



THE ROLE AND FUTURE OF PUBLIC HEALTH IN PAKISTAN: EVALUATING CURRENT EFFECTIVENESS, CAREER OPPORTUNITIES, AND GLOBAL INTEGRATION IN THE HEALTHCARE SYSTEM

Dr. Muhammad Wajaht ul Haq¹, Dr. Muhammad Asad Abbas^{2*}, Dr. Fatima Aftab Khan³, Dr. Imran Mansoor⁴, Dr. Namrah Ahmed⁵, Prof. Dr. Farah Ahmed⁶.

¹*Senior lecturer community medicine, Watim medical college Rawalpindi, evening administrator Riphah international hospital Islamabad, wajahat.haq@riphah.edu.pk (Main Author)

²*Department: community medicine, senior lecturecollege/uni affiliation: senior lecturer Watim medical college, UHSemail address : asadabbas195@icloud.com,

³Community medicine demonstrator Watim medical college, fatima.aftab.khan@gmail.com

⁴Senior lecturer community medicine Watim medical college, imrandactor@hotmail.com

⁵e-mail address: namrah.52@gmail.com WMDC,

⁶department of community medicine. Watim medical college/UHS
doc.farah824@hotmail.com

***Corresponding Author:** Dr. Muhammad Asad Abbas

*Department: community medicine, senior lecturecollege/uni affiliation: senior lecturer Watim medical college, UHSemail address : asadabbas195@icloud.com,

Abstract

Introduction: Pakistan's healthcare system faces significant challenges, including a high burden of infectious diseases like tuberculosis, hepatitis, and malaria, as well as a growing prevalence of non-communicable diseases (NCDs) such as diabetes and cardiovascular diseases. Self-medication, especially with antibiotics, is common, contributing to antimicrobial resistance (AMR), exacerbating public health issues.

Objective: This study aimed to assess the effectiveness of public health initiatives in Pakistan, focusing on antibiotic resistance, healthcare workforce distribution, and integration of global health practices.

Materials & Methods: A cross-sectional study was conducted in Rawalpindi and Islamabad from January to March 2025. A total of 250 participants, including medical students, healthcare professionals, and patients, were selected using convenience sampling. Data were collected via self-administered questionnaires and interviews. Descriptive statistics, chi-square tests, and cross-tabulation were used for data analysis.

Results: The study revealed that 80.8% of participants engaged in self-medication, with cephalosporins being the most commonly used antibiotic (40.8%). While 82.0% were aware of antibiotic resistance, only 62.0% understood its mechanisms. Healthcare access was reported by 82.0% of participants, with rural areas experiencing lower access compared to urban regions ($p = 0.02$).

Conclusion: Despite good awareness of antibiotic resistance, self-medication remains widespread. Stricter regulations, public health campaigns, and workforce distribution reforms are essential to improving Pakistan's healthcare outcomes.

Keywords: Antibiotic Resistance, Public Health, Self-Medication, Healthcare Access, Workforce Development, Global Health Practices.

Introduction

In Pakistan, the issue of health is very critical, and it has affected the efficiency of healthcare delivery. The nation is facing a high rate of infectious disease including tuberculosis, hepatitis, and malaria as well as an increased number of non-communicable diseases (NCDs) like diabetes, cardiovascular diseases, and cancer (1). Tuberculosis is still one of the common causes of death according to the recent data and an estimated 50,000 lives are lost each year (2). NCDs are also increasing at a very high rate with more than 70% of all the deaths in the country being a result of heart disease and diabetes among others (3). Moreover, the population of Pakistan practicing self-medication, particularly with antibiotics, is more than 40% of the total, which has caused heightened antimicrobial resistance (AMR) (4). Moreover, the healthcare system in Pakistan is underfunded and the healthcare spending amounts to 2.5 percent of its GDP, which is way lower than the recommended global percentage of 5% (5). Another urgent problem is the proportion of doctors to population, which is less than 1 doctor per 1000 people, which is much lower compared to the neighbors, and gives rise to considerable discrepancies in healthcare availability, especially in the rural setting where the majority of the population (approximately 65%) lives (6).

