



## Original Research Article

# ETIOLOGICAL DIAGNOSIS OF CHILDREN PRESENTING WITH ABDOMINAL PAIN & MESENTERIC LYMPHADENOPATHY

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**ABSTRACT**

**Background:** Mesenteric lymphadenopathy is a notable finding in children presenting with abdominal pain. It may be associated with a wide spectrum of underlying aetiologies that may range from benign infections to more serious inflammatory or neoplastic conditions. Accurate identification of the etiology is essential for appropriate management and improving outcomes. Recognizing specific causes enables targeted treatment ensuring timely intervention that reduces morbidity and complications in the pediatric population.

**Materials and Methods:** This cross-sectional observational study included 80 children aged 2-12 with recurrent abdominal pain and mesenteric lymphadenopathy. Demographic details, clinical history, and ultrasound (USG) evaluation were done. On ultrasound lymph node size, shape, location, echogenicity, free fluid, bowel wall thickening and signs of appendicitis were assessed. Diagnostic tests included complete blood count, CRP, ESR, blood culture, Widal test, Mantoux test, chest X-ray, urine and stool cultures. Abdominal CT or MRI was done in selected cases. For statistical purposes P value less than 0.05 was taken as statistically significant.

**Results:** In this study of 80 children with mesenteric lymphadenopathy, 57.5% were boys and 42.5% were girls with a male-to-female ratio of 1:0.73. Abdominal pain characteristics varied, with 35% experiencing pain lasting 31–60 minutes, mainly localized to the umbilical region (20%) and right iliac fossa (15%). Most children were aged between 6–10 years. Etiological diagnosis showed bacterial infections in 37.5% of cases, primarily urinary tract infections (66.7%), followed by tuberculosis and enteric fever (16.7% each). Viral infections accounted for 12.5%. Miscellaneous causes were observed in 47.5% out of which predominantly functional abdominal pain (65.8%) was most common followed by constipation (21.1%) and gastrointestinal infections (13.2%).

**Conclusion:** Early identification and thorough evaluation of mesenteric lymphadenitis in pediatric abdominal pain is important for accurate diagnosis thereby enabling appropriate treatment and preventing complications which may be seen in cases of delayed diagnosis.

**Keywords:** Abdominal Pain, Children, Imaging, Ultrasound, Mesenteric lymph nodes.

**INTRODUCTION**

Abdominal pain is a frequent and often challenging complaint in the pediatric age group and is one of the common causes of emergency department and outpatient visits. Children with abdominal pain may

exhibit a wide range of symptoms from mild discomfort to severe abdominal pain.<sup>[1]</sup> The underlying etiology can vary from transient benign conditions to serious life-threatening disorders. This symptom often manifests with nonspecific findings making clinical evaluation complex and necessitating a thorough diagnostic approach to avoid both

underdiagnosis and unnecessary investigations. It is important to diagnose underlying cause of abdominal pain to ensure timely and appropriate management thereby reducing morbidity and complications in the pediatric population.<sup>[2]</sup>

The differential diagnosis for abdominal pain in children is extensive and varies with age, clinical presentation and underlying health conditions. Common causes of abdominal pain in the pediatric age group include gastrointestinal disorders such as gastroenteritis, constipation, and functional abdominal pain. Infections such as urinary tract infections and appendicitis are also prevalent. In addition to gastrointestinal and infectious causes systemic conditions such as Henoch-Schönlein purpura and inflammatory bowel disease are also known to present with abdominal pain. These diverse aetiologies make it important to identify the exact cause of the pain so that the condition can be managed appropriately.<sup>3</sup>

Most often, abdominal pain in children is attributed to benign causes. Functional gastrointestinal disorders such as irritable bowel syndrome and functional dyspepsia represent a substantial number of cases. Viral gastroenteritis is also a frequent diagnosis in young children with abdominal pain. In such cases, conservative management, including hydration and symptomatic treatment is usually sufficient. However, in some instances, abdominal pain may indicate an underlying pathology that warrants further investigation. Recognizing the signs that differentiate benign from potentially serious conditions is crucial for pediatricians as it helps in deciding about the need for further diagnostic workup including abdominal imaging such as ultrasound and computed tomography.<sup>[4]</sup>

