

**THE ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE OF
ANTIBIOTICS USAGE AMONG SAUDI FEMALE STUDENTS IN PRINCESS
NOURAH UNIVERSITY (PNU)**

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ABSTRACT

Background: Antibiotic misuse is one of the biggest major health problems worldwide. Awareness and good practice of antibiotic usage among females has a great influence to build-up in the healthy community. In this study, we analyzed the present status of Princess Nourah University (PNU) students' knowledge, attitude, and practice (KAP) on the usage of antibiotics, and examined the influence of PNU medical curriculum on the appropriate usage of antibiotics among medical students. Objectives: to investigate the knowledge, attitude and behavior of PNU students (Medical and non-medical) in relation of the awareness of using antibiotics. Materials and Methods: In this study, a cross-sectional survey was conducted in Riyadh city. A total of 394 female students from PNU, aged 18-24 years, enrolling in medical school (M) and non-medical school (NM) were chosen as the subject of study. Respondents were surveyed to assess their knowledge, attitude and practice toward antibiotic usage. Results: 77% of M has a good knowledge of the types of antibiotics whereas 36.6% of NM was unable to differentiate between antibiotics and pain-killers. A closely similar percentage of M (85.1%) and NM (81.0%) disagreed the universal principles of antibiotic use is not wide enough. A total of 96.3% of M and 97.2% of NM agreed that human body contains health-beneficial bacteria. Lastly, 77.6% of M and 74.9% of NM believed that newer and more expensive antibiotics would have better effect. The correlation in antibiotic usage without doctor's instruction by medical students is highly significant ($p < 0.001$). Conclusions: It is essential to develop educational interventions to correct the misuse and misunderstanding of antibiotics to be able to have a health educated community.

KEYWORDS: Antibiotics, Attitude, Female students, Knowledge, Practices, Riyadh, King Saudi Arabia.

1. INTRODUCTION

A significant number of population worldwide have been using antibiotics incorrectly, putting their self at a greater risk instead of being cured. Most of the regular populations "especially in the developing countries" consume antibiotics without understanding the antimicrobial route and mechanisms inside the human body.

A major cause of antibiotic resistance is inappropriate use of antibiotics. Moreover, a quite big number of the population worldwide are unaware of the bacterial resistance towards antibiotics, one of the most common misbeliefs among many communities specially in developing and middle east countries believes on antibiotics can be used for viral infections (such as common cold) medication, this wrong practice of antibiotic misuse may lead to over dose and in long run

to bacterial resistant. The term 'bacterial resistant' might as well not be familiar to them.

Appropriate use of antibiotics is of high importance in order to achieve excellent health degree within individuals and communities. An obvious example of a misunderstanding of antibiotic therapy is the idea that antibiotics are effective against viral infection. There are a lot of cases where people take antibiotics without following the right indications and treatment course and this leads to the failure of a complete cure. When a strain of bacteria develops resistance towards antibacterial agents, the antibiotics might be ineffective to eradicate the bacteria and thus the infection is less likely to be cured. Aside from the failure, there is also a risk of adverse effects ranging from mild ones to fatal cases. In addition, resistance towards antibacterial agent can cause the reduction of options for alternative drug choices (particularly in case of first line options).

A previous study conducted by Sanya et al., 2014, investigated antibiotic misuse based on self-report by undergraduate students who were studying majors not related to medicine (art, social sciences, humanities, technology, basic science, agriculture and education) at a Nigerian University. The study involved a questionnaire which surveyed sociodemographic background (gender, age, education level) and open-ended questions. More than 95% of the participants reported that they have experienced antibiotic consumption (Sanya et al., 2014). The antibiotics were obtained according to a prescription by a physicians (68.3%), recommendation by pharmacists (11%), nurse and trade-medical practitioner's recommendation (7.3%), offered by friends/relatives (6.3%) and self-medication (7.3%) (Sanya et al., 2014). Over one-fourth of the participants claimed that they would take antibiotics whenever they feel unwell, while only 2.5% of the participants took antibiotics about once a year (Sanya et al., 2014). Around 36% of participants were willing to take antibiotics if recommended. Interestingly, almost half of the participants completed the treatment course while 30% did not have antibiotic compliance (Sanya et al., 2014). Antibiotics were stopped when the symptoms seem to have been alleviated (28%) or even without any reason (21.5%). Roughly 2% of participants reported that they switched to other antibiotics due to slow progress of cure (Sanya et al., 2014).

