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Prevalence of Water-Borne Diseases in Khyber Pakhtun Khawa: A Case Study on Disease Transmission in Pakistan

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ABSTRACT

The main aim of this study was to assess the water consumption patterns of the Human Population in Khyber Pakhtun Khawa and their association with illness development. The Purpose of the investigation was to analyze the current state of the water supply, water-borne diseases, treatment patterns, sanitation, and the general level of knowledge regarding sanitation. This survey employs practical field observation and data gathering about water availability, types of water-borne diseases, treatment patterns, and sanitation conditions, utilizing techniques for Participatory Rural Appraisal and a questionnaire survey. While the study was being conducted, information was gathered by means of a questionnaire that was expertly constructed and sent to each family in these regions. In this study, there were a total of 100 participants, with 56% of the population falling between the age range of 18-40 years. Their educational attainment was below secondary level (54%), while the proportion at higher levels was minimal (8%). The data indicate that a significant portion of the population had waterborne infections, including typhoid (18%), dysentery (17%), diarrhea (60%), cholera (15%), constipation (12%), jaundice (19%), and Amebiasis (15%). The majority sought therapy from retail pharmacists (55%), while others consulted quack doctors, licensed physicians, homeopathic practitioners, and Ayurvedic treatments. They had the most hardship during the wet season (54%). A lack of basic understanding about cleanliness, a dirty water supply, sanitation that is not sanitary, an extreme level of poverty, and the distribution of drugs without a prescription are the primary factors that contribute to the prevalence of waterborne illnesses in these areas. Each and every person that is conscious ought to step up to assist them, in addition to governments.

INTRODUCTION

Water is considered drinkable when it is devoid of pathogenic microorganisms and detrimental chemical compounds. The World Health Organization (WHO, 2023) states that drinking water quality is often associated with acceptability (physical), microbiological, and chemical factors. Although physical and chemical pollution of water is not less important but the most common and deadly contaminants in the drinking water are of biological origin. WHO states (WHO, 2023) that wide spread health risks are frequently associated with drinking water contaminated with bacteria (Bennett, 2025). Coliform bacteria are among the most significant organisms prevalent in our environment. The detection of coliform bacteria in drinking water signifies contamination by fecal matter from humans or other animals. The inadequate sanitation facilities, such as the drainage system and solid waste disposal system, present in the areas along the riverbank, along with the issue of drains carrying untreated polluted industrial and municipal waste, create a significant health risk not only for the residents but also for the surrounding communities within the river's catchment area (Qureshi et al., 2011). In Pakistan, about 66 percent of the population is deemed to have access to safe drinking water, exhibiting significant differences between urban and rural areas as well as within provinces and regions. Access to safe drinking water in rural areas is a valuable resource. The survival and development of children are seriously threatened by the high occurrence of water-related diseases brought on by an inadequate supply of drinking water, both in terms of quantity and quality. These diseases also raise rates of morbidity and death (Shah et al., 2016).

The Federal Bureau of Statistics reports that in Khyber Pakhtunkhwa province, undernourishment is largely caused by a lack of sanitary facilities and an absence of safe drinking water (2010-11). Infants and young children are especially vulnerable to both, which result in a persistent cycle of sickness and undernutrition. The province exhibits slightly reduced safe water usage among households at 70%, in contrast to the national average of 87%. The utilization of hygienic sanitation facilities is marginally lower at 62% compared to the national average of 66%. This survey seeks to establish a connection between environmental conditions and their subsequent implications for public health, specifically regarding water pollution and sanitation in slum areas. This analysis is based on a thorough survey conducted in January-March 2025 in the rural regions of Khyber Pakhtun Khawa, Pakistan, where around

300,000. individuals reside.

MATERIALS & METHODS

This survey employs practical field observation and data gathering about water availability, types of water-borne diseases, treatment patterns, and sanitation conditions, employing Participatory Rural Appraisal methods alongside a questionnaire survey.

