



Assessing Knowledge, Attitudes and Practices on Antibiotics amongst University Graduates in Bhutan: A Cross-Sectional Survey

Tshokey Tshokey^{1*}, Deepika Adhikari², Thinley Jamtsho³ and Kinley Wangdi⁴

¹Department of Laboratory Medicine, Jigme Dorji Wangchuck National Referral Hospital (JDWNRH), Thimphu, Bhutan.

²Essential Medicine and Technology Division (EMTD), Ministry of Health, Thimphu, Bhutan.

³IT Unit, Royal Centre for Disease Control (RCDC), Thimphu, Bhutan.

⁴Phuentsholing General Hospital, Phuentsholing, Bhutan.

Authors' contributions

This work was carried out in collaboration among all authors. Author TT conceived the study. Authors TT, DA and KW conducted literature review and wrote the study proposal. Author TJ participated in drafting the study questionnaire and designed the online survey. Authors DA and TJ field tested the questionnaire, recruited the participants and supervised the study. Authors DA and TJ extracted and collated the data. Authors TT and KW analysed the data and drafted the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Introduction: Concerns about antibiotic resistances is increasing. Antibiotic misuses mostly result from inadequate knowledge impacting attitudes and practices. The literature on this subject is limited in Bhutan. It is of immense importance to understand the gap and target interventions. Therefore, we assessed the knowledge, attitudes and practices (KAP) on antibiotics amongst Bhutanese university graduates in 2016.

Methods: The survey was conducted through a self-administered online questionnaire after seeking consent. The questionnaire was developed by the investigators using past literature.

Results: Of the 2,229 invited graduates, only 220 (≈10%), 52.3% (115) males, completed the survey. Internet was the commonest source of information on antibiotics. Only 51% (113) showed

*Corresponding author: Email: doc_tshokey@yahoo.com;

good knowledge with a mean score of 15.5 (range 2-30). Penicillin, amoxicillin and cotrimoxazole were correctly identified as antibiotics by 63.6%, 78.7% and 21.4% but 11.4%, 35% and 31.8% misidentified atenolol, paracetamol and ibuprofen as antibiotics respectively. Side effects of antibiotics were poorly recognized. Fifty-four percent (119) showed good attitude score. About 39% (85), 35% (76) and 46% (101) misconceived that antibiotics would be required for common cold, all fevers and all small clean-cut wounds respectively. Almost 91% knew that antibiotic courses should be completed, 12% thought that antibiotics can be stopped when patients improve and 31.8% repeated antibiotics for similar illnesses. Although 76% knew that antibiotics shouldn't be bought without a prescription, 28% were able to get them. About 44.1% revealed that the dispensing pharmacists did not explain adequately about antibiotics. Unfortunately, 43.6% suggested others to take antibiotics during illnesses and 60% used topical antibiotics.

Conclusion: KAP on antibiotics amongst Bhutanese graduates was unsatisfactory except few good specific practices. Health authorities should educate public on antibiotics and other medicines.

Keywords: Knowledge; attitude; practice; antibiotics; Bhutan.

1. INTRODUCTION

Antibiotics are medicines that destroy or slow down the growth of bacteria and include a range of powerful drugs that are used to treat diseases caused by bacteria [1]. There are several groups and generations of antibiotics. Infections caused by viruses, such as colds, flu, most coughs, and sore-throats cannot be treated with antibiotics. In addition to their intended effects, antibiotics also result in unintended common and mild side effects including diarrhoea and nausea; other rare but severe side effects include deafness, kidney and liver injury [1]. Therefore, antibiotics should be used with extreme caution in individuals with impaired liver or kidney function, pregnant and breastfeeding women [1]. Antibiotics are one of the most commonly used medicines both in the communities and hospitals [2-4]. There is increasing global concern on antibiotic resistances and its consequences [5]. As antibiotic resistances increase rendering them ineffective, healthcare may be limited to providing supportive care rather than directly treating an infection pushing us back to how medicine was practiced in the pre-antibiotic era [6]. This calls for increased awareness amongst the public on proper use of antibiotics.