A careful workup is essential in children presenting with abdominal pain particularly when symptoms persist or when there are red flags such as fever, weight loss or persistent vomiting. The clinical workup includes a detailed history, physical examination, laboratory tests and imaging studies. Ultrasound is often the preferred initial imaging modality due to its non-invasive nature, lack of ionizing radiation and high diagnostic accuracy in detecting abdominal pathology in children. Ultrasound can identify causes of abdominal pain, such as appendicitis, intussusception and mesenteric lymphadenopathy. The role of ultrasound in the evaluation of pediatric abdominal pain is well-established as it provides valuable diagnostic information while being safe and well-tolerated by children.<sup>[5]</sup>

One of the common findings on ultrasound in children presenting with abdominal pain is mesenteric lymphadenopathy which refers to the enlargement of lymph nodes in the mesentery. This finding may be an incidental result of a benign, self-limiting viral infection or in some cases may suggest an underlying inflammatory or infectious process.<sup>[6]</sup> When mesenteric lymphadenopathy is identified clinical correlation and follow-up are essential to

determine whether further investigation or intervention is needed. The causes of mesenteric lymphadenopathy in children range from benign infections to more serious conditions requiring intervention.<sup>[7]</sup> Viral illnesses, such as adenovirus and Epstein-Barr virus infections, are frequently associated with mesenteric lymphadenopathy. Bacterial infections such as those caused by *Yersinia* and *Mycobacterium tuberculosis* can also present with enlarged mesenteric lymph nodes. Additionally autoimmune conditions including inflammatory bowel disease and neoplastic diseases such as lymphoma are some of uncommon causes of mesenteric lymphadenopathy in pediatric age group.<sup>[8]</sup>

Despite the extensive knowledge on pediatric abdominal pain and mesenteric lymphadenopathy, there remain gaps in understanding the etiological diagnosis and outcomes in children presenting with these symptoms. Undertook this prospective observational study to provide a better understanding of the underlying causes, clinical course, and outcomes of children presenting with abdominal pain and found to have mesenteric lymphadenopathy.

## MATERIALS AND METHODS

This was a cross sectional observational study conducted in the department of Pediatrics of a tertiary care medical college. 80 children between the age group of 2 to 12 years were included in this study on the basis of a predefined inclusion and exclusion criteria. Institutional ethics committee approval was obtained before commencement of the study and informed and written consent was taken from the parents or guardians of the children. The duration of study was 6 months extending from May 2024 to October 2024. The sample size was determined based on pilot studies related to abdominal pain in children. With a power (1-Beta error) set at 80% and a confidence level (1-Alpha error) of 95%, the minimum required sample size was calculated to be 78 patients. Consequently, we included 80 children with recurrent abdominal pain and mesenteric lymphadenopathy in this study.

Demographic details such as age and gender were noted in all the cases. Socioeconomic status of parents and area of residence was also documented. A detailed history was obtained with respect to duration as well as number of episodes of abdominal pain in recent past. History of severity of abdominal pain and presence of associated symptoms such as loose motions or vomiting was also asked for and noted.

Only those children who were found to have mesenteric lymphadenopathy on abdominal ultrasound were included in this study. For this purpose a short axis diameter of 8 mm was taken as minimum size suggestive of mesenteric lymphadenopathy as suggested by Boaz Karmazyn et al. 9 The ultrasound features noted in these children

included the size, shape and location of mesenteric lymph nodes. In addition to this echogenicity of the lymph nodes, presence of free fluid in the abdomen, bowel wall thickening and signs of appendicitis were also noted.

