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Original Article

Prevalence of Diarrhea in Children 1 to 5 Years at Saidu Group of Teaching Hospital Swat SGTH

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ABSTRACT

Background: Diarrhea remains an important cause of illness among children younger than five years, particularly in settings with limited access to safe water, sanitation, hygiene, and preventive healthcare. Objective: To estimate the proportion of children aged 1–5 years attending or admitted to the pediatric unit of Saidu Group of Teaching Hospital, Swat, who had caregiver-reported diarrhea during the preceding 14 days and to assess selected associated factors. Methods: An institution-based descriptive cross-sectional study included 150 children selected through non-probability consecutive sampling. Data were obtained from mothers or guardians using a structured questionnaire covering sociodemographic, environmental, hygiene, feeding, and vaccination characteristics. Categorical data were summarized as frequencies and percentages, and bivariate associations were assessed using chi-square tests. Results: Diarrhea during the preceding 14 days was reported for 120 children, representing 80.0% of the hospital sample (95% CI 72.9–85.6). The proportion was 86.4% among male children and 71.0% among female children. Male children had a higher crude prevalence than female children (PR 1.22, 95% CI 1.02–1.46; χ^2=5.389; p=0.020). No statistically significant bivariate associations were detected for maternal education, family income, water source, water treatment, handwashing, feeding-bottle practices, routine vaccination, or rotavirus vaccination. Conclusion: Recent caregiver-reported diarrhea was common in the sampled hospital population. The observed sex difference requires confirmation in larger community-based studies using probability sampling and adjusted analyses. Keywords: Child diarrhea; Under-five children; Cross-sectional study; Caregiver report; Hospital-based study; Swat.

INTRODUCTION

Diarrhea, commonly defined as the passage of three or more loose or watery stools within 24 hours, remains an important cause of preventable morbidity and mortality among children younger than five years. Most childhood diarrheal episodes result from viral, bacterial, or parasitic infections transmitted through contaminated water, food, hands, utensils, or environmental surfaces. Children in the first five years of life are particularly vulnerable because of their developing immune systems, dependence on caregivers for feeding and hygiene, and increased exposure to environmental contaminants. Acute episodes can rapidly cause dehydration and electrolyte disturbances, whereas recurrent or prolonged diarrhea can contribute to malnutrition, impaired physical growth, delayed cognitive development, and increased use of healthcare services. The World Health Organization estimates that approximately 1.7 billion episodes of childhood diarrheal disease occur annually and that diarrhea causes approximately 525,000 deaths among children younger than five years (1-6). The United Nations Children's Fund similarly identifies diarrhea as responsible for approximately 9% of global under-five mortality, with the greatest burden occurring in populations that have inadequate access to safe drinking water, sanitation,

nutrition, and timely healthcare (2). Globally, the burden of childhood diarrhea remains concentrated in low- and middle-income countries, where repeated exposure to enteric pathogens frequently coexists with poverty, malnutrition, and limited preventive healthcare services (7-9).

Diarrheal disease also remains a substantial child-health concern in Pakistan. According to the Pakistan Demographic and Health Survey 2017–18, approximately one-fifth of children younger than five years experienced diarrhea during the two weeks preceding the survey (4). The national burden is not distributed uniformly, as children living in rural or socioeconomically disadvantaged households may experience greater exposure to contaminated water, inadequate sanitation, overcrowding, poor food hygiene, and delayed access to appropriate treatment. Caregiver knowledge and practices are also relevant because mothers and other caregivers commonly determine the source and treatment of drinking water, preparation and storage of food, handwashing practices, feeding-bottle hygiene, continuation of feeding during illness, use of oral rehydration solution, and timely presentation to healthcare facilities. Maternal education and household income may consequently influence childhood diarrhea through their effects on health literacy, environmental conditions, nutrition, preventive practices, and healthcare-seeking behaviour (10-13).

