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| RESEARCH ARTICLE

Investigation of Amoxicillin Usage to Treatment of Diseases in Faizabad City of Badakhshan Province

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| ABSTRACT
Amoxicillin is a beta-lactam antibiotic that contains a beta-lactam ring in its chemical structure and can inhibit the formation of bacterial cell walls. Due to the effectiveness of antibiotics in treating diseases, people utilize this drug widely. This study aims to investigate the consumption rate of amoxicillin and its impact on humans in the Faizabad city of Badakhshan province. Interviews were conducted between January and March 2024 by using structured questionnaires. In total, 116 informants from 93 households were interviewed and respondents were selected randomly. The results revealed that residents of this city used amoxicillin to treat nine types of diseases, such as throat inflammation, tooth infections, stomach infections, ear infections, and kidney infections. The highest impact of amoxicillin was reported on throat inflammation (20%), tooth infections (19.9%), stomach infections (19.5%), ear infections (18.3%), kidney infections (7.2%), chest infections (7%), and the lowest impact was observed on the common cold (3,6%), urinary tract infections (3%), and sinusitis (1,3%). In conclusion, the residents of Faizabad city widely used amoxicillin for the treatment of nine types of diseases.

| KEYWORDS

Faizabad, Residents, Utilize, Amoxicillin and Health.

| ARTICLE INFORMATION

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1. Introduction

Amoxicillin is a β-lactam antibiotic that has a β-lactam ring in the chemical structure and can prevent the production of bacterial cell walls (Danesh et al., 2010). Amoxicillin and clavulanic acid together continue to be one of the most commonly used antibiotic combinations, even with the development of new medications over the years (Salvo et al., 2009). In the 1960s, advancements in synthetic production the development of new penicillin with more types of antibiotic activity. Two such developments that are useful in treating skin and urinary tract infections are ampicillin and amoxicillin (Sutherland et al., 1972). Amoxicillin was first given orally in Britain in the early 1970s, and it gradually became known as a significant antibiotic (Preet Kaur et al., 2011). Amoxicillin is one of the most commonly used antibiotics (Watkinson et al., 2009). The health of both humans and animals is greatly benefited by this antibiotic (Poureteda et al., 2014; Dimitrakopoulou et al., 2012).

One of the most popular versions of penicillin for children to use is reportedly its oral suspension (Ghuravi et al.., 2012). Chronic periodontitis is a factor that contributes to tooth loss (Newman et al., 2006). Amoxicillin and metronidazole, as well as their combination, are beneficial in the treatment of chronic periodontitis (Guerrero et al., 2005; Haqgo et al., 2013; Bolouri et al., 2018; Jonabian et al., 2019; A.N.F, 2014). In addition, amoxicillin is effective in treating throat inflammation (Haydin et al., 2004; Simon et al.,2006). Amoxicillin can treat sinusitis (Habibzadeh et al., 2006). Also, ear infections can be treated with amoxicillin (Khuzrai et al., 2014; Alavi et al., 2015; Rekabi Bana et al., 2015).

Amoxicillin is another popular aminopenicillin that has been used for many years to treat respiratory infections (Chambers, 2005). Amoxicillin is less commonly used than amoxiclavlanic acid in some countries (Huttner et al., 2020). However, the situation in Afghanistan is quite different. Because Afghanistan utilizes it excessively. Furthermore, in recent years, the use of this medication has increased, as has its availability in Faizabad City pharmacies also, residents of Faizabad City utilize different medicinal plants to treatment of some diseases (Majidi, 2023, Majidi et al; 2024). This study aimed to investigate the rate of amoxicillin usage for the treatment of various diseases in Faizabad city of Badakhshan province, Afghanistan.

