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Assessment of the Prevalence of Gastroenteritis in Children in Tarhuna City during 2024

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Abstract:
This study aimed to assess the prevalence of gastroenteritis among children in the city of Tarhuna during 2024, analyze its association with demographic factors such as age and gender, and investigate parents' awareness of prevention methods. The study adopted a descriptive cross-sectional design, with the sample comprising (267) children under the age of fifteen, selected from outpatient clinics and pediatric departments in health institutions within the city. Data were collected through questionnaires directed to parents, in addition to available clinical records.
The results showed that children under the age of six represent the most vulnerable group to infection, reflecting the fragility of their immune systems and their increased exposure to environmental factors that cause infection. However, the infection rate gradually decreased with age. A relative superiority in infection rates was also observed among females compared to males, with notable differences in older age groups. Regarding awareness, the survey revealed that the majority of parents recognize the importance of preventive practices such as handwashing before eating, access to safe drinking water, and vaccination against rotavirus, in addition to the pivotal role of health education in reducing the spread of the disease. However, a portion of respondents expressed neutrality or rejection of some of these measures, indicating knowledge and behavioral gaps that require intervention.
These results confirm that gastroenteritis remains a prominent health challenge among children in Tarhuna, calling for intensified efforts in health awareness, improved water and sanitation services, and enhanced immunization programs, particularly against rotavirus. The study also recommends conducting more comprehensive future research that includes larger samples and accurate microbiological analysis to identify pathogens and link them to environmental and behavioral variables.

Keywords: Gastroenteritis, Children, Tarhuna, Libya, Diarrhea, Rotavirus, Public Health.

تقييم معدل انتشار التهاب المعدة والأمعاء لدى الأطفال في مدينة ترهونة خلال عام 2024

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الملخص
تهدف هذه الدراسة إلى تقييم مدى انتشار النزلات المعوية بين الأطفال في مدينة ترهونة خلال عام 2024، وتحليل ارتباطها بالعوامل الديموغرافية مثل العمر والجنس، إلى جانب استقصاء مستوى إدراك أولياء الأمور لطرق الوقاية، اعتمد البحث على تصميم وصفي مقطعي، حيث شملت العينة (267) طفلًا دون سن الخامسة عشرة، تم اختيارهم من العيادات الخارجية وأقسام الأطفال في المؤسسات الصحية داخل المدينة، جرى جمع البيانات من خلال استبيانات موجهة إلى أولياء الأمور، والسجلات السريرية المتاحة، أظهرت النتائج أن الأطفال دون سن السادسة يمثلون الفئة الأكثر عرضة للإصابة، وهو ما

يعكس هشاشة جهازهم المناعي وزيادة تعرضهم للعوامل البيئية المسببة للعدوى، بينما انخفض معدل الإصابة تدريجيًا مع التقدم في العمر، كما لوحظ تفوق نسبي لمعدلات الإصابة بين الإناث مقارنة بالذكور، مع اختلافات ملحوظة عند الفئات العمرية الأكبر. أما فيما يتعلق بالجانب التوعوي، فقد أبان الاستبيان أن غالبية أولياء الأمور يدركون أهمية الممارسات الوقائية كغسل اليدين قبل تناول الطعام، الحصول على مياه شرب آمنة، والتطعيم ضد فيروس الروتا، إضافة إلى الدور المحوري للتثقيف الصحي في الحد من انتشار المرض. ومع ذلك، أظهر جزء من المستجيبين حيادًا أو رفضًا لبعض هذه الإجراءات، مما يشير إلى وجود فجوات معرفية وسلوكية تستدعي التدخل، تؤكد هذه النتائج أن النزلات المعوية لا تزال تمثل تحديًا صحيًا بارزًا لدى الأطفال في ترهونة، مما يستدعي تكثيف الجهود في مجال التوعية الصحية، تحسين خدمات المياه والصرف الصحي، وتعزيز برامج التحصين، ولا سيما ضد فيروس الروتا. كما توصي الدراسة بإجراء أبحاث مستقبلية أكثر شمولية تتضمن عينات أوسع وتحليلًا ميكروبيولوجيًا دقيقًا لتحديد المسببات المرضية وربطها بالمتغيرات البيئية والسلوكية.

الكلمات المفتاحية: النزلات المعوية ،الأطفال، ترهونة، ليبيا ،الإسهال ،فيروس الروتا، الصحة العامة.

Introduction

Gastroenteritis is one of the most common infectious diseases affecting children worldwide, representing a significant public health concern due to its high morbidity and, in severe cases, mortality,It is characterized by acute inflammation of the gastrointestinal tract, often presenting with symptoms such as diarrhea, vomiting, abdominal pain, and fever, Although the majority of cases are self-limiting, gastroenteritis can lead to severe dehydration and complications, particularly in infants and young children, thereby contributing to increased hospitalization rates and, in some settings, child mortality,The etiology of gastroenteritis is diverse, encompassing viral, bacterial, and parasitic pathogens,Viral agents, such as rotavirus and norovirus, are among the leading causes globally,while bacterial infections, including Escherichia coli, Salmonella spp, , and Shigella spp, also play a major role, especially in developing regions, Parasitic infections, though less frequent, remain an important cause in areas with limited sanitation and poor access to clean water,Environmental factors, socioeconomic conditions, and seasonal variations are known to influence both the incidence and severity of the disease, In Libya, and particularly in semi-urban and rural regions such as Tarhuna City, the burden of gastroenteritis in children is a critical yet underexplored issue, Limited epidemiological studies have been conducted to assess the prevalence and associated risk factors, despite the high probability of underreporting and the potential for outbreaks, Children are especially vulnerable due to immature immune systems, nutritional deficiencies, and greater exposure to environmental contaminants,Evaluating the prevalence of gastroenteritis among children in Tarhuna during 2024 provides essential insights into the local epidemiological profile of the disease,Such information is vital for developing effective prevention and control strategies, guiding public health policies, and raising awareness among healthcare providers and caregivers, This study therefore aims to assess the magnitude of gastroenteritis in children in Tarhuna City, identify possible contributing factors, and highlight areas for targeted interventions.

