

RESEARCH ARTICLE**SOCIOECONOMIC AND BEHAVIORAL FACTORS CONTRIBUTING TO
ANTIBIOTICS NON-ADHERENCE**

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ABSTRACT

Background: Antibiotics therapy is the crucial treatment plan employed in community settings. Antibiotics effectiveness and population adherence are key causes of the efficacy of antibiotics therapy. **Objectives:** In this study, we pursue to explore the factors that affect patients adherence to antibiotics therapy to enhance the population adherence and to create awareness among the community related to antibiotics non-adherence. **Methodology:** A questionnaire survey was conducted among the university students having age range 18-40 years who had used antibiotics in the previous 6 months, data analyses were performed using SPSS version 16 by applying descriptive statistics and bivariate correlation function. **Results:** A total of 203 respondents participated in the survey, among them 184 participants provided complete data and were included in the study. Up to 96.7% of participants showed non-adherence to antibiotics regimen, (total adherence score <8), whereas 3.3% of participants showed good adherence, (total adherence score ≥8). Discontinuation of antibiotics due to fear of adverse effects and lack of basic knowledge about antibiotics were the important factors associated with antibiotics non-adherence. **Conclusion:** A range of factors were linked with non-adherence to antibiotics therapy including discontinuing treatment once the symptoms improve, changing antibiotic due to ineffectiveness, difficulty in taking prescribed dose, non-availability of pharmacy and busy work schedule.

Keywords: Antibiotics, Non-adherence, Therapy, Factors

INTRODUCTION

Antibiotic is a word derived from “antibiosis” the substances that are against life. These are the substances which are produced by different microorganisms that can kill the microorganisms at low or high concentration. Bacteriostatic is the term used to describe those antibiotics that can inhibit the growth of microorganisms while those that kill the microbes referred as bactericidal (1, 2). Drug adherence is the extent to which a patient's behavior matches with the specified medicine dosage regimen, including time, dose, and interval of medication administration. Adherence is a multidimensional phenomenon impacted by a variety of factors (3). Medication adherence has long been a source of concern because it has a significant impact on treatment outcomes. The scientists found that if a patient is adherent, their chances of a positive result are roughly three times better than those who are non-adherent, based on an analysis of 63 research studies conducted over a 30-year period (4). Compliance is the degree to which a patient's conduct matches with the prescriber's guidance (5). From the patients view, adherence to appropriately prescribed antibiotics regimens have been linked with better health outcomes, patient safety and better quality of life (6). To improve the patient health is the prime responsibility of the health-care professionals (7). Antibiotic non-adherence refers to when individuals do not take their medications as prescribed. According to one study, drugs non-adherence was responsible for 70% of medication-related hospital admissions (8). Antibiotic misuse is a key contributor to the spread and development of bacterial resistance, which is a serious public health concern. Antibiotic adherence is a significant factor of treatment effectiveness. Non-adherence to short-term antibiotic therapy may raise the chances of therapeutic failure, re-infection, and bacterial resistance, resulting in the need for more aggressive therapies and more hospital admissions (9). Non - adherence with antibiotic therapy for acute community-acquired infections is common, and it can have a negative impact on treatment efficacy, with clinical success rates declining by 16% to 52%, lowering health

related quality of life. Non-compliance raises the chances of treatment failure, medical visits, and hospitalizations, as well as indirect societal costs like lost productivity and money, as well as absence from work or school (10). Antibiotic resistance is multidimensional, including interactions between medical practices, patient behavior, and environmental variables. Resistant microbial strains are increasingly detected in the community, in addition to the regular appearance of resistant microbial strains in the tertiary care environment. Larson has stressed the necessity of addressing the community's involvement in antibiotic resistance development, which includes behavioral, environmental, and regulatory variables (11). The most prevalent causes for antibiotic non-adherence were forgetting to take the pill, taking several prescriptions, drug cost, lack of awareness, insufficient information about antibiotics, and symptoms remission. Antibiotic availability was a major concern in both upper and lower socioeconomic groups, which could be due to the extremely low economic status of many countries, inappropriate use, the high cost of the most recent and effective antibiotics, widespread "over-the-counter" use, and an increasing number of counterfeit drugs (8). According to WHO “increasing the effectiveness of adherence interventions may have a far greater impact on the health of the population than any improvement in specific medical treatments” (12). Adherence to therapies is a primary determinant of treatment success (13). Misuse of Antibiotics is very common nowadays and it results into antibiotic resistance leading to therapeutic failure (14). Many factors are contributing towards antibiotic non-adherence. But low educational and socioeconomic status are of utmost importance (15). Studies shows that people who do not have drug coverage, use less doses than recommended dose due to the price of medications (16, 17). A current survey in China, pinpoints education level is the crucial reason for non-adherence (18).

