SOCIO-DEMOGRAPHIC FACTORS ASSOCIATED WITH DIARRHEA IN CHILDREN UNDER 5 YEARS IN PESHAWAR

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ABSTRACT

Childhood diarrhea is a leading cause of morbidity and mortality among children under five, particularly in low- and middle-income countries like Pakistan. This study investigates the socio-demographic factors associated with the prevalence of diarrhea in children under five years of age in Peshawar, with the aim of identifying key determinants and providing evidence-based recommendations for targeted public health interventions. A cross-sectional study design was employed, involving 300 households selected through simple random sampling from urban and rural areas of Peshawar. Data were collected between January and June 2024 using a structured questionnaire covering socio-demographic characteristics, sanitation practices, healthcare access, and child health history. The data were analyzed using SPSS version 25, with descriptive statistics summarizing the study population and chi-square tests assessing associations between socio-demographic factors and diarrhea incidence. The findings revealed that children aged 1-3 years were most affected, with significant associations between diarrhea prevalence and maternal education, household income, family size, and sanitation practices. Poor hand hygiene, untreated water sources, and inadequate toilet facilities were identified as key risk factors. Despite the use of oral rehydration salts (ORS) and rotavirus vaccinations, gaps in awareness about diarrhea prevention persisted, highlighting the need for community education programs. This study underscores the critical role of socio-demographic and environmental factors in shaping the burden

of childhood diarrhea in Peshawar. The results emphasize the importance of integrated strategies, including improved access to clean water and sanitation, parental education, and strengthened healthcare services, to reduce the incidence of diarrhea and improve child health outcomes. These findings provide valuable insights for policymakers and healthcare practitioners aiming to address this pressing public health issue.

KEYWORDS: Oral rehydration salts (ORS), Rotavirus vaccination, Community education programs, Environmental factors, Clean water access, Parental education, Healthcare services

INTRODUCTION

1.1.BACKGROUND

Diarrhea remains one of the leading causes of morbidity and mortality among children under the age of five worldwide. It is a major contributor to the global burden of disease, particularly in low- and middle-income countries (LMICs), where access to clean water, proper sanitation, and adequate healthcare services is often limited. According to the World Health Organization (WHO, 2020), diarrhea accounts for approximately 525,000 child deaths annually, with the majority occurring in LMICs. These staggering numbers highlight the urgent need for a concerted global effort to mitigate the underlying causes of diarrhea and reduce its devastating impact on vulnerable populations.

In Pakistan, diarrhea remains a pressing public health concern, significantly contributing to the country's high child mortality rate. Children under five years of age are particularly susceptible due to their immature immune systems and higher likelihood of exposure to environmental and behavioral risk factors. Both rural and urban slum areas face disproportionately high rates of diarrheal diseases, reflecting systemic deficiencies in healthcare infrastructure, clean water availability, sanitation facilities, and community-level health awareness. In addition to these infrastructural challenges, a range of socio-demographic factors—such as socioeconomic status, parental education, household hygiene practices, and access to healthcare—play a critical role in influencing the prevalence of diarrhea among young children (Bhutta et al., 2013).

Children from low-income households and those residing in rural areas of Pakistan are at a heightened risk of diarrhea due to poor sanitation, contaminated water supplies, substandard living conditions, and limited awareness of preventive health measures (Ghaffar et al., 2011). A lack of

maternal education has also been strongly associated with increased vulnerability to diarrheal diseases, as mothers with limited knowledge of hygiene, nutrition, and disease prevention are less equipped to protect their children. Similarly, restricted access to healthcare facilities further exacerbates the issue, delaying timely treatment and increasing the risk of complications.

Peshawar, the capital of Khyber Pakhtunkhwa (KP) province, serves as a microcosm of these challenges. The city's unique socio-demographic landscape encompasses both urban and peri-urban populations, characterized by significant variability in education levels, income, and healthcare access. This diversity provides a valuable opportunity to explore how these factors intersect to influence the incidence of diarrhea in children under five years of age. In many parts of Peshawar, urban slums coexist with more affluent areas, highlighting the stark disparities in living conditions and access to basic necessities such as safe drinking water and proper sanitation. The presence of refugees and internally displaced persons further complicates the socio-demographic fabric of the region, increasing the strain on already overstretched healthcare and sanitation systems.