Geographical Focus and Timeframe: The study was conducted in an experimental setting. This study focuses on the human population in Khyber Pakhtun Khawa. The investigation took place from January 2025 to March 2025 in that region.

Data Collection: A sample of 100 households located in Rural Areas of KPK.

Determination of the Sample Size: The sample size was determined to be 100. Data were collected through a carefully structured experimental interview protocol.

Sampling Method: Participants were selected using a random sampling technique.

Exclusion Criteria: Incorporated individuals who had recently relocated to the designated area or those who did not maintain a permanent residence there.

Data Collection: involved gathering information regarding socio-demographic characteristics from residents of chosen households via a questionnaire. Data regarding water-borne diseases and management practices for water-borne illnesses were gathered using a pre-tested questionnaire, which was subsequently administered to the community in the designated areas.

Data Analysis: Utilizing Microsoft Excel 2016 and Microsoft Word 2016.

RESULTS AND DISCUSSION

This investigation involves 100 participants selected through random sampling methods. The study examined the distribution of the population by age, prevalence and frequency of diseases, treatment patterns for waterborne illnesses, the number of respondents who completed their medication, educational qualifications, seasonal variations in waterborne diseases, and the frequency of cleanliness habits during food preparation and consumption. The findings are presented below.

FREQUENCY DISTRIBUTION OF HYGIENE HABITS DURING FOOD PREPARATION AND CONSUMPTION

With the use of table number one, we were able to get an indication of the frequency with which individuals observed hygiene when preparing and consuming meals. In this instance,

98% of the participants who were interviewed stated that they cleaned their hands before preparing meals; yet, it is possible that these responses are rife with prejudice. All participants engaged in handwashing after using the toilet to prevent microbial contamination. All respondents reported that they washed their hands prior to consuming meals. In addressing the source of food or vegetable acquisition, our findings indicate that 80% of respondents procured their items from the market, while 20% sourced them from hawkers. No respondents purchased food or vegetables from neighboring growers since the region is highly inhabited and there is no open space to cultivate veggies.

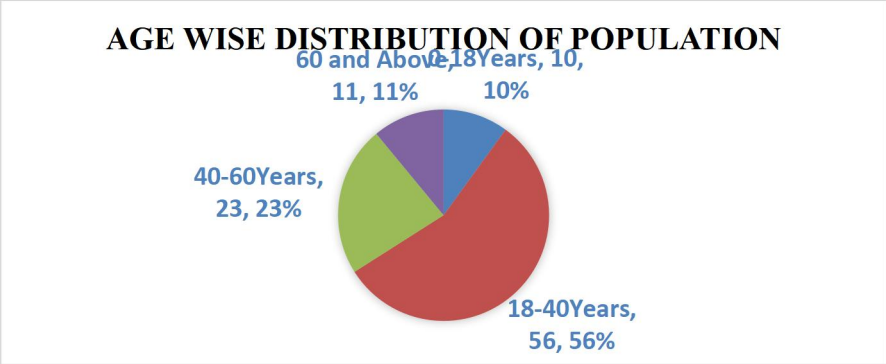
TABLE 1. FREQUENCY DISTRIBUTION OF CLEANLINESS HABITS DURING FOOD PREPARATION AND CONSUMPTION

Variable	Trend	Number of Respondent	Percentage
Washing hands	Yes	98	98%
before cooking meal	No	2	2%
Washing hand after	Yes	99	99%
attainting toilet	No	1	1%
Washing hand before	Yes	98	98%
eating foods	No	2	2%
Keeping food covered	Yes	75	75%
	No	25	25%
Washing raw food	Yes	60	60%
before eating	No	40	40%
Source of obtaining	Market,	80	80%
food/ vegetables	Hawker,	20	20%
	Nearby grown	0	0%

DISTRIBUTION OF THE POPULATION BY AGE

Of the 100 survey respondents, 56% were aged between 18 and 40 years. The bulk of the slum's population consists of adults. Approximately 23% of respondents are aged between 40 and 60 years. The proportion of respondents aged 0-18 years and those aged 60 and above are nearly identical, at 10% and 11% respectively, as illustrated in figure 1.