In this study, our objective is to investigate the socioeconomic and behavioral factors that affects patients' adherence to antibiotics therapy among university students.

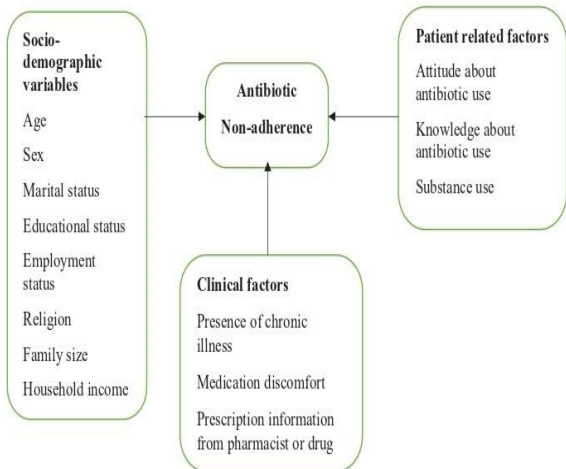


Figure 1. Factors related with antibiotics non-adherence adapted from different literatures (major factor of non-adherence is lack of basic knowledge about antibiotics) (8).

METHODOLOGY

Ethical approval

Every step was taken to ensure the privacy of participants. The study was approved by the institutional ethics review committee, University of Sargodha, Pakistan. The safety of collected data was ensured. Permission was taken from the subjects before collecting data.

Study design

A survey based cross-sectional retrospective study was conducted from June 2019 to August 2019 in different departments of University of Sargodha, Sargodha. A total of 203 participants were involved. The questionnaire was consisting of three parts. The first part consists of Demographic information. The second part was based on pre-validated Chinese version of Morisky medication adherence scale to check the adherence level while the third part consists of a post validated questionnaire which was based on socioeconomic and behavioral factors-based questions. The questionnaire was translated into our national language, Urdu by a professional translator. The reliability and validity of the questionnaire were verified in preliminary pilot study conducted before the start of the survey. The value of Cronbach's alpha is 7.4. The inclusion criteria for participants were age ranges from 18-40 and

People who had used any antibiotic regimen in previous sixth months. The exclusion criteria for participants were age less than 18 or more than 40, the people who had not used any antibiotic in last sixth months, pregnant ladies and lactating mothers. The sample size was calculated from the Cochran's formula with slight modification (19). The value of the sample size obtained from the formula was 168. A total number of 203 participants were involved in the survey. A total of 103 male and 81 females provides the complete data.

Outcomes of patient's adherence with antibiotics therapy

Patient adherence to antibiotics therapy was evaluated by using a Chinese version of the Morisky Medication Adherence Scale which consists of 8 questions given in the Supplementary material. For first 7 questions each "no" was given a score of 1. In contrast no score was given for answer "yes." For question 8 the answers "never," occasionally, "sometimes" "often" and "always" were given a score of 2, 1.5, 1, 0.5 and 0 respectively. A total score < 8 indicated non-adherence and a score of 8 or greater indicated good adherence. In socioeconomic and behavioral based questions each "Yes" was given a score of 1 and each "No" was given a score of 2.

Statistical analysis

We analyzed the data obtained from the survey using SPSS 16 version. Descriptive statistics and bivariate correlation functions were used for the interpretation of the data. The adherence level of the participants was measured and compared with major reasons of antibiotics non-adherence with the help of cross tabulation.