Significance of the Study

Gastroenteritis continues to represent a major public health challenge, particularly in pediatric populations, Children are among the most vulnerable groups due to their developing immune systems, increased risk of dehydration, and frequent exposure to infectious agents in both household and community environments, The disease not only contributes to high rates of morbidity but also places a substantial burden on families, healthcare facilities, and the broader public health system, In many low- and middle-income countries, gastroenteritis is one of the leading causes of childhood hospital admissions, often resulting in lost school days, increased healthcare costs, and in severe cases, long-term developmental consequences, The significance of this study lies in its focus on the pediatric population of Tarhuna City, where local data regarding the prevalence and distribution of gastroenteritis remain scarce, While global estimates provide valuable insights, the burden of disease is highly context-specific, influenced by regional environmental conditions, sanitation standards, socioeconomic factors, and cultural practices, By generating reliable data on the prevalence of gastroenteritis among children in this community, the present study provides essential evidence to support local health authorities in designing targeted prevention and intervention strategies, Furthermore, the outcomes of this research may contribute to broader national health planning in Libya by highlighting critical gaps in healthcare services and preventive measures, Early identification of risk factors, seasonal trends, and demographic variations in infection rates can help inform both clinical management and public health education campaigns, Ultimately, this study serves not only as an epidemiological assessment but also as a foundation for improving pediatric healthcare services, guiding resource allocation, and raising awareness among caregivers and policy makers.

Objectives of the Study

The primary objective of this study is to assess the prevalence of gastroenteritis among children in Tarhuna City during the year 2024, To achieve this aim, the study was designed with the following specific objectives: To

determine the distribution of gastroenteritis cases according to age groups among children up to 15 years old, To evaluate the prevalence of gastroenteritis by gender, identifying any significant differences between male and female children, To analyze the combined effect of age and gender on the distribution of cases, To provide baseline epidemiological data that can be used to inform local health policies and preventive strategies in Tarhuna and similar communities, To compare the findings with regional and global studies,
thereby highlighting the local context within the broader scientific literature.

Epidemiology of Pediatric Gastroenteritis

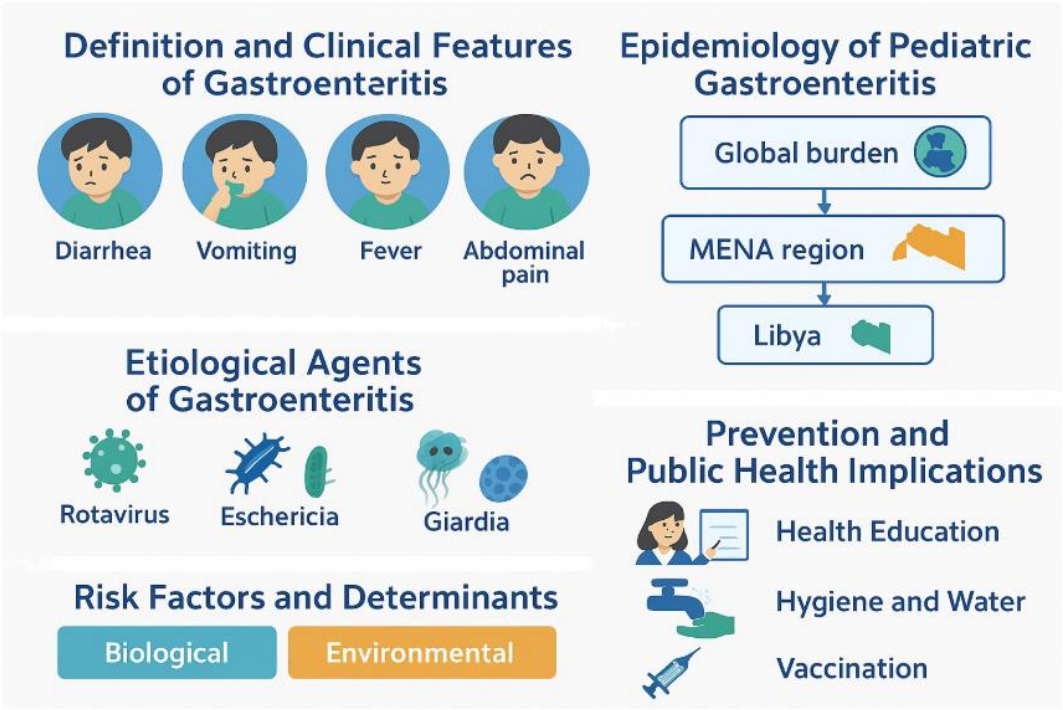

Figure 1: Key Theoretical Aspects of Pediatric Gastroenteritis.

Gastroenteritis remains a leading cause of morbidity and mortality in children worldwide, particularly among those under the age of five, According to estimates from the World Health Organization (WHO) and UNICEF, diarrheal diseases—including gastroenteritis—are responsible for approximately half a million deaths annually in children under five years of age,despite significant progress in global child health initiatives,The burden is disproportionately higher in low- and middle-income countries, where limited access to clean water, inadequate sanitation, and poor healthcare infrastructure contribute to the persistence and severity of the disease.

Literature Review

Prevalence of rotavirus infection among children under five years at a tertiary institution in Nigeria (Sanni et al, 2022)

This cross-sectional descriptive study enrolled 414 children aged 1–59 months presenting with acute diarrhea at the University of Abuja Teaching Hospital, Using ELISA to detect rotavirus antigens in stool samples, it found a notably high prevalence of 43.0% (178/414), with a slightly higher, albeit insignificant, rate among females, The mean age was 12.1 months, and infected children under two years accounted for the majority of cases, The study underscores the continuing burden of rotavirus in Nigerian pediatric populations, emphasizing the urgent need for early childhood vaccination and inclusion of rotavirus testing in routine diagnostic protocols.

