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Original Research

Comparison of knowledge and attitudes about antibiotics and resistance, and antibiotics self-practicing between Bachelor of Pharmacy and Doctor of Pharmacy students in Southern India

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ABSTRACT[*]

Background: There is limited research on pharmacy specialization based differences with regards to usage of antibiotics.

Objective: To compare the knowledge, attitude and practice of Bachelor of Pharmacy (BPharm) and Doctor of Pharmacy (PharmD) students about usage and resistance of antibiotics in Southern India.

Methods: This was a cross sectional study involving final year BPharm and PharmD students studying in two private institutions located in Andra Pradesh, India. The study was conducted for the period of 3 months. The questionnaire was divided into 5 components: demographics, knowledge about antibiotic use, attitude towards antibiotic use and resistance, self-antibiotic usage, and possible causes of antibiotic resistance. The study questionnaire was assessed for reliability. Data were analysed by employing Mann Whitney and chi square tests using SPSS version 19.

Results: The sample size comprised of 137 students. The response rate was 76.11% for the study. There was a significant difference in the knowledge of antibiotic use in BPharm and PharmD students (Mean score: 5.09 vs 6.18, $p<0.001$). The overall attitude of PharmD students about antibiotic use and resistance was positive compared to BPharm students (Mean score: 3.05 vs 2.23, $p<0.05$). The self-antibiotic practices was higher in BPharm students than PharmD students (36.4% vs 20%, $p<0.05$). A significantly high number of PharmD students believed that empirical antibiotic therapy led to antibiotic resistance (19.5% versus 48%, $P<0.05$).

Conclusion: PharmD students were more knowledgeable about antibiotic usage and resistance compared to BPharm students who did not have accurate and the much needed information about the same. Future interventions should be targeted towards educating the BPharm students so that they can implement the acquired knowledge in their practice.

Keywords: Students, Pharmacy; Health Knowledge, Attitudes, Practice; Anti-Bacterial Agents; Drug Resistance, Bacterial; India

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INTRODUCTION

WHO has reported high prevalence of drug resistance in healthcare facilities and in global community.[1] The extent of damage by drug resistance could be realized by a report that suggested an increase of USD20 billion in direct healthcare cost in developed country like United States (US). The report also suggested of around 2 million reported cases of antibiotic resistance every year in US.[2] However, in developing countries, many studies have been conducted in the past, but it is very difficult to quantify the burden imposed by antibiotic resistance on developing societies with precision. The situation is not so different in India as the identification of New Delhi metallo-beta-lactamase 1 (NDM-1) in recent past has raised many questions regarding antibiotic use. This gram negative Enterobacteriaceae is potentially resistant to all antibiotics except tigecycline and colistin.[3] Earlier, Global Antibiotic Resistance Partnership (GARP) - India Working Group reported that between the span of 5 years from 2005 – 2009, the consumption of antibiotics was increased by 40%. The study also highlighted that many researchers in recent past have established significant rate of resistance to number of antibiotics in India.[4] This statement was supported by another study which reported 24-67% of antibiotic prevalence in Maharashtra, India.[5] Lack of knowledge of healthcare professionals, malpractice in community pharmacies and Pharmaceutical industry are the main contributors of this resistance saga.[6-8] Several measures have been taken by the government in order to halt this surge of antibiotic resistance. The implementation of Schedule H-1 is one of the attempts to procrastinate the catastrophe of antibiotic self-medication practices in India.[5]

A noteworthy area was highlighted by many researchers regarding the inadequate training of healthcare professionals in their undergraduate education in an area of antibiotic use and resistance.[9] Competence in understanding of resistance patterns is a valuable guide to devise antibiotic guidelines and directing the antibiotic

practices towards the right path. In view of this, many studies have emphasized on revising the curriculum of junior healthcare professionals to promote the judicious use of antibiotics.[10] Recently, WHO has also embraces the role of undergraduate training in prudent prescribing.[1]