2. Materials and methods

2.1 Study Area

The current study was carried out in Faizabad city of Badakhshan province, Afghanistan. Faizabad is 513.7 square kilometers m^2 and it is divided into eight regions (figure 1). Its geographical coordinates are 37°7′03″N 70°34′47″E. Faizabad city situated along the Kokcha River and surrounded by mountains, the population of this city is reliant on small-scale trade and agriculture. The weather in Faizabad is moderate, with comparatively warm summers and chilly winters (GDEDP, 2023). The healthcare infrastructure is limited to residents of the city depending on a public hospital. The healthcare system struggles to meet the demands of a growing population, exacerbated by limited access to modern facilities, medicines, and trained medical professionals. Residents of Faizabad city include Tajiks and Uzbeks, economically people aren't good they widely utilize herbal medicine for the treatment of diseases (Majidi, 2023, Majidi et al; 2024).

Figure 1 illustrates the study area in the map of Afghanistan

2.2 Methodology

The present study was conducted between January and March 2024 in Faizabad city, Badakhshan Province, using structured questionnaires. In this study116 informants from 93 households of regions were interviewed and respondents were selected randomly (Majidi, 2023, Majidi et al; 2024).

The participants included 71 males (61.2%) and 45 females (38.8%), reflecting a diverse demographic in the region (Table 1). A questionnaire served as the study's primary data-gathering instrument. Data and information were gathered via the questionnaire. The duration of this study was three months. The data was statistically evaluated with Excel software. The following questions were posed to the customers during the interviews: How much do people in Faizabad use antibiotics? How can amoxicillin influence the treatment of disorders?

3. Results

In this study, 116 respondents were interviewed from two regions of Faizabad city, Badakhshan Province of Afghanistan. The demographic characteristics of the respondents are shown in Table 1.

Table 1. Demographic characteristics of the respondents					
Characteristic		**Interview location**		**Number (Total)**	**Percentages**
		New City	**Old City**		
Gender	**Male**	30	41	71	61.20%
	Female	23	22	45	38.80%
Age		Diverse			
Total respondents		**53**	**63**	**116**	**100%**

Amoxicillin is an antibiotic that belongs to the penicillin family, and the Faizabad people use it a lot. The findings indicate that antibiotic use is prevalent in this city, with amoxicillin being the most commonly used antibiotic in the treatment of bacterial infections. The results show that 60% of patients used amoxicillin frequently, but 42% used it moderately and 8% reported low usage (figure 2).

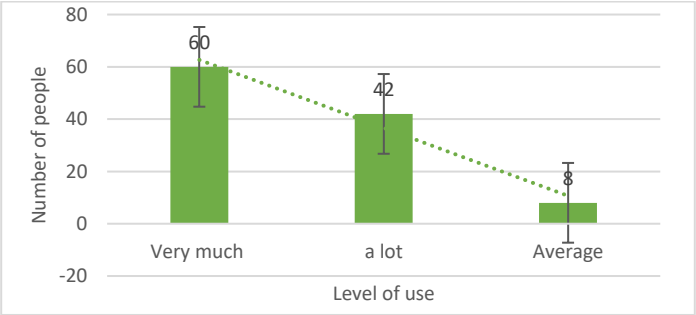

Figure 2: Frequency of amoxicillin use among patients

Faizabad is one of the poorest areas in Afghanistan, where residents engage in agriculture and livestock breeding. They face numerous challenges, such as illnesses, unemployment, financial stress, economic poverty, and limited access to transportation (Rustai, 2017). The data from this research reveal that self-medication with amoxicillin is widespread, with 55% of participants reporting that they use it without consultation with a doctor. And 45% of amoxicillin consumers used it according to the doctor's advice (figure 3). The primary reasons for self-medication include limited access to healthcare services. Perceived effectiveness of amoxicillin, high doctor's fees, shortage of specialist doctors, neglect of patients by doctors, and inadequate facilities in city clinics (For these reasons, people do not visit clinics). Customers of amoxicillin received the medicine from city pharmacies or clinics (figure 4).