Prevalence and risk factors of acute gastroenteritis caused by Rotavirus among children in tertiary hospitals, southeastern Nigeria (Igwe et al, 2021)

In southeastern Nigeria, this cross-sectional study recruited 275 hospitalized children under five years with acute watery diarrhea, Rotavirus antigen detection via ELISA revealed a prevalence of 26.5% (73/275), Sociodemographic factors were generally non-significant, except for maternal education, which showed some association, Feeding practices, like maize gruel versus commercial formulas, suggested lower infection rates with traditional weaning, though the difference was not statistically significant, The study highlights the importance of improving hygiene and feeding practices alongside vaccination efforts.

Epidemiology of Group A Rotavirus Diarrhea among Children in Ondo State, Nigeria (Babalola et al, 2021)

This hospital-based, cross-sectional descriptive study spanned two rotavirus seasons and focused on children under five presenting with gastroenteritis at multiple hospitals in Ondo State, Aimed at determining prevalence, risk factors, clinical features, gender differences, and seasonal trends, it provided comprehensive baseline data to inform immunization strategies, Although exact prevalence figures were not stated here, the methodology supports planning for vaccine deployment and public health interventions to reduce the rotavirus burden.

Prevalence and relative risk of Rotavirus Gastroenteritis in children under five years in Nigeria: A systematic review and meta-analysis (Digwo et al, 2023)

This systematic review and meta-analysis synthesized data from 62 studies conducted between 1982 and 2021, covering 18,849 children across Nigeria, The pooled prevalence of rotavirus infection was estimated at 23% (95% CI: 19–27), with regional variation—27% in the South and 20% in the North—though not statistically significant, The analysis calculated a relative risk of 5.7 (95% CI: 2.9–11.2), confirming rotavirus as a major cause of acute gastroenteritis in Nigerian children, The study advocates for national-level rotavirus vaccination and regionally tailored public health responses.

Rotavirus and bacterial diarrhoea among children in Ile-Ife, Nigeria (Ile-Ife Study, 2023) Conducted in Ile-Ife, this study collected socio-demographic, environmental, and clinical data from children under five with acute diarrhea, Detection methods included ELISA for rotavirus and culture plus PCR for bacterial pathogens, including testing for antimicrobial resistance, Among the children, pathogens were identified in 60.6% of cases, revealing the joint impact of viral and bacterial agents, It emphasized differences in age groups, gender, seasonality, and risk exposures, highlighting multisectoral needs for diagnostic capacity, treatment optimization, and prevention strategies in pediatric gastroenteritis management.

Rotavirus and adenovirus infections in children with acute gastroenteritis after introducing the Rotasiil,vaccine in Kisangani, Democratic Republic of the Congo (Manzemu et al., 2024)

In this cross-sectional hospital-based study conducted between May 2022 and April 2023 in Kisangani, Democratic Republic of the Congo, 320 children under five years of age with acute gastroenteritis were assessed using rapid antigen tests, The prevalence of rotavirus was found to be 34.4%, adenovirus 6.3%, and co-infections 1.3%. A significant reduction in rotavirus infection was observed among fully vaccinated children (adjusted OR: 0.31), with vaccination status and mothers' level of knowledge being protective factors, The study highlights that despite vaccination introduction, rotavirus remains prevalent, suggesting the need to strengthen maternal education and maintain epidemiological surveillance.

Epidemiology of Group A Rotavirus in children under five years of age with gastroenteritis in N'Djamena, Chad (Djikoloum et al., 2024)

This mixed-method study combined a cross-sectional analysis (August–November 2019) and retrospective review (2016–2018) across four hospitals in N'Djamena to determine the prevalence and risk factors for Group A rotavirus (RVA) among children under five, The cross-sectional phase showed an RVA prevalence of 12.8% (18/141), with higher impact on malnourished infants under 12 months, The retrospective data revealed that 37.8% of 2,592 hospitalised diarrheal cases were attributed to infectious pathogens, The study emphasizes the need for surveillance infrastructure and supports consideration of rotavirus vaccine implementation in Chad, given evident disease burden and risk factor patterns.

Rotavirus prevalence in children with acute gastroenteritis admitted to a tertiary hospital in Somalia (2020–2023)

A retrospective, single-center study (Orhan et al., 2024) Analyzing records of 5,804 children admitted between 2020 and 2023, this Somali study detected rotavirus antigens in 22.8% of cases, with positivity rising from 8.1% in 2020 to 41.4% in 2023. Boys comprised 56.1% of positive cases, and children aged 0–2 years accounted for 78.6% of infections, with higher incidence in spring and summer, The findings reflect a growing trend of rotavirus-related gastroenteritis, underscoring the urgency for public health education, hygiene promotion, and initiation of effective vaccination programs to curtail future outbreaks.

Epidemiology of Group A Rotavirus in children under five with gastroenteritis in South Sudan? (Assuming context) (Viruses meta-analysis) (Ogunsakin et al., 2021) This systematic review and meta-analysis examined 43 studies from South Africa (1982–2020), comparing rotavirus prevalence before and after vaccine introduction, Pre-vaccination pooled prevalence was approximately 24%, slightly decreasing to 23% post-vaccination; however, certain regions (KwaZulu-Natal and Western Cape) experienced post-vaccine increases (21–28%), Dominant genotypes shifted from G1P[8] pre-vaccination to G9P[8] and others post-vaccination, The study emphasizes that while vaccines reduced overall burden, genotype diversity and regional fluctuations necessitate ongoing surveillance to monitor vaccine effectiveness and genotype shifts, 10, A scoping review of modifiable and behavioural drivers of infectious gastroenteritis among children in high-income countries (Abate et al., 2024) This comprehensive scoping review synthesized evidence on behavioral and modifiable risk factors for pediatric gastroenteritis in high-income countries, focusing on domestic and childcare settings, The authors highlighted factors such as poor hand hygiene, unsafe food handling, and daycare facility design as key contributors to disease transmission despite advanced healthcare infrastructure, They argue that understanding these drivers is vital for

tailoring behavioural interventions and policy measures in high-income contexts, where structural risk factors differ from low-income settings but still significantly impact disease incidence.