The role of pharmacist is unequivocal in this war against antibiotic resistance. They are viewed as a more knowledgeable and resourceful healthcare professional to assist in infection control campaign. More importantly, community pharmacists are blessed to be called as a 'gateway practitioner'. They have the significant opportunity to portray a prestigious role of promoting public health by their active participation in antibiotic stewardship program.[11] In this consideration, Doctor of Pharmacy (PharmD) program was started in India with the aim of providing pharmaceutical care and to meet the pressing needs of healthcare in society.[12] Before the introduction of this course, Diploma in Pharmacy (DPharm) and Bachelor of Pharmacy (BPharm) were the main degree programs in pharmacy offered in India. The entry point for BPharm and PharmD programs is 12 years of formal education in the sciences. The BPharm involves 4 years of study with no standardized curriculum. The focus of this degree is mainly towards industrial orientation, and there is no compulsory training in hospital/community practice site. The PharmD program constitutes 6 years of full-time study, while the PharmD (post-baccalaureate) program is a 3-year program. The final year of the study consist of practical training and/or residency at practice sites. The curriculum of PharmD program emphasizes majorly on clinical and patient-oriented aspects of the profession. At present, all three programs are running concurrently in different institutes of India. The curriculum of BPharm is mainly industry and product oriented unlike PharmD, However, the degree holders of both these programs are presenting their services in healthcare settings of India.[13]

To the best of our knowledge, no study has been conducted till date comparing the knowledge of BPharm and PharmD students. The objective of this study was to compare the knowledge, attitude and practice of BPharm and PharmD students towards antibiotic use and resistance. Our goal was to identify the knowledge gaps among students to form a basis of effective interventions regarding their understanding of pharmacist directed antibiotic stewardship program.

METHODS

A cross sectional study was conducted between final year Bachelor of Pharmacy (BPharm) and Doctor of Pharmacy (PharmD) students in two private institutes approved by pharmacy council of India (PCI) in South Indian state of Andhra Pradesh. PCI has granted an approval of 30 seats for PharmD and 60 seats for BPharm in the studied pharmacy colleges. The study was conducted for the period of 3 months from July to September, 2014 in which all the final year students of both the colleges were invited to participate in this study. All the students are briefed about the nature and the objectives of the research before requesting them to their voluntary participation in this study. Students were also informed via questionnaire about the operational definition of self-medication given by World Health Organization which is 'the selection and use of medicines by individuals to treat self-recognised illnesses or symptoms'.[1]

A self-administered questionnaire was designed and used as an instrument to collect data from the participants. A thorough literature review was done initially by one of the authors and research papers were shortlisted for further discussions among authors.[6,9,14-17] After all the selected papers were comprehensively reviewed by the authors, an initial draft of the questionnaire was designed. The questionnaire was then subjected to content validity and face validity. The draft was sent to pharmacy academicians responsible for delivering lectures relating to antibiotics use and resistance for their opinion on the contents of the questionnaire. The suggestions given by the expert were incorporated and the second version of the questionnaire was developed which then sent to a small sample 10 pharmacy students (5 from each course) for their suggestions on making the questionnaire more brief and simple. The data was then subjected to Statistical Package for the Social Sciences (SPSS) for reliability coefficient. A Cronbach's alpha of 0.76 was computed. Necessary changes were incorporated and after a series of discussions among the authors and between authors and selected pharmacy academicians. A final version of the questionnaire was then distributed to students for data collection.

The study instrument consisted of 5 sections. First section highlighted the demographic information like gender, living status and residence. Second section, comprised of 10 questions, evaluated the knowledge of participants about the use of antibiotics. Third section assessed the attitudes of respondents regarding antibiotic use and resistance. This section included 5 questions. The fourth part explored the self-antibiotic practices between BPharm and PharmD students. The last part of the questionnaire appraised the students regarding their knowledge of possible causes of antibiotic resistance.