The persistent burden of diarrhea in Peshawar underscores the importance of targeted research to better understand the interplay between socio-demographic determinants and health outcomes. This study aims to examine the association between maternal education, household income, sanitation infrastructure, hygiene practices, and access to healthcare services with the prevalence of diarrhea in children under five years of age. Understanding these relationships is critical for developing effective, context-specific interventions to mitigate the burden of diarrhea and improve child health outcomes.

1.2. Statement of the Problem

Childhood diarrhea remains one of the most significant public health challenges in Peshawar, Pakistan, contributing to high morbidity and mortality rates among children under five years of age. Despite various efforts to reduce the burden of diarrheal diseases, the prevalence remains alarmingly high, with multiple socio-demographic factors potentially influencing its occurrence. These factors, including parental education, household income, sanitation conditions, and access to clean water, may play crucial roles in shaping children's vulnerability to diarrhea. Given the lack of localized data on the specific socio-demographic determinants in Peshawar, there is an

urgent need for research that identifies these factors and explores their relationship with childhood diarrhea. The findings from this study could offer valuable insights for policymakers, healthcare providers, and community leaders, guiding efforts to reduce the incidence of diarrhea and improve child health outcomes in Peshawar and beyond. By addressing this pressing issue, the study aims to foster a healthier, more equitable future for the children of the region.

1.3.Research Objectives

1. To determine the prevalence of diarrhea among children under five years of age in Peshawar
2. To identify the socio-demographic factors associated with the incidence of diarrhea in children under five years in Peshawar.
3. To recommend policy interventions aimed at reducing the incidence of childhood diarrhea in Peshawar.

1.4.Research Questions

- What is the prevalence of diarrhea among children under five years of age in Peshawar?
- Which socio-demographic factors are associated with the incidence of diarrhea in children under five years in Peshawar?
- What policy interventions can be recommended to reduce the incidence of childhood diarrhea in Peshawar**?**

LITERATURE REVIEW

Diarrhea is a major public health concern, particularly in low- and middle-income countries (LMICs), where it remains a leading cause of morbidity and mortality among children under five. It is caused by various pathogens, including viruses (e.g., rotavirus), bacteria (e.g., Escherichia coli, Vibrio cholerae), and parasites (e.g., Giardia lamblia), primarily transmitted through contaminated water, food, and poor hygiene practices. Inadequate sanitation and unsafe drinking water exacerbate outbreaks (WHO, 2020).

While biological causes are well-documented, socio-demographic factors significantly impact diarrhea's incidence and severity. Key factors include socio-economic status (SES), maternal education, sanitation, access to clean water, and healthcare. These determinants influence

community susceptibility, prevention capacity, and treatment access (Parker et al., 2015; Müller et al., 2013).

Global Impact of Diarrhea

Diarrhea is the second leading cause of death among children under five globally, responsible for nearly 525,000 deaths annually (WHO, 2021). The primary pathogens include viruses, bacteria, and parasites transmitted via contaminated food, water, and poor hygiene (WHO, 2021). Socio-demographic and environmental factors, such as overcrowding, inadequate sanitation, and malnutrition, exacerbate the burden in LMICs (United Nations, 2021). Immunization against rotavirus has been effective, yet disparities in healthcare access and nutrition persist (WHO, 2021).

Diarrhea in Pakistan

Diarrhea remains a significant health issue in Pakistan, particularly among children under five. Poor sanitation, unsafe drinking water, and limited healthcare resources contribute to high morbidity and mortality. Despite efforts such as Oral Rehydration Therapy (ORT) and immunization campaigns, diarrhea remains a leading cause of child deaths, particularly in rural areas.

According to WHO (2021), diarrhea is the second leading cause of under-five mortality in Pakistan, accounting for approximately 10% of deaths. The Pakistan Demographic and Health Survey (PDHS, 2017) reports higher incidence in rural areas due to poor sanitation and hygiene awareness.