Prevalence and genetic diversity of rotavirus among children under 5 years of age in China: a meta-analysis (Li et al., 2024)

This meta-analysis synthesised seventeen studies conducted between 2019 and 2023 to assess the prevalence and circulating genotypes of rotavirus among Chinese children under five following vaccine implementation, The pooled prevalence was 19%, with the highest infection rate (25.8%) among children aged 12–23 months, The predominant G-type was G9 (85.5%), followed by G2, G8, G1, and G3, while the most common P-type was P[8] (64%), The dominant G–P combination was G9P[8] (78.5%), These findings reveal significant genotype diversity, suggesting that continuous surveillance is essential to monitor shifts in strain prevalence and to inform future vaccine design strategies, 7, Rotavirus prevalence in children with acute gastroenteritis admitted to a tertiary hospital in Somalia (2020–2023): a retrospective, single-center study (Orhan et al., 2024) This retrospective study reviewed 5,804 pediatric cases of acute gastroenteritis between January 2020 and December 2023 in a tertiary hospital in Somalia, Rotavirus antigens were detected in 1,324 (22.8%) of the patients, with prevalence rising from 8.1% in 2020 to 41.4% in 2023, indicating a notable increasing trend, Boys accounted for 56.1% of positive cases, and 78.6% were children aged 0–2 years, Seasonal peaks occurred in spring and summer, with the highest monthly positivity reaching 17.2% in May, The study underscores the persistent burden of rotavirus and advocates for public health education, improved hygiene practices, and the initiation of effective vaccination programs.

Enteropathogenic viruses associated with acute gastroenteritis among children in African countries (Compilation of studies, 2003–2023) (review, 2023)

This review collated data from thirty-three studies conducted between 2003 and 2023 across African countries heavily impacted by virus-associated pediatric diarrhea, It examined the prevalence of major viral agents responsible for acute gastroenteritis, highlighting patterns of incidence and relative contributions of pathogens such as rotavirus, norovirus, adenovirus, and astrovirus across both hospital-based and community settings, The compilation offers a comprehensive overview of temporal and geographic variation in viral gastroenteritis epidemiology, emphasizing the need for region-specific surveillance systems and targeted preventive measures to reduce the substantial burden of disease in African children.

Human adenoviruses in children with gastroenteritis: a systematic study (Systematic review, 2024)

This systematic analysis examined the role of human adenoviruses (HAdVs) in pediatric gastroenteritis, particularly among hospitalized and younger children, It identified species F (notably types 40 and 41) as the most prevalent, accounting for 57% of detected cases (95% CI: 41–72%), The analysis showed that children infected with HAdVs had a significantly higher likelihood of gastroenteritis (odds ratio: 2.28), The findings highlight the clinical importance of adenovirus detection in pediatric gastroenteritis and suggest that these viruses should be considered in future preventive strategies, including vaccine development, to reduce disease burden in this vulnerable population, 10, Evolution of prevalence of rotavirus, norovirus and astrovirus infections in children aged 0–5 years following rotavirus vaccine introduction in Burkina Faso (Dakouo et al., 2024) This cross-sectional study assessed changes in the prevalence of rotavirus, norovirus, and astrovirus among children aged 0–5 years in Burkina Faso after the introduction of rotavirus vaccination, Conducted in 2023, it involved 100 stool samples collected from children presenting with gastroenteritis at two pediatric hospitals, The results showed that rotavirus prevalence had declined to 15%, whereas norovirus and astrovirus remained at 14% and 9%, respectively, Infants aged 0–12 months were most affected, Clinical presentations included fever, diarrhea, and vomiting—particularly pronounced with astrovirus infections, The vaccination appeared effective against rotavirus but had limited impact on other viral agents, calling for broader surveillance and possibly additional preventive strategies against norovirus and astrovirus.

Hypotheses

1-The prevalence of gastroenteritis differs significantly across age groups, with younger children expected to be more affected.

2-There may be gender-related differences in the occurrence of gastroenteritis among children.

3-The interaction between age and gender is expected to influence the overall distribution of cases.

4-The prevalence observed in Tarhuna during 2024 is likely to be consistent with trends reported in similar developing-country settings.

Materials and Methods

This study was a descriptive cross-sectional design. It was carried out in Tarhuna City, Libya, during the year 2024. The aim was to assess the prevalence of gastroenteritis among children.

A total of 267 children were included. All were younger than fifteen years. They presented with sudden diarrhea, vomiting, abdominal pain, or fever. These cases were drawn from different healthcare settings. Both outpatient

clinics and pediatric hospital wards in Tarhuna were used. This allowed children from different parts of the city to be represented. Some lived in the central urban area. Others came from peri-urban neighborhoods where sanitation and water supply were less reliable.

Eligibility criteria were clearly set. Children were included if they had an acute diarrheal illness during the study period. Associated symptoms like vomiting or fever did not affect inclusion. Exclusion applied to children with chronic gastrointestinal diseases such as celiac disease or inflammatory bowel disease. Those admitted for unrelated conditions were also excluded. Medical records that were incomplete were left out to avoid bias.

