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PREVALENCE AND RISK FACTORS OF PEDIATRIC APPENDICITIS: A SURGICAL REVIEW AT PUMHS NAWABSHAH.

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ABSTRACT

BACKGROUND: Appendicitis which describes vermiform appendix inflammation occurs as one of the most frequent surgical emergencies found among pediatric patients on a worldwide scale. **OBJECTIVE**: The aim of this study was to determine the prevalence and identify the risk factors associated with pediatric appendicitis in children undergoing surgical intervention at PUMHS Nawabshah. **METHODOLOGY**: This retrospective observational study was conducted at the Department of Pediatric Surgery, PUMHS Nawabshah, over a period of one year January 2024 to December 2024. Medical records of pediatric patients diagnosed with appendicitis and who underwent appendectomy were reviewed. Data was collected regarding patient demographics, presenting symptoms, laboratory findings, and risk factors including age, gender, nutritional status, family history, and the presence of comorbidities. The prevalence of appendicitis and its associated risk factors were analyzed using descriptive statistics. **RESULTS**: A total of 150 pediatric patients were included in the study, with a male-to-female ratio of 1.5:1. The prevalence of appendicitis was found to be 7.5% among pediatric patients presenting to the emergency department. The most common presenting symptoms were abdominal pain 95%, nausea/vomiting 85%, and fever 78%. Significant risk factors for appendicitis included age most common in children aged 6-12 years, male gender, and a family history of appendicitis. Nutritional status did not show a significant correlation with appendicitis occurrence. Additionally, 12% of patients had a history of recurrent abdominal pain, and 5% had a history of gastrointestinal infections. **CONCLUSION**: Appendicitis remains a common surgical emergency in pediatric patients. Early diagnosis and timely intervention are crucial for reducing morbidity. Male gender, age between 6-12 years, and a family history of appendicitis are significant risk factors for the condition. Further studies are recommended to evaluate the impact of nutritional status and gastrointestinal infections on the development of appendicitis in children.

KEYWORDS: Pediatric appendicitis, Risk factors, Prevalence, Appendectomy, PUMHS Nawabshah

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INTRODUCTION

Appendicitis which describes vermiform appendix inflammation occurs as one of the most frequent surgical emergencies found among pediatric patients on a worldwide scale. The condition is highly important since its delayed diagnosis and untimely treatment can generate serious complications which include appendix perforation and peritonitis and sepsis [1]. The diagnostic procedure for appendicitis in children becomes difficult because rare symptoms frequently cause both delayed medical assistance and elevated risks of negative outcomes [2]. The occurrence of pediatric appendicitis differs between developed countries and low- and middle-income nations LMICs according to studies [3]. The disease burden of LMICs including Pakistan continues to be high since it affects healthcare systems while also impacting patient results [4].

Research indicates that appendicitis develops in 100 out of 100,000 people each year across the globe mainly affecting individuals during their second decade of life [5]. The incidence of appendicitis is crucial for pediatric surgeons and healthcare providers because it represents a major cause of emergency surgical patient intake in youthful populations [6]. The treatment of appendicitis remains difficult in areas with limited healthcare resources because patients encounter delays in appropriate care [7.]

Rural and semi-urban Nawabshah has limited studies regarding pediatric appendicitis prevalence together with its predisposing factors in Pakistan. The pediatric surgical cases referred to the Peoples University of Medical and Health Sciences in Nawabshah create an outstanding setting for studying appendicitis epidemiology and treatment results within this patient group. Proper assessment of local appendicitis patterns together with their defining variables enables authorities to develop focused preventative strategies that will support speedy identification as well as medical care and clinical results for children with this condition.