Further evaluation for etiological diagnosis was done in all cases. Complete blood count (including hemoglobin, total count and differential count), C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), blood culture with antibiotic sensitivity, Widal test, Mantoux test, chest X-ray, sputum culture and sensitivity, acid-fast bacillus (AFB) smear examination, nucleic acid amplification test (CB-NAAT) with culture sensitivity, urine routine examination and culture & sensitivity, stool routine examination and culture & sensitivity, throat swab culture and sensitivity and abdominal CT or MRI were done in selective cases depending upon history, clinical examination and ultrasound features. On the basis of history, clinical features, laboratory investigations and imaging studies an etiological diagnosis was made.

Statistical analysis was done using the Statistical Package for the Social Sciences version 23.0 software. Quantitative data was presented as mean and standard deviation. Qualitative data was shown as incidence and percentage tables. For quantitative data, paired t-test and for qualitative data Chi-square test was used. P value less than 0.05 was taken as significant for statistical purpose.

#### Inclusion Criteria

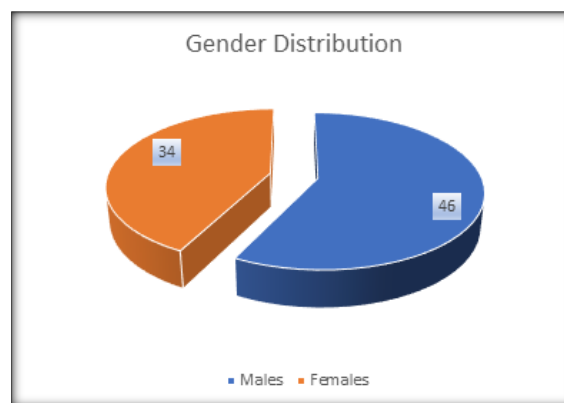
1. Children presenting with abdominal pain and having enlarged mesenteric lymph nodes of at least 8 mm size in short axis diameter (as suggested by Boaz Karmazyn et al9).
2. Age between 2 to 12 years.
3. Written and informed consent obtained from parents.

#### Exclusion Criteria

1. Age below 2 or above 12 years.
2. Parents' or guardians' refusal to give written consent to be part of study.
3. Children with pre-existing chronic gastrointestinal diseases.
4. History of abdominal surgeries in last 3 months.
5. Severe Acute Illness or Hemodynamic Instability.

## RESULTS

The analysis of gender distribution amongst the studied cases showed that out of 80 children there were 46 (57.50%) boys and 34 (42.50%) girls. There was a male preponderance with M:F ratio of 1:0.73. [Figure 1]



**Figure 1: Gender Distribution of the studied cases.**

The analysis of the age distribution among boys and girls presenting showed that the majority of cases in both genders fell within the 6–10 years age group. 20 boys (25.00%) and 15 girls (18.75%) were in this age category. For children aged 2–5 years, there were 11 boys (13.75%) and 9 girls (11.25%). In the age group above 10 years, 15 boys (18.75%) and 10 girls (12.50%) were observed. The mean age of boys and girls was  $9.48 \pm 4.46$  and  $9.48$  years and  $8.91 \pm 3.92$  years respectively. The mean age of boys and girls was found to be comparable with no statistically significant difference ( $P=0.5540$ ). [Table 1]

The analysis of abdominal pain characteristics in children revealed that 20 children (25%) experienced their first episode, while 26 (32.50%) and 34 (42.50%) children each reported 1–3 episodes and more than 3 episodes. The mean duration of abdominal pain showed that 28 children (35.00%) experienced pain lasting between 31 and 60 minutes, while 23 children (28.75%) reported pain lasting more than 1 hour. Additionally, 17 children (21.25%) had pain episodes lasting 16–30 minutes, and 12 children (15.00%) reported pain episodes of less than 15 minutes. In highest number of cases pain was localized to the umbilical region (20.00%). Other common pain sites included the right iliac fossa (15.00%), the epigastric region (11.25%), and the right lumbar region (8.75%). 12 children (15.00%) experienced diffuse pain without specific localization. [Table 2]