Knowledge of antibiotics use was assessed by asking question about the effectiveness, side effects, resistance, cost, policy matters and implication of antibiotic use on public health. Each response was scored as 'True', 'False' or 'Don't Know'. A score of 1 was given to the correct answer and 0 to incorrect answer. Respondent who marked 'Don't know' was considered as a wrong answer. The maximum possible marks of knowledge section were 10 and the minimum mark was 0. A cut-off value of 6 or higher was taken as good knowledge while score of <6 was considered as poor knowledge. The same criteria were also used when assessing the knowledge of respondents about the possible causes of antibiotic resistance. The attitude of students was measured on 4 point Likert scale. A score of 1 was given to strongly agree, 2 to agree, 3

Table 1. Interrelation of Knowledge of antibiotic use and score with demographic information of participants (N=137)

Demographic Characteristics (n)	Knowledge Score Mean (SD)	Mean Rank	P value*
Gender			0.433
Male (93)	5.56 (1.43)	70.78	
Female (44)	5.31 (1.39)	65.23	
Degree			<0.001
B. Pharm (87)	5.09 (1.24)	58.63	
Pharm D (50)	6.18 (1.46)	87.05	
Living Status			0.168
Hostler/Outsider (34)	5.41 (1.41)	61.06	
Family home (103)	5.60 (1.41)	71.62	
Family Residence			0.021
Rural (44)	5.13 (1.09)	57.90	
Urban (93)	5.65 (1.53)	74.25	

* derived from Mann-Whitney U test

Note: Knowledge was assessed by giving 1 point to correct answer and 0 to incorrect answer. The scale measured knowledge from maximum 10 to minimum 0. A score of ≥6 was taken as good knowledge while score of <6 termed as poor knowledge.

to disagree and 4 to strongly disagree. A mean score of 3 or higher was considered as positive attitude while score of <3 was taken as negative attitude. Self-antibiotic practices among students were examined by asking closed ended questions regarding their self-antibiotic practices, frequency of self-medication, reason of self-medication, source of information about antibiotics, and the disease condition in which they practice self-medication. Participants were asked to respond to this part of questionnaire based on their practices since their enrolment at pharmacy schools.

Descriptive analysis was used to illustrate demographic characteristics. Results were reported as percentage and frequency. The Kolmogorov-Smirnov test was carried out to observe the nature of data distribution. Mann-Whitney U test was applied to integrate the mean score of knowledge with the demographic information. Chi square test was used to assess the association between dependent and independent variables. However, if the expected frequency is lower than 5, in contingency table, fisher exact test was used instead. Monte Carlo test was utilized at 99% confidence level to estimate the fisher exact p value, which was considered as significant at $p<0.05$.

The study was conducted with the approval of the dean of the faculty and the permission of the concerned lectures was also taken. Students were thoroughly explained about the objectives of this study. It was also clarified to the students that the completion and submission of the questionnaire would be taken as their consent to participate voluntarily in this study. High level of confidentiality and anonymity was maintained throughout the study.

RESULTS

A total of 137 students participated in this study. PharmD students demonstrated greater overall knowledge of antibiotic use than BPharm students (Mean score: 5.09 vs 6.18, $p<0.01$). It was explored that the students with urban family background had greater knowledge as compared to students from rural background (Mean score: 5.65 vs 5.13, $p<0.05$). The results were not significantly different when the current living status of the participants was integrated with the knowledge. The interrelation of demographic characteristics and the knowledge is presented in Table 1.

The superiority of PharmD students was apparent as majority of them correctly answered all the knowledge related questions. However, it is noteworthy to mention that the concept of superbugs and NDM-1 was low in both the groups, as only 2.3% of BPharm students and 28% of PharmD students correctly answered the question about the concept mentioned above. Similarly, it was also noticed that BPharm students incorrectly identified the use of antibiotics in common cold and flu (24.1%) as compared to PharmD student (64%). The knowledge gap was also exposed by this study as only one third of BPharm students and one half of PharmD students were aware of the National Antibiotic Policy of India. The responses of the all the knowledge questions is mentioned in Table 2.