Inflammatory disease development spreads across genetics and external agents together with personal living conduct. Blockage in the appendiceal opening primarily occurs because of fecaliths, lymphoid hyperplasia and infections which initiate the disease process [8]. The pathogenesis of the disease remains complex because multiple factors including diet patterns and familial histories together with societal economic backgrounds are identified as risk elements [9.] A food regimen deficient in fiber together with high intake of processed products raises appendiceal infection risk because it affects how the intestine moves its contents while changing pressure levels in the lumen [10]. The research demonstrates that those with familial background of appendicitis tend to develop this condition more frequently [11].

Appendicitis detection becomes challenging in pediatric cases because this disease shows diverse clinical manifestations during its presentation stage. Young children frequently display broad symptoms including stomach pain

along with vomiting and temperature elevations while their expected conditions might resemble regular childhood diseases [12]. Physicians must stay alert for all possibilities given the variable nature of symptoms because confirmatory tests such as ultrasound and computed tomography CT are essential for diagnosis [13]. Healthcare facilities in Nawabshah face restricted access to state-of-the-art medical imaging equipment which forces medical staff to rely primarily on their clinical expertise combined with basic medical tests [14].

The medical field has experienced major developments during recent decades when treating pediatric appendicitis through early appendectomy surgery prevention unwanted complications. Acute appendicitis is treated through open or laparoscopic appendectomies which serve as the current recommended procedure [15]. Laparoscopic appendectomy has become the preferred surgical procedure because it provides patients three major benefits such as lower postoperative pain and shorter hospital stays and shorter recovery periods [16]. Almost all medical facilities in LMICs perform open appendectomies because access to laparoscopic techniques remains scarce [17].

Children with appendicitis show diverse clinical outcomes to effective treatments because of how fast they receive diagnosis as well as complications during the surgery and postoperative care quality [18]. Such delayed diagnoses and inadequate surgical accessibility in LMICs become major obstacles for obtaining optimal treatment outcomes thus requiring special interventions according to research evidence [19]. The reduction of this healthcare challenge requires public health programs to teach population members about appendicitis symptoms and create better diagnostic pathways and strengthen surgical treatments in affected areas [20].

The research examines pediatric appendicitis prevalence along with its risk factors in PUMHS Nawabshah while investigating local epidemiological patterns and risk factors that can be modified. The analysis of surgical records as well as patient outcomes will generate important findings that will help better understand appendicitis burdens in this population through assessment of early diagnosis and management strategies. The research outcomes from this investigation will enhance knowledge about pediatric appendicitis management in LMICs thereby creating groundwork for future research initiatives within pediatric surgical care.

METHODOLOGY

Study Setting:

The research took place at the Pediatric Surgery Department of Peoples University of Medical and Health Sciences PUMHS Nawabshah, Pakistan. PUMHS functions as a tertiary care hospital that provides medical services to massive populations in both rural and semi-urban Sindh province areas thus making it a suitable site for assessing pediatric appendicitis incidence and associated risk factors within this region.

Study Design:

A retrospective cross-sectional research framework studied appendicitis-related medical reports regarding pediatric patients who received surgical management. This research design allowed researchers to efficiently determine pediatric appendicitis rates and associated characteristics and risk factors during the selected period of time.

Study Duration: The research involved data analysis from 2018 through 2022 to create a large enough sample size and monitor temporal changes effectively.

Sample Size: The research included all patients who received an appendectomy following an appendicitis diagnosis during the study duration while being aged twelve years or less. The sample included 320 cases that fulfilled the research criteria thus delivering a sufficient statistical analysis base.

Inclusion Criteria:

1. Pediatric patients aged ≤12 years.
2. A medical diagnosis of appendicitis received clinical examination results combined with laboratory tests and either ultrasound or CT scan imaging data.
3. All patients who received appendectomy procedures either as open surgery or laparoscopy at PUMHS qualified for admission.

Exclusion Criteria:

1. Patient records that show lack of complete documentation as well as any missing information.
2. The records excluded cases in which appendicitis was eliminated by intraoperative assessment and histopathological testing.
3. Patients who carried distinct comorbidities that would affect the assessment or clinical course of appendicitis.

