

## RESEARCH ARTICLE

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## Self-medication with antibiotics and its associated factors among university students: a cross-sectional study

Shams Ullah<sup>1</sup>, Qurish Ali<sup>1</sup>, Dost Mohammad<sup>1</sup>, Anisa<sup>1</sup>, Talha Ahmed<sup>1</sup>, Muhammad Arif<sup>1</sup>, Riaz Ahmed<sup>1</sup>, Muhammad Farooq<sup>1</sup>, Abdul Ghafar<sup>2</sup>, Abdul Wahid<sup>3</sup>

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### Abstract

**Background** Self-medication is the use of medications to address self-perceived disorders or symptoms, typically without a prescription or medical oversight. Throughout the COVID-19 pandemic, there has been a notable increase in self-medication practices, particularly with antibiotics. This study is incited by the rising prevalence of antibiotic resistance and the increased antibiotic consumption observed during the COVID-19 crisis in Pakistan.

**Methods** This study was conducted at the University of Balochistan from April to November 2022, to find out the prevalence of self-medication among students through a comprehensive questionnaire covering frequency, reasons, types of medications used, sources of information, and demographic characteristics. SPSS version 21 was used to analyze the data.

**Results** In this study, a total of 730 participants took part, resulting in a response rate of (708) 97%. The average age of the study participants was  $22.78 \pm 2.758$  years. The study found that most participants were male (69.5%), with the highest representation from third-year students in the biological sciences field (30.5%), primarily residing in hostels (59.3%) and receiving monthly allowances between 10000-15000 (54.2%). Factors such as gender, marital status, field of study in biological and natural sciences, residing in a hostel, absence of family members in the health profession, and specific monthly allowance ranges.

**Conclusion** The study concluded high rates of self-administration of antibiotics among University of Balochistan students, with factors such as gender, marital status, field of study, hostel residency, family healthcare background, and financial constraints playing significant roles. Urgent interventions are necessary to educate students on the dangers of self-medication.

**Key words** antibiotics, antibiotic resistance, self-medication, Pakistan

1. Department of Pharmacy, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, Pakistan.

2. Department of Pharmacology, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, Pakistan.

3. Department of Pharmacy Practice, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, Pakistan.

Correspondence: Abdul Wahid (Department of Pharmacy Practice, Faculty of Pharmacy and Health Sciences, University of Balochistan, Quetta, Pakistan; E-mail: [royalbolan@gmail.com](mailto:royalbolan@gmail.com)).

## Introduction

Antibiotics play a critical role in treating bacterial infections and have significantly contributed to improving public health worldwide [1]. However, their benefits are now under threat due to concerning practices of self-medication and parent-to-child medication, particularly with over-the-counter antibiotics, in developing countries [2-4]. Self-medication refers to the use of medications to treat self-diagnosed disorders or symptoms, often without a prescription or medical supervision [5, 6]. The COVID-19 pandemic has exacerbated this trend, influenced by several factors. Fear of catching the virus has made people reluctant to seek medical care at clinics or hospitals [7]. Furthermore, lockdowns and restrictions have hindered access to healthcare services, leading to an increase in self-medication [8].

Globally, the prevalence of self-medication ranges from 11.2% to 93.7%, depending on living standards. In developing countries, most people take care of their health problems by using medicines on their own. In Pakistan, the prevalence of self-medication is notably high, up to 85%, with contributing factors including easy access to medicines, lack of healthcare knowledge, and limited access to healthcare facilities [9]. In countries with weak healthcare systems, the existing issue of limited healthcare access has been further exacerbated by the pandemic. Factors such as the quality of the healthcare system, poverty levels, gender, and age contribute to the varying prevalence of self-medication across different regions [10]. Using antibiotics without a doctor's advice often leads to medication errors, including improper dosage, sharing drugs, and prematurely stopping treatment once symptoms improve. These actions can cause problems like drug interactions, other health issues, and develop antibiotic resistance [11]. The rise in antibiotic resistance poses a significant danger to public health, leading to longer hospital stays and increased mortality rates [11, 12]. Studies in Pakistan have shown very high rates of people using antibiotics without a doctor's advice [13, 14]. The accessibility of antibiotics without prescriptions and the lack of regulatory control further burden state and federal healthcare systems [14, 15].

This study aims to investigate and assess the prevalence of self-medication with antibiotics, identify the risk factors contributing to this practice, determine the common symptoms treated through self-medication, and explore the reasons behind antibiotic self-medication. This study is motivated by the growing prevalence of antibiotic resistance and the excessive use of antibiotics during the COVID-19 pandemic in Pakistan.