A study in Pakistan among students showed high (76%) prevalence of self-medication in the educated youth, despite the majority (87%) of study participants being aware of its harmful effects. The commonest reason for self-medication was previous experience (50.1%); and about 62% stopped taking a prescribed medicine on their own [7]. Another study in India showed that self-medication was common in dental patients [8]. A Chinese study amongst

university students showed that the level of knowledge on the proper use of antibiotic use of medical students was significantly higher than non-medical students. However, medical students used antibiotics more than non-medical students leading to higher misuse [9]. In Kuwait, around 36% of the participants in the survey reported not completing the prescribed course of antibiotics, 28% self-medicated with antibiotics and 53% believed that doctors prescribed antibiotics to meet the patients' expectations [10]. In New Delhi, a preliminary survey by the WHO South-East Asia Regional Office (SEARO) on perceptions of communities and physicians on antibiotic use showed that 25% of the people stopped medication before the course is completed and a similar number thought that antibiotics should be given to a child with any fever. About 47% of participants revealed that they would visit another doctor if the first doctor did not prescribe an antibiotic for their illness [11].

In Bhutan, primary healthcare, including medicines, is provided free of cost by the state as outlined in the constitution [12]. This is achieved through different levels of health facilities. The national essential medicines list (EML) [13] outlines the types of medicine, including antibiotics, that are supplied to different levels of hospitals. As a result, there are limited antibiotics on the EML. In addition, limited private pharmacy shops deal with medicines, including antibiotics, which are not included in the EML. The drug regulatory authority (DRA) [14] of Bhutan monitors private pharmacies and legally antibiotics can only be sold against a medical prescription. Recently, several programmes and activities to monitor and control antibiotics

resistances have been initiated. Antibiotic resistance surveillance with improved laboratory capacity building in undergoing through a ONE health approach (involving human and animal sectors) under the UK government Fleming Fund project. Under this project, activities to train health professionals on rational antibiotics prescription are given high importance.

Despite all the mechanism in place to limit inappropriate use of antibiotics in Bhutan, there are reports of inappropriate use of antibiotics in Bhutan [15]. Also, a review of pathogens causing urinary tract infections in the national referral hospital found that resistance against commonly used antibiotics was as high as 70% [16]. This finding was an eye opener to the issue of antibiotic resistance in the country. Further, the use of antibiotics in Bhutan is increasing with 30% of the total annual medicines budget spent on procurement of antibiotics even though they constitute only 10% of the total medicines on EML (Departmental presentation, department of pharmacy, 2013). With the increasing use of antibiotic each year in Bhutan and inappropriate use contributing towards antibiotic resistance, there is an urgent need to study the knowledge, attitudes and practices (KAP) of the public to develop appropriate awareness materials and other interventional plans and policies targeting antibiotic resistances and drug resistant infections. A previous KAP study on antibiotics in Bhutan [17] did not find any significant differences in KAP between different demographic characteristics of the participants except for a likely better knowledge amongst those with an education level of graduate and higher as compared with no education in univariate analysis. This survey was therefore conducted to assess the KAP on antibiotics amongst university graduates in Bhutan.

2. MATERIALS AND METHODS

2.1 Study Setting

In Bhutan, university graduates from within and outside the country annually attend the national graduate orientation program (NGOP) organized by the Ministry of Labour and Human Resources (MoLHR) prior to employment. During this program, graduates are familiarised on the government policies and plans as well as oriented on career opportunities. For graduates pursuing a career in the public service, NGOP attendance is a pre-requisite, however it is optional for those seeking public or corporate

jobs. In 2016, a total of 2,229 graduates attended the NGOP in August 2016 [18].

2.2 Study Method and Participants

This study was a cross-sectional survey. It was conducted amongst the graduates attending the NGOP in August 2016. All graduates attending the NGOP 2016 were invited to the survey through notifications, social media and public announcement. The survey used a validated questionnaire which was self-administered online by the participants after reading the information sheet and providing informed consent on the first page before entering the survey questionnaires.

2.3 Survey Questionnaire

The questionnaire was developed specifically for this survey by the investigators after referring previous literature on similar studies. The questionnaire comprised of five parts. Part A consisted of six demographic questions, while part B contained 13 questions aimed at assessing the antibiotic knowledge of respondents. The areas evaluated included identification of antibiotics (six sub-sets to choose), three questions on the knowledge about uses and duration of treatment, one question on the side effects (six sub-sets to provide the correct answers), and one question to test the knowledge on habits to do and avoid (five sub-sets to provide the correct answers). Part C consisted of nine questions to evaluate the participants' attitudes towards antibiotics. Part D evaluated practice on antibiotics with 12 questions. Excepting part A, respondents had to choose, according to a three-point Likert scale, among three possible answers: "Yes", "No", and "Don't Know".