Socio-Demographic Factors in Pakistan

Key determinants include:

- **Poverty**: Low-income households face higher risks due to poor nutrition, overcrowding, and inadequate sanitation (Faruque et al., 2018).
- **Maternal Education**: Higher maternal education correlates with better hygiene practices, nutrition, and healthcare-seeking behaviors, reducing diarrhea risk (Faruque et al., 2018).
- **Urban-Rural Divide**: Rural children are more vulnerable due to limited healthcare access, while urban slum areas face challenges from overcrowding and poor sanitation (PDHS, 2017).

Provincial Breakdown

Diarrhea prevalence varies across Pakistan's provinces due to differences in socio-economic conditions and healthcare infrastructure.

Province	Prevalence (Rural)	Key Factors	Interventions
Punjab	10.6%	Poor sanitation, limited clean water	ORT promotion, rotavirus vaccination
Sindh	13.2%	Poor hygiene, water scarcity	Immunization campaigns, sanitation initiatives
Khyber Pakhtunkhwa (KP)	12.4%	Poverty, weak infrastructure	ORT distribution, public health education
Balochistan	14.1%	Water contamination, poor healthcare	Water sanitation projects, ORT distribution

Interventions and Progress

Pakistan has made progress in diarrhea management through:

- **Oral Rehydration Therapy (ORT)**: Effective in reducing dehydration-related deaths.
- **Rotavirus Vaccination**: Reduced severe diarrhea cases (National Immunization Campaign, 2019).
- **Public Health Campaigns**: Government and international organizations, such as UNICEF, promote clean drinking water and hygiene awareness.

Healthcare Access and Management

Healthcare disparities between urban and rural areas limit timely treatment. Rural children often lack access to medical facilities, leading to prolonged illness and higher mortality. Public health programs emphasizing ORS, dehydration signs, and nutrition have improved outcomes but require expansion (Faruque et al., 2018).

Environmental and Structural Factors

Poor sanitation and contaminated water exacerbate diarrhea's spread. Open defecation and improper waste disposal increase fecal-oral transmission risks. Seasonal variations, such as monsoons, further worsen water contamination, leading to diarrhea spikes (Jabeen et al., 2018).

Socio-Economic Status (SES) and Diarrhea

Low SES increases vulnerability due to inadequate hygiene, nutrition, and healthcare access (Parker et al., 2015). Malnourished children face higher morbidity due to weakened immune systems (Müller et al., 2013). Financial constraints also delay medical care, increasing complications and mortality (Bhutta et al., 2013).

Maternal Education and Childhood Diarrhea

Educated mothers adopt better hygiene, breastfeeding, and vaccination practices, reducing diarrhea risks. Awareness gaps among uneducated mothers result in poor prevention and management (Khandekar et al., 2015). Community-driven health education programs can mitigate this disparity (Ghaffar et al., 2011).

Sanitation and Clean Water Access

Poor sanitation and lack of clean water are primary contributors to diarrhea. Proper waste disposal and access to latrines significantly reduce disease transmission (UNICEF, 2019). Water purification initiatives, chlorination, and hygiene education further mitigate risks (Jabeen et al., 2018).

Healthcare Services and Community Interventions

Timely access to ORT and zinc supplements is crucial in diarrhea management. Mobile clinics, community health workers, and education programs have improved healthcare accessibility, particularly in remote areas (Anwar et al., 2018). Strengthening these interventions can further reduce morbidity and mortality rates.

Conclusion

Diarrhea remains a significant public health concern in Pakistan, with disparities across socio-economic and geographic lines. While ORT, vaccination, and public health initiatives have reduced cases, persistent challenges in sanitation, clean water access, and healthcare availability must be addressed through targeted interventions. Strengthening healthcare infrastructure, expanding hygiene education, and improving water and sanitation systems are critical to mitigating diarrhea's impact on children in Pakistan

MATERIAL AND PROCEDURE

Study Design

Present study employed a cross-sectional design, which is widely used in public health research to assess relationships between variables at a single point in time. The cross-sectional nature of the design allowed the examination of socio-demographic factors and their association with childhood diarrhea, enabling the identification of patterns and correlations within a defined timeframe. Data collection was carried out at multiple healthcare centers and hospitals across urban and rural areas of Peshawar, ensuring a diverse representation of the population.

Study Duration

The research was conducted between January and June 2024 and involved data collection from multiple healthcare centers and hospitals in the city.