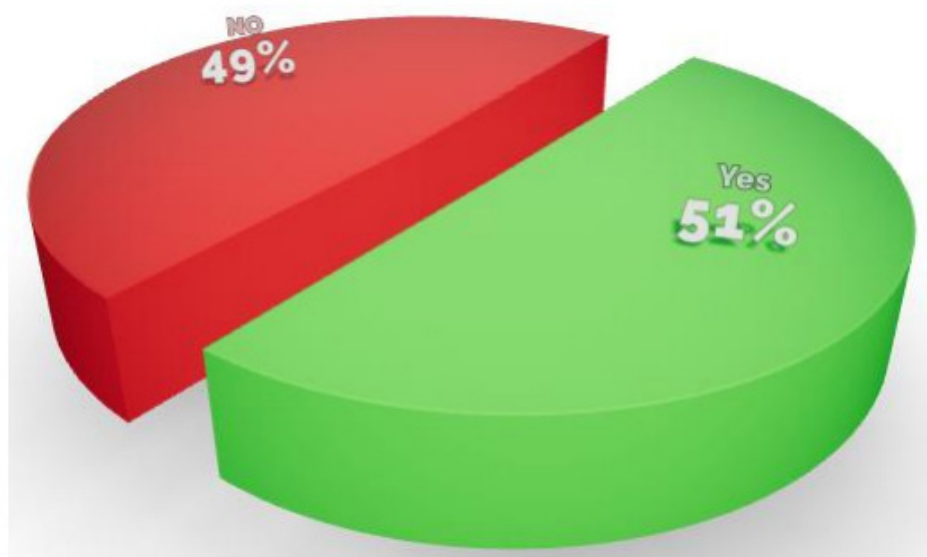
## Methodology

### *Study Design, Population, and Sampling*

The current study was a prospective cross-sectional study carried out at the University of Balochistan, Quetta, from April 2021 to November 2021. The University of Balochistan is a public university established in 1974 in Quetta, Balochistan, Pakistan. It has more than 10,000 students, three sub-campuses, 35 different departments, and six faculties. Initially, students from various fields such as Social Sciences, Natural Sciences, and Biological Sciences were approached. Subsequently, a convenience sampling technique was used in the second stage to recruit study participants from different academic departments and years of study.

### *Data Collection*

The data were collected using a comprehensive data collection form designed from previous literature. The data collection form included questions regarding frequency, reasons, types of medications used, sources of information, and demographic characteristics of the study participants. Prior to data collection, a pilot study was conducted on 30 students to ensure that the data collection form was clear, applicable, and understandable to the study population. The data were collected by qualified research assistants using a convenient sampling approach. Participants were briefed on the study objectives, assured of confidentiality, and provided informed consent before completing the questionnaire. Rigorous quality control measures were implemented throughout



**Figure 1. Prevalence of self-medication using antibiotic among university students.**

**Table 1. Socio-demographics of the study participants and self-medication with antibiotics.**

Items	Variables	Total No. (%)	Without Antibiotics, No. (%)	With Antibiotics, No. (%)
Age	15-20	72 (10.2)	36 (50.0)	36 (50.0)
	21-25	540 (76.3)	269 (49.8)	271 (50.2)
	26-30	72 (10.2)	15 (20.8)	57 (79.2)
	<30	24 (3.4)	14(58.3)	10(41.7)
Gender	Male	492 (69.5)	178 (36.2)	314 (63.8)
	Female	215 (30.5)	156 (46.7)	60 (27.8)
Marital status	Single	660 (93.2)	296 (44.8)	364 (55.2)
	Married	48 (6.8)	38 (79.2)	10 (2.8)
Field of Study	Social Sciences	192 (27.1)	132 (68.8)	60 (31.3)
	Natural Sciences	252 (35.6)	106 (42.1)	146 (57.9)
	Biological Sciences	264(37.3)	96(36.4)	168(63.6)
Year of Study	1 <sup>st</sup> year	108 (15.3)	24 (22.2)	84 (77.8)
	2 <sup>nd</sup> year	156 (22.0)	82 (52.6)	74 (47.4)
	3 <sup>rd</sup> year	216 (30.5)	127 (58.8)	89 (41.2)
	4 <sup>th</sup> year	96 (13.6)	36 (37.5)	60 (62.5)
	5 <sup>th</sup> year	132 (18.6)	65 (49.2)	67 (50.8)
Residence	Home	288 (40.7)	157 (54.5)	131 (45.5)
	Hostel	420 (59.3)	177 (42.1)	243 (57.9)
Family member in Health	Yes	96 (13.6)	72 (75.0)	24 (25.0)
	No	612 (86.4)	262 (42.8)	350 (57.2)
Monthly Allowance	5000-10000	72 (10.02)	12 (16.7)	60 (83.3)
	10000-15000	384 (54.2)	187 (48.7)	197 (51.3)
	15000-20000	132 (18.6)	60 (45.5)	72 (54.5)
	>20000	120(16.9)	75(62.5)	45(37.5)