Table 2. Students who answered correctly to knowledge questions regarding antibiotic use (N=137)

Knowledge Questions	Correctly Answered (%)		P value*
	BPharm students	PharmD students	
Indication of antibiotic use	24.1	64	0.01
Effectiveness of antibiotics	68	72.4	0.035
Complication of antibiotics	74	88.5	0.01
Resistance due to antibiotics	55.2	78	0.001
Cost of antibiotics	63.2	90	0.046
Future of antibiotics use	58.6	88	<0.001
Effects of superbugs	2.3	28	<0.001
Knowledge of Schedule H1	46.4	53.6	<0.001
National antibiotic policy	32	48.3	<0.001
Implications on public health	70	79.3	0.074

* derived from chi-square test

Table 3. Students' attitude towards antibiotic use (N=137)

Attitude Questions (%disagreed)*	BPharm students	PharmD students	P-value**
When I have a cold, I should take antibiotics to prevent getting a more serious illness [a]	24.1	66	**<0.001**
When I get fever, antibiotics help me to get better more quickly [b]	27.5	52	**0.021**
Antibiotic intake should be stopped as soon as possible patient feel better [c]	24.1	76	**<0.001**
Skipping one or two doses does not contribute to the development of antibiotic resistance [d]	59.7	58	0.10
Antibiotics are safe, hence they can be commonly used [e]	47.1	76	**0.001**

*Percentages of Disagreed and Strongly disagreed responses were combined
** P value derived from Chi-square test
Note: Attitude was assessed by giving 1 to SA, 2 to A, 3 to D and 4 to SD. Score of 3 or higher were taken as positive attitude while <3 as negative attitude. Mean attitude of BPharm students was 2.23 ± 0.29, and PharmD students were3.05±0.14.
Mean Attitude Score (SD): [a] 2.19 (1.06), [b] 2.03 (0.96), [c] 2.18 (1.06), [d] 2.42 (0.93), [e] 2.55 (0.95)

The data suggested that overall attitude of PharmD students was positive in contrast to BPharm students (Mean score: 3.05 vs 2.23). This difference in attitude was statistically significant in all the attitude related questions, except for one question concerning skipping of doses and its effect on resistance. The responses of BPharm and PharmD students towards attitude statements in summarized in Table 3.

Furthermore, the study also revealed the self-antibiotic practices of participants as expressed in Table 4. Significant difference was observed between the two groups when asked whether they consult physician before taking antibiotics ($p<0.05$). Practices of the contrasting groups varied in terms of disease in which antibiotics were self-practiced ($p<0.05$). However, the practices were similar with regards to the frequency, reason and sources of antibiotic use ($p>0.05$). No significant differences were observed between BPharm students and PharmD students in terms of different classes of antibiotics used ($p>0.05$). Penicillins were amongst the common antibiotic frequently used by the participants. Antibiotics which were self-practiced by the respondents are illustrated in Table 5.

Another aspect of this study was to understand the perception of students regarding the possible causes of antibiotic resistance. It is worth reporting that only 19.5% of BPharm students believed that empirical therapy is a possible cause of antibiotic resistance. The figure rose to 48% when the same question was asked to PharmD students ($p<0.01$). Similarly PharmD students were also more of the opinion that use of broader antibiotics and lack of restrictions do contribute to the development of resistance ($p<0.05$). The participants' response towards the possible causes of resistance is tabularized in Table 6.

DISCUSSION

This study aimed to assess the knowledge, attitude and practice related to antibiotic usage and antibiotic resistance in BPharm and PharmD students. The results of the study showed that PharmD students had better knowledge about antibiotic usage compared to BPharm students. BPharm students, as opposed to their PharmD peers, fared poorly on questions pertaining to costs of antibiotics, effects of superbugs, indications of

Table 4. Self-Antibiotics practice among student (N=137)

Self-Antibiotic data	Categories	BPharm students* (%)	PharmD students* (%)	P-value**
Self-medication use	Do you consult physician before taking antibiotics	63.6*	80*	0.039
How often they take self-medication	Occasionally	36.8	22	0.052
	Weekly	4.6	2	
	Rarely	54	60	
	Never	4.6	16	
Reason	Disease is simple	18.4	36	0.144
	Treatment cost is high in clinics	11.5	10	
	There was a previous experience with the disease	34.5	26	
	Lack of hospitals in the nearest place	4.6	4	
	Lack of trust in medical service	6.9	0	
	Self-decision	24.1	24	
Source	Drugs directory	5.7	18	0.227
	Family, friends or neighbours	5.7	4	
	Pharmacist (retail pharmacy shops)	44.8	36	
	Previous prescription	31.2	32	
	Others	12.6	10	
Disease conditions	Cough/cold/flu and other respiratory problems	46	32	0.011
	Fever and other milder illness	23	40	
	Wound infection	13.8	8	
	Diarrhea and other GIT related problems	11.5	4	
	Eye/ ear infection	1.1	12	
	Others	4.6	4	