Public health in Pakistan has been on the frontline in terms of change since it has been experiencing a number of issues such as inadequate infrastructure, inadequate healthcare funding and the number of problems about a healthy working health care force. Research refers to the key role of transitioning to healthcare strategies in the 21st century, which involves the need to enhance the state of the population of a specific country and incorporate new technologies in medical care (7). Inadequate education of the public and shortage of workforce as the issue in question must be considered critical since they were assessed as the educational gaps in the workforce needs of the health system (8). In addition, the Global Health Security agenda and the attempts of Pakistan to evaluate its health capabilities under the form of international tests, including the Joint External Evaluation, show that the nation wants to become a part of the global healthcare system successfully (1). These studies emphasise the way in which Pakistani professionals in the field of public health are making the country much more global and solving domestic challenges in the country by providing professional training and training employees.

The career prospects in the field of public health in Pakistan are bound to expand due to the growing number of requirements in the fields of health care management, epidemiology, and disease prevention of qualified specialists. The changing demands of the Pakistani health sector, i.e., the occurrence of the gaps in the human resources, offers the possibilities of growing the career options of the graduates in the field of the public health (9). One of the main issues that publicly health experts are demanding is to reform the health system in the country so that not only the local requirements are met but also the contribution to the international scene of health concerning Pakistan is increased (10). Public-private integration of the healthcare industry may further streamline the healthcare delivery system in Pakistan and introduce some synergies between state healthcare interventions and the international healthcare policies (11). Furthermore, as digital health technologies start to become the new reality in the world, the growing popularity of the digital health interventions in the further development of the Pakistani public health strategies provides new career opportunities, potential paths of inclusion within the global healthcare ecosystem (12).

The role of the public health in Pakistan is becoming more crucial than ever as the country is still facing serious problems with its healthcare system. Strengthening the healthcare infrastructure, training of the effective workforce, and merging with technological advancement are the key

elements in approaching current healthcare problems as well as the threats to global health. The future of the public health in Pakistan is attained through increased career prospects, development of international partnerships and coming up with a robust health care facilities capable of adapting to the changing health needs. Such initiatives are to enhance the health outcomes of the people both locally and internationally and present Pakistan as a participant in the global healthcare environment. The objective of this study was to evaluate the current effectiveness of public health initiatives in Pakistan, focusing on antibiotic resistance, healthcare workforce development, and the integration of global health practices.

Material & Methods

The study was a quantitative cross-sectional research undertaken in two urban Rawalpindi and Islamabad, Pakistan, to find answers to the public challenges with health, especially in relation to antibiotic resistance, self-medication, and healthcare access. The research would be conducted in three months, between January and March 2025. This study used as the population medical students, healthcare professionals, and patients who visit healthcare facilities within these areas. Convenience sampling method was used to choose the sample and this means that those who were easily available within the period of conducting the study were within reach. The sample consisted of 250 participants, which sufficiently represented people interested in the healthcare system itself and who are involved in problems of public health.

The participants were also selected based on the following criteria; medical students, healthcare professionals (doctors, nurses and pharmacists) and patients who had visited clinics or hospitals in Rawalpindi and Islamabad. Other individuals unwilling to join the research or unable to fill all the data were not included in the research. Structured questionnaires were administered in order to collect data on the self-medication practices, understanding of antibiotic resistance, and healthcare service access by the participants. The questionnaires were designed to be self-administered by medical students and healthcare professionals and interviews were conducted with the patients by the trained research assistants to help them understand and be clear.

The data collected were processed with the help of descriptive statistics that helped to summarize the demographic features of the participants and the prevalence of the key variables (self-medication and the awareness of antibiotic resistance). Self-medication (binary yes/no), knowledge of antibiotic resistance (binary aware/unaware), access to healthcare (categorical urban/ rural, availability of services), and availability of healthcare workers (continuous number of healthcare workers per 1,000 people) were the primary variables in this study. Cross-tabulation was used to check relationships between variables i.e. age, gender, and education level with self-medication practices and healthcare access. Chi-square test was used to determine whether there was a statistical significance between the associations of categorical variables. Statistical significance was defined as a p-value of 0.05 and all the calculations were done on SPSS version 25.

Results

Table 1 shows the demographic characteristics of the study participants. Participants are majorly between 18- 25 years and this is 44.8% of the sample; a slight percentage of 8.8% are aged 46 years and above. The gender proportion is also balanced, with 60% of participants being male, and 40% being female. The majority of the respondents possess an undergraduate degree (72%), and the other 28% are undergraduate level holders. By itself, a large proportion of participants had experienced self-medication at 80.8% of the respondents, pointing to an important public health concern. Regarding access to healthcare, the number of participants residing in urban regions is 70.4%, and in rural areas is 29.6%, which demonstrates a higher density in urban areas and which can affect access to healthcare and methods.