In 2013, Huang et al. conducted a questionnaire-based study on students' knowledge, attitude and practice toward antibiotic usage. The study involved 2500 students from three different universities in North-East China, in which one of the university is a medical university. The study provided an overview of how the students understand antibiotic usage and the difference of such understanding between medical students and non-medical students. Four aspects were assessed in the study: knowledge regarding antibiotics, attitude towards antibiotic usage, perception of public education and the practice of antibiotic consumption. It was found that the knowledge of antibiotic usage among medical students were significantly higher than non-medical students ($\chi^2 = 191.8869$, $p < 0.0001$) but there was no significant difference between first-year-medical student and first-year non-medical student ($\chi^2 = 1.2190$, $p = 0.2696$) (Huang et al., 2013). The study reported that medical students had a better access to information about antibiotics compared to non-medical students or the public (Huang et al., 2013). This was based on their response to relatively specialized question: whether antibiotics can cure viral infection.

In another study conducted by Shehadeh et al., 2012, similar questionnaire-based study was performed in a wider range of participants at various study sites such as shopping center, supermarket, café/restaurant, gym, beauty center, and many more. The reason was to achieve an improved generalizability of sample. Out of 1500 sheets of questionnaire, 1141 were answered

completely (response rate=76.1%). More than 70% of the participants were female and more than half the participants were in 18-25 age group. Around 66% of the participants were single. Findings showed that almost 80% of participants have recently consumed antibiotics as outpatients at least once (Shehadeh et al., 2012). However, they seemed not to have insufficient knowledge regarding effectiveness of antibiotics either for bacterial-, viral-, and parasitic infections. Only 32.9% were aware that antibiotics are effective for bacterial infection while around 7% believed that antibiotics can be used to treat viral infection (Shehadeh et al., 2012).

Interestingly, 9.7% of participants thought that antibiotics work similarly like antipyretic drugs to treat fever and around 28% thought that antibiotics can be used as a pain-killer in stomach upset (Shehadeh et al., 2012). Over half the participants even believed that antibiotics are effective for common cold, cough, and nasal congestion (Shehadeh et al., 2012).

Based on previous research, it is very likely that antibiotic misuse in other parts of the world follows the same pattern. Therefore, this study was conducted with the aim to assess the knowledge, attitude and behavior of undergraduate students in Prince Nourah University (PNU), Saudi Arabia, regarding antibiotic usage. The specific objectives of this study were as the following,

- To guide students to the correct sources of antibiotics knowledge and information.
- To explain antibiotics abuse and side effects.
- To explain in which event of illness antibiotics should be used.
- To explain why should patients follow a specific method in using antibiotics.

2. MATERIALS AND METHODS

The study was carried out in Princess Nourah University (PNU), Riyadh, Saudi Arabia, from 1st of September 2014 to 5th of June 2015. A cross-sectional survey using a validated questionnaire was conducted according to previous study in China in 2013 with a slight modification (Huang et al., 2013). PNU is one of the outcomes of the attention given to the higher education of women; it has broad disciplines such as: non-medical; humanities including (College of Education, College of Arts, College of Social Services and College of Languages and Translation), collage of computer and information sciences, business administration, arts, design, and medical including; collages of nursing, pharmacy, health and rehabilitation Sciences, dentistry and medicine.

In this study, 394 students from medical (M) and non-medical school (NM) at PNU were selected randomly as the participants of a questionnaire survey to evaluate their knowledge, practice and attitude of antibiotic usage. Previous literature showed that the average acceptance score among university students

was 4.9 ± 0.29 , with expected difference as low as 0.1, with level of confidence of 95% ($\alpha = 0.05$), and power of study of 80% ($\beta = 20\%$). The minimal sample size needed for the current study was 394, based on rationalization found on <http://www.raosoft.com/samplesize.html>. The survey was distributed to M and NM students with different levels of study. The questionnaire was distributed on the spot at university campus from 26th of February to 15th of March 2015.