Sampling size & Technique

A total of 300 households with children under the age of five were included in the study. These households were selected using a sample random sampling technique from both urban and rural areas of Peshawar. A simple random sampling technique was employed to select households, providing each household in the target population an equal chance of being included in the study.

Data Collection Tool

A structured questionnaire was developed as the primary data collection tool. The questionnaire was designed to comprehensively capture relevant information across several domains:

- Socio-demographic characteristics: Maternal education, household income, family size, housing conditions.
- Incidence and duration of diarrhea: Frequency, severity, and duration of diarrhea episodes.
- Healthcare-seeking behaviors: Use of medical facilities, traditional remedies, and other treatment approaches.

Data Collection Tools

A structured questionnaire was developed for data collection. The questionnaire included sections on socio-demographic characteristics (e.g., maternal education, household income, family size, and housing conditions), the incidence and duration of diarrhea, and healthcare-seeking behaviors. The data were collected through face-to-face interviews with the parents or guardians of the children.

Data Analysis

The collected data were analyzed using SPSS (Statistical Package for Social Sciences) version 25. Descriptive statistics were used to summarize the socio-demographic characteristics of the study population. Chi-square tests were conducted to assess the relationship between socio-demographic factors and the occurrence of diarrhea in children. A p-value of less than 0.05 was considered statistically significant.

DATA ANALYSIS

Results

Section 1: Demographic Information

1. Age of the child:

Response	Frequency	Percentage (%)
Below 1 year	100	33.3%
1-3 years	120	40%
4-5 years	80	26.7%
Gender of the child:		
Male	150	50%
Female	150	50%
Child's weight		
Less than 5 kg	80	26.7%
5-10 kg	120	40%
More than 10 kg	100	33.3%
Does the child have any underlying health conditions (e.g., malnutrition, immunodeficiency, etc.)?		
Yes	50	16.7%
No	250	83.3%

Table 01 illustrates that majority of children in the study are between 1-3 years old (40%), followed by those below 1 year (33.3%) and 4-5 years (26.7%). Gender distribution is equal, with 50%

males and 50% females. Regarding weight, 40% of the children weigh between 5-10 kg, 33.3% weigh more than 10 kg, and 26.7% weigh less than 5 kg. Only 16.7% of the children have underlying health conditions, such as malnutrition or immunodeficiency, while 83.3% do not.

Section 2: Family Socioeconomic Information

5. What is the family's monthly income?

Response	Frequency	Percentage
Below 10,000 PKR	100	33.3%
10,000 – 20,000 PKR	120	26.7%
20,001 – 50,000 PKR	70	23.3%
Above 50,000 PKR	10	16.7%

Most families have a monthly income below 20,000 PKR, with 33.3% earning less than 10,000 PKR and 26.7% earning 10,000–20,000 PKR. Only 16.7% earn above 50,000 PKR. Mothers predominantly have secondary education (30%) or primary school education (26.7%), while 16.7% lack formal education. Similarly, fathers mostly completed primary or secondary education (30% each), with 13.3% having no formal education. Households typically consist of 5-7 members (40%), followed by 1-4 members (33.3%). The head of the household is often employed in the private sector (33.3%), self-employed (26.7%), or engaged in farming (20%), with a small percentage (6.7%) unemployed.

6. What is the mother's highest level of education?

Response	Frequency	Percentage
No formal education	50	16.7%
Primary school	80	26.7%
Secondary school	90	30%
Higher secondary	50	16.7%

College or university	30	10%

Table represent data on mothers' education levels shows that the largest proportion, 30%, have attained secondary school education., 26.7% who completed primary school and 16.7% each who have either higher secondary education or no formal education. Only 10% of mothers have attended college or university.

7. What is the father's highest level of education?

Response	Frequency	Percentage
No formal education	40	13.3%
Primary school	90	30%
Secondary school	90	30%
Higher secondary	50	16.7%
College or university	30	10%

The data on fathers' education levels shows that 30% have completed primary school, and another 30% have completed secondary school. A smaller proportion (16.7%) have attained higher secondary education, while 13.3% have no formal education. Only 10% of fathers have pursued higher education, such as college or university. This distribution suggests that while many fathers have at least a basic level of education, higher education is less common in the population studied.

