete courses of treatment and misuse of antibiotics may lead to bacterial resistance. In this study, 34.6% of respondents incorrectly thought that they could stop treatment with antibiotics as soon as the complaint left; these reinforced studies done in Ethiopia (36%) [26], Malaysia (28.9%) [28], and Pakistan (67.4%) [19]. However, most respondents (81.5%) agreed that the more antibiotics are used, the higher the risk that resistance develops. This study showed a misconception when most respondents incorrectly recognized that Cephadrine, Norfloxacin, and Roxithromycin were not antibiotics. This may be related to a lack of access to these antibiotics or their high cost or less prescription.

This study found that the primary source of information on antibiotics was physicians, followed by pharmacists and the internet. This was in line with studies done in Europe [29], Malaysia [30], and Thailand [21], that doctors were the common source of information. As a result, healthcare providers play a key role in limiting antibiotic misuse and minimizing resistance, i.e., a current problem in Yemen [5,31,32]. The difference in contexts and policy interventions created variations in the source of information about antibiotic use. For example, family or friends were the most common source in Senegal [33]; in Kuwait, more respondents, obtained information about antibiotic use from pharmacists than physicians [17].

Several factors contribute to the occurrence and increase of antibiotic resistance, such as over-prescription by physicians even in the absence of appropriate indications due to diagnostic doubt, their lack of knowledge regarding optimal therapies, and patient. Most of the respondents agreed that physicians should confirm the cause of their illness before

prescribing antibiotics. However, only 34% of respondents agreed that they would comply with physician advice and made no further requests. This is in line with numerous studies reported that antibiotics are more likely to be prescribed under patient pressure, and physicians often prescribe antibiotics because they perceive that patients want them despite their opinion that antibiotics are not required [34,35]; 70.5% of respondents reported they would not be dissatisfied if physician refused their request for antibiotic need. Thus, effective communication and interaction made by physicians can play a key role in helping to promote optimal adherence to antibiotic use by the patient and minimize the problem of antibiotic resistance.

The fact that Yemen has an inadequate policy and no action made to strengthen legislation against dispensing antibiotics without a prescription could explain why Yemen has a greater percentage of self-medication than other nations in the region. In the current study, the prevalence of self-medication with antibiotics among the general public in Aden was 3 in 5 individuals (67.3%), which is higher than studies done in Egypt (23.3%), the United States (25.4%), and Kuwait (27.5%) [17,36,37]. However, these results were similar to those in Pakistan (59.6%), and Ethiopia (67.3%) [19,26]. The above disparity could be attributed to varying degrees of antibiotic awareness, as well as differences in educational status, income, access to contemporary health facilities, and study participants' cultural preferences and views.

Among those who practice self-medication, 54.3% obtained un-prescribed antibiotics from a retail pharmacy. Hence, pharmacists can play an important role in the proper use of antibiotics and help in public education and spreading awareness about effective antibiotic usage. Patient's expectations and private pharmacies' business interests have been noted as variables contributing to the incorrect dispensing of antibiotics without a prescription. As a result, a balance between professionalism and commercial success must be struck [30].

Study limitations and strengths

This study had some limitations that should be highlighted. First, this study was based on a cross-sectional design, which precludes any precise conclusion regarding the causal relationships between variables. Secondly, as with most surveys with a self-administered questionnaire, there is the possibility that participants may over-report socially desirable behaviors or under-report socially undesirable behaviors. Finally, the findings of this study could fall

short in representativeness to the whole country. However, it is worth mentioning that this study also has certain advantages which include: respondents who live in urban and rural areas with various ages, levels of education, level of income, and relatively representative value for actual gender distribution in the population. Also, respondents were sampled from the general population but not from healthcare settings.

Conclusions

Respondents have adequate knowledge and moderate attitude toward antibiotic use. However, self-medication was common practice among the general public of Aden. As a result, they had a misunderstanding, misconception, and irrational use of antibiotics. Hence, several measures that may be undertaken immediately across the country to fulfill the goal of long-term healthcare and to prevent antibiotic resistance from spreading were proposed. These include auditing antibiotic prescriptions; targeting healthcare professionals (pharmacists and nurses) in prohibiting the self-medication practice with antibiotics; continuing public-education programs aimed at increasing knowledge but also improving attitudes and practices in the use of antibiotics; emphasizing the role of healthcare professionals in public health education and promotion of appropriate antibiotic use; and enforcing rigorous rules to restrict antibiotic distribution. These activities could be built using the WHO antimicrobial stewardship programs as a guide. In all aspects, strong international support would be required for a war-torn country.

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