* Students answered in yes
** P value derived from Chi-square test

Table 5. Use of antibiotics by BPharm and PharmD students

Antibiotic	BPharm students (%)	PharmD students (%)
Penicillins	26%	34%
Cephalosporins	15%	18%
Macrolides	21%	10%
Aminoglycosides	5%	4%
Quinolones	14%	4%
Others	20%	30%

antibiotic use and complications caused by antibiotic use. There is a need for targeting case-based and outcome-based educational interventions towards BPharm students to improve their awareness about the actual prevalence of antibiotic resistance in the country, to enhance their understanding of the reasons for failure of antibiotic therapy in non-adherent resistant patients, and to optimise antibiotic therapy.[18,19]

Pharmacists practicing in the urban areas had better knowledge about antibiotic usage. This finding was similar to a previous study conducted in Vellore, India for understanding antibiotic resistance among physicians, pharmacists and patients with higher and lower socioeconomic status respectively. The study showed that urban pharmacists had fair information about antibiotic resistance. Rural pharmacists on the other hand, prescribed more antibiotics due to incentives provided by pharmaceutical companies. Urban pharmacists also advised their patients to regulate their antibiotic dosage.[20]

In our study PharmD students showed a positive attitude towards appropriate usage of antibiotics. Compared to BPharm students, majority of the PharmD students were of the opinion that an antibiotic course once started, should be completed (76% versus 24.2%) and that antibiotics should not be commonly used (76% versus 47.1%). PharmD students also avoided taking antibiotics if they had common cold (66%) versus BPharm students (24.1%). These findings indicate that PharmD students were more aware about antibiotic resistance as compared to the BPharm students. Wrong beliefs held by BPharm students may lead to their inappropriate antibiotic usage and eventual development of antibiotic resistance. A study conducted among 1st year university students in Portugal showed that 43%-68% study participants studying in different majors were of the opinion that antibiotics should be prescribed for viral infections. However, none of the students in the Portugal study were pharmacy majors.[21] Our study raises concerns about safe usage of antibiotics by BPharm students.

The practice of antibiotic self-medication was higher in BPharm students than PharmD students. Previous studies assessing the self-medication practices among students found that more than 50% Nigerian undergraduate students[22], more than 25% Nigerian pharmacy students[23] and nearly 80% Sudanese undergraduate students[24] had antibiotics in their possession respectively. In our study, since PharmD students were more knowledgeable about appropriate antibiotic usage than BPharm students, they used fewer antibiotics for treating themselves. The Nigerian study also found that pharmacy students had many leftover antibiotics, indicating the development of antibiotic resistance due to either medication non-adherence or inappropriate antibiotic usage.[23] Another study reported that self-medication practices among senior medical students (4th year) was higher than junior medical students (2nd year).[25] The researchers also reported that the appropriateness of the usage of medications was also high among senior medical students. Further studies are warranted to explore the appropriateness of self-medication among pharmacy students in India. However, a plausible link between antibiotic resistance, community antibiotic prescribing and high consumption of antibiotics cannot be denied.[26]

PharmD students, when asked about the reasons associated with antibiotic resistance did significantly better on questions related to antibiotic prescribing and restrictions on antibiotic sales. PharmD curriculum in India includes hospital rotations that might be one of the reasons that PharmD students have more experience with optimal antibiotic therapy. PharmD students understood that using higher generation antibiotics for mild infections can increase the risk of developing antibiotic resistance.[17] Many PharmD students believed that empirical therapy (best guess therapy) led to antibiotic resistance. This finding is similar to a previous study monitoring the impact of antibiotic changes in empirical therapy on antibiotic resistance. Even though empirical therapy led to the emergence of resistant strains in the study, if antibiotics were substituted depending on the detected resistance patterns and if patients were monitored on a continuous basis, the antibiotic resistance rates could be controlled.[27] A carefully monitored empirical antibiotic therapy can lead to decreased medication costs and hospital stays.[28]

