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Original Article

ASSESSING KNOWLEDGE, PERCEPTION AND ATTITUDES ABOUT ANTIBIOTICS AMONG FINAL YEAR PHARMACY UNDERGRADUATES IN SRI LANKA

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ABSTRACT

Objective: Anti-microbial resistance has become a global problem especially in developing countries. The aim of the study was to evaluate the effect of socio-demographic predictors amongst final year pharmacy undergraduates in Sri Lanka on their knowledge, perception and attitudes regarding antibiotic use.

Methods: A questionnaire-based study involved final year pharmacy students from four public universities in Sri Lanka. Data on knowledge, attitudes and perception about the appropriate use of antibiotics were analysed. Ethics approval was granted by the university of Ruhuna Sri Lanka.

Results: There was good general knowledge of antibiotics (mean=15.57), however, 46% said metronidazole is not an antibiotic, 82% said that the use of antibiotics speed-up the recovery from the common cold. Perception (p=0.033) and attitudes (p=0.028) of respondents from urban area were significantly higher than that of those from rural area.

Conclusion: Clinical education for pharmacy undergraduates should have an in-depth focus on the rational of antibiotics use in Sri Lanka.

Keywords: Antibiotics, Knowledge, Attitudes, Perception, Sri Lanka, Pharmacy students

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INTRODUCTION

Antimicrobial agents have been used to treat patients who have infectious diseases over the last 70 y. Since the 1940s, these medications have reduced morbidity and mortality related to infectious diseases, saving countless lives through scientific discoveries [1]. However, these achievements are now threatened by the global emergence of resistant strains [2] and the inability of the industry to introduce new antibiotics [3].

Antibiotics are among the most commonly prescribed, sold and used drugs globally [4, 5]. Their use could be either appropriate or inappropriate, the use has been viewed as a key driver for progressive loss of bacterial sensitivity to antibiotics and the emergence, increase and spread of antibiotic resistance (ABR) [4, 5]. The emergence and spread of microbial resistance to antibiotics is an important global public health issue that has been linked to the inappropriate use of antibiotics worldwide [6-8]. This is known to contribute to therapeutic failure when treating infections, due to presence of antibiotic-resistant micro-organisms. This leads to longer hospital stays, and increased mortality and health-care costs [2, 9-11].

The ABR crisis impacts more in developing countries, (especially in low socioeconomics countries) because of high burden of infectious diseases [1, 12]. This may be compounded by irrational practices of prescribing antibiotics mainly for upper respiratory infections [13-16], and immature antibiotics stewardship policies. This may be complicated by the availability of antibiotics without prescription (regulated but not controlled) [17-19] and lack of laboratories for antibiotics susceptibility testing and surveillance. Factors such as; lack of access to health care services, services are not affordable, limited regulatory control of the use of prescription medicines including antibiotics, limited understanding of the role of antibiotics, the opportunity to self-medicate, the concern of doctors for the risk of secondary bacterial infections after viral illnesses in poor environments, prohibitive cost sensitivity testing and pharmaceutical promotional tactics all compound the problem [20-22].

In many countries where antibiotics are 'prescription only medicines,' they are in practice widely available 'over the counter,' especially in developing and resource limited countries. A 'prescription only' drug such as tetracycline could be obtained easily from pharmacies without prescription in the capital city of Sri Lanka [23]. Though antibiotics are not indicated for acute diarrhoea, they are widely supplied without prescription in Sri Lanka, Bangladesh and Yemen [24].

The measures required to slow the development and transmission of resistant microorganisms are used internationally for infection control and microbial surveillance to decrease the global burden of infectious diseases and control the use of antibiotics [25]. Pivotal to these measures are changing antibiotic use and public and professional attitudes and require all parties including physicians, pharmacists and consumers to be better informed about the dangers of inappropriate use [25].

In Sri Lanka, dispensing any prescription medicines, including antibiotics, without a valid prescriptions is prohibited by law [26], yet it is common knowledge that pharmacies often sell restricted medicines to clients who seek medical care, either based upon their expressed symptoms or on specific product requests [27]. Although every pharmacy is legally required to have a registered pharmacist, in many instances, an assistant pharmacist is operating the store without a pharmacist in attendance. These assistants generally have only a few years of school education and seldom has received any formal pharmacy education or training [23].