RESULTS

A total number of 203 Participants were involved. Out of these 184 participants provided complete data and were included in the study, 178 participants (96.7%) had a total score < 8, which indicated non-adherence, whereas only 6 (3.3%) participants showed good adherence by having score ≥ 8 as shown in figure 2. Only 3.3 % participants showed good adherence on adherence scale while 96.7 % participants showed non-adherence.

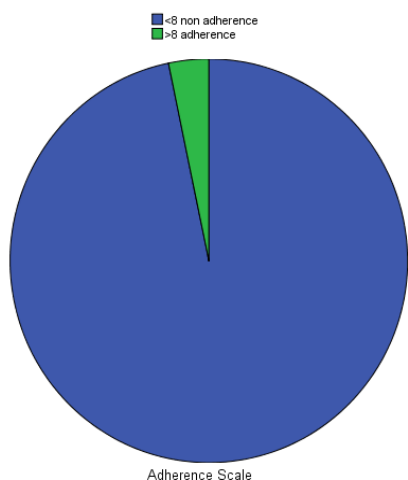


Figure 2. Proportion of study population with adherence and non-adherence to antibiotics therapy.

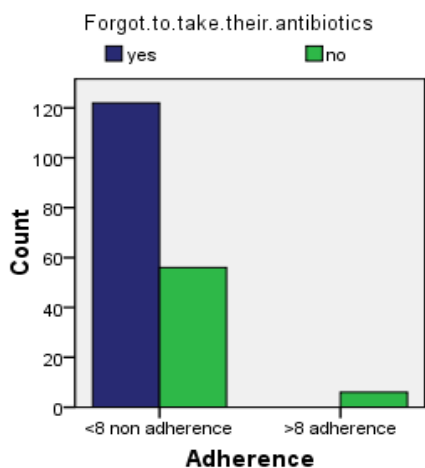
Table 1. Reasons/factors for non-adherence to antibiotics therapy

Reasons for non-adherence	N	Percentage	P value
1) Lack of basic knowledge about antibiotics	38	20.7%	0.03
2) Non availability of pharmacy	122	66.3%	0.004
3) Due to busy work schedule	123	66.8%	0.004
4) Changing antibiotic due to ineffectiveness	138	75%	0.008
5) Discontinue treatment once the symptoms improve	145	78.8%	0.04
6) Problem in taking antibiotics due to bitter taste	127	69%	0.028
7) Discontinue antibiotic due to fear of adverse effects	127	69%	0.028
8) The color of the drugs is difficult to accept	65	35.3%	0.03
9) Preference to Expensive Antibiotics	142	77.2%	0.35
10) Taking less number of antibiotics than prescribed	110	59.8%	0.36
11) Forget to take their medicine	122	66.7%	0.001
12) Don't carry their medicine when go out	102	59.2%	0.001
13) Difficulty in taking prescribed dose	81	44%	0.001

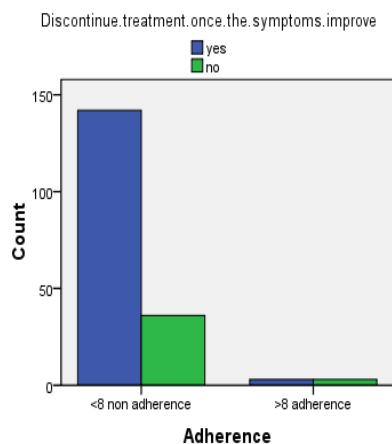
The results of the bivariate correlation and descriptive statistics are presented in Table 1. Some of the factors that contribute to the non-adherence of antibiotics prescribed schedule are epitomized and their P-values calculated by bivariate correlation are mentioned in the table 1. In a majority (78.8%) of participants “Discontinue treatment once the condition improves” was the main reason attributed to poor adherence with a p-value 0.04. Lack of basic knowledge about antibiotics (20.75%) also contribute to the non-adherence of antibiotics and its p value is calculated by bivariate correlation shows a significant result with p-value 0.03.