Table 6. Students perception of possible causes of antibiotic resistance

Following are the possible causes of resistance	Respondents answered Yes (%)		P value*
	BPharm students	PharmD students	
Use of antibiotics for self-limited non bacterial infections	56.63	62	0.516
Use of antibiotics with a broader than necessary spectrum	44.8	64	**0.034**
Use of antibiotics for shorter than standard duration	42.5	38	0.604
Poor infection control measures	54	52	0.819
Use of antibiotics for self-limited bacterial infections	56.3	60	0.675
Empirical antibiotic therapy (best guess therapy)	19.5	48	**0.001**
Mutational and evolutionary changes in the micro organism	55.2	72	0.052
Lack of restrictions on antibiotic usage	56.3	74	**0.039**
Excessive antibiotic use in livestock (Animals reared for food)	38.8	34	0.744
Use of antibiotics for longer than standard duration	62.1	68	0.486

* P value derived from Chi-square test

PharmD students were more informed about the restrictions on antibiotic usage than their BPharm counterparts, indicating more awareness about the recently adopted Schedule H15 and related regulatory policies.

This study is not without limitations. The conclusions were drawn from a convenience sample representing two institutions in South India. These findings might not be generalizable for BPharm students all over India. However, this study provides a valuable insight about knowledge, attitude and practice about antibiotic usage and resistance among pharmacy students.

CONCLUSIONS

The study highlighted significant difference between the knowledge and attitude of PharmD and BPharm students regarding antibiotic use and resistance. However, no significant difference was observed in the self-antibiotic practices among the students. The study also identified the areas where marked deficiencies were observed in the knowledge of BPharm and PharmD students regarding the possible causes of antibiotic resistance. This research can become a basis for nationwide study comparing the knowledge of BPharm and PharmD students and the possible inclusion of advanced antibiotic education in BPharm curriculum subsequently.

CONFLICT OF INTEREST

Nill.

COMPARACIÓN DE CONOCIMIENTOS Y ACTITUDES SOBRE ANTIBIÓTICOS Y RESISTENCIAS Y AUTO-MEDICACIÓN CON ANTIBIÓTICOS ENTRE LOS ESTUDIANTES DE LA LICENCIATURA EN FARMACIA Y EL DOCTORADO EN FARMACIA EN EL SUR DE INDIA

RESUMEN

Antecedentes: Existe poca investigación sobre la especialización en farmacia en relación al uso de antibióticos.
Objetivo: Comparar el conocimiento, actitudes y práctica de los estudiantes de licenciatura en farmacia (BPharm) y de Doctor en Farmacia (PharmD) sobre el uso de antibióticos y resistencias en el Sur de India.
Métodos: Este fue en un estudio transversal que envolvió a estudiantes de BPharm y PharmD de dos instituciones privadas localizadas en Andra Pradesh, India. Se realizó el estudio durante 3 meses. Se dividió el cuestionario en 5 componentes: demográficos; conocimiento sobre uso de antibióticos; actitud hacia el uso de antibióticos y resistencias; automedicación con antibióticos; y causas posibles de resistencias antibióticas. Se evaluó la fiabilidad del cuestionario. Se analizaron los datos usando test de Mann Whitney y chi cuadrado mediante el uso de un SPSS versión 19.
Resultados: La muestra incluyó 137 estudiantes. La tasa de respuesta del estudio fue del 76,11%. Hubo diferencia significativa en el conocimiento sobre antibióticos entre los estudiantes de BPharm y los PharmD (puntuación media: 5,09 vs 6,18; p<0,001). La actitud general de los estudiantes de PharmD sobre el uso de antibióticos y las resistencias fue más positiva, comparado con los estudiantes de BPharm (puntuación media: 3,05 vs 2,23; p<0,05). El uso de antibióticos en automedicación fue más alto en los estudiantes de BPharm que los de PharmD (36,4% vs 20%; p<0,05). Un número significativamente mayor de estudiantes de PharmD creía que la terapéutica antibiótica empírica conducía a resistencias (19,5% vs 48%; p<0,05).
Conclusión: Los estudiantes de PharmD tenían más conocimientos sobre uso de antibióticos y resistencias que los estudiantes de BPharm, que no habían recibido la información apropiada sobre este tema. Las intervenciones futuras deberían centrarse en educar a los estudiantes de BPharm para que puedan implantar el conocimiento adquirido en su ejercicio profesional.