Table 1: Demographic Characteristics (n = 250)

Variables	Categories	n (%)
Age	18-25	112 (44.8%)
	26-35	69 (27.6%)
	36-45	47 (18.8%)
	46+	22 (8.8%)
Gender	Male	150 (60.0%)
	Female	100 (40.0%)
Education Level	Undergraduate	180 (72.0%)
	Graduate	70 (28.0%)
Self-medication	Yes	202 (80.8%)
	No	48 (19.2%)
Healthcare Access	Urban	176 (70.4%)
	Rural	74 (29.6%)

Table 2 provides an overview of self-medication among the participants. A large percentage (56.4%) of participants said that they often engaged in self-medication, with 31.2% engaging in self-medication occasionally and 12.4% engaging in self-medication rarely. The chi-square p-value 0.04 is an indication that there are some demographic variables that have a significant association with the frequency of self-medication. In terms of the antibiotic type used, 40.8 percent of the participants were on cephalosporin, 25.6% were using quinolones, 18% were using penicillin, and 15.6% were using macrolides, which reflects a wide variety of antibiotic options. The association of antibiotics used is significant ($p = 0.02$). Regarding the information source, 27.6% of the participants responded that they used the internet, which made them contrive self-medication practices, with a significant p-value of 0.03, indicating that people relied heavily on online resources to inform their health-related behavior.

Table 2: Self-Medication Practices (n = 250)

Variables	Categories	n (%)	Chi-Square p-value
Self-medication Frequency	Rarely	31 (12.4%)	0.04
	Occasionally	78 (31.2%)	
	Often	141 (56.4%)	
Antibiotics Used	Cephalosporins	102 (40.8%)	0.02
	Quinolones	64 (25.6%)	
	Penicillin	45 (18.0%)	
	Macrolides	39 (15.6%)	
Source of Information	Internet	69 (27.6%)	0.03
	Family	88 (35.2%)	
	Friends	53 (21.2%)	
	Pharmacists	40 (16.0%)	

Table 3 shows the awareness and knowledge level on the subject of antibiotic resistance among the participants. Most respondents (82.0%) have heard about antibiotic resistance, and 18.0% have not, which yields a p-value of 0.01, which is significant. In the analysis of the perception of resistance mechanisms, 62.0% of respondents had the correct understanding of the way resistance was developed, and 38.0% had the wrong knowledge, indicating that despite the general awareness, there was still a need to understand better the science behind the antibiotic resistance ($p = 0.02$). The table also indicates that 72.8% of the respondents regularly take antibiotics and this is alarming considering the sensitivity of resistance, and the chi-square statistic of 0.00 states that there should be improved control and more education on antibiotic use.

Table 3: Awareness of Antibiotic Resistance (n = 250)

Variables	Categories	n (%)	Chi-Square p-value
Awareness of Antibiotic Resistance	Yes	205 (82.0%)	0.01
	No	45 (18.0%)	
Understanding of Resistance Mechanism	Correct	155 (62.0%)	0.02
	Incorrect	95 (38.0%)	
Frequent Use of Antibiotics	Yes	182 (72.8%)	0.00
	No	68 (27.2%)	

Table 4 analyzes healthcare accessibility and workforce distribution among the study participants. A high percentage of respondents (82.0%) indicated that their access to healthcare was good and 18.0% reported having limited or no access with a significant chi-square p-value of 0.05 indicating that the accessibility of healthcare depends on a number of demographic and structural variables. Regarding the number of healthcare workers, almost half (47.2%) of the participants reside in regions with 0-2 healthcare workers per 1,000 population, which denotes a severe shortage, and 36.8% have 3-5 healthcare workers and 16.0% have more than 6 healthcare workers. The chi-square p-value of 0.03 shows that healthcare access is highly connected to the workforce availability. Also, only 62.0% of the population in rural setting confirmed that they have access to healthcare facilities, and, what is more, 38.0% of this population continues to receive insufficient healthcare services, with the chi-square p-value of 0.02 indicating a difference in healthcare delivery between the rural and urban regions.