Non-availability of pharmacy (66.3%) in respective areas is also a contributing factor to antibiotic non-adherence, whose p-value is 0.004, too busy work schedule (66.8%) in daily life is also a connective factor for antibiotics non-adherence having significant p-value 0.004. Changing the antibiotic due to ineffectiveness (75%, p=0.008), Problem in taking antibiotic due to bitter taste (69%, p=0.028), color of the drug is difficult to accept (35.3%, p=0.03), preferring expensive antibiotics (77.2%), fear of adverse effects (69%, p=0.028), forgot to take medicine (66.7% p=0.00), don't carry their medicine when go out (59.2%, p=0.001) and difficulty in taking prescribed dose (44%, p=0.001) are also the contributing factors to antibiotic non-adherence having significant p-value.

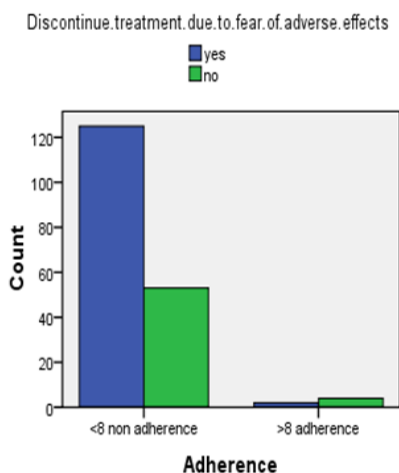
These are the socioeconomic and behavioral factors that are contributing towards antibiotics non-adherence. The results articulate how the majority of sample population shows non-adherence towards their antibiotic regimen. The result of factors affecting non-adherence is shown categorically in bar charts in the figure no. 3. Table no. 2 comprehensively portray the reasons of non-adherence to antibiotics in the form cross tabulation.



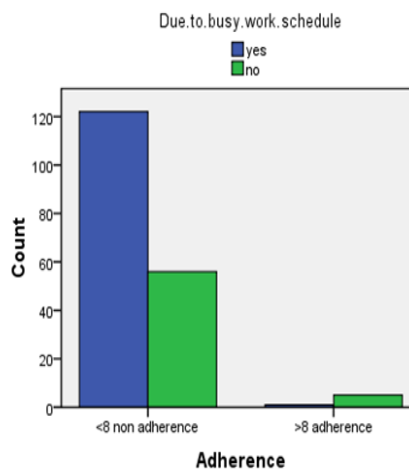
a) Forgot to take antibiotics



d) Discontinue treatment once the symptoms improve



b) Discontinue treatment due to fear of adverse effects



c) Busy work schedule

Figure 3. Results of the non-adherence factors: a) Forgot to take antibiotics; b) Discontinue treatment due to fear of adverse effects; c) Busy work schedule; d) Discontinue treatment once the symptoms improve

Table 2. Cross tabulation of non-adherence factors with adherence scale

Count	Adherence scale		Total
	<8 non-adherence	≥8 adherence	
1. Forget to take their antibiotics	Yes	122	122
	No	56	62
Total		178	184
2. Don't carry their antibiotics when go out	Yes	109	109
	No	69	75
Total		178	184
3. Difficulty in taking prescribe dose	Yes	81	81
	No	97	103
Total		178	184
4. lack of basic knowledge about antibiotics	Yes	143	146
	No	35	38
Total		178	184
5. Preference to expensive antibiotics	Yes	137	142
	No	41	42
Total		178	184
6. Non availability of pharmacy	Yes	121	122
	No	57	62
Total		178	184
7. Due to busy work schedule	Yes	122	123
	No	56	61
Total		178	184
8. Changing antibiotics due to ineffectiveness	Yes	136	138
	No	42	46
Total		178	184
9. Discontinue treatment once the symptoms improve	Yes	142	145
	No	36	39
Total		178	184
10. Problem in taking antibiotics due to bitter taste	Yes	125	127
	No	53	57
Total		178	184
11. Discontinue antibiotics due to fear of adverse effects	Yes	125	127
	No	53	57
Total		178	184
12. Taking less no of antibiotics than prescribed	Yes	106	110
	No	72	74
Total		178	184
13. The color of the drugs is difficult to accept	Yes	65	65
	No	113	119
Total		178	184