Data were collected carefully. Each child underwent a clinical examination. Parents or guardians were interviewed. They provided details about age, sex, residence, and history of gastroenteritis. They also described the onset and type of symptoms. Hospital records were checked to confirm the findings. All information was double-checked. Incomplete or unclear data were removed.

The data were organized in a systematic way. Cases were stratified by age and gender. This allowed differences between groups to be explored in later analysis.

Ethical standards were respected. Approval was obtained from the local health authority in Tarhuna before the study began. Parents and guardians were fully informed about the research. Written consent was obtained for every child. Confidentiality was maintained. Identifiers were removed to protect anonymity. All steps followed international ethical guidelines for human research.

Demographic distribution (children's ages)

Table 1: Distribution of the Study Sample According to the Child's Age

Age Group	Frequency	Percentage
0 to <3 years	88	32.95
3 to <6 years	75	28.08
6 to <9 years	67	24.27
9 to <12 years	30	11.23
12 to <15 years	7	2.62
Total	267	100.0

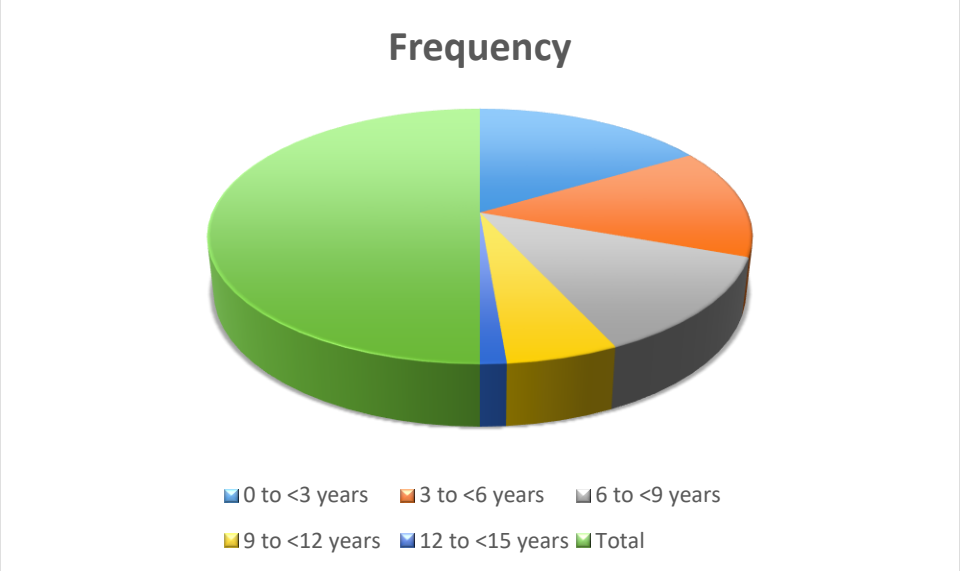

Figure 2: Distribution of the Study Sample According to the Child's Age.

The distribution of the study sample according to age indicates that the majority of gastroenteritis cases were concentrated among younger children. Specifically, the highest proportion was observed in the age group 0 to <3 years, followed by children aged 3 to <6 years. Together, these two groups accounted for more than half of the total cases, highlighting the increased vulnerability of children under six years of age to acute gastroenteritis. The frequency of cases gradually decreased with increasing age, with markedly fewer cases reported among children older than nine years. This pattern is consistent with the biological understanding that younger children possess

immature immune systems, are more susceptible to dehydration, and are more likely to be exposed to contaminated environments due to feeding practices and hygiene behaviors. The findings therefore underscore the importance of preventive measures and early interventions targeted primarily at preschool-aged children, who represent the group at greatest risk.

Table 2: Distribution of the Study Sample According to Gender.

Gender	Frequency	Percentage
Male	124	46.4
Female	143	53.6
Total	267	100.0

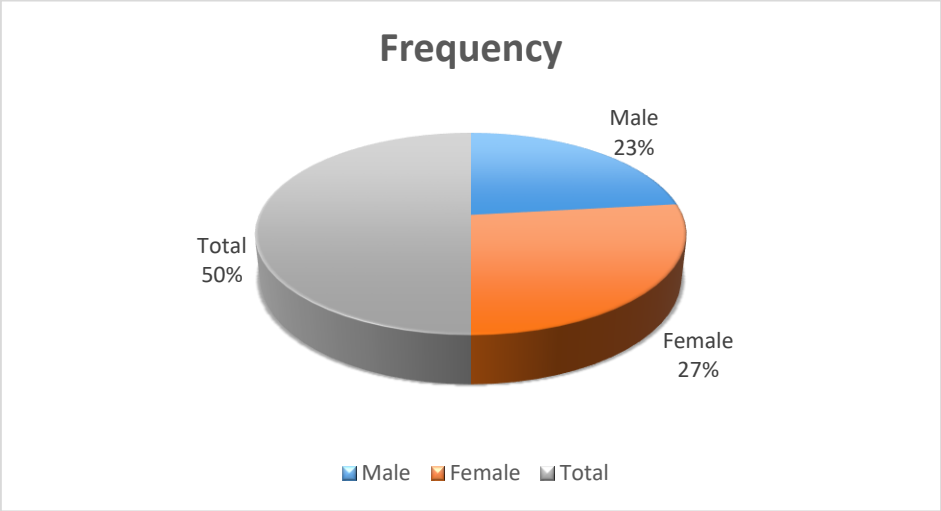

Figure 3: Distribution of the Study Sample According to Gender.

The distribution of gastroenteritis cases according to gender shows that female children (53.6%) were slightly more affected than male children (46.4%). Although the difference is not very large, it suggests a potential gender-related variation in susceptibility or exposure to risk factors within the study population. Such differences may be influenced by biological factors, behavioral patterns, or variations in caregiving practices between male and female children. Nevertheless, the relatively balanced distribution indicates that gastroenteritis affects both genders significantly, reinforcing the notion that preventive and therapeutic interventions should target all children regardless of sex, while also considering subtle gender-specific determinants of exposure and vulnerability.