the data collection process to maintain the integrity and accuracy of the collected data.

#### Statistical Analysis

SPSS version 21 was used to analyze the data, involving both descriptive and inferential statistics. Frequencies, percentages, means, and standard deviations were calculated to summarize demographic characteristics and self-medication behaviors. Additionally, regression models were employed to identify potential predictors and factors influencing self-medication practices, with a p-value less than 0.05 considered significant.

#### Results

In this study, a total of 730 participants took part, resulting in a response rate of 97% (708 respondents). The average age of the study participants was  $22.78 \pm 2.758$  years. The majority of the participants were male, accounting for 69.5% of the total sample. Among the students, the largest proportion belonged to the 3rd year (30.5%) in the field of biological sciences. In terms of residence, most of the participants resided in hostels (59.3%). Regarding the monthly allowance, a significant portion of the participants (54.2%) had an allowance in the range of 10,000-15,000 PKR.

The overall prevalence of self-medication among university students was found to be 50.1% (**Figure 1**). However, certain

subgroups exhibited higher rates of self-medication. Specifically, male students had a prevalence rate of 63.8%, students in the field of biological sciences had a rate of 63.6%, and students residing in hostels had a rate of 57.9%, while those with a monthly allowance in the range of 5,000-10,000 PKR had the highest prevalence (83.3%) of self-medication as shown in **Table 1**.

The primary reasons for self-medication included the desire for immediate access without the need to wait (28.8%), perceiving the disease as not serious (27.1%), lack of trust in healthcare professionals (20.3%), poor economic status (18.6%), and past personal experiences (5.1%) (**Figure 2**). In terms of the specific complaints that led individuals to self-medicate with antibiotics, gastric problems accounted for 28.2%, dental issues for 16.4%, and renal pain for 13.7% of the cases, as shown in **Table 2**.

The majority of individuals obtained antibiotics from different sources: community pharmacies (47.5%), friends and relatives (27.1%), and previous doctors' prescriptions (15.3%) (**Figure 3**). Amoxicillin was the most frequently used antibiotic (30.4%), followed by Co-Amoxiclav (12.1%), Ampicillin (10.1%), and Azithromycin (8.7%), as shown in **Table 3**.

#### *Factors associated with self-medication with antibiotics*

To identify the factors associated with self-medication with antibiotics, both univariate and multivariate binary logistic regression analyses were conducted. In the univariate analysis, several variables showed significant associations with self-medication. These included gender (male) with an odds ratio (OR=1.497, p-value=0.000), marital status (married) (OR=0.2663, p-value=0.000), field of study (biological sciences) (OR=1.514, p-value=0.001), year of study (3rd year, 4th year, and 5th year) with respective odds and p-values (OR=0.0701, p-value=0.010,

OR=1.667, p-value=0.015, and OR=0.571, p-value=0.002), and monthly allowance >20,000 PKR (OR=0.290, p-value=0.000), all of which had significant associations with self-medication with antibiotics.

Following the univariate analysis, the significant variables were further analyzed using multivariate binary logistic regression analysis, considering the adjusted odds ratios. In this analysis, the variables that retained their significance as risk factors for self-medication with antibiotics were male gender (OR=99.998, p-value=0.000), marital status (married) (OR=10.665, p-value=0.000), field of study (biological sciences) (OR=24.873, p-value=0.000), field of study (natural sciences) (OR=12.587, p-value=0.000), year of study (2nd year and 3rd year) with respective ORs of 0.295 and 0.035, and corresponding p-values of 0.033 and 0.000, residence (hostel) (OR=43.316, p-value=0.000), absence of family members in health (OR=0.012, p-value=0.000), and monthly allowance (10,000-15,000 PKR, 15,000-20,000 PKR, and >20,000 PKR) with respective ORs of 0.004, 0.001, and 0.0000, and corresponding p-values of 0.000, 0.000, and 0.000. **Table 4** provides insights into the factors associated with self-medication with antibiotics, both univariate and multivariate.