Pharmacy practice in Sri Lanka is behind that in developed and in some other developing countries. Dispensing is the core business of pharmacists in Sri Lanka in both community and hospital pharmacy settings. The majority of hospital pharmacists have a pharmacy proficiency qualification; this is a two-year formal pharmacy education in a certificate program with the internship in the public hospitals. Conversely community pharmacists are mostly trained through apprenticeships with external community pharmacy training (efficiency pharmacy qualification) and are registered with the Sri Lanka medical council as a pharmacist [28]. There are very few University graduate pharmacists, and they work mainly in the formulation and production areas, public and private hospitals or drug

regulatory authorities in Sri Lanka. Since 2005, public universities in Sri Lanka have started to offer a number of bachelor of pharmacy (B Pharm) undergraduate degrees [26], with the first candidates having graduated in 2009. Now, pharmacy practice is slowly gaining recognition in the local health services. The concept of this study was developed to evaluate the knowledge and competency of B Pharm graduates (future pharmacists) in aspects of clinical practice of pharmacy in both community and hospital pharmacy settings.

To date, no study has been published on the knowledge, attitude and perception of the use of antibiotics among final year pharmacy undergraduates in Sri Lanka. This aim of this study was to establish a starting point for the knowledge, perception and attitudes regarding antibiotic use in Sri Lankan final year pharmacy undergraduates.

MATERIALS AND METHODS

Study design

A cross-sectional study was carried out among final year pharmacy students at four out of five universities in Sri Lanka offering this course.

Setting

The survey encompassed final year pharmacy undergraduates at the University of Ruhuna, University of Colombo, University of Sri Jayewardenepura and the University of Jaffna. All the above universities offering BPharm program except the University of Colombo, which offers a Bachelor of Science (Pharmacy) degree.

Population

The total study population was 79 final year pharmacy students with 30 students from the University of Ruhuna, 25 students from the University Sri Jayawardenapura, 12 students from the University of Colombo and 12 students from the University of Jaffna. All the eligible students had given consent; hence the response rate was 100%.

Method

The study instrument was a self-administered questionnaire. This was adopted from previous studies that have already undergone a face validation and content validation process [29-31]. The original questionnaire was written in English, which is the approved language of study for pharmacy degrees in Sri Lanka. The questionnaire consisted of four sections. The first section explored demographic information; gender, family background, family residence, parents' level of education and ethnicity. The second section comprised of 9 questions, evaluating the participants' knowledge regarding antibiotics and their use (table 2). The third part explored perceptions on antibiotics use and resistance among the participants which included 8 questions (table 3). The fourth section assessed the attitude of participants regarding antibiotics and this section included four questions (table 4).

A common scoring standard was used for each question in all the three categories, knowledge, perception and attitudes. The answers were deemed as 'correct' or 'wrong' for the single-answer questions generally considering whether it corresponded with the prevailing evidence. Value of 1 or 0 points were assigned to the 'correct' or 'wrong' answers, respectively. The score was then summed to give a total between 0-14 for the knowledge of participants, 0-10 for their perceptions and 0-4 for their attitudes regarding antibiotics. Each of these summed variables were treated as a continuous outcome variable as all of them were showing a normal distribution pattern in the preliminary analysis.

The Universities were assigned a code as A, B, C and D for Colombo, Jayewardenepura, Jaffna and Ruhuna respectively.

Inclusion criteria

The pharmacy undergraduate who were (1) in final year of their undergraduate pharmacy course and (2) gave written informed consent to participate in the study.

Data analysis

Statistical analysis was conducted using SPSS™ 20 (IBM Armonk, NY, USA) statistical software. Descriptive statistics results were expressed as mean±SD (standard deviation) and frequencies (percentages). Assessment of difference between demographic characteristics of the participants and their knowledge, perception and attitudes were carried out using independent t test and one-way ANOVA and whenever appropriate post hoc Bonferroni's multiple comparison test was also conducted. A Pearson product-moment correlation coefficient test was computed to assess the relationship among the all three outcome variables. In all cases, p values<.05 were taken as statistically significant.

Ethical approval

The study was conducted after obtaining ethical approval (Reference No: 31.03.2015.03.10) from the ethical review committee, faculty of medicine, University of Ruhuna Sri Lanka. Written permission also obtained from heads of the respective departments or faculties of the four universities prior to the data collection.