2.4 Data Analyses

Data entry was done in Microsoft excel and analysis was carried out using the statistical package STATA 12.1 (Stata Corporation, College Station, Texas, USA). Descriptive statistics were carried out by providing the number and percentage of each of the demographic variables as well as the questions about knowledge, attitudes and practices. To describe the knowledge and attitudes of the participants, a score was calculated according to the number of correctly answered questions targeting the knowledge about antibiotics and attitudes regarding antibiotic usage, and the attitude and knowledge scores were both

categorized as poor and good. The scores were calculated by giving one point for every correct question answered and no points if the answer was wrong or uncertain, to reach a maximum of 30 points and 9 points for the knowledge and attitudes scores, respectively. Thus, the knowledge scores were categorized into poor (< mean knowledge score), or good (> mean knowledge score) and the attitudes scores were categorized into poor (< median attitude score) and good (> median attitude score) (4-5/5).

Males made up 52.3% (115) of the participants and the mean age was 23.7 years. Nearly two third of the participants graduated within Bhutan 64.1% (141). Most of the participants were general graduates followed by medical graduates, 89.5% (197) and 5.0% (11), respectively. Only 12.3% (27) of participants had medical conditions requiring regular treatment. More than eight percent (19) of participants never visited hospitals while 9.6% (21) visited hospital more than five times a year (Table 1).

3. RESULTS

Of the 2,229 graduates attending the NGOP, 376 (17%) consented and started the online survey, however, only 220 (10%) completed the survey.

The main source of information on antibiotics to the participants was internet, followed by friends, health workers, newspapers and university curriculum or electives as shown in Fig. 1.

Table 1. Summary of study participants (N=220)

Characteristics		Number	Percent
Country of education	In-country (Bhutan)	141	64.1
	Ex-country	79	35.9
Educational degrees	General	197	89.5
	Medical	11	5.0
	Allied health	9	4.1
	Nursing	3	1.4
Gender	Male	115	52.3
	Female	105	47.3
Hospital visit (in a year)	Never	19	8.6
	Once in a few years	49	22.3
	1-2 times per year	90	40.9
	4-5 times per year	41	18.6
	> 5 times per year	21	9.6