#### **Discussion**

In this study, the prevalence of self-medication with antibiotics among university students was 50.1%. This prevalence is lower than the findings of other studies conducted in Ghana (70%), Uganda (75%), Pakistan (76%), and Tanzania (58%) [16-18]. However, the findings were higher than in other studies conducted in China, European countries, and Brazil (29.3-48%) respectively [19-21].

The high prevalence of self-medication among university

**Table 2. Reasons and complaints for self-medication with antibiotics.**

Items	Classification	Frequency	Percentage (%)
Reasons	Poor economic status	132	18.6
	Lack of trust on Doctors	144	20.3
	Emergency use and no waiting	204	28.8
	The disease was not serious	192	27.1
	My own previous experience	36	5.1
	Allergy	82	11.6
	Fever	24	3.4
Complaints	Flu/cough	12	1.7
	Gastric problem	200	28.2
	Skin infection	72	10.2
	Infection and wounds	57	8.1
	Dental issues	116	16.4
	Renal pain	97	13.7
	Sore throat	48	6.8

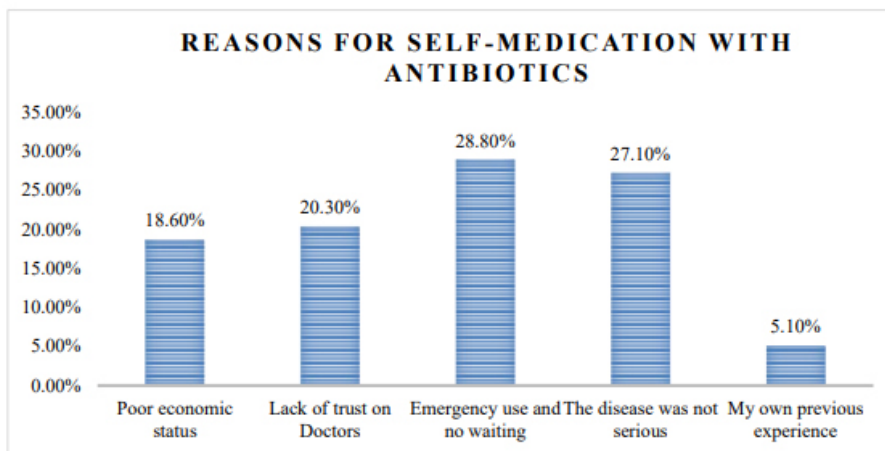


Figure 2. Reasons for self-medication with antibiotics.

students could be due to difficulties in accessing the healthcare system and insufficient income levels to afford private physicians. In regions where access to formal healthcare services is limited or where private healthcare is financially burdensome, some individuals may opt for self-medication as a more accessible and cost-effective alternative. This phenomenon is particularly prevalent among university students, who may face additional barriers to healthcare access due to their transient living arrangements and limited financial resources [22].

The findings of our study indicate that 28.8% of university students self-administered antibiotics for immediate access

without the need to wait, 27.1% thought the illness wasn't serious, 20.3% didn't trust healthcare professionals, 18.6% had financial constraints, and 5.1% relied on their past experiences. Different studies conducted elsewhere have reported similar findings, with people using antibiotics without waiting, having limited financial resources, and relying on their past experiences [23-25]. Overall, these findings demonstrate why university students self-medicate with antibiotics. It's about convenience, their perception of symptom severity, trust in doctors, financial status, and past healthcare experiences. To address these reasons, we need to implement various measures to promote responsible medicine