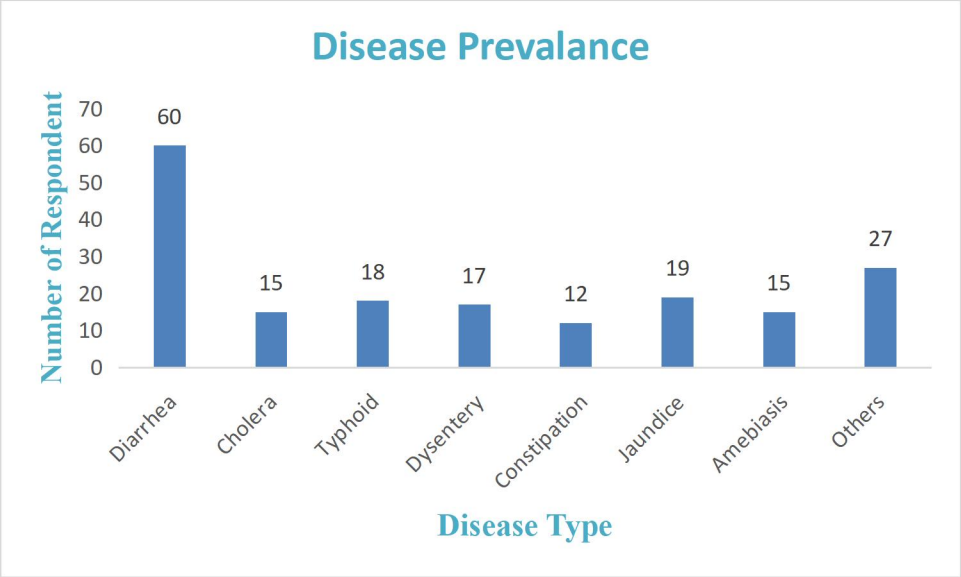
FIGURE 1. AGE WISE DISTRIBUTION OF POPULATION



PREVALENCE OF DISEASES

According to figure 2, the majority of respondents (60) experienced diarrheal diseases, followed by jaundice (19) and other waterborne diseases. Viruses are a primary contributor to the incidence of diarrhea in this subcontinent (Parvez et al., 2019). The aforementioned percentage indicates that the availability of the virus in the drinking water is also significant. Twenty-four percent of respondents experienced dysentery. A total of 18 respondents experienced typhoid fever. Typhoid fever is an infectious sickness characterized by fever and is most commonly caused by the Salmonella typhi bacterium. It can also be caused by Salmonella paratyphi, a similar bacterium that normally results in a milder disease (Ravindra et al., 2019). Stool, which has a high concentration of the germs, is the drinking water that causes typhoid fever (Tijani et al., 2024). The respondents use the same source of water to produce or cook meals and to consume it. Once more, the water that is delivered is the primary source of contamination, which is the primary cause of this sickness. Both cholera and constipation have the same number of cases in this area. Cholera is an acute case of diarrhea that is mostly brought on by the consumption of food or water that has been contaminated with the bacteria Vibrio cholera via consumption (Ramírez et al., 2018). Water is often the predominant source of Vibrio cholera. Fifteen participants in the research were afflicted with Amebiasis. Amebiasis is an intestinal parasite illness caused by the protozoan *Entamoeba histolytica*, commonly referred to as *E. histolytica*. Individuals residing in institutions with inadequate sanitation and consuming contaminated water are often afflicted by this sickness; hence, it may be concluded that slum dwellers also suffer from this ailment for similar reasons. Approximately 27 respondents experienced additional waterborne infections (Bidhuri et al., 2018).

FIGURE 2. DISEASE PREVALENCE



INCIDENCE RATE OF DISEASES

Figure 3 makes it abundantly evident that around 39% of individuals suffered from a variety of waterborne diseases over a span of one month, whereas 17% of people suffered from waterborne diseases within a span of two to three months. The proportion is 26% over the 4-6 months' period. When the duration is six months or more, the illness frequency percentage rises to 18%. The data indicate that the maximum illness frequency occurs within one month, followed by the second highest frequency occurring between four to six months.