DISCUSSION

As Pakistan is considered as the third highest antibiotic consuming country among under developed countries and their usage increased from 0.8 to 1.3 billion defined daily dose (DDD)

(65% increase) between 2000-2015 (20). Antibiotics are usually thought to be safe, although they might have a variety of negative effects. When they are taken for no reason and without consulting a doctor, the problem gets

serious. They are widely available, and every type of antibiotic is on the market. It is heavily consumed and has been ingrained in people's lives (Post, 2020). In many developing countries, like Pakistan, sick individuals tend to seek treatment from a medical store or even ask a neighbor for drugs that have already been left unused from a prior sickness. Despite the terrible (possibly fatal) implications of using drugs without proper care and attention, this issue persists. Iatrogenic disorders are on the rise in Pakistan, and this is thought to be due to a number of factors, including a lack of control over the sale of medicines without a prescription; weak and ineffective drug regulations in terms of medicine registration, licensing, and distribution; and the lack of an active role for qualified pharmacists in medication supply governance. As a result, Pakistan's market places are swamped with fake, counterfeit, and outdated pharmaceuticals, as well as drugs that are prohibited in other nations (21). Non-adherence to antibiotics is a major problem in our country. High prices of antibiotics also compelled the patients towards non-adherence. People don't complete their course of therapy due to lack of self-care. In Pakistan, mostly people do not consult with the health care practitioners, due to very high consultation fee. As compared to other countries, in Pakistan people prefer to live in rural areas, due to unavailability of pharmacies in rural areas non-adherent ratio is increasing day by day (22). A survey conducted in China showed that 86.97% people were non-adherent to antibiotics but in our study 96.7% of the population showed non-adherence to antibiotics (total score <8), only 3.3% showed good adherence (total score ≥ 8), which is greater than the rates reported from survey conducted in the China. Another study conducted in China showed that 54% people were non-adherent to antibiotic due lack of basic knowledge about antibiotics, but our study showed that 21% people were non-adherent to antibiotics which is less than from the Chinese study but that may be due to the reason that our sample size is less than China. Due to the gap between pharmacy and residence, 49% people were non-adherent in China but 66% people were non-adherent to antibiotics in Pakistan which is higher than

Chinese studies (18). A survey conducted in Iran showed that due to ineffectiveness of present antibiotics regimen 39% people were non-adherent in Iran but our study results showed that 75% people were non-adherent due to this factor which depicts higher variation (12). An Australian study showed that 17% people showed non-adherence due to busy work schedule and our study depicts 66.8% individual were non-adherent to antibiotics due to busiest working schedule, our study results were higher than Australian study (16). Another study was performed in Italy, showed that 15% people stop their medication due to improvement of disease symptoms, but in our study 78% population were non-adherent due to this factor which was greater than Italy survey results and that is a major factor for antibiotics non-adherence (3). In our study population the main objective of our study is to check the Antibiotics non-adherence factors among university students. The reason behind to forget antibiotic regimen in university students is due to get involved in numerous social activities like social media e-technology, e-gaming etc. Now day's students do not take interest in their health-related issues due to busy work schedule. When we collected the data from different students of various departments and analyzed, a reason came out that mostly young people do not follow the physician prescription due to complex antibiotic dosage regimen. Along with that mostly student do not know about antibiotics, their usage, when and how. An interesting factor is that some people know about how and when to use antibiotics but still they do not follow the practitioner's prescription because of their busy working schedule. Some people responds that they prefer expensive antibiotic over cheaper ones, but they are still non-adherent because of their preferences. Now a days physician prescribes cheaper antibiotics due to personal interest, but some people believe that they only get relief from the expensive antibiotic, it is also a leading cause of people's non-adherence. Pakistani people mostly belong to rural areas, where facility of pharmacy is not available due to this reason people do not complete their prescribed antibiotic therapy. The reason of majority participants non-adherence is that mostly people discontinue their antibiotic therapy either due to relieve of symptoms or fear