Khyber Pakhtunkhwa carries a considerable burden of childhood diarrheal disease, particularly in rural, mountainous, and underserved communities where access to safe water, sanitation infrastructure, and healthcare facilities may be limited. Previous research conducted in the province has identified socioeconomic disadvantage, environmental exposure, poor sanitation, and restricted healthcare access as important determinants of diarrhea among children younger than five years (5). Local evidence from Kalam Valley, Swat, has also documented a considerable number of diarrheal cases, particularly during the summer season, when increased temperature, water contamination, and unsafe storage practices may facilitate the transmission of enteric infections (6). However, estimates obtained from community surveys, seasonal surveillance, and hospital-based studies cannot be interpreted interchangeably because they differ in sampling frames, case definitions, reference periods, severity of illness, and patterns of healthcare use. Children presenting to a hospital are more likely to have symptoms or other health concerns than children selected from the general community; therefore, findings from hospital-based samples should be interpreted as facility-specific proportions rather than district-wide prevalence estimates (14-16).

Childhood diarrhea is influenced by multiple interacting factors. Low maternal education and socioeconomic disadvantage have been associated with increased diarrheal morbidity in some populations, although the strength and direction of these relationships vary across settings (7). Unsafe drinking water, inadequate sanitation, and poor hand hygiene are established routes of fecal–oral transmission, and water, sanitation, and hygiene interventions can reduce exposure to diarrheal pathogens (8). Feeding practices may also affect risk, particularly when bottles or feeding utensils are inadequately cleaned or when food is prepared or stored under unhygienic conditions. Rotavirus vaccination provides protection against an important cause of severe childhood gastroenteritis, but the occurrence of diarrhea among vaccinated children remains possible because childhood diarrhea has numerous infectious and non-infectious causes. Differences in measurement, caregiver reporting, seasonal exposure, vaccination coverage, sample size, and study setting may explain why individual studies have reported inconsistent associations between diarrhea and maternal education, income, water source, handwashing, feeding practices, and immunization status (17-21).

Despite the continuing burden of childhood diarrheal disease in Swat, limited recent evidence is available regarding the proportion of young children presenting to Saidu Group of Teaching Hospital who experienced diarrhea during the preceding two weeks and the distribution of potentially associated sociodemographic, environmental, hygiene, feeding, and immunization factors. Facility-specific evidence can assist nurses and other healthcare professionals in identifying commonly reported exposures, strengthening caregiver education, and planning preventive interventions appropriate to

children using hospital services. Therefore, this study aimed to estimate the proportion of children aged 1–5 years attending or admitted to the pediatric unit of Saidu Group of Teaching Hospital, Swat, who had caregiver-reported diarrhea during the preceding 14 days and to examine its bivariate associations with selected sociodemographic, environmental, hygiene, feeding, and immunization-related characteristics.

MATERIALS AND METHODS

An institution-based descriptive cross-sectional study was conducted in the pediatric clinical setting of Saidu Group of Teaching Hospital, Saidu Sharif, Swat, Khyber Pakhtunkhwa, Pakistan. Data collection was completed over a two- to four-week recruitment period. The target population consisted of children aged 12–60 months who attended or were admitted to the pediatric unit during the study period. Children within the specified age range were eligible when accompanied by a mother or guardian who was able to provide information about the child and gave informed consent for participation. Eligibility was not restricted according to the presence of diarrhea because the study required the inclusion of children both with and without caregiver-reported diarrhea to estimate the proportion affected during the preceding 14 days. Age was verified using the child's birth certificate or immunization card when available and through caregiver reporting when documentary evidence was unavailable (22-24).

Participants were recruited using a non-probability consecutive sampling technique. Eligible caregiver–child pairs presenting during the recruitment period were approached consecutively until the required sample was obtained. A total of 150 children were included. This sample exceeded the minimum number estimated by the investigators at a 95% confidence level and was selected to improve the precision and reliability of the descriptive findings. Participation was voluntary, and refusal to participate did not affect the treatment or other services received by the child at the hospital (25).