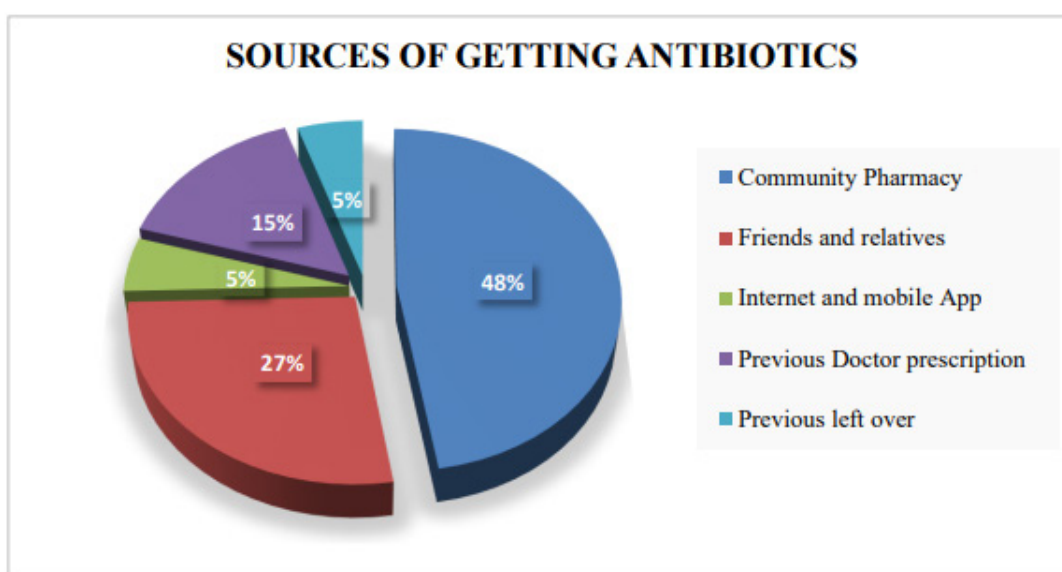


Figure 3. Sources of getting antibiotics.

**Table 3. Types and source of antibiotics used for self-medication.**

Items	Classification	Frequency	Percentage (%)
Sources of getting Antibiotics	Community Pharmacy	336	47.5
	Friends and relatives	192	27.1
	Internet and mobile App	36	5.1
	Previous Doctor prescription	108	15.3
	Previous left over	36	5.1
Antibiotics used for Self medication	Amoxicillin	168	30.4
	Ampicillin	56	10.1
	Amoxicillin + calvanic acid	67	12.1
	Azithromycin	48	8.7
	Cephadrine	24	4.3
	Ciprofloxacin	24	4.3
	Levofloxacin	16	2.9
	Moxifloxacin	18	3.2
	Cefixime	18	3.2
	Clarithromycin	30	5.4
	Erythromycin	36	6.5
	Doxicyclin	26	4.7
	Cephalexin	20	3.6

use, ensure easy access to healthcare, and enhance health literacy among students [23-25]. The most common complaints for self-medication with antibiotics were stomach problems (28.2%), dental issues (16.4%), and kidney pain (13.7%). This indicates that people often prefer quick solutions for their health problems, particularly when they believe they can manage them without consulting a doctor [26, 27].

Community pharmacies were the most common source (47.5%), followed by friends and relatives (27.1%), and previous doctors' prescriptions (15.3%) for obtaining antibiotics. This suggests that antibiotics are easily accessible without a prescription, possibly due to lax regulations or practices in certain regions. Furthermore, there may be a lack of awareness regarding antibiotic resistance and the importance of completing prescribed courses. Factors such as convenience, cost, and trust in informal networks likely drive individuals to obtain antibiotics from these sources. To address this, stricter regulation, public education, and improved access to professional healthcare services are needed. Otherwise, inappropriate antibiotic use could lead to the emergence of antibiotic resistance [28, 29].

The antibiotics Amoxicillin (30.4%), Co-Amoxiav (12.1%), Ampicillin (10.1%), and Azithromycin (8.7%) were frequently chosen. Similar findings have been reported by other studies conducted elsewhere [30, 31]. Their effectiveness against common bacterial infections and widespread prescription patterns

contribute to their use. Several factors influence antibiotic selection, including local prescribing practices, patient allergies, and perceived efficacy. To combat antibiotic resistance and ensure the best patient outcomes, careful and informed antibiotic prescribing practices are necessary [32, 33].

The significant risk factors associated with self-medication with antibiotics included female gender, married marital status, field of study in biological and natural sciences, residing in a hostel, absence of family members in the health profession, and specific monthly allowance ranges. Female gender emerges as a notable risk factor because females are more health-conscious and may be more proactive in seeking out remedies for minor ailments independently, leading to higher rates of self-medication [31, 32]. Cultural factors and experiences related to menstruation or reproductive health may contribute to increased self-medication behaviors among female students, as they seek relief from associated symptoms [34, 35]. The field of study in natural and biological sciences may provide students with better healthcare knowledge, leading to self-diagnosis and self-medication based on their medical knowledge. Additionally, staying in a hostel with friends, previous prescriptions, and having limited financial resources may contribute to increased self-medication behaviors among students [36]. Inadequate facilities or financial limitations may promote students' self-medication as a convenient and cost-effective solution to manage health issues. Lower monthly