of adverse drug reactions (ADRs) of antibiotics. Participants responded that they often change their antibiotics due to ineffectiveness of the present prescribed antibiotics, in consequences therapeutic failure occur. Our prescribers often are not aware about the palatability choice of agent that they are prescribing because many young people prefer to take antibiotics of good taste. Prescriber do not consider the taste of antibiotics while prescribing. As a follow up studies, the participants were asked about the taste experience before and after taking the antibiotics. Our study determined that many participants alter their prescription as a result of its (medicine) bad taste. Our survey shows that people also have believe on the color and packaging of the drug when the physician prescribe the antibiotics other than their choice of color and package as a result the people alter their antibiotic therapy. The main value addition made by this study is that it identified various socioeconomic and behavioral factors for non-adherence in a community, which may help inform clinical practice.

Future Recommendations

In future research should be conducted in multiple cities with the collaboration of peers to increase the sample size for the accuracy of data related to antibiotics non-adherence.

Limitations

There are numerous limitations to this study. Firstly, the study was conducted in a confined area; the results presented herein may not be a representative to a larger population. In addition, our questionnaires were age restricted.

CONCLUSION

Our study was conducted to highlight the non-adherence to antibiotic therapy among university students. A range of factors and reasons were cited by the participants that included various socioeconomic and behavioral factors that lead to antibiotic non-adherence. Forgetting to take antibiotics, discontinuation of antibiotic due to fear of adverse effects or once the symptoms resolved, facing problems while buying antibiotics due to non-availability of pharmacy in home town, bitter taste of antibiotics, taking less number of antibiotics than prescribed and lack of basic knowledge about antibiotic were the main roots of non-adherence stated by the participants.

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None

Supplementary Data

Supplementary data related to this article (questionnaire) can be given on demand.

DECLARATIONS

Authors' Contributions

SH, HRH and AAU contributed to study concept, study design and data collection. MAK and MU contributed in data analysis and interpretation. WHN, GZ and FA did the literature review and TM critically reviewed the manuscript. All the authors read and approved the final manuscript.

Ethical Approval

The study was approved by the institutional ethics review committee, University of Sargodha, Pakistan.

Conflict of Interest

The authors declared no conflict of interest among them.

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REFERENCES

1. Russell ADJH. Types of antibiotics and synthetic antimicrobial agents. Hugo and Russell's Pharmaceutical Microbiology. 2004:152-86.
2. Schlegel HG, Zaborosch C. General microbiology: Cambridge university press; 1993.
3. Gast A, Mathes T. Medication adherence influencing factors—an (updated) overview of systematic reviews. *Systematic Reviews*. 2019;8:1-7. <https://doi.org/10.1186/s13643-019-1014-8>
4. Llor C, Hernández S, Bayona C, Moragas A, Sierra N, Hernández M, Miravittles M. A study of adherence to antibiotic treatment in ambulatory respiratory infections. *International Journal of Infectious Diseases*. 2013 1;17(3):e168-72. <https://doi.org/10.1016/j.ijid.2012.09.012>
5. Horne R. Compliance, adherence, and concordance: implications for asthma treatment. *Chest*. 2006;130(1):65S-72S. https://doi.org/10.1378/chest.130.1_suppl.65S
6. Lehane E, McCarthy G. Medication non-adherence—exploring the conceptual mire.

International Journal of Nursing Practice. 2009;15(1):25-31.

<https://doi.org/10.1111/j.1440-172X.2008.01722.x>

7. Atreja A, Bellam N, Levy SR. Strategies to enhance patient adherence: making it simple. *Medscape General Medicine*. 2005;7(1):4.

8. Endashaw Hareru H, Sisay D, Kassaw C, Kassa R. Antibiotics non-adherence and its associated factors among households in southern Ethiopia. *SAGE Open Medicine*. 2022;10:20503121221090472.