Table 4: Healthcare Access and Workforce Distribution (n = 250)

Variables	Categories	n (%)	Chi-Square p-value
Healthcare Access Availability	Yes	205 (82.0%)	0.05
	No	45 (18.0%)	
Number of Healthcare Workers	0-2	118 (47.2%)	0.03
	3-5	92 (36.8%)	
	6+	40 (16.0%)	
Access to Healthcare in Rural Areas	Yes	155 (62.0%)	0.02
	No	95 (38.0%)	

Table 5 compares self-medication among the various age groups. In the group of individuals aged 18-25, 51.2% confessed having engaged in self-medication frequently with a convenient 32.0% having done it a few times and 6.4% rarely indulging in self-medication. The same tendency is followed in the same age group of 26-35 with 56.5% reporting of often self-medicated. In 36-45 age group, 46.8% self-medicated frequently with the highest percentage (14.9%) self-medication hardly ever. The age 46 and above did the same with 50.0% self-medicating frequently, and 13.6% rarely self-medicating, respectively. The p-value of the chi-square of 0.04 indicates that age group has a considerable effect on the frequency of self-medication and young respondents are more likely to frequent self-medication than the older ones.

Table 5: Cross-Tabulation of Self-Medication Practices by Age Group (n = 250)

Age Group	Rarely	Occasionally	Often	Total	Chi-Square p-value
18-25	8 (6.4%)	40 (32.0%)	64 (51.2%)	112 (44.8%)	0.04
26-35	6 (8.7%)	24 (34.8%)	39 (56.5%)	69 (27.6%)	
36-45	7 (14.9%)	18 (38.3%)	22 (46.8%)	47 (18.8%)	
46+	3 (13.6%)	8 (36.4%)	11 (50.0%)	22 (8.8%)	

Table 6 indicates self-medication at various levels of education. In the case of undergraduate's participants, 72.8% said that they self-medicated frequently, 21.7% frequently, and 5.6% rarely. Conversely, graduate respondents showed a marginally less tendency toward frequent self-medication as 40.0% reported having frequently self-medicated, 25.7% sometimes, and 4.3% rarely. The p-value of chi square test is 0.02 and this indicates that the level of education is a major factor in the probability of self-medication and the undergraduates have a higher likelihood of engaging in self-medication regularly as compared to the graduates. The difference indicates that the education level could affect health behaviors and very educated people can be more responsible in their attitudes towards self-medication practices.

Table 6: Cross-Tabulation of Self-Medication Practices by Education Level (n = 250)

Education Level	Rarely	Occasionally	Often	Total	Chi-Square p-value
Undergraduate	10 (5.6%)	39 (21.7%)	131 (72.8%)	180 (72.0%)	0.02
Graduate	3 (4.3%)	18 (25.7%)	28 (40.0%)	70 (28.0%)	