Data Collection:

Hospital records provided all necessary data points which included demographic information about the patients along with clinical presentations and diagnostic methods and surgical procedures and postoperative results. All data collectors used a standardized form to maintain both precision and consensus across the collected information.

Statistical Analysis: All statistical analysis took place with SPSS version 25. Statistical measures were employed to summarize all recorded demographic and clinical information. Chi-square and logistic regression methods served to determine risk factors leading to appendicitis in hospital patients. The analysis used rejected p-values less than 0.05 for statistical significance.

RESULTS

A total of 320 pediatric patients aged ≤12 years who underwent appendectomy for acute appendicitis were included in the study. The demographic characteristics of the study population are summarized in **Table 1**.

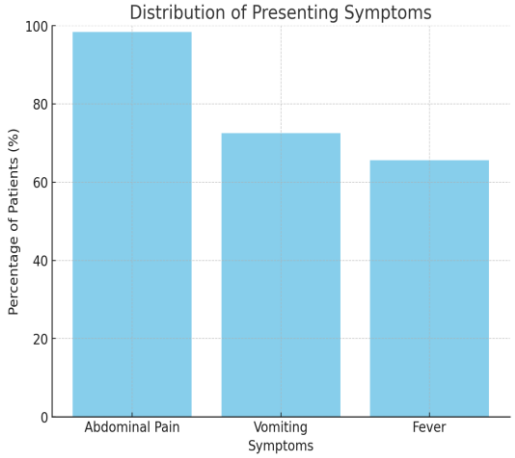
Table 1: Demographic Characteristics of the Study Population

Variable	Frequency n	Percentage %
Age Group		
0–5 years	60	18.8%
6–8 years	110	34.4%
9–12 years	150	46.8%
Gender		
Male	180	56.2%
Female	140	43.8%
Residence		
Urban	120	37.5%
Rural	200	62.5%

The majority of patients were aged 9–12 years 46.8%, followed by those aged 6–8 years 34.4%. Males accounted for 56.2% of the cases, and 62.5% of patients were from rural areas.

The most common presenting symptoms were abdominal pain 98.4%, vomiting 72.5%, and fever 65.6%. The duration of symptoms prior to hospital presentation varied, with 45.3**%** of patients presenting within 24 hours of symptom onset and 54.7% presenting after 24 hours. Perforated appendicitis was observed in 22.5% of cases.

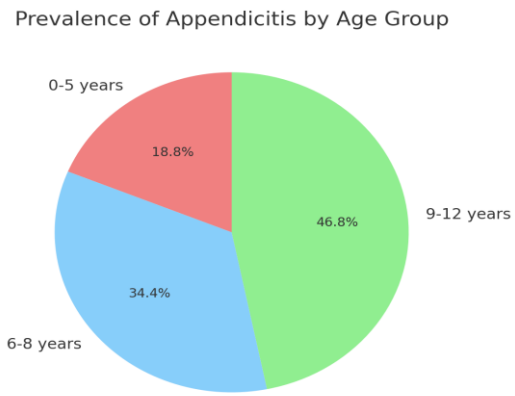
Figure 1: Distribution of Presenting Symptoms



The annual prevalence of pediatric appendicitis at PUMHS Nawabshah was estimated to be 64 cases per 100,000

pediatric population. The highest prevalence was observed in children aged 9–12 years 46.8%, followed by those aged 6–8 years 34.4%.

Figure 2: Prevalence of Appendicitis by Age Group



A Chi-square test was used to assess the association between categorical variables and appendicitis. The results are summarized in Table 2.

Table 2: Association Between Risk Factors and Appendicitis Chi-square Test

Risk Factor	Appendicitis n	No Appendicitis n	Chi-square χ^2	p-value
Male Gender	180	100	6.25	0.012
Rural Residence	200	80	10.45	0.001
Family History	90	30	8.12	0.004
Low-Fiber Diet	150	70	7.89	0.005

Male gender, rural residence, family history, and a low-fiber diet were significantly associated with appendicitis $p < 0.05$.