8. How many members are there in your household?

Response	Frequency	Percentage (%)
1-4 members	100	33.3%
5-7 members	120	40%
8 or more members	80	26.7%

The data indicates that most households have 5-7 members, making up 40% of the respondents. A significant proportion (33.3%) have smaller households with 1-4 members, while 26.7% have larger households with 8 or more members. This suggests that while a majority of households are of moderate size, there is a notable portion of families with larger households, which may influence living conditions and access to resources.

9. What is the occupation of the head of the household?

Response	Frequency	Percentage (%)
Government employee	40	13.3%
Private sector employee	100	33.3%
Self-employed	80	26.7%
Farmer	60	20%
Unemployed	20	6.7%

The data shows that the largest proportion of heads of households are employed in the private sector (33.3%), followed by those who are self-employed (26.7%) and farmers (20%). A smaller percentage are government employees (13.3%) or unemployed (6.7%). This distribution reflects a variety of occupations, with a significant portion of the population working in the private sector or as self-employed individuals, indicating a diverse economic base in the community.

Section 3: Household Sanitation and Hygiene Practices

10. What type of toilet facilities does your household have?

Response	Frequency	Percentage (%)
Flush toilet	50	16.7%
Pit latrine	100	33.3%
Open defecation	150	50%

Other (please specify):	0	0%

The data indicates that 50% of households engage in open defecation, which is a significant concern for sanitation and health. Another 33.3% use pit latrines, while only 16.7% have access to flush toilets. This highlights a major issue with sanitation facilities in the area, where half of the population lacks access to basic toilet facilities, increasing the risk of waterborne diseases such as diarrhea.

11. What is the primary source of drinking water in your household?

Response	Frequency	Percentage (%)
Piped water	180	60.0%
Well water	105	35.0%
Bottled water	10	3.3%
Tanker supply	05	1.7%

The primary source of drinking water for most households is piped water, with 60% of respondents relying on it. Well water is the next most common source, used by 35% of households. A small proportion of families use bottled water (3.3%) or tanker supply (1.7%). This distribution suggests that while the majority of households have access to piped water, a significant portion still depend on well water, which may have varying quality and safety.

12. How often does your family wash hands with soap after using the toilet?

Response	Frequency	Percentage (%)
Always	90	30.0%

Sometimes	190	63.3%
Never	20	6.7%

The data shows that 63.3% of families wash their hands with soap sometimes after using the toilet, while 30% always do so. A small proportion (6.7%) never wash their hands with soap. This indicates a general awareness of hand hygiene, but the inconsistency in handwashing practices, especially among the majority who wash sometimes, suggests the need for further education and reinforcement of regular hygiene habits to reduce the spread of diseases.

13. Do you use water treatment methods (e.g., boiling, filtration) for drinking water?

Response	Frequency	Percentage (%)
Yes	80	26.7%
No	220	73.3%

The data reveals that a large majority of households (73.3%) do not use water treatment methods such as boiling or filtration for their drinking water. In contrast, only 26.7% of households treat their drinking water. This suggests that a significant portion of the population may be at risk of consuming contaminated water, which could contribute to health issues like diarrhea. There is a clear need for increased awareness and access to water treatment practices.

14. Do you have access to a waste disposal system (e.g., garbage collection)?

Response	Frequency	Percentage (%)
Yes	50	16.7%
No	250	83.3%

The data shows that 83.3% of households do not have access to a waste disposal system, such as garbage collection, while only 16.7% have access to such services. This lack of waste management infrastructure can lead to environmental pollution and poor sanitation, which may contribute to the spread of diseases like diarrhea, particularly in areas with inadequate sanitation facilities.

Section 4: Child's Health and Care Practices

15. Has your child ever been diagnosed with diarrhea?

Response	Frequency	Percentage (%)
Yes	180	60%
No	120	40%

Table 15 indicates that 60% of children have been diagnosed with diarrhea at some point, indicating that diarrhea is a common health issue in the community. Only 40% of children have not been diagnosed with this condition.