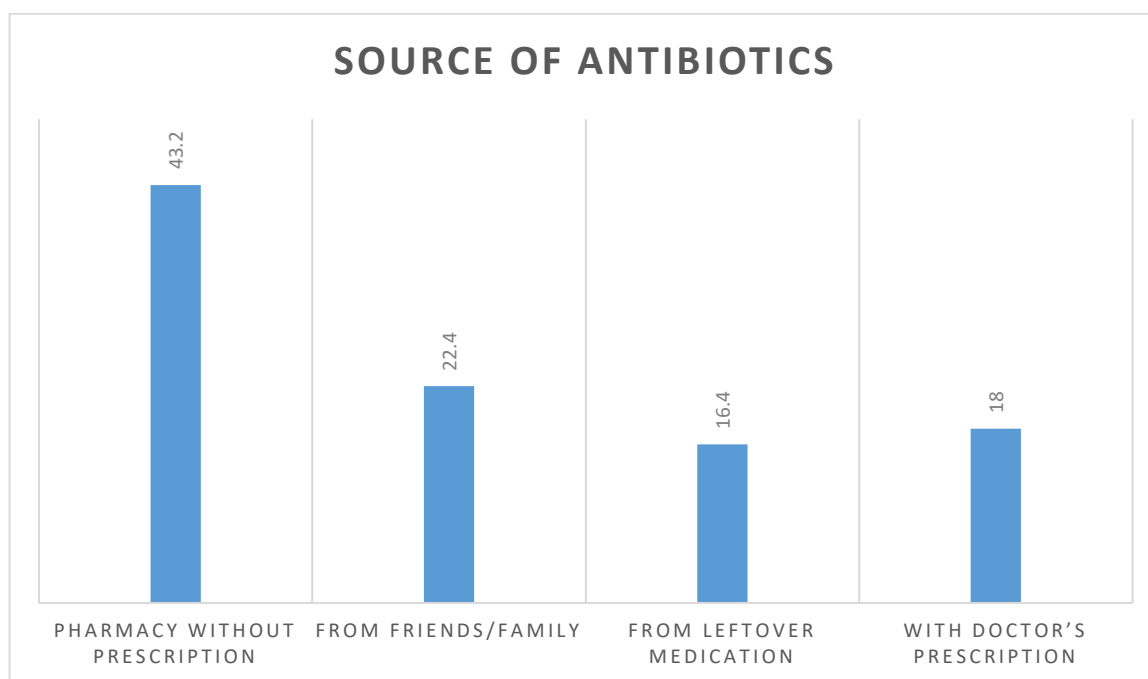


Figure 1. Sources of Antibiotics among Participants

Discussions

The results of the study demonstrate that the public health condition in Pakistan is grave especially when it comes to antibiotic resistance, self-medication, and access to healthcare. The findings showed that self-medication with the antibiotics is very common and 80.8% of the participants said that they engage in this practice. This trend indicates the general patterns in the developing world, where simple access to over-the-counter medications leads to antimicrobial resistance (AMR). The most popular antibiotics (40.8% and 25.6%, respectively) consisted of cephalosporins and quinolones respectively, which was reflected in other South Asian countries (13). The rate at which people have been misusing antibiotics especially the young adults and undergraduates is high, which reflects a lack of awareness on antimicrobial stewardship. The findings of the research conducted in similar socio-economic settings, including Nepal and Bangladesh, reveal the same direct association between the education level and antibiotic misuse with higher awareness resulting in less irrational use (14). Chi-square results of the current study ($p = 0.04$) indicate that age and education

significantly determine self-medication behavior, which implies that treating young populations and students with specific public health education programs about self-prescription and development of resistance can be used to reduce adverse outcomes (8, 1).

The research also revealed a knowledge and awareness void about antibiotic resistance with only 62.0% of the participants displaying the correct knowledge about the mechanisms of AMR despite their awareness of 82.0% being positive. This awareness-comprehension difference is oriented to surface knowledge that is not supported with practical applications, which is consistent with previous studies that were carried out in Pakistan and India, revealing issues in translation of knowledge into behavior (15). The use of antibiotics (frequently and not necessarily) is an urgent problem in Pakistan where the pharmaceutical regulations are poorly enforced and sales of antibiotics over-the-counter are widely practiced. This case reflects the universal data about the WHO, which points to the fact that the misuse of antibiotics in low- and middle-income countries is a significant contributor to AMR (16). The findings of this paper support the significance of enhancing pharmaceutical regulation, responsible prescribing habits, and the inclusion of AMR awareness information into the medical education curriculum to enhance people to use the knowledge gained in healthcare institutions and the medical profession (17).

The results of the study on accessibility to healthcare and the distribution of workforce also showed a strong difference between the urban and rural regions. Approximately 82.0% of respondents indicated access to healthcare, but nearly half (47.2%) of those in the areas listed 0-2 health care workers per 1,000 residents in underscoring an extreme lack of qualified professionals. This urban-rural gap is also consistent with earlier results by the Pakistan Bureau of Statistics and the WHO reports that revealed that more than 65% of the rural individuals do not have the proper healthcare facilities (18). The chi-square test statistics ($p = 0.03$) prove that access to a healthcare is directly linked to the availability of the workforce, which implies that the unequal allocation of medical staff worsens healthcare inequities. This lack helps to propagate trends of self-medication as people living in rural and semi-urban communities frequently self-treat because of the lack of appropriate treatment (3, 10). The solution to these disparities involves a long-term effort in health workforce development, especially in rural Pakistan and privatizing global strategies in strengthening the systems of health by incorporating public health strategies. Moreover, the reforms in the field of health policy should be concerned with equitable healthcare provision and introduction of best practices (global) to secure sustainable improvement of the population health outcomes (19).

Limitations and Future Recommendations

The limitations of the study are that it involves the convenience sampling, which might not adequately reflect the large population and self-reported information, which might also prove to be biased. The future investigation must be based on randomizing and long-term studies aiming to elucidate the long-term impacts of self-medication. Secondly, education and government control measures should be considered to mitigate antibiotic resistance through measures to enhance awareness by the population and increased restrictions on these incidence.

Conclusion

This has identified the most problematic issues in Pakistan in terms of the self-medication rates being extremely high, as well as the fact that people remain unaware of the issues related to antibiotic resistance. The results highlight the importance of tougher regulations and awareness campaigns to fight with the misuse of antibiotics. Overcoming these challenges will involve taking a multi-faceted approach, such as improving health care infrastructure and specific public health measures.

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