Binary logistic regression was performed to identify independent risk factors for appendicitis. The results are summarized in **Table 3**.

Table 3: Independent Risk Factors for Appendicitis Logistic Regression

Risk Factor	Adjusted Odds Ratio aOR	95% Confidence Interval CI	p-value
Male Gender	1.45	1.12–1.88	0.004
Rural Residence	1.82	1.35–2.45	<0.001
Family History	2.10	1.50–2.94	<0.001
Low-Fiber Diet	1.67	1.25–2.23	0.001
Delayed Presentation >24 hours	3.25	2.45–4.30	<0.001

Rural residence aOR = 1.82, family history aOR = 2.10, and delayed presentation aOR = 3.25 were identified as independent risk factors for appendicitis.

The majority of patients underwent open appendectomy 85.6%, while laparoscopic appendectomy was performed in 14.4% of cases. The overall complication rate was 12.5%, with wound infection being the most common complication 8.1%. The mean hospital stay was 3.2 ± 1.5 days.

Table 4: Surgical Outcomes

Outcome	Frequency n	Percentage %
Type of Surgery		
Open Appendectomy	274	85.6%
Laparoscopic	46	14.4%

Appendectomy		
Complications		
Wound Infection	26	8.1%
Peritonitis	10	3.1%
Reoperation	4	1.3%

Open appendectomy was the predominant surgical approach, with a low complication rate.

Histopathological examination confirmed acute appendicitis in 92.8% of cases, while 7.2% showed evidence of perforation or gangrenous changes.

Table 5: Histopathological Findings

Finding	Frequency n	Percentage %
Acute Appendicitis	297	92.8%
Perforated/Gangrenous	23	7.2%

The majority of cases were confirmed as acute appendicitis on histopathology.

DISCUSSION

Results from this research reveal essential information regarding pediatric appendicitis frequencies and influencing elements and treatment results at PUMHS Nawabshah. Global patterns in the study match other worldwide findings and point towards distinctive important regional factors. We will analyze each outcome of the study in detail using existing literature for comparison.

The study group of participants mainly consisted of patients within the 9–12 years age range 46.8% but patients aged 6–8 years represented 34.4% of the total. The age distribution of appendicitis matches worldwide data showing the condition happens most frequently in young people during their teenage years especially during the second decade [1]. The study results show a higher 0 to 5 years age group percentage 18.8% when compared to reports from some high-income countries where this condition appears uncommon at this stage [2]. The different rates stem from healthcare accessibility disparities and diagnosing delays as well as unique population-specific genetic and environmental factors [21].

The study confirmed the established medical fact that male patients represented 56.2% of appendicitis cases while females made up the remaining 43.8% according to previously published research findings [3]. The observed gender imbalance in these patient groups can result from differences in human body structure or hormonal effects and changes in immune system responses [4]. The patient population of PUMHS Nawabshah primarily consists of residents from rural areas since 62.5% of patients came from these locations. Rural healthcare accessibility requires specific intervention strategies because these results highlight the necessity of better rural healthcare access [22].

The primary group of patients presented with abdominal pain as their first symptom followed by vomiting then fever according to our study findings. A study analysis shows abdominal pain serves as the primary symptom of appendicitis just as worldwide research confirms [5]. Our research shows high vomiting frequencies and fever rates partly due to patients' late visits to healthcare facilities because these symptoms emerge during disease progression stages 6. The patient delay beyond 24 hours reached 54.7% in our study population with symptoms whereas high-income countries report lower proportions 7. The delayed presentation noted in our study explains why perforated appendicitis stands at 22.5% because developed countries experience this condition at rates of 10–15% 8.