The analysis of lymph node characteristics showed the majority of cases (37.50%) had between 3 and 5 enlarged lymph nodes, while 29 children (36.25%) had more than 5 nodes, and 21 children (26.25%) had fewer than 3 nodes. As for the short-axis size of the largest lymph node, 33 children (41.25%) had nodes measuring between 11 and 15 mm, followed by 28 children (35.00%) with nodes larger than 15 mm, and 19 children (23.75%) with nodes sized 8–10 mm. In 12 (15%) children further imaging in the form of CT or MRI was done. [Table 3]

The analysis of the etiological classification of mesenteric lymphadenitis among children showed that the most common etiological causes were bacterial infections (37.5%), viral infections (12.5%) and miscellaneous causes (47.5%). Within the

bacterial etiology (n=30), urinary tract infections (UTIs) were the primary cause, identified in 20 cases (66.7%). Tuberculosis and enteric fever each accounted for 5 cases (16.7%). For cases classified under miscellaneous causes (n=38), functional

abdominal pain was the predominant diagnosis observed in 25 cases (65.8%). This was followed by constipation in 8 cases (21.1%) and GI infections in 5 cases (13.2%). [Table 4]

**Table 1: Gender Distribution of the studied cases**

| Age Group (Years) | Boys (n=46) |            | Girls (n=34) |            |
|-------------------|-------------|------------|--------------|------------|
|                   | Number      | Percentage | Number       | Percentage |
| 2-5               | 11          | 13.75%     | 9            | 11.25%     |
| 6-10              | 20          | 25.00%     | 15           | 18.75%     |
| Above 10          | 15          | 18.75%     | 10           | 12.50%     |
| Total             | 46          | 57.50%     | 34           | 42.50%     |
| Mean ± SD (years) | 9.48 ± 4.46 |            | 8.91 ± 3.92  |            |

**P = 0.5540 95% CI -2.4791 to 1.3391**

**Table 2: Duration and characteristics of abdominal pain**

| Characteristics of abdominal pain                     |                                   | Number of cases | Percentage |
|-------------------------------------------------------|-----------------------------------|-----------------|------------|
| Number of episodes of abdominal pain in last 6 months | First Episode                     | 20              | 25.00%     |
|                                                       | 1-3 Episodes                      | 26              | 32.50%     |
|                                                       | More than 3 Episodes              | 34              | 42.50%     |
| Mean duration of abdominal pain                       | Less than 15 minutes              | 12              | 15.00%     |
|                                                       | 16-30 minutes                     | 17              | 21.25%     |
|                                                       | 31-60 minutes                     | 28              | 35.00%     |
|                                                       | More than 1 hour                  | 23              | 28.75%     |
| Site of maximal Pain                                  | Right hypochondriac               | 5               | 6.25%      |
|                                                       | Epigastric region                 | 9               | 11.25%     |
|                                                       | Left hypochondriac                | 4               | 5.00%      |
|                                                       | Right lumbar                      | 7               | 8.75%      |
|                                                       | Umbilical                         | 16              | 20.00%     |
|                                                       | Left lumbar                       | 3               | 3.75%      |
|                                                       | Right iliac fossa                 | 12              | 15.00%     |
|                                                       | Hypogastric                       | 6               | 7.50%      |
|                                                       | Left iliac fossa                  | 2               | 2.50%      |
|                                                       | Diffuse pain without localization | 12              | 15.00%     |

**Table 3: Imaging features of mesenteric lymphadenopathy**

| Number size and further evaluation of studied cases |                 | Number of cases | Percentage |
|-----------------------------------------------------|-----------------|-----------------|------------|
| Number of Enlarged mesenteric lymphnodes            | Less than 3     | 21              | 26.25%     |
|                                                     | 3-5             | 30              | 37.50%     |
|                                                     | More than 5     | 29              | 36.25%     |
|                                                     | Total           | 80              | 100.00%    |
| Short axis size of largest lymphnode                | 8-10 mm         | 19              | 23.75%     |
|                                                     | 11-15 mm        | 33              | 41.25%     |
|                                                     | More than 15 mm | 28              | 35.00%     |
|                                                     | Total           | 80              | 100.00%    |
| Further Imaging                                     | Yes (CT/MRI)    | 12              | 15.00%     |
|                                                     | Not indicated   | 68              | 85.00%     |
|                                                     | Total           | 80              | 100.00%    |