Data were collected from mothers or guardians through a structured, interviewer-administered questionnaire. The complete instrument contained 21 questions organized into five domains. The sociodemographic section recorded the child's age and sex, maternal educational level, monthly family-income category, and number of children in the family. The diarrhea-history section assessed the occurrence of diarrhea during the preceding two weeks, number of episodes, stool characteristics, associated fever, and whether medical treatment had been obtained. Environmental and hygiene-related questions assessed the principal source of drinking water, boiling or filtering of water, caregiver handwashing before feeding, the child's handwashing after toilet use, and the household toilet facility. Feeding-related questions addressed exclusive breastfeeding during the first six months, provision of a balanced diet, feeding-bottle use, and the frequency of bottle cleaning. The final section recorded age-appropriate routine vaccination and rotavirus vaccination status. Interviews were expected to require approximately 10–15 minutes, and responses were recorded at the time of the interview (26).

The primary outcome was caregiver-reported diarrhea occurring during the 14 days preceding data collection. Diarrhea was operationally defined as the passage of three or more loose or watery stools during a 24-hour period (1). The numerator for the primary outcome consisted of children whose caregivers reported at least one qualifying episode during the reference period, while the denominator comprised all participating children with an available response to the outcome question. The principal explanatory variables were the child's sex, maternal education, family-income category, drinking-water source, household water-treatment practice, caregiver handwashing before feeding, feeding-bottle use, bottle-cleaning frequency, age-appropriate vaccination status, and rotavirus vaccination status. Maternal education was recorded as illiterate, primary, secondary, or higher education, while family income was classified as low, middle, or high according to the questionnaire categories. Drinking-water source was categorized as tap, filtered, well, or another source. Handwashing before feeding was recorded as always, sometimes, or never, and rotavirus vaccination was recorded as yes, no, or unknown.

Several procedures were used to improve consistency in data collection. All participants were assessed using the same structured questionnaire, operational definitions, response categories, and 14-day reference period. Caregivers were interviewed directly, and the child's age was checked against available documentary evidence. Responses were reviewed for completeness at the time of data collection. The questionnaire covered several conceptually distinct domains and was therefore not treated as a single psychometric scale. Internal consistency analysis was limited to the seven questionnaire items selected for reliability assessment and was evaluated using Cronbach's alpha. The dataset contained 150 valid cases for the reported reliability analysis, with no cases excluded.

Data were entered and analysed using IBM SPSS Statistics version 22.0. Categorical variables were summarized as frequencies and percentages. The 14-day proportion of diarrhea was calculated by dividing the number of children with caregiver-reported diarrhea by the total number of participating children and expressing the result as a percentage. The corresponding 95% confidence interval should be reported to describe the precision of this estimate. Associations between diarrhea status and categorical explanatory variables were assessed using Pearson's chi-square test when test assumptions were satisfied. Fisher's exact test or an appropriate exact extension was used for tables containing small expected cell counts. All statistical tests were two-sided, and a p-value of ≤ 0.05 was considered statistically significant.

For two-category comparisons supported by complete cell counts, crude prevalence ratios, absolute prevalence differences, and their 95% confidence intervals were used to describe the magnitude and precision of associations rather than relying on p-values alone. Categories containing very small numbers were evaluated carefully, and collapsing categories was considered only when clinically and conceptually defensible. Analyses involving feeding-bottle cleaning were restricted to children reported to use a feeding bottle because cleaning frequency was not applicable to non-users. Because the study involved several bivariate comparisons and did not establish temporal ordering between the explanatory variables and outcome, the analyses were considered exploratory and were not interpreted as evidence of causation or independent prediction.