The questionnaire covered four domains: knowledge of antibiotics, attitude towards antibiotic use, perception of public education, and practice. The first part on knowledge of antibiotic use had 11 questions covering the normal flora of microbes, uses of antibiotic, concepts of drug sensitivity and susceptibility; drug resistance, and side effects of antibiotics. The second part on attitude had five questions on antibiotic abuse; its influence on the female student and her family, cause of abuse of antibiotics and resistance problem in PNU. The third part on the perception had five questions relating to sources of antibiotics knowledge, the importance to have antibiotic information, and eagerness to the related knowledge; college course arrangement and proper use of antibiotics campaign. The last part on behavior had nine questions ranging from the frequency of antibiotic use in fever, illnesses and various other symptoms; understanding of prescription drugs and doctors prescriptions, the main symptoms that need the

antibiotic uses, drug withdrawal status among others. The overall results of each partition all questions were compared and concerned.

3. RESULTS

All the data obtained in this study were analyzed statistically using SPSS version 22. We compared the knowledge, attitude and practice of antibiotics misuse between M and NM students in PNU. It was found that the knowledge, attitude, and practice between M and NM students were significantly different. The medical students have better knowledge and more experience in antibiotic drug use compared to NM students.

The sample of this study was 394, consisting of 137 M students (34.7%) and 257 NM students (65.2%). This sample size was considered valid for analysis. Demographic background of the subjects varied (see Table 1), where 95.6% were single and $\approx 4.3\%$ were married. The age group was mostly between 19 to 22 year old. We made a statistic hypothesis test for our questionnaire and the results were asymptotic significances (significance level of 0.05). In the questionnaire we covered five domains which were about the bacteria in human body (99.2% answered), the indication of antibiotics (99.2% answered), bacterial resistance (97.2% answered), recurrent use of antibiotics (98% answered), and the relation between the cost of antibiotics and effectiveness (97.7% answered).

Table 1: Population Characteristics in the Study

Characteristics	137	Number
Specialization	137	Medical
	257	Non- Medical
	394	Total
Age (year)	116	18 -19
	156	20- 21
	120	22- 24
	394	Total
Marital status	377	Single
	17	Married
	394	Total
Gender	394	Female
	0	Male
	394	Total

The difference in the knowledge level between M and NM students was significantly high, where 77% of M students have a good knowledge of the types of antibiotics whereas 36.6% of NM students were unable to differentiate between antibiotics and pain-killers. Medical curriculum has a high impact on medical students, showed better knowledge towards antibiotics uses compare to non-medical students in the awareness and attitude towards antibiotics, although they were all in the same age group and same the university. Although 85.1% of M students and 81.0% of NM students disagreed that universal principles of antibiotic usage were not wide spread enough, NM

students need to have more awareness by learning from campaigns to acknowledge the dangers of antibiotics misuse or by distributing brochures. There were some points where M and NM students had closely similar level in knowledge. Firstly, 96.3% of M students and 97.2% of NM students agreed that there are beneficial bacteria in human body. About 77.6% of M students and 74.9% of NM students believed that newer/more expensive antibiotics would give better effect, which is a false piece of information that needs to be corrected. Actually there is no relationship between the quality of the drug and its price. On the other hand, we found highly significant correlation in antibiotic usage

without doctor’s instruction among M students in comparison with NM students ($p < 0.001$). The overall results regarding the source of antibiotics consumed by the subjects (summarized in Table 2), were that most of the participants (76.4%) obtained the drugs according to prescription by the physicians, while only 3.1% obtained

antibiotics from drug inventory at their own home. This means that the participants had more confidence to trust the prescribers, probably because they felt the high effectiveness in the treatment and experienced less side effects. In contrast, only a small percentage of students did their own prescription.

Table 2: The Source of Antibiotics Consumed

Source	Frequency	Percent
Preparation at home	12	3.1
Provided by classmates	6	1.6
Self-purchase	68	17.6
Prescribed by physicians	295	76.4
Others	5	1.3
Total	386	100.0

Among all participants, 87.6% followed prescription when they choose antibiotics. Meanwhile, 22.8% of respondents agreed about discontinuing antibiotic consumption if its harms and benefits were equals but 77.2% disagreed. This means that the students understand the nature of antibiotics, which is a good indicator. Most of the participants (83.0%) did not stop antibiotic usage when they experienced side effects. When we asked about the indication of antibiotic usage towards viral infections, we found a relatively good results in the knowledge and practice, as shown in Figure 1.

Table 3: The Use of Antibiotics for URTI

Frequency of use	Frequency	Percent
Always	76	22.3
Often	67	19.6
Sometimes	67	19.6
Rarely	54	15.8
Never	77	22.6
Total	341	100.0

About 75% of students have heard about the resistance of bacteria. However, more than 79% of students did not think that recurrence antibiotic use can decrease the effectiveness of the drug, as shown in Figure 2. This means that most students have a misunderstanding regarding antibiotic resistance.