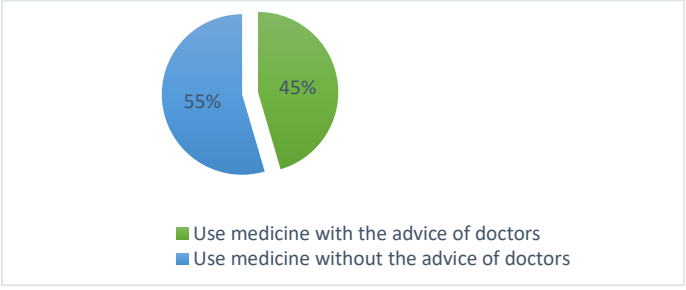

Figure 3: The percentages of the amoxicillin users based on medical consultation

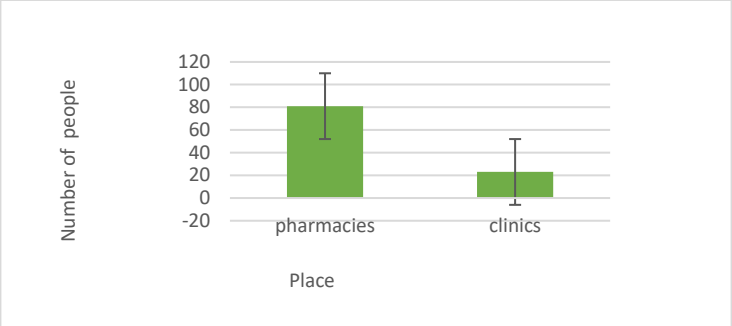

Figure 4 Sources of amoxicillin acquisition by consumers

According to this research, amoxicillin is effective in treating 9 types of common infectious diseases, such as throat (20%), Tooth (19.9%), Helicobacter Pylori (19.5%), ear (18.3%), kidney (7.2%), chest infection (7%), common cold (3.6%), urinary tract infection (3%) and sinusitis (1.3%), (Table 3, figure 5).

Table 3: Common infections treated with amoxicillin

No	Diseases	Very High	High	Average	Law	Very few	Total	Percentages
1	Throat infection (TI)	25	27	30	19	5	106	20%
2	H. pylori (H.P)	19	36	29	13	6	103	19.5%
3	Tooth infection (TI)	13	40	31	16	5	105	19.9%
4	Ear infection (EI)	21	39	26	11	0	97	18.3%
5	Chest infection (CI)	37	0	0	0	0	37	7%
6	Kidney infection (KI)	30	8	0	0	0	38	7.2%
7	Common Cold (CC)	19	0	0	0	0	19	3.6%
8	Urinary tract infection (UTI)	16	0	0	0	0	16	3%
9	Sinusitis (S)	7	0	0	0	0	7	1%
10	Total	187	150	116	59	16	528	

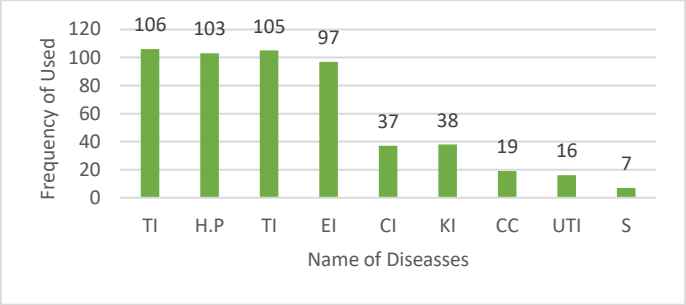

Figure 5: The effectiveness of amoxicillin in treating nine types of diseases

Regarding the effectiveness of amoxicillin, 38% of patients reported moderate improvement, whereas 42% experienced significant relief and 21% saw minimal changes. These results highlight that while amoxicillin is effective for most patients, a portion of them did not achieve full recovery (Figure 6).

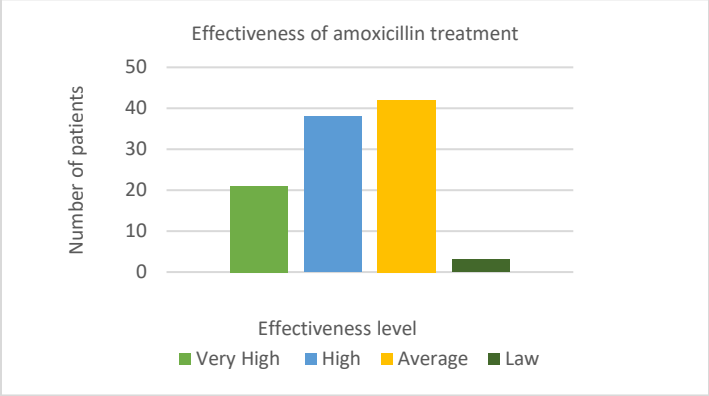

Figure 6: Levels of amoxicillin treatment effectiveness

Table 3. Levels of amoxicillin treatment effectiveness				
Effectiveness level	**Very High**	**High**	**Average**	**Law**
Number of patients	21	38	42	3
Percentages	10%	18%	20%	1%