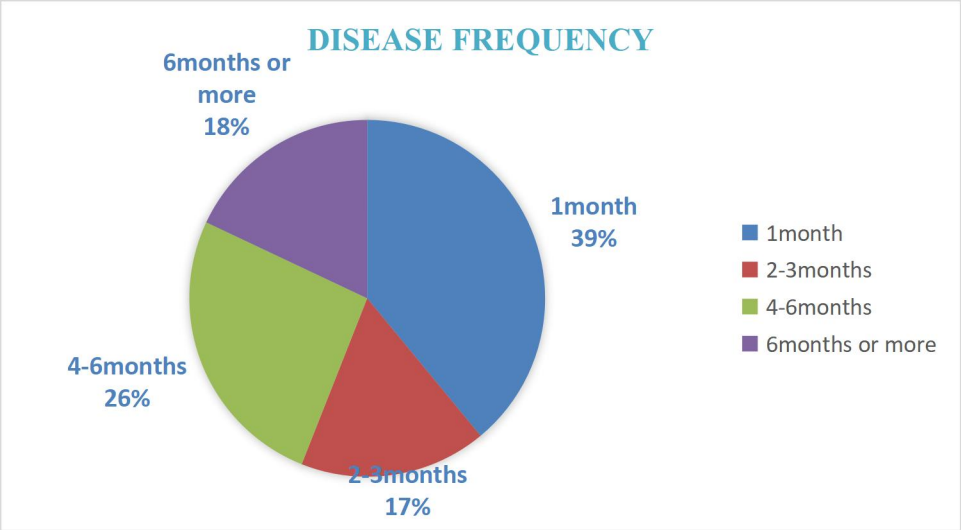


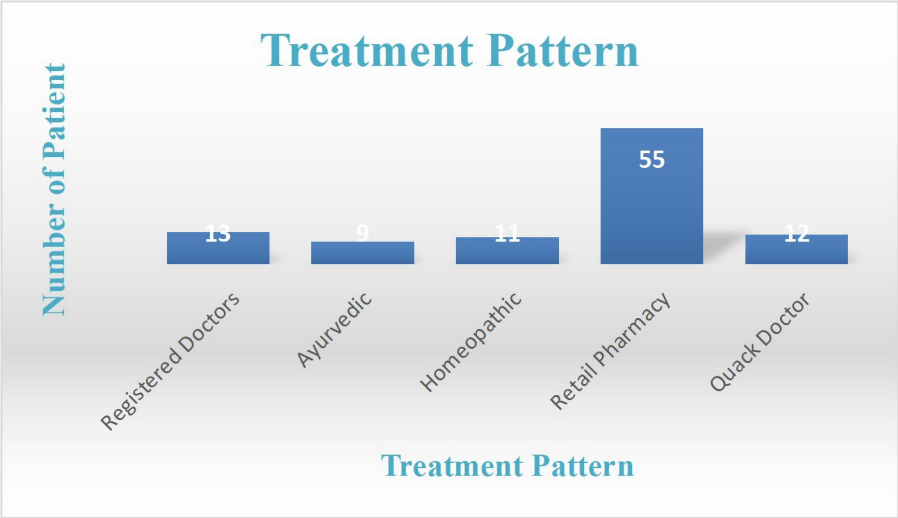
FIGURE 3. DISEASE FREQUENCY

MANAGEMENT STRATEGIES FOR WATERBORNE ILLNESSES

Figure 4 indicates that, for the treatment of waterborne infections, an average of 55% of individuals sought medical attention and obtained medication from retail pharmacies. This retailer sells the majority of medications, including prohibited substances, without requiring a prescription. As a result, these poor people have easy access to harmful medications that can lead to overdose, antibiotic resistance, incorrect treatment, and other negative effects. All of these problems may be solved by raising public awareness among People of these areas & restricting the dispensing of prescribed drugs without a prescription from retail pharmacies. On average, 12% of persons visited and received treatment from a quack doctor. They have easier access to quack doctors than certified doctors, and they are also cheaper. This quack doctor is not completely educated and lacks adequate training and expertise in medical science. For these reasons, slum dwellers frequently receive unsuitable care. Raising public awareness among slum dwellers and providing quack doctors with the necessary knowledge and training are the answers to these issues. On average, 13% of persons went to a registered doctor to get medication. We discovered that individuals with higher secondary school or college education typically seek therapy from a certified physician for their children. It is widely recognized that the treatment provided by a registered doctor is superior to that of others. However, they are unable to visit a registered doctor due to financial constraints and lack of convenient access to such healthcare professionals. An average of 9% of individuals sought treatment from

practitioners of ayurvedic medicine, while an average of 11% consulted homeopathic doctors for their healthcare needs. These individuals accept therapy from them since they have a strong belief and commitment to them.

FIGURE 4. TREATMENT APPROACHES FOR WATERBORNE DISEASES



THE NUMBER OF RESPONDENTS WHO COMPLETED THE MEDICAL COURSE

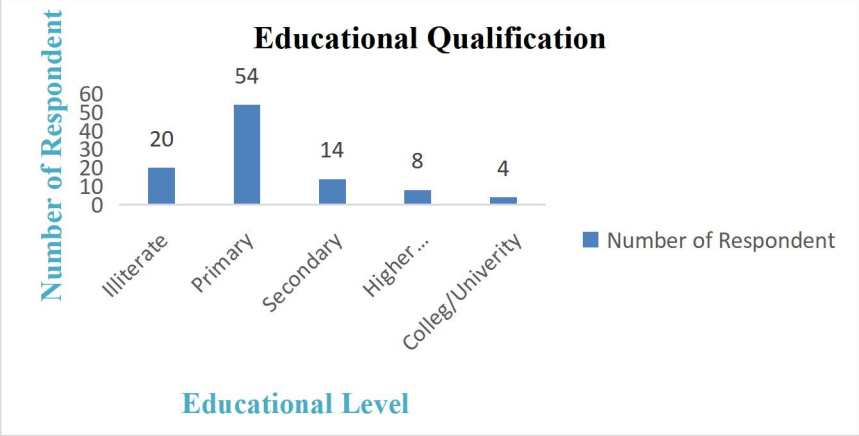