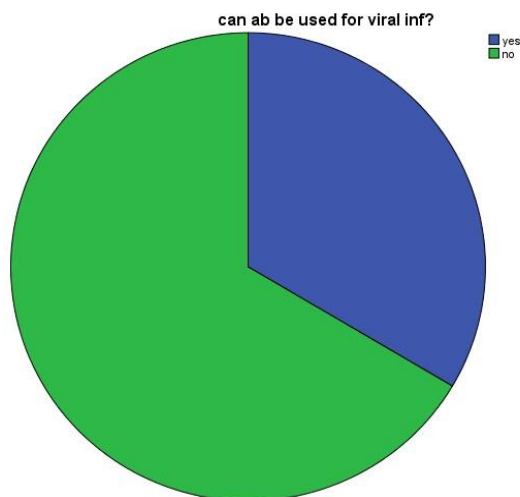


Figure 1: Indication of antibiotics medication toward viral infection

The result in figure 1 shows that more than 65% of the students disagreed that antibiotics can be used with viral infection. We also assessed their knowledge of antibiotic use for respiratory tract infection by asking two questions about the common cold and cough. The results showed that 22.6% of students have never used antibiotics for upper respiratory infections (URTI) while 22.3% always use antibiotics for URTI, as shown in Table 3.

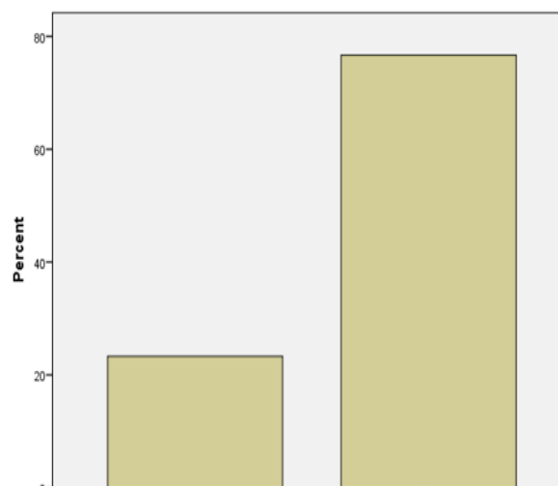


Figure 2: Effect of recurrent antibiotic use

As much as 95.6% of the participants did not believe that the excessive use of antibiotics can lead to antibiotic abuse. More than half (54.5%) have used antibiotics without doctor’s instruction, which may be related to the poor awareness of the risk factors of antibiotics. Lastly, 83.2% disagreed that drug manufacturers, hospitals and other sectors are driven by economic interests.

4. DISCUSSION

A study conducted by Zhang *et al.* (2011) in China involved 2088 subjects, consisting of 1236 M students and 852 NM students. The number of subject was considered valid for analysis. The level of knowledge of M students on the proper use of antibiotics was significantly higher than that of NM students ($p < 0.0001$) (Huang *et al.*, 2013). However, based on their responses on actual practice, M students were found to rely on antibiotics more than NM student ($p < 0.0001$) (Huang *et al.*, 2013). In comparison with this study, 77% of M students have a good knowledge of the types of antibiotics whereas 36.6% of NM could not differentiate between antibiotics and pain-killers. Therefore, this study showed highly significant difference regarding the knowledge of antibiotic use between M and NM students. Medical students had better awareness and attitude although all groups in this study were in the same age group and same university.