The data indicate that 32% of patients experienced moderate side effects, although 23% reported server reactions and encountered mild symptoms. Additionally14% had minimal or no adverse effects. This result shows that amoxicillin is widely used, and its potential side effects should be carefully monitored (figure 7).

Table 4. Frequency of side effects among patients				
Side Effects Level	**Very High**	**High**	**Average**	**Law**
Number of patients	32	20	14	7

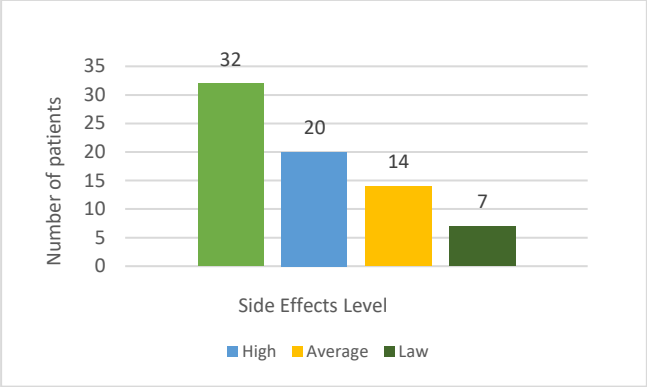

Figure7: Frequency of side effects among patients

Using this antibiotic not only reduces infection-related problems, it has fewer side effects, and the patients become healthier than the first. Its availability in Faizabad pharmacies has made it easier to use. This medicine has become popular among the people of Faizabad because of its effectiveness and few adverse effects. Although amoxicillin has benefits, using it in the wrong way, like taking it without a doctor's advice or in the wrong doses, can cause antibiotic resistance, which can be dangerous for public health. Also, amoxicillin usually has mild side effects, but some people may have problems like diarrhea or allergic reactions, which need care (figure 8).

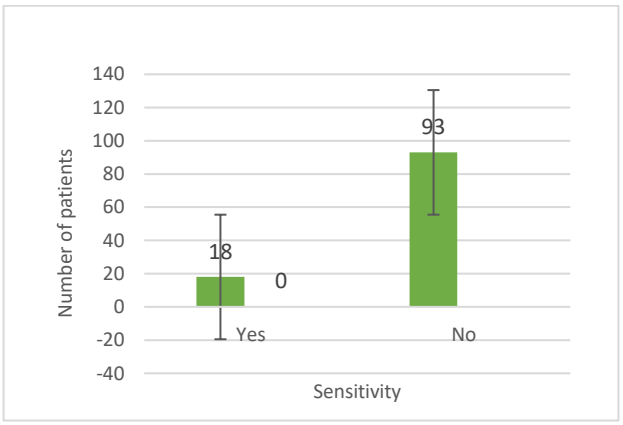

Figure8: Drag sensitivity (number of people with allergic reactions)

The result of this study shows that people need to learn how to use antibiotics correctly. Teaching programs about antibiotic use can help them understand the side effects and dangers of using medicine without a doctor's advice.

4. Discussion

In the current study, a total of 116 respondents were interviewed. The results reveal key findings regarding the usage and efficacy of amoxicillin, a semi-synthetic penicillin with a structure similar to that of ampicillin. Amoxicillin is particularly advantageous due to its ability to destroy sensitive microorganisms and its high absorption into the bloodstream and urine (Hunter et al., 1973). The present investigation aimed to evaluate human consumption of amoxicillin and its therapeutic effects. The findings confirm that amoxicillin is an effective antibiotic for treating various illnesses. These results align with the study conducted at Semnan University in 2000, where 84% of patients responded positively to amoxicillin treatment (Danai and Ghaffari, 2002). Similarly, Khuzrai et al, (2004) reported an 80% recovery rate in a study conducted at Kurds Hospital. Their research demonstrated that amoxicillin and ceftriaxone were equally effective in treating acute otitis media (Khuzrai & Soroush, 2005). Additional studies have shown that amoxicillin and cefixime exhibit comparable efficacy in managing acute otitis media, with minimal side effects (Berjis et al., 2010).