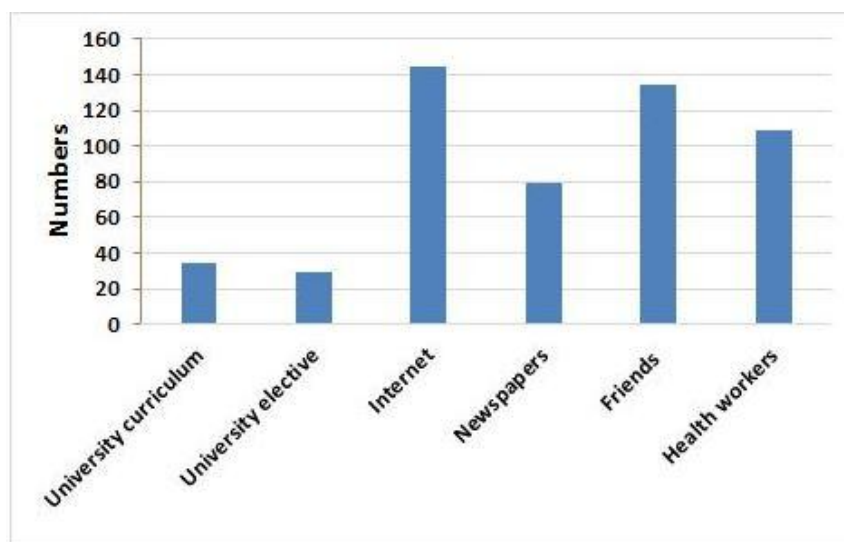


Fig. 1. Main sources of information on antibiotic

3.1 Knowledge

More than half, 51.4% (113) of the respondents showed good knowledge level. Most of participants, 95.9% (211) have heard about antibiotics before. The knowledge on antibiotics varied significantly with 63.6% (140) and 78.7% (173) participants correctly identified penicillin and amoxicillin as antibiotic. However, only 21.4% (47) could identify septran (cotrimoxazole) as antibiotics. Participants wrongly identified atenolol 11.4% (25), paracetamol 35.0% (77) and brufen 31.8% (70) as antibiotics. More than 79.6% (175) of respondents correctly answered that antibiotics were taken for infections caused by bacteria. However, 57.3% (126) incorrectly answered that antibiotics were effective against viral infections. Nearly half (49.6%, 109) knew that antibiotics were to be taken for short duration of time and 75.0% (165) were aware that inappropriate use of antibiotics can lead to microbial resistance. Knowledge on global problem of antibiotic resistance and its consequences were answered correctly by 58.2% (128) and 48.2% (106), respectively. The side effects of antibiotics such as stomach upset, allergic rashes, nausea and vomiting, effect on pregnancy and diarrhoea were answered correctly by 37.3(82), 61.4% (135), 53.2% (117), 54.1% (119) and 27.3% (60) respectively. Thirteen percent (28) of participants thought that use of antibiotics can cause cancer. More than 90.9% (200) of participants knew about the need to complete the full course of antibiotics, 95.5% (210), 90.0% (198) each knew antibiotics should be taken on time, avoid alcohol and report to health worker on any allergic reactions that might develop while taking antibiotics. However, only 74.1% (163) knew drinking plenty of fluid while taking antibiotics was important. Participants responded that antimicrobial resistance can affect the treatment of hypertension 13.2% (29), HIV 21.8% (48), Tuberculosis 44.1% (97), malaria 27.7% (61), and asthma 15.5% (34) (Table 2). The mean score of knowledge in the study population was 15.5 (range 2-30).

3.2 Attitude

About 54.1% (119) of the participants scored 'good' on attitude score. About 38.6% (85) had misconception that antibiotics would be required for common cold and 34.6% (76) responded that antibiotics would be required for all illness with fever. Eleven percent (24) answered that antibiotics should be given to a child with any fever. Nearly half (101) responded that antibiotics

would be required for all small clean-cut wounds and 12.3% (27) answered that antibiotics can be stopped after the patient feels better even if the course was not completed. One third (70) repeated antibiotics for same or similar illness till illness improved. A high proportion of respondents, 93.6 (206) thought that public need to be educated on the effects and use of antibiotics (Table 3).

3.3 Practice

One fourth (56) of participants use antibiotics less than once a year, while 7.7% (17) used antibiotics more than three times a year (Fig. 2).

Two-third, 75.9% (167) knew that antibiotics cannot be bought from drug stores without prescription, however 28% (61) of the participants were able to get antibiotics from medical stores without prescription. More than 25% (57) and 10.5% (23) took antibiotics without prescription and requested doctor to prescribe antibiotics for non-specific illness such as fever, cough and diarrhoea. However, only 6.8% (15) consulted another doctor if the first doctor did not prescribe antibiotics. Around 27.3% (60) and 26.4% (58) shared antibiotics with other people with similar illness and saved antibiotics for later use respectively. While 44.1% (97) revealed that pharmacy staff did not instruct adequately about antibiotics while dispensing, nearly 80% (175) followed the instructions about taking antibiotics and completed the course of antibiotics on time. Interestingly, 43.6% (96) suggested or made other people to take antibiotics during illness. Sixty percent (132) applied antibiotic cream or paste on cuts and skin infections (Table 4).

4. DISCUSSION

In this study, only about half of the graduates showed good knowledge and 54.1% had good attitude on antibiotics. Practice was very much variable to different questions but better than knowledge and attitude. This level of knowledge, attitude and practices on antibiotics amongst the young and educated group of the society is probably inadequate. These findings unfortunately compel us to believe that the KAP in the general population of Bhutan, with a general literacy rate of 63% [19] could be lower since it was shown that medical knowledge in the community were positively associated with education and negatively associated with age [20]. However, it could also be possible that the level of KAP amongst the Bhutanese population

may not be significantly affected by education level, as shown in a previous study [17]. In addition, an overall study participation rate of only 10% despite repeated notification and reminders implicated that even the educated category of people did not understand the importance of research and were unwilling to come forward, especially in inactive recruitments.