Palabras clave: Estudiantes de Farmacia; Conocimientos, Actitudes y Práctica en Salud; Antibacterianos; Farmacorresistencia Bacteriana; India

References

1. WHO. The Evolving Threat of Antimicrobial Resistance: Options for Action.2012. Available at: http://whqlibdoc.who.int/publications/2012/9789241503181eng.pdf (Accessed August 25, 2014).
2. US Department of Human and Health Services, Centre for Disease Control and prevention. Antibiotic Resistance Threats in the United States, 2013. Available at: http://www.cdc.gov/drugresistance/threat-report-2013/pdf/ar-threats-2013-508.pdf (Accessed August 25, 2014).
3. Kumarasamy KK, Toleman MA, Walsh TR, Bagaria J, Butt F, Balakrishnan R, Chaudhary U, Doumith M, Giske CG, Irfan S, Krishnan P, Kumar AV, Maharjan S, Mushtaq S, Noorie T, Paterson DL, Pearson A, Perry C, Pike R, Rao B, Ray U, Sarma JB, Sharma M, Sheridan E, Thirunarayan MA, Turton J, Upadhyay S, Warner M, Welfare W, Livermore DM, Woodford N. Emergence of a new antibiotic resistance mechanism in India, Pakistan, and the UK: a molecular, biological, and epidemiological study. Lancet Infect Dis. 2010;10(9):597-602. doi: 10.1016/S1473-3099(10)70143-2
4. Ganguly NK, Arora NK, Chandy SJ, Fairoze MN, Gill JP, Gupta U, Hossain S, Joglekar S, Joshi PC, Kakkar M, Kotwani A, Rattan A, Sudarshan H, Thomas K, Wattal C, Easton A, Laxminarayan R; Global Antibiotic Resistance Partnership (GARP) - India Working Group. Rationalizing antibiotic use to limit antibiotic resistance in India. Indian J Med Res. 2011;134:281-294.