In 2012, Shehadeh *et al.* conducted similar study with better generalizability of the sample, in which research assistants interviewed members of the general public at different study sites. The results showed that out of 1500 questionnaires distributed, 1141 were completed (response rate= 76.1%). The majority of respondents (70.9%) were female and 612 subjects (54.3%) were between 18 and 25 year old. Over half of the respondents (66.9%) were single. More than 3 out of 4 respondents (79.1%) have used antibiotic on an outpatient basis at least once during the past year (Shehadeh *et al.*, 2012). As much as 32.9% of participants agreed correctly that antibiotics are effective only against bacteria, whereas 6.9% of respondents incorrectly agreed that antibiotics are effective against viruses. (Shehadeh *et al.*, 2012) Around 66% of the participants were single. Findings showed that almost 80% of Interestingly, 9.7% of participants thought that antibiotics work similarly like antipyretic drugs to treat fever and around 28% thought that antibiotics can be used as a pain-killer in stomach upset (Shehadeh *et al.*, 2012). Over half the participants even believed that antibiotics are effective for common cold, cough, and nasal congestion (Shehadeh *et al.*, 2012). In our study, more than half (54.5%) of the subjects admitted that they used antibiotics without doctor's instruction. This might be related to many factors such as poor awareness of risk factors of antibiotics resistance. Meanwhile, 76.4% of participants used antibiotics as prescribed by physicians while small percentage (3.1%) took antibiotics from preparations at home. Most of respondents (87.6%) followed prescription when they choose antibiotics.

We also we assessed their knowledge of antibiotic use for respiratory tract infection by asking two questions about the common cold and cough. The results showed that 22.6% of students have never use antibiotics for URTI while 22.3% always use antibiotics for URTI.

Previous study conducted by Sanya *et al.*, 2014, investigated on antibiotic misuse based on self-report by undergraduate students in a Nigerian University who was taking major other than medical. According to the study, the participants obtained antibiotics from prescription by physicians (68.3%) (Sanya *et al.*, 2014). However, the study revealed gross antibiotic misuse by the majority of responders (298; 74.5%), either by keeping left-over antibiotics for future use or throwing it away with refuse (Sanya *et al.*, 2014). More than 70% of the respondents sometimes forgot to take the antibiotics (Sanya *et al.*, 2014). These non-adherence to antibiotic use was the result of financial constraints (73; 18.3%), long duration of treatment (70; 17.5%), side effects (60;15.0%), polypharmacy (56;14.0%), tablet size (45;11.3%), and perceived low level of confidence in the prescriber (11; 2.8%) (Sanya *et al.*, 2014). Course of study of respondents had no significant effect on respondents' knowledge or adherence ($p > 0.05$) (Sanya *et al.*, 2014). Misuse of antibiotics among NM undergraduate students in a Nigerian university setting was pervasively suggesting an urgent need for enlightenment on rational use and disposal of antibiotics. In comparison with our results, 76.4% of the subjects used antibiotics prescribed by physicians while small percentage (3.1%) made preparation at home. This means that our students have more confidence to trust the prescribers. Also, while 22.8% agreed that they could stop consuming antibiotics when they experience side effects, 83.0% disagreed. This might be because they have read or they have a background that antibiotics can cause side effects.

Ling *et al.*, 2011 conducted a study on public knowledge and attitude towards antibiotics, which play a vital role in the success of the treatment process. The results showed that nearly 55% of the respondents had a moderate level of knowledge (Ling *et al.*, 2011). Three quarters of the respondents (76.7%) could correctly identify that antibiotics are indicated for the treatment of bacterial infections (Ling *et al.*, 2011). However, 67.2% incorrectly thought that antibiotics are also used to treat viral infections (Ling *et al.*, 2011). About 59.1% of the respondents were aware of antibiotic resistance phenomena in relation to overuse of antibiotics (Ling *et al.*, 2011). With regard to attitudes, 38% believed that taking antibiotics when having cold symptoms could help them to recover faster, while 47.3% expected antibiotics to be prescribed for common cold symptoms (Ling *et al.*, 2011). In comparison with our results, in terms of having antibiotics to treat cold symptoms, we have a better result which 83.2% of the students have never used antibiotics for common cold and cough, while only small percentage (22.3%) used antibiotics for such conditions. This indicates that most of the students have a good awareness in this issue. On the other hand, more than 78% did not realize about antibiotics resistance and that excessive use of antibiotics will decrease its efficacy.

In Maastricht University, Maastricht, the Netherlands, a research group conducted a study among the general public aged 16 years and over in the Netherlands to evaluate knowledge, attitude and practice towards use of antibiotics for upper respiratory infections (URTIs) among medical students (Jochen W L Cals *et al.*, 2007). Out of 1042 randomly selected medical students in Saudi Arabia, the majority of respondents indicated that they had previous knowledge of antibiotic agents (99.7%) and of their usage (98.3%). Only 86.6% of them, however, correctly identified penicillin as an antibiotic, while 51.8% did not know whether codeine was an antibiotic or not. Almost all the participants (97.2%) had used antibiotics during the past year. Of these medicines, 51% were obtained through a doctor's prescription. Most of them, 61.8% of cases, were used for an URTI case. In the past year, 87.1% of respondents had obtained some information on antibiotics from one source or another. Among the top three sources of information cited were doctors (43.6%), followed by the internet (41.2%) and other sources (47.2%), which was the most common answer, ahead of the other choices given to respondents. In comparison with our results, 77% of our medical students have a good knowledge in identifying the antibiotics drugs and in the prescription of the drugs. We observed higher percentage (76.4%) of responders who used antibiotics based on prescription by doctor and 87.6% followed prescription when they choose antibiotics.