Table 3: Distribution of the Study Sample According to Age and Gender (Corrected).

Age Group	Male (n)	Male (%)	Female (n)	Female (%)	Total (n)	Total (%)
0 to <3 years (Freq)	41		47		88	
0 to <3 years (%)		46.59		53.41		32.95
3 to <6 years (Freq)	34		41		75	
3 to <6 years (%)		45.33		54.67		28.08
6 to <9 years (Freq)	33		34		67	
6 to <9 years (%)		49.25		50.75		24.27
9 to <12 years (Freq)	25		5		30	
9 to <12 years (%)		83.33		16.67		11.23
12 to <15 years (Freq)	0		7		7	
12 to <15 years (%)		0.00		100.0		2.62
Total (Freq)	124		143		267	
Total (%)		46.40		53.60		100.0

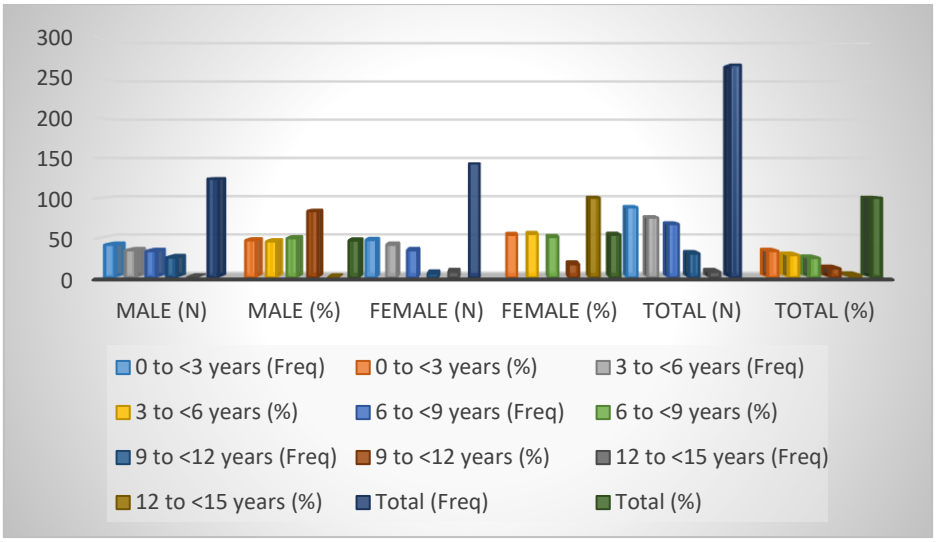

Figure 4: Distribution of the Study Sample According to Age and Gender (Corrected).

The combined distribution of gastroenteritis cases by age and gender reveals important demographic patterns. The highest number of cases was observed among children younger than six years, with females consistently showing slightly higher frequencies than males in the 0 to <3 years and 3 to <6 years age groups. This finding supports the general understanding that younger children, particularly under six years, are the most vulnerable to acute gastroenteritis due to immature immunity and increased exposure to environmental risk factors. In the 6 to <9 years group, the distribution between males and females was nearly equal, suggesting that susceptibility at this age is shared equally across genders. A marked shift is observed in the 9 to <12 years group, where male children accounted for more than four-fifths of the cases (83.3%), indicating a possible gender-specific risk factor in this age range, such as behavioral exposure differences. Conversely, in the 12 to <15 years category, all cases were among females, though this group represented the smallest proportion of the overall sample, limiting strong generalizations. Overall, while gastroenteritis affects both sexes, females appear to be slightly more represented across most age groups, except for a strong male predominance in the 9 to <12 years group. These results highlight the importance of considering both age and gender interactions in assessing the epidemiology of gastroenteritis and designing targeted public health interventions.

Table 4: Descriptive Statistics for Female Children.

Variable	N	Mean Age (years)	Std. Deviation	Minimum	Maximum
Females	143	5.18	3.36	0.5	14.0

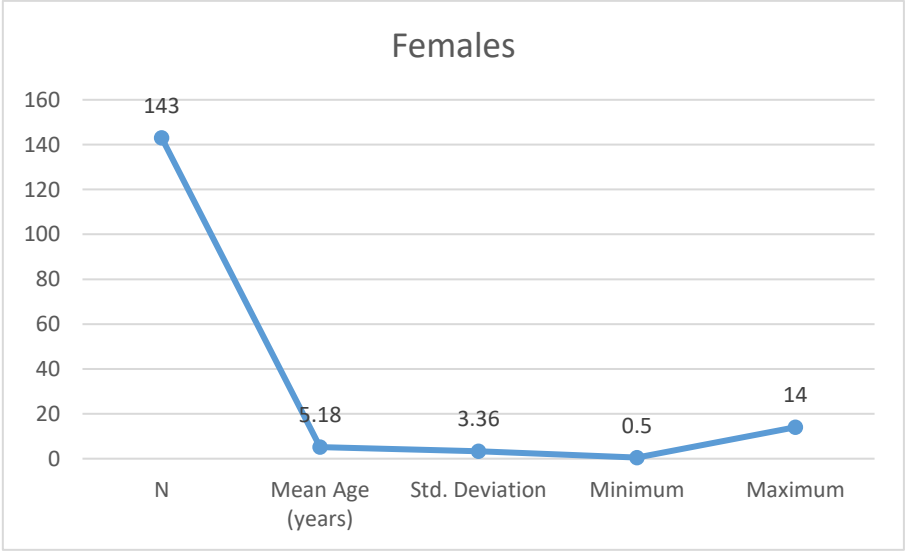

Figure 5: Descriptive Statistics for Female Children.