**Table 4. Risk factors associated with self-medication using antibiotics.**

Variables	Self-medication with Antibiotics		Univariate analysis		Multivariate analysis	
	No, No. (%)	Yes, No. (%)	OR (95%CI)	p-value	OR (95%CI)	p-value
Age	15-20	36 (50.0)	Referent			
	21-25	269 (49.8)	1.007 (0.616-1.647)	0.976		
	26-30	36 (47.2)	1.118 (0.581-2.149)	0.739		
	<30	14 (58.3)	0.714 (0.281-1.817)	0.480		
Gender	Male	197 (40.0)	Referent		Referent	
	Female	156 (46.7)	1.497 (1.250-1.793)	0.000	99.998 (41.012-243.823)	0.000
Marital status	Single	313 (47.7)	Referent		Referent	
	Married	38 (79.2)	0.263 (0.131-0.528)	0.000	10.665 (3.062-37.140)	0.000
Field of Study	Social Sciences	132 (68.8)	Referent		Referent	
	Natural Sciences	116 (46.0)	1.172 (0.915-1.502)	0.208	12.587 (6.134-25.832)	0.000
	Biological Sciences	105 (39.8)	1.514 (1.184-1.938)	0.001	24.873 (11.846-52.224)	0.000
Year of Study	1 <sup>st</sup> year	24 (22.2)	Referent		Referent	
	2 <sup>nd</sup> year	82 (52.6)	0.902 (0.659-1.236)	0.522	0.295 (0.096-0.908)	0.033
	3 <sup>rd</sup> year	127 (58.8)	0.0701 (0.534-0.919)	0.010	0.035 (0.009-0.141)	0.000
	4 <sup>th</sup> year	36 (37.5)	1.667 (1.103-2.519)	0.015	4.094 (0.954-17.565)	0.058
	5 <sup>th</sup> year	84 (63.6)	0.571 (0.401-0.815)	0.002	0.012 (0.003-0.044)	0.853
Residence	Home	158 (54.9)	Referent		Referent	
	Hostel	195 (46.4)	1.154 (0.953-1.398)	0.144	43.316 (17.947-104.549)	0.000
Family member in Health	Yes	72 (75.0)	Referent		Referent	
	No	281 (45.9)	0.333 (0.210-0.529)	0.000	0.012 (0.003-0.044)	0.000

Table 4. Risk factors associated with self-medication using antibiotics (Continued).

Variables	Self-medication with Antibiotics		Univariate analysis		Multivariate analysis	
	No, No. (%)	Yes, No. (%)	OR (95%CI)	p-value	OR (95%CI)	p-value
5000-10000	12 (16.7)	60 (83.3)	Referent		Referent	
10000-15000	188 (49.0)	196 (51.0)	1.043 (0.854-1.273)	0.683	0.004 (0.001-0.017)	0.000
15000-20000	60 (45.5)	72 (54.5)	1.200 (0.852-1.690)	0.297	0.001 (0.000-0.007)	0.000
>20000	93 (77.5)	27 (22.5)	0.290 (0.189-0.446)	0.000	0.000 (0.000-0.000)	0.000

allowances potentially limit access to professional medical care and prescribed medications [37]. These findings underscore the need for targeted interventions addressing socio-cultural norms, healthcare access, and financial constraints to promote responsible antibiotic use among university students and mitigate the associated risks of self-medication [38].

### Conclusion

In the current study, it was found that many students at the University of Balochistan frequently practice self-administration of antibiotics. Factors such as female gender, married marital status, field of study in biological and natural sciences, residing in a hostel, absence of family members in the health profession, and low monthly allowance were identified as contributing factors. It is crucial to educate students about the risks associated with self-medication. Additionally, there is a need for national guidelines on accessing medications and strict measures to prevent the sale of drugs without a valid prescription. Further research should also investigate self-medication practices within the broader community.

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### Ethics approval

The ethical committee of Faculty of Pharmacy and Health Sciences University of Balochistan approved the study and written consent was taken from study participants.

### Data availability

The Data will be available upon request.

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The authors did not receive any funding or support to report.

### Authors' contribution

Abdul Wahid conceptualized and supervised the study, while Shams Ullah, Qurish Ali, Dost Mohammad, Anisa, Talha Ahmed collected and Muhammad Arif, Riaz Ahmed, Muhammad Farooq, entered the data. Abdul Wahid analyzed the data, and Abdul Ghafar critically reviewed it.

### Competing interests

The authors have reported no conflicts of interest.

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