Amoxicillin's therapeutic effects in acute otitis media were further highlighted by Koochak Alavi (2005), who reported an efficacy rate of 84.4%. Untreated otitis media can lead to complications, underscoring the importance of prescribing amoxicillin as a suitable treatment approach (Kliegman et al., 2007; Berjis et al., 2010). Research has also indicated that infections like otitis media in children are influenced by high bacterial density, particularly from beta-lactamase-producing pathogens (Brook et al., 2004;

Al-Sheikhli et al., 1980). In a study by Javadzadah Bolouri and colleagues, 56 patients with acute dental infections were divided into two groups: one treated with injectable penicillin G and the other with oral amoxicillin. Improvement was observed in 89.3% of patients in the first group and 92.2% in the second, indicating that oral amoxicillin has comparable efficacy to injectable penicillin G without the associated limitations and adverse reactions (Bolouri et al., 2009).

In contrast, Haghighou et al. (2014) reported that the combination of metronidazole and amoxicillin had a limited impact on the treatment duration for chronic periodontitis. However, other studies suggest that oral amoxicillin can be effective in short-term treatment of conditions such as suspected cervical lymphadenopathy (Jajarm et al., 2008). Amoxicillin has also been proven effective in combination therapies. For example, a four-drug regimen comprising amoxicillin, bismuth, omeprazole, and clarithromycin achieved an 89.9% eradication rate of Helicobacter pylori in a gastrointestinal clinic study (Shafagh et al., 2013). Similarly, a survey conducted in Japan in 2005 reported eradication rates of 78% for low-dose regimens and 83% for high-dose regimens (Yuksel et al., 2004). While Calhoun et al. (1993) found no significant difference between clarithromycin and amoxicillin for treating acute sinusitis, Habibzadeh et al. (2006) reported that clarithromycin was significantly more effective. In their study, 86% of patients treated with clarithromycin showed complete improvement by the tenth day compared to only 30% of those treated with amoxicillin. Keshavarz et al. (2009) further demonstrated that both high- and low-dose regimens of amoxicillin, omeprazole, and clarithromycin achieved acceptable efficacy levels of 87.5%. Finally, research involving 141 children established improvement rates of 86.6% with co-amoxiclav, 84.4% with amoxicillin, 83.9% with cefixime, and 80.6% with cotrimoxazole (Koochak Alavi, 2005). To date, no similar studies reported in Faizabad city. This study focuses on the usage of amoxicillin and its effects on patients, highlighting the need for further research in this area.

5. Conclusion

The present survey was conducted in Faizabad city, Badakhshan province. The region was surveyed in 2024 to determine the number of amoxicillin users and its effects on human health in Faizabad, Badakhshan Province. Amoxicillin is one of the antibiotics that people use a lot, because of is a very effective antibiotic and people use it more to get healthy. The majority of the people in this city use this drug wi th a doctor's advice due to their poor economy. The results of this study showed that 65% of the people in Faizabad city use the antibiotic amoxicillin is a suitable drug for the treatment of diseases such as ear n, throat, dental, sinusitis, and stomach infection. According to the report, the most effective use of amoxicillin was reported for stomach infection (19.5%), tooth infection (19.9%), sore throat (20%). Fonts (7%) and the least effective use was observed for colds (3.6%), urinary tract infection (3%) and sinusitis (1.3%).

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Author contributions: All authors contributed equally to this study; the data was collected by Zuhal Sediqi. The manuscript was drafted by Sayed Mohammad Ramish and Abdulraof Faiaq Data curation and editing were performed by Abdul Hallim Majidi. All authors read and approved the final manuscript.

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