Table 2. The percentages of answers on questions related to knowledge and the frequencies of the different knowledge scores

Knowledge on antibiotics	Yes (%)	No (%)	Don't know (%)
Have you ever heard of antibiotics?	211 (95.9)	5 (2.3)	4 (1.8)
Do you know that there are different groups of antibiotics?	136 (61.8)	57 (25.9)	27 (12.3)
Of the following, which are antibiotics:			
Penicillin	140 (63.6)	15 (6.3)	65 (29.6)
Atenolol	25 (11.4)	62 (28.2)	133 (60.4)
Amoxicillin	173 (78.7)	8 (3.6)	39 (17.7)
Paracetamol	77 (35.0)	111 (50.5)	32 (14.5)
Brufen	70 (31.8)	90 (40.9)	60(27.3)
Septran (Cotrimoxazole)	47 (21.4)	39 (17.7)	134 (60.9)
Antibiotics are taken for infections caused by bacteria	175 (79.6)	21 (9.5)	24 (10.9)
Antibiotics are also effective against viral infections	126 (57.3)	44 (20.0)	50 (22.7)
Unlike anti-hypertensives and diabetics, antibiotics are given for a shorter course?	109 (49.6)	24 (10.9)	87 (39.5)
When antibiotics are not taken properly, the microorganism causing the infection becomes resistant and antibiotics become ineffective.	165 (75.0)	10 (4.6)	45 (20.5)
Are you aware of the global problem of increasing antibiotic resistance and drug-resistant infections?	128 (58.2)	50 (22.7)	42 (19.1)
Antibiotic resistance can affect you, your family and the community due to spread in the hospitals and the community?	106 (48.2)	49 (22.3)	65 (29.5)
Antibiotics cause the following side effects:			
Stomach upset	82 (37.3)	44 (20.0)	94 (42.7)
Allergic rashes	135 (61.4)	15 (6.8)	70 (31.8)
Nausea and vomiting	117 (53.2)	28 (12.7)	75 (34.1)
Cancer	28 (12.7)	80 (36.4)	112 (50.9)
Effect on pregnancy	119 (54.1)	21 (9.6)	80 (36.4)
Diarrhoea	60 (27.3)	48 (21.8)	112 (50.9)
Are following important to consider while taking antibiotics?			
Complete the course	200 (90.9)	7 (3.2)	13 (5.9)
Take on time	210 (95.5)	3 (1.4)	7 (3.2)
Drink plenty of fluids	163 (74.1)	15 (6.8)	42 (19.1)
Avoid alcohol	198 (90.0)	6 (2.7)	16 (7.3)
Report if any allergic reaction occurs	198(90.0)	6 (2.7)	16 (7.3)
Antimicrobial resistance can affect the treatment of following diseases:			
Hypertension	29 (13.2)	31 (14.1)	160 (72.7)
HIV	48 (21.8)	43 (19.6)	129 (58.6)
Tuberculosis	97 (44.1)	12 (5.4)	111 (59.5)
Malaria	61 (27.7)	25 (11.4)	134 (60.9)
Asthma	34 (15.5)	39 (17.7)	147 (66.8)
Knowledge score	Number	Percentage	
Poor	107	48.6	
Good	113	51.4	

Table 3. The percentages of answers on questions related to attitude and the frequencies of the different attitude scores

Attitude on antibiotics	Yes (%)	No (%)	Don't know(%)
We require antibiotics for common cold	85 (38.6%)	106 (48.2)	29 (12.2)
We require antibiotics for all illness with fever	76 (34.6)	96 (43.6)	48 (21.8)
Antibiotics should be given to a child with any fever	24 (10.9)	125 (56.8)	71 (32.3)
Every person with cough and fever needs antibiotics	54 (24.5)	121 (55.0)	45 (20.5)
We require antibiotics for all clean cut wounds.	101 (45.9)	72 (32.7)	47 (21.4)
All diarrhoea need antibiotics treatment	27 (12.3)	126 (57.3)	67 (30.4)
Antibiotics can be stopped after the patient feels better even if the course is not completed	27 (12.3)	156 (70.9)	37 (16.8)
Antibiotics courses can be repeated for the same/similar illnesses till the illness is gone?	70 (31.8)	57 (25.9)	93 (42.3)
Do you think the public need to be more educated on the effects and use of antibiotics and other medicines?	206 (93.6)	5 (2.3)	9 (4.1)
Attitude score	Number		Percentage
Poor	101		45.9
Good	119		54.1