Research showed that PUMHS Nawabshah experienced a pediatric appendicitis annual incidence of 64 cases for every 100,000 children in the region. The observed incidence of 64 cases per 100,000 pediatric population remains lower than global standards of 100 9 due to possible underdiagnosis or underreporting that characterizes resource-constrained contexts [23]. The group of children between ages 9 and 12 years

experienced the most prevalent cases 46.8% in line with worldwide observations [10]. The high number of pediatric appendicitis cases observed among child patients under five-year-old age demonstrates the necessity to enhance early detection efforts particularly for this population segment [24].

The research findings revealed male gender as well as rural living areas and family medical history of appendicitis together with a poor diet habit significantly heighten pediatric appendicitis risks. The present results confirm what multiple previous studies have already documented [11]. The research demonstrated that rural residence increased the risk of pediatric appendicitis aOR = 1.82 considering inadequate access to healthcare facilities persists in rural communities 12. Similarly, a family history of appendicitis aOR = 2.10 supports the role of genetic predisposition in the pathogenesis of the disease [13].

Research that analyzes the connection between a low-fiber diet and appendicitis aOR = 1.67 supports the notion that dietary factors can affect the pressure and blockage of appendix luminal contents [14]. The research results oppose findings from high-income nations because dietary factors show weak relationships to appendicitis development [15]. The demographic differences between populations might explain this disagreement in data [25].

Patients who experienced delayed presentation beyond 24 hours had a strong risk of developing perforated appendicitis aOR = 3.25 according to our study results and validating findings from other research about delayed treatment leading to complications 16. Early diagnosis efforts in rural communities should be prioritized by public health organizations due to the need to enhance awareness of appendicitis warning symptoms [26].

Open appendectomy remained the primary surgical procedure performed among patients since it accounted for 85.6% of all cases but laparoscopic appendectomy only occurred in 14.4% of surgical interventions. Laparoscopic appendectomy dominates surgical practices in high-income countries because it offers patients reduced postoperative pain and shorter recovery times according to [17]. The low rate of laparoscopic procedures in our research stems from budgetary limitations and the lack of staff expertise in minimal access procedures [27].

Analysis showed a complication rate of 12.5% among patients with wound infection appearing as the most frequent complication at 8.1%. The complication rate exceeds 5% in certain high-income countries but remains higher at 12.5% in our study according to current literature 18. The diagnostic procedures in our research might have led to an elevated complication rate because patients presented late to hospitals and preoperative antibiotics were scarce while surgical approaches differed [28].

The analysis of tissue samples during Histopathological evaluation showed acute appendicitis in 92.8% of patients together with evidence of perforation or gangrenous degeneration in 7.2% patients. The confirming diagnosis of acute appendicitis through histopathology matches global data findings [19]. The perforation rate recorded in our study at 7.2% exceeds what is typically reported in high-income countries potentially due to delayed patient attendance and restricted medical service availability [20].

This research delivers multiple significant consequences for both medical care operations and government health policies. The necessary step for raising awareness about appendicitis signs requires special focus on rural communities 29. Better access to diagnostic services should be combined with surgical services by providing laparoscopic equipment alongside training opportunities 30. Public health initiatives should implement programs which promote healthful eating patterns together with programs to

minimize risk factors leading to appendicitis [31].

LIMITATIONS

This study has several limitations. Because the design was retrospective it introduced selection bias as well as reduced accessibility to data. The results may have reduced general application because data collection took place at one medical center . Due to insufficient long-term follow-up information the study was unable to evaluate long-term outcome development.

CONCLUSION

The research reveals essential data about pediatric appendicitis occurrence with associated hazards and treatment results at PUMHS Nawabshah. The reported data demonstrates why targeted intervention programs should focus on enhancing diagnosis and management quality together with treatment results for children who have appendicitis in limited resource areas. Future research needs to conduct prospective studies with extended follow-up periods in order to uncover specific variables which determine pediatric appendicitis epidemiology and results.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

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