<https://doi.org/10.1177/20503121221090472>

9. Fernandes M, Leite A, Basto M, Nobre MA, Vieira N, Fernandes R, Nogueira P, Jorge P. Non-adherence to antibiotic therapy in patients visiting community pharmacies. *International journal of clinical pharmacy*. 2014;36:86-91.

10. Pechère JC, Hughes D, Kardas P, Cornaglia G. Non-compliance with antibiotic therapy for acute community infections: a global survey. *International Journal of Antimicrobial Agents*. 2007;29(3):245-53.

<https://doi.org/10.1016/j.ijantimicag.2006.09.026>

11. Chan YH, Fan MM, Fok CM, Lok ZL, Ni M, Sin CF, Wong KK, Wong SM, Yeung R, Yeung TT, Chow WC. Antibiotics nonadherence and knowledge in a community with the world's leading prevalence of antibiotics resistance: implications for public health intervention. *American Journal of Infection Control*. 2012;40(2):113-7.

<https://doi.org/10.1016/j.ajic.2011.03.017>

12. Moradi M, Hamed-Shahraki S, Rezayee M, Verdi MJJoPC. Compliance with antimicrobial therapy: evaluating the related factors. *Journal of Pharmaceutical Care*. 2013:60-4.

13. Dunbar-Jacob J, Mortimer-Stephens M. Treatment adherence in chronic disease. *Journal of Clinical Epidemiology*. 2001;54(12):S57-60.

[https://doi.org/10.1016/S0895-4356\(01\)00457-7](https://doi.org/10.1016/S0895-4356(01)00457-7)

14. Llor C, Bjerrum L. Antimicrobial resistance: risk associated with antibiotic overuse and initiatives to reduce the problem. *Therapeutic Advances in Drug Safety*. 2014;5(6):229-41.

<https://doi.org/10.1177/2042098614554919>

15. Pavydė E, Veikutis V, Mačiulienė A, Mačiulis V, Petrikonis K, Stankevičius E. Public knowledge, beliefs and behavior on antibiotic use and self-medication in Lithuania. *International Journal of Environmental Research and Public Health*. 2015;12(6):7002-16.

<https://doi.org/10.3390/ijerph120607002>

16. Cockburn J, Gibberd RW, Reid AL, Sanson-Fisher RWJBMJ. Determinants of non-compliance with short term antibiotic regimens. *British Medical Journal* 1987;295(6602):814-8.

<https://doi.org/10.1136/bmj.295.6602.814>

17. Mojtabai R, Olfson M. Medication costs, adherence, and health outcomes among Medicare beneficiaries. *Health Affairs*. 2003;22(4):220-9.

<https://doi.org/10.1377/hlthaff.22.4.220>

18. Tong S, Pan J, Lu S, Tang J. Patient compliance with antimicrobial drugs: a Chinese survey. *American Journal of Infection Control*. 2018;46(4):e25-9.

<https://doi.org/10.1016/j.ajic.2018.01.008>

19. Woolson RF, Bean JA, Rojas PB. Sample size for case-control studies using Cochran's statistic. *Biometrics*. 1986:927-32.

<https://doi.org/10.2307/2530706>

20. Kumarasamy KK, Toleman MA, Walsh TR, Bagaria J, Butt F, Balakrishnan R, et al. Emergence of a new antibiotic resistance mechanism in India, Pakistan, and the UK: a molecular, biological, and epidemiological study. *Lancet*. 2010;10(9):597-602.

[https://doi.org/10.1016/S1473-3099\(10\)70143-2](https://doi.org/10.1016/S1473-3099(10)70143-2)

21. Ali I, Ahmad J, Khan AU, Khan TM, Khan J, Ul-Haq Z. Self-medication and non-adherence with antibiotics: the current situation in Pakistan. *Journal of Pharmacy Practice and Research*. 2016;46(1):34-7.

<https://doi.org/10.1002/jppr.1153>

22. Shaikh BT, Haran D, Hatcher J. Where do they go, whom do they consult, and why? Health-seeking behaviors in the northern areas of Pakistan. *Qualitative Health Research*. 2008;18(6):747-55.

<https://doi.org/10.1177/1049732308317220>



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