Out of 100 respondents, only 27 individuals reported completing the entire course of medication prescribed by a physician or provided by others. In contrast, 73 persons do not complete their medical studies. Many patients quit taking the medication once they feel better and there is no indication of the sickness. They believe that taking more medication would be a waste of money. Aside from poverty, the causes for a completed medical course include a lack of money and expertise. As a consequence of this, there is a risk that antibiotic resistance will reach a catastrophic level. In addition, we discovered that they had a propensity to take twice as much of a medication at once in the event that they forget to take the preceding dose. Therefore, a drug with a limited therapeutic window may result in severe adverse drug reactions and deleterious effects.

ACADEMIC BACKGROUND

Figure 5 shows that approximately 20% of the 100 respondents are illiterate. It is evident that approximately one-fifth of the slum population is completely illiterate. Among the 100 respondents, the largest proportion, at 54%, is represented by those with primary level education. For this reason, it may be deduced that more over half of the individuals who

participated in the survey had finished their primary school. Considering that the citizens of Bangladesh are required to complete elementary school, this proportion is significantly higher than the national average. A total of 100 persons participated in the survey, and our findings revealed that 14 percent of them have completed secondary school. That being the case, it suggests that one-fifth of the people living in slums falls within this educational level. The fraction of responders who have completed higher levels of education, which is only six percent, is extremely low. They are unable to complete this level of school since they do not have sufficient funds or facilities thanks to their poverty. College or university attendance is under 4% of the population. mainly due to the fact that the expense of schooling is significantly higher for persons living in slum-like conditions. Taking into consideration the results shown above, it is evident that the percentage is gradually dropping from primary education to higher education. One of the biggest causes is poverty, and the majority of parents have the expectation that their children would be able to earn money when they have completed their elementary level of school. Due to a lack of basic education, the people living in slums do not have sufficient information and awareness regarding the need of cleanliness, safe drinking water, and diseases that are transmitted through water.