5. Ahmad A, Patel I. Schedule H1: Is it a Solution to Curve Antimicrobial Misuse in India? Ann Med Health Sci Res. 2013;3(Suppl 1):S55-S56. doi: 10.4103/2141-9248.121228
6. Chen C, Chen YM, Hwang KL, Lin SJ, Yang CC, Tsay RW, Liu CE, Young TG. Behaviour, attitudes and knowledge about antibiotic usage among residents of Changhua, Taiwan. J Microbiol Immunol Infect. 2005;38(1):53-59.
7. Alanis AJ. Resistance to antibiotics: are we in the post-antibiotic era?. Arch Med Res. 2005;36(6):697-705.
8. Grundmann H, Klugman KP, Walsh T, Ramon-Pardo P, Sigauque B, Khan W, Laxminarayan R, Heddini A, Stelling J. A framework for global surveillance of antibiotic resistance. Drug Resist Updat. 2011;14(2):79-87. doi: 10.1016/j.drup.2011.02.007
9. Wright EP, Jain P. Survey of antibiotic knowledge amongst final year medical students. J Antimicrob Chemother. 2004;53(3):550-551.
10. Steinberg I. Clinical Choices of Antibiotics: Judging Judicious Use. Am J Manag Care. 2000;6(23 Suppl):S1178-S1188.
11. Dellit TH, Owens RC, McGowan JE Jr, Gerding DN, Weinstein RA, Burke JP, Huskins WC, Paterson DL, Fishman NO, Carpenter CF, Brennan PJ, Billeter M, Hooton TM; Infectious Diseases Society of America; Society for Healthcare Epidemiology of America. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. Clin Infect Dis. 2007;44(2):159-177.
12. Ahmad A, Srikanth BA, Patel I. Indian Pharm.D: Should it be pursued? Arch Pharm Pract. 2014;5(2):97-98.
13. Basak SC, Sathyanarayana D. Pharmacy education in India. Am J Pharm Educ. 2010;74(4):68.
14. Khan AKA, Banu G, KKR. Antibiotic Resistance and Usage-A Survey on the Knowledge, Attitude, Perceptions and Practices among the Medical Students of a Southern Indian Teaching Hospital. J Clin Diagn Res. 2013;7(8):1613-1616. doi: 10.7860/JCDR/2013/6290.3230
15. Shehadeh M, Suaifan G, Darwish RM, Wazaify M, Zaru L, Alja'fari S. Knowledge, attitudes and behavior regarding antibiotics use and misuse among adults in the community of Jordan. A pilot study, Saudi Pharm J. 2012;20(2):125-133. doi: 10.1016/j.jsps.2011.11.005
16. Ahmad A, Patel I, Mohanta G, Balkrishnan R. Evaluation of self medication practices in rural area of town Sahaswan at Northern India. Ann Med Health Sci Res. 2014;4(Suppl 2):S73-S78. doi: 10.4103/2141-9248.138012
17. Jamshed SQ, Elkalmi R, Rajiah K, Al-Shami AK, Shamsudin SH, Siddiqui MJ, Abdul Aziz MA, Hanafi MB, Mohammad Shariff NI, Ramlan NH, Jamil NB, Mustapha NH, Hasman Yusri NB, Shahri NA, Ismail RB, Zamri SM. Understanding of antibiotic use and resistance among final-year pharmacy and medical students: a pilot study. J Infect Dev Ctries. 2014;8(6):780-785. doi: 10.3855/jidc.3833
18. Wester CW, Durairaj L, Evans AT, Schwartz DN, Husain S, Martinez E. Antibiotic Resistance - A Survey of Physician Perceptions. Arch Intern Med. 2002;162(19):2210-2216.
19. Davenport LA, Davey PG, Ker JS; BSAC Undergraduate Education Working Party. An outcome-based approach for teaching prudent antimicrobial prescribing to undergraduate medical students: report of a Working Party of the British Society for Antimicrobial Chemotherapy. J Antimicrob Chemother. 2005;56(1):196-203.
20. Chandy SJ, Mathai E, Thomas K, Faruqui AR, Holloway K, Lundborg CS. Antibiotic use and resistance: perceptions and ethical challenges among doctors, pharmacists and the public in Vellore, South India. Indian J Med Ethics. 2013;10(1):20-27.
21. Azevedo MM, Pinheiro C, Yaphe J, Baltazar F. Portuguese students' knowledge of antibiotics: a cross-sectional study of secondary school and university students in Braga. BMC Public Health. 2009 23;9:359. doi: 10.1186/1471-2458-9-359
22. Olayemi OJ, Olayinka BO, Musa AI. Evaluation of antibiotic self-medication pattern amongst undergraduate students of Ahmadu Bello University (Main Campus) Zaria. Res J Applied Sci Eng Tech. 2010;2:35-39.
23. Auta A, Banwat S, Sariem C, Shalkur D, Nasara B, Atuluku M.Medicines in Pharmacy Students' Residence and Self-medication Practices. J Young Pharm. 2012;4(2):119-123. doi: 10.4103/0975-1483.96627
24. Awad AI, Eltayeb IB. Self-medication practices with antibiotics and antimalarials among Sudanese undergraduate university students. Ann Pharmacother. 2007;41(7):1249-1255.
25. James H, Handu SS, Khaja KA, Sequeira RP. Influence of medical training on self-medication by students. Int J Clin Pharmacol Ther. 2008;46(1):23-29.
26. Steinke D, Davey P. Association between antibiotic resistance and community prescribing: a critical review of bias and confounding in published studies. Clin Infect Dis. 2001;33(Suppl 3):S193-S205.
27. Allegranzi B, Luzzati R, Luzzani A, Girardini F, Antozzi L, Raiteri R, Di Perri G, Concia E. Impact of antibiotic changes in empirical therapy on antimicrobial resistance in intensive care unit-acquired infections. J Hosp Infect. 2002;52(2):136-140.
28. Pasquale TP, Komorny KM, Letting-Mangira D, Peshek S. A Pharmacist-physician antibiotic support team. P&T. 2004; 29(1):33-40.