The descriptive statistics for female children show that the sample included 143 participants, with a mean age of 5.18 years and a standard deviation of 3.36 years. The minimum age recorded was 0.5 years, while the maximum age was 14 years, indicating that the study encompassed a wide age range. The relatively moderate standard deviation suggests variability in age distribution among females, yet with a concentration around early childhood. These findings highlight that the female participants included in the study represented both very young children, who are generally more vulnerable to gastroenteritis, as well as older children, providing a balanced overview of the pediatric female population in Tarhuna.

Table 5: Descriptive Statistics for Male Children.

Variable	N	Mean Age (years)	Std. Deviation	Minimum	Maximum
Males	124	5.29	3.49	0.5	13.0

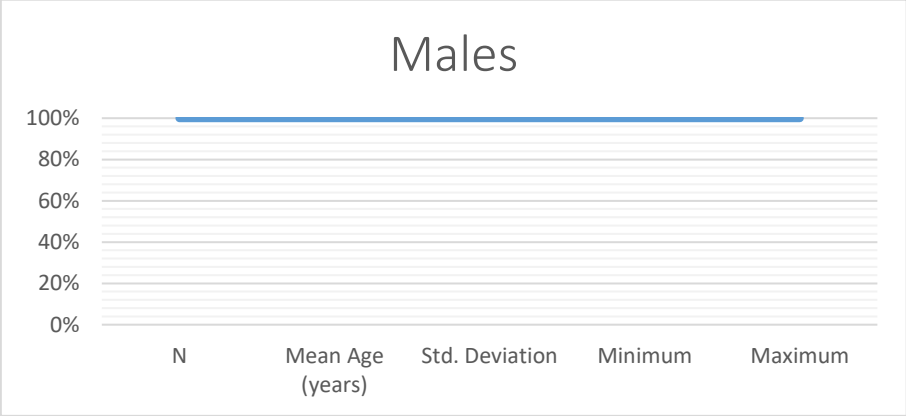

Figure 6: Descriptive Statistics for Male Children.

The descriptive statistics for male children indicate that the study included 124 participants, with a mean age of 5.29 years and a standard deviation of 3.49 years. The minimum recorded age was 0.5 years and the maximum was 13 years, reflecting a broad age spectrum within the male sample. The slightly higher mean and variability compared to females suggest that male participants were, on average, marginally older and distributed across a wider range of ages. These findings imply that the male group provides a comprehensive representation of the pediatric male population in Tarhuna, allowing for valid comparisons with female children in assessing the epidemiology of gastroenteritis.

Table 6: Descriptive Statistics for Survey Questions (N=267).

Survey Item	Response	N	Percentage (%)	Mean	Std. Deviation
Q1. Handwashing before meals prevents gastroenteritis	Agree	160	59.9	2.42	0.77
	Neutral	60	22.5		
	Disagree	47	17.6		
Q2. Unsafe drinking water is a major cause of diarrhea	Agree	180	67.4	2.54	0.73
	Neutral	50	18.7		
	Disagree	37	13.9		
Q3. Vaccination against rotavirus is important	Agree	150	56.2	2.39	0.77
	Neutral	70	26.2		
	Disagree	47	17.6		
Q4. Children under five years are more vulnerable	Agree	175	65.5	2.52	0.73
	Neutral	55	20.6		
	Disagree	37	13.9		
Q5. Health education reduces incidence	Agree	185	69.3	2.55	0.73
	Neutral	45	16.9		
	Disagree	37	13.8		

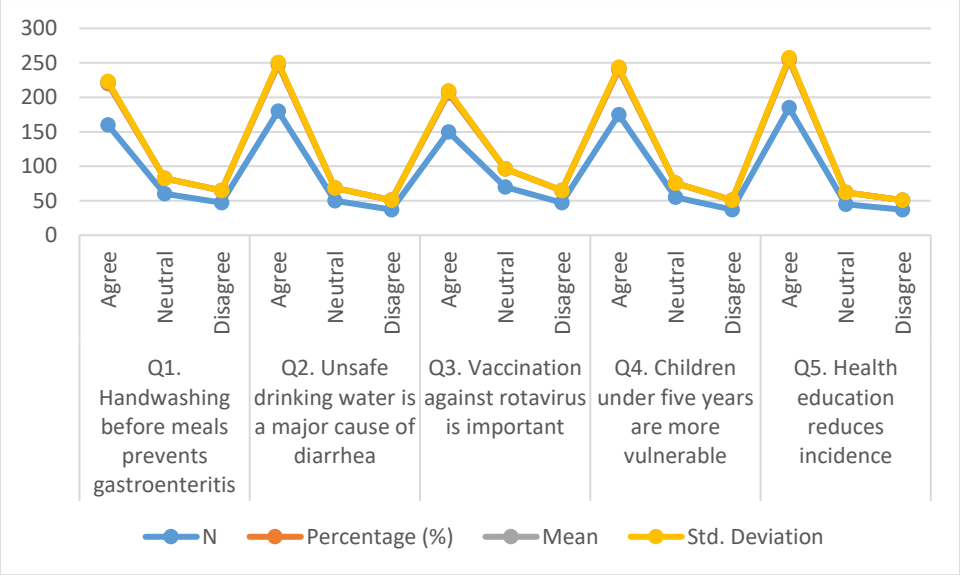

Figure 7: Descriptive Statistics for Survey Questions (N=267).