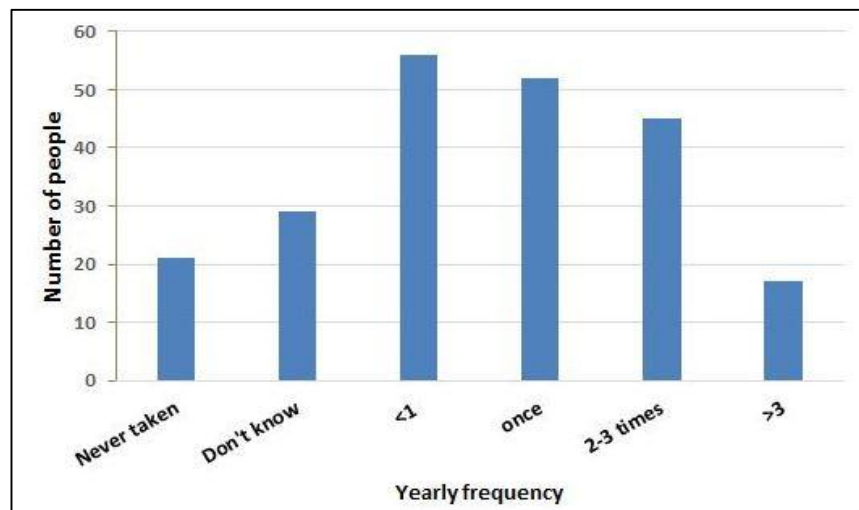


Fig. 2. Frequency of antibiotic use by participants

There was almost an equal participation rate between the two genders, and graduates within the country were more forthcoming in studies than ex-country graduates. The main source of information on antibiotics were the internet and friends, implying that healthcare workers did not spend much time in explaining about the appropriate use of antibiotics and do not involve themselves in educational activities. It could however, also be due to the participants feeling more comfortable to get information from online sources or friends.

The failure to identify commonly used antibiotics such as penicillin, amoxicillin and septran

(cotrimoxazole) reflected the poor knowledge amongst the participants. Such inadequate knowledge can hamper their attitude and practice significantly leading to misuse and related consequences. In addition, a significant misidentification of the commonly used antipyretics and analgesics, brufen and paracetamol as antibiotics was disheartening. This average level of knowledge implies the need for healthcare workers to spend more time in explaining about medicines to patients in the hospitals or in community health forums. Another explanation for the participants not being able to identify commonly used medicines could be due to the medicines being supplied free of cost so

that people do not value them. It was encouraging that about 75% of the participants understood that improper use of antibiotics can lead to antibiotic resistance. This was better than a Lebanese finding where only about 67% understood that antibiotic abuse can lead to resistance [21].

Only about 54% of the participants showed good attitude towards antibiotic use. Simple and practical concepts like antibiotics are not helpful in common cold and all febrile illnesses do not require antibiotics are lacking. However, our findings are slightly better than a Malaysian study that showed nearly 68% of the parents believing that antibiotics were helpful in treating cold, 69% for treating cough and 76% for fever in children [22]. Graduates as potential young parents would benefit from their knowledge on antibiotics and their use and also as a source of information for friends and colleagues. With 50% of the participants believing that antibiotics are required for all small cuts and wounds, there is risk that the people in the community may be resorting to inappropriate use of antibiotic ointments and other preparation on cuts and wounds. This practice must be encouraging people to save antibiotics for future use and may be a significant contributor to antibiotic resistance. The finding from our study showed that the practice of stopping antibiotics before completing the prescribed course was not as high as in a study in New Delhi, India [11]. This could be influenced

by existing private practices and having to purchase antibiotics by the users in India compared to Bhutan. Such practices risk inadequate dosing, saving and repeating the same antibiotics in the future with self-medication or sharing with other people, wastage of antibiotics and ultimately contributing to antibiotic resistance.