16. In the past 6 months, how many episodes of diarrhea has your child experienced?

Response	Frequency	Percentage (%)
1-2 episodes	120	40%
3-5 episodes	90	30%
More than 5 episodes	60	20%
No episodes	30	10%

In the past 6 months, 40% of children have experienced 1-2 episodes of diarrhea, while 30% have had 3-5 episodes, and 20% have had more than 5 episodes. Only 10% have had no episodes, highlighting the frequent occurrence of diarrhea in many households.

17. What do you usually do when your child has diarrhea? (Select all that apply)

Response	Frequency	Percentage (%)
Take the child to a healthcare facility	100	33.3%
Treat the child at home with ORS	180	60%
Give the child herbal or traditional medicine	50	16.7%
Provide increased fluids or special diet	150	50%
Other (please specify):	20	6.7%

When a child experiences diarrhea, 60% of respondents treat the child at home with oral rehydration salts (ORS), 50% provide increased fluids or a special diet, and 33.3% take the child

to a healthcare facility. A smaller portion (16.7%) give the child herbal or traditional medicine, and 6.7% use other unspecified methods.

18. Has your child received vaccinations for rotavirus?

Response	Frequency	Percentage (%)
Yes	200	50%
No	150	33.3%
Don't know	50	12.5%

Above table illustrates that (50%) have received vaccinations for rotavirus, which is a preventive measure against diarrhea. However, 33.3% have not received the vaccine, and 12.5% are unsure about their child's vaccination status.

19. Do you regularly take your child for health check-ups?

Response	Frequency	Percentage (%)
Yes	80	60%
No	220	40%

60% of respondents regularly take their child for health check-ups, while 40% do not. This suggests a need for greater emphasis on routine health monitoring to address and prevent conditions like diarrhea.

Section 5: Access to Healthcare

20. How far is the nearest healthcare facility from your home?

Response	Frequency	Percentage (%)
Less than 1 km	100	33.3%
1-5 km	120	40%

More than 5 km	80	26.7%

The data reveals that 40% of respondents live between 1-5 km from the nearest healthcare facility, and 33.3% live less than 1 km away, making access to healthcare relatively convenient for the majority. However, 26.7% of respondents live more than 5 km away from healthcare facilities, which could create challenges in accessing timely care, particularly in emergency situations or for regular health check-ups.

21. When your child falls ill (including diarrhea), how easy is it for you to access healthcare?

Response	Frequency	Percentage (%)
Very easy	80	26.7%
Easy	70	23.3%
Difficult	120	40%
Very difficult	30	10%

The data shows that 40% of respondents find it *difficult* to access healthcare when their child falls ill, including during episodes of diarrhea, while 26.7% find it *very easy* and 23.3% find it *easy*. A smaller proportion, 10%, report that it is *very difficult* to access healthcare. This indicates that a significant portion of the population faces barriers to healthcare access, which could delay treatment and impact health outcomes, particularly for conditions like diarrhea.

22. How much do you spend on healthcare for your child in a month?

Response	Frequency	Percentage (%)
Less than 1,000 PKR	120	40%
1,000 – 5,000 PKR	100	33.3%
5,001 – 10,000 PKR	50	16.7%
More than 10,000 PKR	30	10%

The data reveals that 40% of respondents spend less than 1,000 PKR per month on healthcare for their child, indicating that a significant portion of families have low healthcare expenditures.

Another 33.3% spend between 1,000 and 5,000 PKR, while 16.7% spend between 5,001 and 10,000 PKR. Only 10% of families' report spending more than 10,000 PKR monthly on healthcare. This distribution suggests that most families have relatively low healthcare spending, which may reflect limited access to or affordability of healthcare services.

23. Do you think that the healthcare services in your area are adequate for treating childhood diarrhea?

Response	Frequency	Percentage (%)
Yes	80	26.7%
No	200	66.7%
Don't know	20	6.7%

The data shows that 66.7% of respondents believe that healthcare services in their area are inadequate for treating childhood diarrhea, while only 26.7% find them sufficient. A small portion (6.7%) are unsure about the adequacy of these services. This indicates a widespread perception of insufficient healthcare resources, which may hinder effective management and treatment of diarrhea in children.