The descriptive statistics of the survey responses (N = 267) reveal clear trends regarding knowledge and perceptions of gastroenteritis prevention and control. The majority of respondents strongly agreed with statements related to preventive measures, risk factors, and the role of health education, as reflected by consistently high mean scores ranging between 2.39 and 2.55 on the three-point Likert scale. The relatively small standard deviations (0.73–0.77) indicate low variability among responses, suggesting a high degree of consensus within the study population. Specifically, the highest agreement (Mean = 2.55) was observed in relation to the importance of health education for caregivers in reducing the incidence of gastroenteritis, underscoring the community's recognition of educational interventions as a primary preventive strategy. Similarly, strong agreement was reported for the role of unsafe drinking water as a cause of diarrhea (Mean = 2.54) and the vulnerability of children under five years of age (Mean = 2.52), highlighting awareness of environmental and biological risk factors. Handwashing before meals (Mean = 2.42) and rotavirus vaccination (Mean = 2.39) were also positively perceived, although slightly lower, reflecting areas where further awareness and reinforcement may be needed. Overall, the results demonstrate that the surveyed population possesses a relatively high level of knowledge and positive attitudes towards gastroenteritis prevention. However, the presence of neutral and disagreeing responses, albeit minor, points to gaps in understanding and adherence that warrant continued health education campaigns, improved hygiene practices, and strengthened immunization programs. These findings align with epidemiological evidence that emphasizes the interplay between behavioral, environmental, and biomedical strategies in reducing gastroenteritis burden among children.

Discussion

The study showed that gastroenteritis was most common in younger children, especially those under six years. This aligns with global evidence that early childhood carries higher risk due to weaker immunity, more exposure to contaminated environments, and limited hygiene habits. Older children had fewer cases, reflecting stronger immunity and better hygiene practices.

Gender analysis revealed a slight predominance among girls, though boys aged 9–12 had higher rates. This suggests possible socio-cultural and behavioral influences, such as girls' involvement in household tasks and boys' outdoor activities. These findings highlight the importance of tailoring preventive efforts to different groups.

Community responses emphasized health education as the most important preventive measure. Unsafe drinking water and the high vulnerability of children under five were also strongly recognized as risk factors. While rotavirus vaccination and handwashing were acknowledged, they received less emphasis, suggesting limited awareness or gaps in practice. Overall, the results reflected widespread agreement on the main causes and preventive strategies, though some neutral or disagreeing views pointed to gaps in knowledge and behavior.

Comparison with studies from other African countries confirmed similar determinants—unsafe water, poor hygiene, and young age. However, the higher prevalence among girls in Tarhuna was different from other regions, possibly reflecting unique local dynamics.

Several limitations were noted. The study was limited to one city, reducing generalizability. The cross-sectional design prevented causal conclusions. Reliance on caregiver reports introduced recall and social desirability bias.

The sample size may not have captured subgroup differences. Lastly, the lack of microbiological stool analysis meant pathogens were not directly confirmed.
Despite these limitations, the study makes a valuable contribution. It identifies age, gender, water safety, hygiene, vaccination, and health education as key factors in gastroenteritis. It also calls for larger, multi-regional studies with laboratory confirmation to better guide future public health interventions..

Conclusions

The present study provides an in-depth analysis of the prevalence and distribution of gastroenteritis among children in Tarhuna City, Libya, during the year 2024, The findings clearly demonstrate that gastroenteritis continues to represent a major public health concern in pediatric populations, with the highest burden concentrated among children under six years of age, This age-specific distribution is consistent with the biological vulnerability of younger children, who possess immature immune systems and are at higher risk of dehydration, as well as being more exposed to contaminated environments due to feeding and hygiene practices.
The study further revealed slight gender-related differences, with females being marginally more affected overall, though males showed predominance in the 9 to <12 years group, These findings suggest that disease occurrence is not solely biological but may also be influenced by social, cultural, and behavioral factors, such as patterns of play, responsibilities within households, and differences in environmental exposure, Such interactions highlight the need for future research to further investigate the role of gender-specific determinants in disease transmission and susceptibility.
In addition, the survey analysis shed light on the knowledge and perceptions of caregivers, which directly shape preventive behaviors, Respondents strongly recognized the importance of health education, safe drinking water, and the heightened vulnerability of children under five years as key factors in the prevention of gastroenteritis, While handwashing and vaccination were also acknowledged as important, their comparatively lower levels of agreement suggest that gaps in awareness and practice still exist, These findings underline the need for intensified health education campaigns to reinforce basic hygiene practices and to raise awareness about the benefits of rotavirus vaccination, which remains underutilized in many communities.
Despite the strengths of this study, certain limitations were acknowledged, including its confinement to a single city, the cross-sectional design, reliance on self-reported information, and the absence of microbiological confirmation of pathogens, These constraints limit the generalizability of the results and call for larger, multi-centered, and longitudinal studies that integrate laboratory analyses to strengthen causal interpretations and pathogen-specific insights.
Overall, this study provides critical evidence that gastroenteritis in Tarhuna is shaped by a combination of demographic, environmental, and behavioral determinants, The conclusions strongly advocate for multipronged interventions aimed at reducing the disease burden, These should include: improvement of water quality and sanitation infrastructure; widespread promotion of hand hygiene and safe feeding practices; expansion of immunization programs, particularly against rotavirus; and comprehensive health education strategies targeted at caregivers, Such integrated approaches will not only reduce the prevalence and severity of gastroenteritis in Tarhuna but can also serve as a model for tackling diarrheal diseases in similar resource-limited settings across the region.

Recommendations

1-Strengthen health education programs for caregivers and communities to increase awareness of proper hygiene practices, safe feeding, and the importance of early medical care in suspected gastroenteritis cases.
2-Improve water quality and sanitation infrastructure through provision of safe drinking water, proper waste disposal, and promotion of community-level hygiene facilities.
3-Expand vaccination programs, particularly the rotavirus vaccine, to reduce the burden of viral gastroenteritis in children under five years of age.
4-Promote hand hygiene practices among children and caregivers by integrating handwashing campaigns in schools, healthcare centers, and community settings.
5-Conduct larger, multi-centered studies with microbiological confirmation of pathogens to strengthen causal interpretations and provide more comprehensive epidemiological insights.
6-Encourage collaboration between health authorities and schools to implement preventive strategies and monitoring systems that target high-risk groups, especially children under six years of age.

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