Annual individual antibiotic usage was low compared to antibiotic use among adults in Jordan [23] where as high as 20% used antibiotic more than three times a year. Although a good understanding of the regulation binding the sale of antibiotics without prescriptions (76%), the fact that 28% were able to get them without prescription is concerning. This revealed a loophole in the DRA regulation and calls for its immediate reinforcement. In addition, self-medication was high with 25% from using antibiotics without prescription. This finding was, however, lower than other studies in India and Pakistan which reported similar rates at 74.6% [24] and 76% [7] respectively. The practice of requesting a doctor for an antibiotic prescription was low (11%) but considerable. This low incidence could probably be due to limited practising doctors in the Bhutanese hospitals and non-existence of private practice in Bhutan. Antibiotic misuse is presumed to be high with 27% sharing antibiotics with others and 26% saving them for future use. This could easily be prevented with community education since

Table 4. Questions targeting practice on antibiotics

Practice on antibiotics	Yes (%)	No (%)	Don't know (%)
Do you go to buy antibiotics without prescription in Bhutan?	43 (19.6)	167 (75.9)	10 (4.5)
Were you able to get antibiotics from the medical shops without prescription?	61 (27.7)	125 (56.8)	34 (15.5)
Do you take antibiotics without prescription?	57 (25.9)	159 (72.3)	4 (1.8)
Do you request the doctor to prescribe antibiotics for non-specific fever, cough and diarrhoea?	23 (10.5)	187 (85.0)	10 (4.5)
Do you go to another doctor if the first doesn't agree to prescribe antibiotics for you?	15 (6.8)	199 (90.5)	6 (2.7)
Do you share your antibiotics with other people of similar illnesses?	60 (27.3)	154 (70.0)	6 (2.7)
Do you save unused antibiotics for later use for yourself or others?	58 (26.4)	156 (70.9)	6 (2.7)
Does the pharmacy staff explain properly on antibiotics during dispensing?	84 (38.2)	97 (44.1)	39 (17.7)
Do you follow the instructions and complete the medications all the time?	175 (79.6)	32 (14.5)	13 (5.9)
Do you make/suggest someone to take antibiotics?	96 (43.6)	117 (53.2)	7 (3.2)
Do you apply antibiotic cream/paste on any cuts and skin infections?	132 (60.0)	66 (30.0)	22 (10.0)

medicines are provided free by the state. With only 44% accepting that pharmacy staffs explained adequately during dispensing medicines, the poor practice could be a result of this. About 44% had suggested other people to take antibiotics during illness and this could be one of the main reasons for getting antibiotics from hospital pharmacies or private pharmacy shops without prescription or antibiotic leftovers from past incomplete courses or other people. The high level of topical antibiotic use (60%) is alarming and this could result into antibiotic resistance if such practices are continued. This should be done through rigorous enforcement of laws and regulation by the DRA to limit the availability and selling topical antibiotics.

This study was not free of limitations. Only about 10% of the total graduates participating in the NGOP took part in the study despite several mechanisms to encourage participation. Graduates came from different educational background, different countries (both within and outside Bhutan) and a few graduates might even be people with work experience since they had taken up higher studies as part time students while in service. KAP of different educational backgrounds (such as medical versus law graduates) were not compared.

4.1 Utilization of the Findings for Public Health

This study is a first of its kind amongst the graduates in Bhutan and it has contributed in producing baseline data for the Ministry of Health and the Ministry of Education to direct future activities in regard to antibiotics. The findings can be extrapolated to other medicines and health related subject matters in general. Incorporating basic educational topics on medicines and health and rational utilization of medicines into high school and undergraduate course materials may help people to understand these concepts better and contribute to being responsible consumers. This is specially required in the Bhutanese setting where healthcare and medicines are provided free of cost for people to value and prevent wastage. The policy and planning sector of the Ministry of Health should utilize the results of this study, incorporate public health activities based on these findings, design educational activities in the similar line and strive to educate the public on various aspects of health and medicine. The MoH should liaise with other government and non-government agencies to set

a trend in such education in formal and informal public health education.

5. CONCLUSION

The level of knowledge, attitude and practices on antibiotics amongst the graduates attending the NGOP 2016 were generally unsatisfactory except for few good responses on specific practices. This highlights the need for health education on proper use of antibiotics and the consequences of their improper uses. Public education should also focus on values of medicines in terms of cost implications to a resource limited country like Bhutan. The rules and regulation on sales of antibiotics without prescriptions needs strengthening and implementation strictly. Future studies should look at KAP amongst different groups of occupation, educational background and determining factors to help in formulating national strategic plans.

CONSENT AND ETHICAL APPROVAL

The study was approved by the Research Ethics Board for Health (REBH), Ministry of Health, Bhutan, through approval no. REBH/Approval/2016/037. All participants provided informed consent after reading and agreeing to the information and consent form on the first page of the online survey.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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