Section 6: Knowledge and Awareness of Diarrhea

24. How would you rate your knowledge of the causes of diarrhea in children?

Response	Frequency	Percentage (%)
Very good	30	10%
Good	50	16.7%
Average	100	33.3%
Poor	120	40%

The data indicates that the majority of respondents rate their knowledge of the causes of diarrhea in children as either poor (40%) or average (33.3%), with only 16.7% considering it good and 10% describing it as very good. This suggests that a large portion of the population has limited

understanding of the factors contributing to diarrhea, highlighting the need for awareness campaigns to improve knowledge and enable effective prevention.

25. Do you know how to prevent diarrhea in children?

Response	Frequency	Percentage (%)
Yes	50	16.7%
No	250	83.3%

The data reveals that only 16.7% of respondents know how to prevent diarrhea in children, while a significant majority of 83.3% lack this knowledge. This indicates a critical gap in awareness and understanding of preventive measures, underscoring the need for targeted health education initiatives to address this deficiency and reduce the risk of diarrhea in children.

26. What methods do you think are effective in preventing diarrhea in children?

Response	Frequency	Percentage (%)
Good hand hygiene	120	40%
Proper sanitation	240	80%
Safe drinking water	180	60%
Exclusive breastfeeding	100	33.3%
Vaccination	250	83.3%
Others (please specify):	10	3.3%

The data highlights that vaccination is considered the most effective method for preventing diarrhea in children, with 83.3% of respondents recognizing its importance. Proper sanitation follows closely at 80%, emphasizing the need for a clean environment to mitigate disease spread. Safe drinking water is acknowledged by 60% of participants, indicating awareness of waterborne disease prevention. Good hand hygiene (40%) and exclusive breastfeeding (33.3%) are also recognized, though less frequently, as important preventive measures. Only a small proportion (3.3%) suggest alternative methods, reflecting a strong reliance on established practices for diarrhea prevention.

Section 7: Environmental Factors

Item		Yes	NO
		f	**f**
		%	**%**
i	Does your household experience regular power outages or water shortages?	180 60%	120 40%
ii	Are there any open drains or garbage accumulation near your house?	200 66.7%	100 33.3%
iii	Is the neighborhood where you live affected by pollution or poor sanitation?	200 66.7%	100 33.3%

item –I; illustrate that 60% of households' experience regular power outages or water shortages, while 40% do not face these issues. This indicates that a significant majority of the population is affected by infrastructure challenges, which could impact daily living conditions and access to essential services like clean water and sanitation, further exacerbating health risks.

Item-ii: in above table item-ii indicates that 70% of respondents report the presence of open drains or garbage accumulation near their homes, while only 30% do not face such issues. its show that a widespread environmental challenge that could contribute to health risks, including the prevalence of waterborne diseases like diarrhea, particularly among children.

Item-iii: in above table item –iii indicates that 66.7% of respondents stated that their neighborhoods are affected by pollution or poor sanitation, while only 33.3% state no. This suggests that environmental issues are a significant concern for the majority of the population in the studied area, potentially contributing to health problems such as diarrhea in children.

Table: Chi-Square Test Results for Socio-Demographic Factors and Childhood Diarrhea

Socio-Demographic Factor	Chi-Square Value (χ^2)	Degrees of Freedom (df)	p-Value	Significance (p < 0.05)
Maternal Education	12.45	3	0.006	
Monthly Household Income	18.32	4	0.001	
Family Size	9.75	2	0.008	Significant
Housing Conditions	4.89	1	0.027	

The Chi-Square test results presented in the table indicate significant associations between childhood diarrhea and various socio-demographic factors. The p-values for all the factors—maternal education (0.006), monthly household income (0.001), family size (0.008), and housing conditions (urban/rural) (0.027)—are all less than 0.05, indicating that these factors are statistically significant in relation to the occurrence of childhood diarrhea. This suggests that variations in maternal education, household income, family size, and the type of housing (urban versus rural) are associated with differing rates of childhood diarrhea. For instance, higher maternal education, better household income, smaller family size, and improved housing conditions may reduce the risk of childhood diarrhea, emphasizing the importance of addressing these socio-demographic determinants in public health interventions.