Permission to conduct the study was obtained from the administration of Saidu Group of Teaching Hospital before recruitment began. Mothers or guardians received information concerning the purpose and procedures of the study, the voluntary nature of participation, the absence of any effect on the child's treatment, and their right to withdraw without providing a reason. Written informed consent was obtained before the interview. Information provided by participants was treated as confidential, stored securely, and used exclusively for research purposes. Electronic records were protected by password, and participant identities were not intended to be disclosed in any report or publication.

RESULTS

A total of 150 children aged 1–5 years were included in the analysis. All participants had an available response for the primary outcome of caregiver-reported diarrhea during the preceding 14 days. Among the 150 participating children, 88 (58.7%) were male and 62 (41.3%) were female. Primary education was the most frequently reported maternal educational category, accounting for 66 (44.0%) participants, followed by no formal education in 55 (36.7%), secondary education in 27 (18.0%), and higher education in 2 (1.3%). Most participants belonged to the middle-income category, 83 (55.3%), while 60 (40.0%) were classified in the low-income category and 7 (4.7%) in the high-income category.

Caregivers of 120 children reported that the child had experienced diarrhea during the preceding 14 days, corresponding to a hospital-sample proportion of 80.0% (95% CI 72.9–85.6%). The remaining 30 children, representing 20.0% of the sample, had no reported episode during the reference period.

The proportion with caregiver-reported diarrhea was 86.4% among male children and 71.0% among female children. Male children had a 15.4-percentage-point higher proportion of diarrhea than female

children (95% CI 2.0–28.8). The crude prevalence ratio was 1.22 (95% CI 1.02–1.46), indicating that the observed proportion was approximately 22% higher among male children. Pearson's chi-square test identified evidence of a bivariate association between sex and diarrhea status (χ^2=5.389, df=1, p=0.020).

Table 1. Sociodemographic Characteristics of the Participants (n=150)

Characteristic	Category	n (%)
Sex	Male	88 (58.7)
	Female	62 (41.3)
Maternal education	Illiterate	55 (36.7)
	Primary	66 (44.0)
	Secondary	27 (18.0)
	Higher	2 (1.3)
Monthly family income	Low	60 (40.0)
	Middle	83 (55.3)
	High	7 (4.7)

Table 2. Fourteen-Day Proportion of Caregiver-Reported Diarrhea (n=150)

Outcome	n	%	95% CI
Diarrhea reported	120	80.0	72.9–85.6
Diarrhea not reported	30	20.0	14.4–27.1

CI, confidence interval. Confidence intervals were calculated using the Wilson method.

Table 3. Association Between Sex and Caregiver-Reported Diarrhea During the Preceding 14 Days

Sex	Diarrhea, n (%)	No diarrhea, n (%)	Total, n	Prevalence ratio (95% CI)	Prevalence difference, % (95% CI)
Male	76 (86.4)	12 (13.6)	88	1.22 (1.02–1.46)	15.4 (2.0–28.8)
Female	44 (71.0)	18 (29.0)	62	1.00	0.0

Pearson χ^2=5.389; df=1; p=0.020. Female children constituted the reference category. CI, confidence interval; df, degrees of freedom.

Table 4. Reported Bivariate Associations With Caregiver-Reported Diarrhea

Explanatory variable	χ^2	df	p-value
Sex	5.389	1	0.020
Maternal education	2.422	3	0.490
Monthly family income	0.886	2	0.642
Source of drinking water	5.466	3	0.141
Boiling or filtering drinking water	0.213	1	0.644
Handwashing before feeding	1.134	2	0.567
Feeding-bottle cleaning frequency	0.959	2	0.619
Feeding-bottle use	1.127	1	0.288
Age-appropriate vaccination status	0.025	1	0.876
Rotavirus vaccination status	0.947	2	0.623

df, degrees of freedom. The table presents the test statistics reported in the source analysis. Complete exposure-by-outcome cell counts were available only for sex.