There was a study on antibiotic use for upper respiratory tract Infections in children: a cross-sectional survey of knowledge, attitudes, and practices (KAP) of parents in Greece by Panagakou *et al.*, It was reported that Greek parents rarely gave antibiotics to their children without medical advice (10%) (Panagakou *et al.*, 2011). In our study, 76.4% of PNU students used antibiotics prescribed by doctor while small percentage (3.1%) consumed antibiotics preparation available at home. Another study in Palestine by Zyoud *et al.*, 2015, showed that only 18.9 % of parents thought that antibiotics did not have any harmful side effects. In our study, 77.2% of PNU students disagreed that it is allowed to stop using antibiotics if its harm and benefit equals while 22.8% agreed with that idea. Most of the participants in our study (83.0%) did not stop using antibiotics when they experience side effects. Panagakou *et al.*, 2011, reported that 88% of Greek parents believed that unnecessary antibiotic use drives antibiotic resistance. Whereas a study in Cyprus by Roussounides *et al.*, 2011, showed that 69.3% of parents followed pediatricians advice and rarely administer antibiotics acquired over the counter. Another study on the knowledge, attitude and practices concerning self-medication with antibiotics among university students in western China by Lv *et al.*, 2014, revealed that 40.2% had self-medicated with antibiotics in the past 6 months. Meanwhile in our study, more than half (54.5%) of PNU students used antibiotics without doctor's instruction, which may be related to many

factors such as poor awareness of risk factors of antibiotics resistance.

Other study about the knowledge, attitude and practice towards antibiotic use among the public in Kuwait by Awad and Aboud, 2015, reported that over one-quarter (27.5%) of the cases were self-medication with antibiotics to treat mainly common cold, sore throat and cough. In our study, the use of antibiotics for respiratory tract infection by PNU students (for common cold and cough) was 22.3%, while 22.6% of the students have never used antibiotics to treat URTI. Another study in Malaysia by Islahudin, Madidah, Tamezi, & Shah, 2015, reported a significantly greater number of patients (67.2%) who took antibiotics more than once during the previous year did not complete the full course. In contrast, 87.6% of PNU students followed prescription when they choose antibiotics.

5. CONCLUSIONS

We concluded this study by highlighting the need to educate patients regarding antibiotic usage and the consequences of misuses such as what diseases actually require antibiotics, why full daily doses must be respected, the absence of significant alterations of immunity associated with antibiotic therapy, the danger of keeping part of a course for future uncontrolled use, and the need of a prescription for getting antibiotics from the doctor. The impact of the medical curriculum and knowledge of the medical students' on antibiotic use is important to prevent misuse of antibiotics and antibiotic resistance. Antibiotics can be lifesavers, but we should educate the public to correct the misuses and misunderstandings of antibiotics.

6. RECOMMENDATIONS

The output of this study shown a quite high percentage of the university students believed that new and more expensive antibiotics brand has a better treatment effect towards infections, these believes should be corrected. The health authorities should dedicate and arrange workshops and public seminars to raise awareness of the students and the general public on the pros and cons of responsible antibiotics usage. Eventually improve their attitudes towards non-prescription antibiotics. We recommend upgrading the health education regarding antibiotic use by holding seminars, distributing brochures, and attending lectures by the help of the media.

This would significantly help to improve the health education of the population and their uses for drugs. Also starting a campaign to improve student's knowledge about the importance of only taking antibiotics if prescribed by a professional pharmacist. Moreover, it might be helpful if the concepts and principles of medication usage could be reflected in the formal curricula of health care disciplines in KSA. Hence, strong regulatory enforcement and community awareness campaign is called for to limit non-prescription sale of

antibiotics over the counter. Furthermore, encouraging pharmacists to only sale antibiotics to the patients with prescription.

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