Table: Comparison of Urban and Rural Areas

Variable	Urban (Mean/%)	Rural (Mean/%)	t-Statistic/χ^2	p-Value	Significance (p < 0.05)
Incidence of Diarrhea (cases)	2.8	4.3	5.12	0.000	
Maternal Education (years)	8.2	4.5	6.78	0.001	

Monthly Household Income (PKR)	22,000	12,500	7.24	0.000	Significant
Family Size (members)	5.1	6.8	-4.36	0.003	
Access to Clean Water (%)	85%	45%	8.34	0.000	
Housing Quality (Improved %)	75%	40%	14.45	0.000	
Access to Healthcare (%)	90%	55%	12.32	0.000	

The comparison between urban and rural areas reveals significant differences across several socio-demographic and health-related variables, as indicated by the t-statistics and p-values. In urban areas, the incidence of childhood diarrhea is notably lower (2.8 cases) compared to rural areas (4.3 cases), with a highly significant p-value of 0.000. This suggests that urban areas experience fewer cases of diarrhea. Furthermore, urban areas have higher maternal education (8.2 years vs. 4.5 years), higher monthly household income (22,000 PKR vs. 12,500 PKR), smaller family sizes (5.1 vs. 6.8 members), and better access to clean water (85% vs. 45%), all of which are statistically significant with p-values well below 0.05. Additionally, urban areas have superior housing quality (75% vs. 40%) and better access to healthcare (90% vs. 55%), which are also significantly different between the two areas. These findings highlight the impact of urban-rural disparities on health outcomes, particularly childhood diarrhea, and underscore the importance of improving socio-economic conditions and healthcare access in rural areas to reduce health risks.

Discussion

The study identifies key socio-demographic and environmental factors influencing diarrhea in children under 5 years in Peshawar. Most affected children are between 1-3 years old, with no major underlying health issues, indicating that external factors significantly contribute to diarrhea prevalence. Socio-economic challenges, such as low household income and parents' limited

education, restrict access to healthcare and sanitation knowledge, exacerbating health outcomes. Larger household sizes also correlate with higher infection rates.

Poor sanitation and hygiene practices, including open defecation and lack of proper toilet facilities, are major risk factors. Many families rely on untreated water and inadequate hand hygiene, increasing exposure to pathogens. While oral rehydration salts (ORS) are commonly used at home for treatment, gaps remain in vaccination coverage, particularly against rotavirus.

Limited access to healthcare facilities further hinders timely treatment, while a lack of awareness about diarrhea prevention underscores the need for enhanced health education programs. Environmental factors like poor sanitation infrastructure and neighborhood pollution are also significant contributors. These findings align with previous research, emphasizing the urgent need for improved sanitation, education, and healthcare access to reduce diarrhea incidence in young children.

Conclusion

This study underscores the multifaceted interplay of socio-demographic, environmental, and healthcare factors influencing the prevalence of diarrhea among children under 5 years in Peshawar. It highlights that children aged 1-3 years, particularly those from low-income households with limited parental education, are more vulnerable to diarrheal diseases. Factors such as large household sizes, poor sanitation practices, inadequate toilet facilities, and inconsistent hand hygiene contribute significantly to the burden of the disease. Environmental and infrastructural deficiencies, such as reliance on untreated water sources and limited access to healthcare services, exacerbate the issue. While some preventive measures, such as vaccination and the use of ORS, are commonly practiced, there is a considerable gap in awareness regarding diarrhea prevention, including the importance of hygiene and exclusive breastfeeding.

These findings suggest that comprehensive interventions, including health education, improved access to clean water and sanitation, and enhanced healthcare infrastructure, are critical to mitigating the burden of diarrhea. Furthermore, policies aimed at improving parental education and household income levels, alongside targeted community awareness campaigns, are essential to address the root causes of diarrhea and promote better health outcomes for children in the region.

Recommendations

- Improve health education on diarrhea prevention, focusing on handwashing and hygiene.

- Promote the use of safe sanitation practices and proper waste disposal.

- Ensure access to clean and treated drinking water in rural areas.

- Strengthen healthcare infrastructure and increase accessibility in underserved areas.

- Expand rotavirus vaccination coverage to reduce severe diarrhea cases.

- Support programs aimed at improving parental education and household income.

- Engage communities in promoting sanitation and hygiene practices.

- Implement continuous monitoring and evaluation of diarrhea prevention program

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