Consent and data collection

The data collection was carried out by one of the researchers visiting each respective university between July and October 2015. After explaining the purpose of the study, voluntary participation and the confidentiality of the data, and confirming that every participant was clearly informed about the study, written consent was obtained from all participants. The time burden was approximately 10-15 min to complete the questionnaire.

RESULTS

Socio demographic characteristics of participants

Table 1 shows the descriptive statistics of the socio-demographic characteristics of participants. Out of the total 79 students who participated in this study, 38% were from the University of Ruhuna followed by 31.6% from University of Sri Jayewardenepura and 15.2% each from the of University of Jaffna and University of Colombo. All the participants were final year pharmacy students. More than half of the participants were females (N=52, 65.8%). Slightly more than half of the participants were from an urban area (51.9%). For most participants, their parents highest level of education was until advanced level (Year 13) (N=53, 67%) and almost all their parents (N=75, 94.9%) had education other than in health-related fields. Regarding ethnicity 84.8% (N=67) of the participants identified as Sinhalese, 8.9% as Tamil and 6.3% as Muslim.

Knowledge about antibiotics

Table 2 describes the knowledge regarding antibiotics. The results reveal good basic knowledge but some concerning findings (Mean =12.08 SD=0.89). A considerable number mentioned that antibiotics can cure viral infections (9%) and many suggested that antibiotics will speed up the recovery of cold and cough (82%). About 11.4% of the participants believed that frequent use of antibiotics will not decrease the efficacy the treatment when using the antibiotics again. Some of the participants said that newer and higher price antibiotics are better (32%). Regrettably almost half (46%) of the future pharmacists (final year pharmacy students) said that metronidazole is not an antibiotic.

As determined by one-way ANOVA there was no statistically significant difference on mean knowledge about antibiotics among final year pharmacy students of different universities ($F(3,75) = 0.597$, $p = .619$), different level of parents' education $F(2,76) = 0.147$, $p = .863$) and the ethnicity $F(2,76) = 0.260$, $p = .772$) (where F is the F-statistics and p is probability).

A Bonferroni post-hoc test also confirmed no significant difference ($p>0.05$).

An independent-samples t-test was conducted to compare mean knowledge in males and females; rural and urban; parent's occupation related to the medical field of participants. These results suggest that these predictors do not have an effect on pharmacy students' knowledge about antibiotics.

Table 1: Socio demographic characteristics of participants

Variable	Frequency (%)
Name of the university	N=79
A	12 (15.2)
B	12 (15.2)
C	30 (38.0)
D	25 (31.6)
Academic year	N=79
4thYear	79 (100.0)
Gender	N=79
Male	27 (34.2)
Female	52 (65.8)
Family residence	N=79
Urban	41 (51.9)
Rural	38 (48.1)
Parent' Education	N=79
Up to O/l	12 (15.2)
Up to A/l	41 (51.9)
High Education	26 (32.9)
Parent' Occupation	N=79
Related to medical field	4 (5.1)
Not related to medical field	75 (94.9)
Ethnicity	N=79
Sinhalese	67 (84.8)
Tamil	7 (8.9)
Muslim	5 (6.3)

N= Number of participants

Table 2: Knowledge on antibiotics among pharmacy undergraduates in Sri Lanka

Variables	Frequency (%)
Are there bacteria in human body which are good for our health?	N=79
Yes	77 (97.5)
Antibiotics can be used to cure infections caused by bacteria.	N=79
Yes	79 (100.0)
Antibiotics can be used to cure infections caused by viruses.	N=79
Yes	8 (8.9)
The use of antibiotics will speed up the recovery of common cold.	N=79
Yes	65 (82.3)
Heard about resistance of bacteria	N=79
Yes	78 (98.7)
Frequent use of antibiotics may reduce future antibiotic use benefit.	N=79
Yes	70 (88.6)
Antibiotics are more effective if they are newer and expensive.	N=79
Yes	25 (31.6)
Which of the following drugs are antibiotics?	
Amoxicillin	N=79
Yes	79 (100.0)
Furosemide	N=79
Yes	1 (1.3)
Metronidazole	N=79
Yes	43 (54.4)
Tetracycline	N=79
Yes	78 (98.7)
Phenytoin	N=79
Yes	1 (1.3)
What is "antibiotics susceptibility test" used for?	N=79
To test if the antibiotic is efficient for infections by some bacteria.	77 (97.5)
To test if the antibiotic is efficient for infections by some viruses.	2 (2.5)