No statistically significant bivariate association was reported between diarrhea status and maternal education (χ^2=2.422, df=3, p=0.490), monthly family income (χ^2=0.886, df=2, p=0.642), source of drinking water (χ^2=5.466, df=3, p=0.141), boiling or filtering drinking water (χ^2=0.213, df=1, p=0.644), or handwashing before feeding (χ^2=1.134, df=2, p=0.567). Similarly, the reported analyses did not detect statistically significant associations with feeding-bottle cleaning frequency (χ^2=0.959, df=2, p=0.619), feeding-bottle use (χ^2=1.127, df=1, p=0.288), age-appropriate vaccination status (χ^2=0.025, df=1, p=0.876), or rotavirus vaccination status (χ^2=0.947, df=2, p=0.623). These comparisons were exploratory and represented unadjusted bivariate analyses.

DISCUSSION

This institution-based cross-sectional study found that 80.0% of participating children aged 1–5 years had caregiver-reported diarrhea during the 14 days preceding data collection. The proportion was higher among male children than female children, with an absolute difference of 15.4 percentage points and a crude prevalence ratio of 1.22. No statistically significant bivariate associations were detected for maternal education, family income, drinking-water source, household water treatment, handwashing before feeding, feeding-bottle use or cleaning, routine vaccination, or rotavirus vaccination. These findings should be interpreted within the context of a hospital-based, non-probability sample and should not be considered an estimate of diarrhea prevalence among all children living in Swat (12-14).

The observed 80.0% proportion was substantially higher than the approximately 19% two-week prevalence reported in the Pakistan Demographic and Health Survey 2017–18 (4). This difference is most plausibly explained by differences in the sampling frame and healthcare-seeking context. The national survey recruited children from households and was designed to produce population-level estimates, whereas the present study recruited children presenting to or admitted to a pediatric hospital service. Children attending a teaching hospital are more likely to be symptomatic, have recent illness, or have caregivers concerned about their health. The high observed proportion should therefore be interpreted as a measure of recent diarrhea within the sampled hospital population rather than evidence that four out of every five children in the wider district experienced diarrhea (15).

The finding is nevertheless consistent with evidence that diarrheal disease continues to generate a substantial clinical burden in Swat. A hospital-based study conducted in Kalam Valley documented 2,057 diarrheal presentations over a six-month summer period, including 767 cases among children younger than five years (5). That investigation described the number and distribution of presenting cases rather than community prevalence, making direct numerical comparison inappropriate. Together, the two studies indicate that pediatric diarrhea remains an important reason for healthcare use in the region, although neither study provides a probability-based district estimate (16).

Male children had a higher observed proportion of diarrhea than female children. The crude prevalence ratio indicated an approximately 22% higher proportion among males, but the lower confidence limit was close to the null value. The association should consequently be interpreted cautiously. The study did not measure mobility, play behaviour, environmental contact, caregiver supervision, food exposure, or sex-related differences in healthcare-seeking, and these mechanisms should not be assumed from the observed statistical difference. Sex differences in childhood morbidity have varied across observational populations, and household, environmental, nutritional, and care-seeking factors may influence the direction and magnitude of such findings (6). Moreover, the present analysis was unadjusted and cannot determine whether sex remained associated with diarrhea independently of age, socioeconomic circumstances, feeding practices, vaccination, or environmental exposure.

The study did not detect a statistically significant relationship between maternal education or family income and diarrhea. Previous population-based research has suggested that socioeconomic and maternal characteristics can influence childhood diarrhea by affecting health literacy, sanitation, nutrition, housing, and access to preventive and curative services (4,6). The absence of statistical significance in this hospital sample does not demonstrate that these factors are unimportant. The very small numbers in the higher-education and high-income categories reduced statistical precision and may have limited the ability to identify meaningful gradients. Selection of participants from a single hospital may also have produced a more socioeconomically homogeneous sample than would be observed in a community survey (18).