FIGURE 5. EDUCATIONAL QUALIFICATION

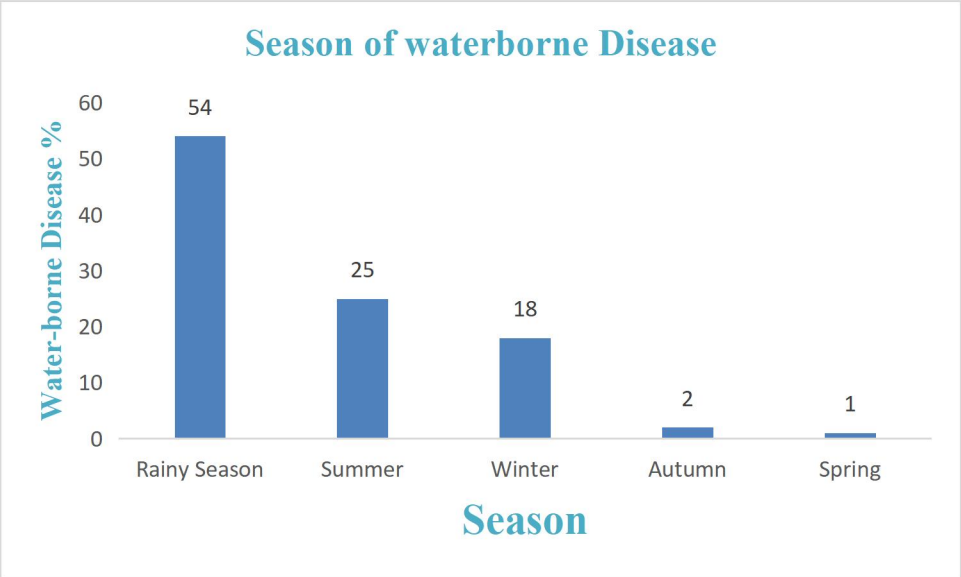


SEASONAL DISTRIBUTION OF WATERBORNE ILLNESSES

Figure six indicates that the biggest percentage (54%) of waterborne diseases occurs during the rainy season in that area. The primary source of potable water is supplied water. During the rainy season, there is a risk of contamination of the water supply owing to pipeline leaks and

the transmission of microorganisms from unsanitary latrines via rainwater. In July, the slum has the second greatest percentage (25%) of waterborne diseases. The summer season also establishes conducive conditions for germs that cause waterborne illnesses. During summer, surplus water is expelled from the body; nevertheless, the impoverished population is unable to consume enough amounts of pure water and instead resorts to polluted sources. During the winter season, the incidence of waterborne diseases is relatively low, at 18%. During autumn and spring, the weather tends to be dry, resulting in conditions that are not conducive to the growth of microorganisms.

FIGURE 6. SEASON WISE DISTRIBUTION OF WATER- BORNE DISEASES



CONCLUSION

The aforementioned results indicate that inadequate knowledge of hygiene, contaminated water supply, insufficient water availability, poor water management practices, unsanitary sanitation conditions, limited access to licensed medical practitioners, and easy access to retail pharmacies that dispense medication without prescriptions are the primary factors contributing to the prevalence and suffering caused by waterborne diseases in the Rural Areas of District D. I. Khan. Nevertheless, the Government, Non-Governmental Organizations, and other social entities should proactively implement essential actions and effective strategies to provide optimal facilities for enhancing programs in slum regions concerning potable water supply, sanitation, and quality education. Furthermore, particular laws and regulations must be

implemented to compel homeowners and associated individuals to supply clean, sufficient water and sanitary amenities in those locations.

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