N= Number of participants

Perception towards antibiotics use and emergence of resistance

Descriptive statistics of the students' perceptions are shown in table 3. The results show clear overall favourable perception among the participants on antibiotic use and resistance (Mean =8.37 SD=1.34). Almost all perceived the current existence of antibiotics abuse (92%) and that it is the main cause of ABR (84%). They also perceived that ABR is a major health problem in Sri Lanka (95%) and it may harm themselves and their family (92%). They recognized the importance of gaining more information about antibiotics (96%) and the establishment of university level courses promoting rational use of antibiotics (95%). They also saw the need for a major campaign to educate the public in Sri Lanka on antibiotic use (77%). Participants believe the one of the major root causes of antibiotics abuse is that the drug manufacturers, hospitals, and other sectors are driven by economic interests rather than health benefits of the patients (81%).

A one-way ANOVA test revealed that there was no statistically significant difference on mean perception about antibiotics use and resistance among final year pharmacy students of different

universities ($F(3,75) = 0.796, p = 0.500$), different level of parents education ($F(2,76) = 1.778, p = 0.176$) and the ethnicity ($F(2,76) = 0.170, p = .844$). Again a Bonferroni post hoc test confirmed this ($p>0.05$).

Independent-sample t-test results revealed that there was a significant different in the perception about antibiotic use and resistance between the students from urban (M=8.83, SD=1.05) and rural (M=7.87, SD=1.45); t(77)=3.39, p=0.01 areas.

Table 3: Perception on antibiotics use and resistance among final year pharmacy students

Variable	Frequency (%)
I think it is necessary to get more information about antibiotics	N=79
Yes	76 (96.2)
It is necessary to establish the course "Rational use of antibiotics" at the university level	N=79
Yes	75 (94.9)
I think, the "antibiotics campaign" is a kind of large-scale science propaganda activity	N=79
Yes	61 (77.2)
I think there is abuse of the current antibiotics.	N=79
Yes	73 (92.4)
Bacterial antibiotic resistance is a problem in Sri Lanka.	N=79
Yes	75 (94.9)
The abuse of antibiotics is the main cause of bacterial resistance.	N=79
Yes	66 (83.5)
Antibiotic resistance can affect me and my family's health.	N=79
Yes	73 (92.4)
Root Cause of antibiotics abuse;	
Principles of antibiotic use are not globalised.	N=79
Yes	46 (58.2)
Drug manufacturers are more driven by economic interests.	N=79
Yes	64 (81.0)
There are loopholes in the health and medicine regulation.	N=79
Yes	52 (65.8)

N= Number of participants

Attitudes about antibiotics use

Table 4 describes the attitudes of final year pharmacy students in relation to the side effects of antibiotics. The one-way ANOVA test determined no statistically significant difference on mean attitudes about antibiotics score between universities ($F(3,75) = 1.518, p = .217$), different level of parents education ($F(2,76) = 0.501, p = .608$) and the ethnicity ($F(2,76) = 2.919, p = .060$). Once more a Bonferroni post hoc test confirmed this ($p>0.05$). Conversely, an independent-samples t-test revealed a statistically significant positive attitude among females (M=2.83, SD=0.83) and urban (M=2.85, SD=0.94) final year pharmacy students compared to males (M=2.30, SD=0.99); t(77)=2.51, p=0.014 and rural (M=2.42, SD=0.86); t(77)=2.13, p=0.036 students.

There was a significant positive correlation found between variables; overall knowledge about antibiotics and perception on antibiotic use and resistance. Overall perception scores increase in proportion with knowledge-related antibiotics score (r = 0.22, n= 79, p =0.047) and vice versa.

Table 4: Attitudes on antibiotics among pharmacy undergraduates in Sri Lanka

Variable	Frequency (%)
When use antibiotics, I am worried about side effects.	N=79
Agree	60 (75.9)
I tend to stop using antibiotics when I experience side effects.	N=79
Agree	32 (40.5)
If antibiotics harm equals their benefit, I prefer not to use them.	N=79
Agree	51 (64.6)
If I experience side effects when using antibiotics, I will consult a doctor.	N=79
Agree	66 (83.5)

N= Number of participants

DISCUSSION

So far as can be established, this is the first survey conducted in Sri Lanka to demonstrate knowledge, perception and attitudes regarding antibiotics among only final year pharmacy undergraduates. Final year pharmacy undergraduate students are the immediate future pharmacist workforce throughout the Island, so this study provides some insight into their competency to work against ABR and to guide improvements in the curriculum of B Pharm programs in Sri Lanka to specifically focus on antibiotics and their resistance.