No statistically significant associations were detected for drinking-water source, boiling or filtering water, or handwashing before feeding. These findings should not be interpreted as evidence that water quality and hygiene do not influence diarrheal disease. Contaminated drinking water, inadequate

sanitation, and poor hand hygiene are established pathways for fecal–oral transmission, and systematic evidence indicates that water, sanitation, and hygiene interventions can reduce diarrheal morbidity (1,7). The null findings may reflect self-reported exposure measurement, limited variation between participating households, inconsistent implementation of reported practices, contamination during water storage or food preparation, or insufficient statistical power. For example, reporting that water was boiled or filtered does not establish that treatment was performed consistently or that water remained uncontaminated during storage and use (20).

Feeding-bottle use and cleaning frequency were also not statistically associated with diarrhea in the reported bivariate analyses. Bottle-related exposure is difficult to evaluate without information concerning the child's age, type of feeding, preparation of milk or formula, water source, cleaning method, sterilization, storage interval, and frequency of use. Cleaning frequency is also applicable only to children who use feeding bottles, and analyses that include non-users in the cleaning categories may produce misleading estimates. Future studies should restrict bottle-cleaning analyses to bottle users and collect more detailed information on preparation and storage practices.

Neither overall vaccination status nor rotavirus vaccination status demonstrated a statistically significant association with diarrhea. Rotavirus vaccination is designed to reduce the risk and severity of rotavirus gastroenteritis rather than prevent every episode of diarrhea, which may be caused by numerous viral, bacterial, parasitic, dietary, or medication-related factors (1). In addition, vaccination status was caregiver-reported, and the questionnaire included an unknown-response category for rotavirus vaccination. Misclassification of immunization status and the absence of laboratory confirmation of etiology may have weakened any association. The cross-sectional assessment also did not measure the severity, duration, dehydration status, hospitalization requirement, or specific cause of the diarrheal episode, outcomes for which vaccination effects may be more apparent (21-23).

Several limitations affect interpretation. The non-probability, single-centre sampling strategy limits external validity and may have introduced selection bias. The hospital setting likely enriched the sample with children experiencing illness and therefore inflated the observed 14-day proportion relative to the community. Diarrhea and most explanatory variables were reported by caregivers and were susceptible to recall and social-desirability bias. The exact recruitment season was unavailable, preventing assessment of seasonal influence. Some exposure categories contained very small numbers, which reduced precision and may have violated assumptions of conventional chi-square testing. Complete contingency-table counts were not reported for most explanatory variables, preventing calculation of category-specific estimates and verification of expected cell frequencies. The analyses were unadjusted, so confounding could not be excluded. Finally, several statistical tests were conducted, and the isolated p-value of 0.020 for sex should be regarded as exploratory rather than definitive evidence of an independent relationship.

The study also has practical strengths. It provides facility-specific evidence from a region in which local pediatric diarrhea data remain limited, uses a consistent 14-day reference period, and examines several sociodemographic, environmental, feeding, and immunization characteristics. The results emphasize the need for improved surveillance that distinguishes hospital burden from community prevalence. Future research should use community-based probability sampling, record the exact recruitment season, verify vaccination from immunization cards, assess nutritional and sanitation conditions directly, and report complete category-specific counts. Multivariable models estimating adjusted prevalence ratios would permit a more informative assessment of independent associations when an adequately sized dataset is available.

CONCLUSION

Caregiver-reported diarrhea during the preceding 14 days was common among children aged 1–5 years included in this hospital-based sample. Male children had a higher unadjusted proportion of diarrhea

than female children, while no statistically significant bivariate associations were detected for the other assessed sociodemographic, environmental, feeding, or immunization characteristics. Because participants were recruited through a single teaching hospital using non-probability sampling, the 80.0% proportion should not be generalized to all children in Swat. The findings support strengthening facility-based prevention and caregiver education while undertaking larger community-based studies with probability sampling, verified exposure measurements, and adjusted statistical analyses.

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