The overall knowledge of participants regarding antibiotics was predominantly sound. This suggests the curriculum relating to antibiotics and their use is mostly appropriate. A similar type of study was conducted in China, with medical students. It showed their knowledge improved as they progressed with their study [30]. However, examining individual questions, it is concerning that a majority of the participants (82%) believed antibiotics will speed up the recovery of coughs and colds. This observation has been reported in a number of studies conducted among undergraduate students of medical sciences and non-medical sciences [5,32]. However, as the majority of upper respiratory tract infections (URTIs) are viral, antibiotics are not indicated [35]. Studies demonstrate that antibiotics can provide only minor benefit, or no benefit for these infections [13-14, 33-35]. The unnecessary use of antibiotics for viral URTIs is claimed to be an important contributors to antibiotic misuse globally [36].

Also of concern was that 46% of the participants failed to identify metronidazole as an antibiotic. This should be also considered as a serious issue as the nation's future pharmacists were unable to recognize one of the commonest antibiotics. Previous studies found a lack of knowledge of pharmacists is one the factors attributed to dispensing malpractices [37, 38]. As a study conducted in Kuwait showed that public advice on how to use antibiotics primarily comes from pharmacists rather than doctors [39].

The participants perceived that ABR is a serious health problem in Sri Lanka and believed that inappropriate use is one of the main causes. This in line with a Portuguese study that reported patients' non-compliance with prescribed dosage to be one cause of ABR [40]. Other factors such as the economic interests of drug manufacturers, hospitals and other sectors, and loopholes in the regulation are the identified by the participants as contributors to ABR in Sri Lanka. Similar findings have been seen from other studies around the globe [20, 21].

Since almost all of the participants agreed that it is important for them to get more information about antibiotics and were supportive of the establishment of courses at the university level to promote rational use of antibiotics, these are clear indicators that this group of graduates are seeking to study more about antibiotics.

As we found that there is no significant different in knowledge, perception and attitudes among final year pharmacy undergraduates from different universities in Sri Lanka, the academic curriculum is perhaps standardized among these universities specifically pharmacology, microbiology and clinical pharmacy modules related to antibiotics. All are based upon the same indicative syllabus.

Participants from urban Sri Lanka had a significantly positive perception ($p=0.01$) and attitudes ($p=0.036$) towards antibiotics and ABR compared to that of rural participants. This may be due to easy access of information and availability of pharmacies and doctors to students in urban areas compared to rural.

As shown in our study, the knowledge of participants is predicting their perception (significant positive correlation) that may or may not lead to their behaviour. Hence correct knowledge about antibiotics and ABR are vital for future pharmacists to possess positive perception on antibiotics use and resistance.

STRENGTH AND LIMITATION

The main strengths of this study are the use of broadly representative samples with different cultural and geographical environments, thus, allowing us to generalise our findings, and that a 100% response rate from approached participants was achieved. However, the study also has several limitations. Self-reported measures are susceptible to memory bias and the social desirability effect. Events that are salient and recent are more likely to be remembered and reported compared to those that are less salient and more distant. The use of cross-sectional data also precludes any inferences about the directionality of effects.

CONCLUSION

This study reveals that final year pharmacy undergraduates' knowledge related to the appropriate use of antibiotic should be improved in Sri Lanka, hence this should be considered as a serious issue and immediate action is required to correct this before graduation.

This study indicated that specific in-depth education of university pharmacy students regarding antibiotics and their resistance is vital and may improve their knowledge and perception on rational usage of antibiotics, but knowledge may not always correlate with behaviour. Perhaps the pharmacology and clinical pharmacy modules of the B Pharm curriculum should also include considerable weight on antibiotics and antibiotics resistance. This could be achieved by incorporating more clinical practical components to their curriculum including clinical placement.

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AUTHORS CONTRIBUTION

We certify this is our own original work, first author conducted the research, second author supervised the intervention and third author drafted the publication. All authors have contributed and agreed to the submission of this manuscript and that this work has not been submitted for publication elsewhere.

CONFLICTS OF INTERESTS

Declared none

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