**Table 4: Etiological profile of children with mesenteric lymphadenopathy**

| Etiological Classification                                                        | Frequency                                      | Percentage (%) |      |
|-----------------------------------------------------------------------------------|------------------------------------------------|----------------|------|
| Possible Etiological Agent of Mesenteric Lymphadenitis                            | Viral                                          | 10             | 12.5 |
|                                                                                   | Bacterial                                      | 30             | 37.5 |
|                                                                                   | Parasitic                                      | 2              | 2.5  |
|                                                                                   | Miscellaneous (e.g., Functional, GI infection) | 38             | 47.5 |
|                                                                                   | Total                                          | 80             | 100  |
| Classification of Bacterial Etiology of Mesenteric Lymphadenitis (N = 30)         | Tuberculosis                                   | 5              | 16.7 |
|                                                                                   | UTI (Urinary Tract Infection)                  | 20             | 66.7 |
|                                                                                   | Enteric Fever                                  | 5              | 16.7 |
|                                                                                   | Total                                          | 30             | 100  |
| Working Diagnosis Among Miscellaneous Causes of Mesenteric Lymphadenitis (N = 38) | Functional Abdominal Pain                      | 25             | 65.8 |
|                                                                                   | GI Infection                                   | 5              | 13.2 |
|                                                                                   | Constipation                                   | 8              | 21.1 |
|                                                                                   | Total                                          | 38             | 100  |



## DISCUSSION

Abdominal pain in children can indicate a broad spectrum of underlying conditions from self-limiting infections to severe bacterial and systemic diseases including conditions such as tuberculosis and enteric fever.<sup>[10]</sup> The use of ultrasound serves as a valuable tool in the initial evaluation as it not only aids in visualizing enlarged lymph nodes but also directs the need for further interventions like CT or MRI in selected cases. Given the varied etiologies, clinical correlation with laboratory and imaging findings is indispensable for appropriate diagnosis and management of children presenting with mesenteric lymphadenopathy.<sup>[11]</sup>

IN this study there was a male preponderance with M:F ratio of 1:0.73. The mean age of boys and girls was  $9.48 \pm 4.46$  and  $9.48$  years and  $8.91 \pm 3.92$  years respectively. In highest number of cases pain was localized to the umbilical region (20.00%). Other common pain sites included the right iliac fossa (15.00%), the epigastric region (11.25%), and the right lumbar region (8.75%). 12 children (15.00%) experienced diffuse pain without specific localization. Allagadda DA et al conducted a prospective observational study to evaluate the aetiology of abdominal pain associated with significant mesenteric lymphadenopathy in a pediatric population.<sup>[12]</sup> The study found that among the children studied, 30.8% were aged 5-8 years, 36.9% were aged 9-12 years, and 32.3% were aged 13-15 years. Significant mesenteric lymphadenopathy was present in all cases, with no etiological agent identified in 53.8% of cases. For the remaining 46.2%, the causes included bacterial infections (38.5%), viral infections (6.2%), and parasitic infections (1.5%). On the basis of these findings, the authors concluded that Children should be evaluated for an etiological agent; if none is found, the pain may be classified as functional abdominal pain. Proper diagnosis and treatment of these cases could significantly improve the patients' quality of life. Similar age groups of children with mesenteric lymphadenopathy were also reported by the authors such as Vayner N et al,<sup>[13]</sup> and Zu DM et al.<sup>[14]</sup>

In this study most cases (37.5%) had between 3 and 5 enlarged lymph nodes, while 36.25% of children had more than 5 nodes, and 26.25% had fewer than 3 nodes. Regarding the size, 41.25% of children had a largest lymph node short-axis measurement of 11–15 mm, 35% had nodes larger than 15 mm, and 23.75% had nodes sized 8–10 mm. Further imaging with CT or MRI was conducted in 15% of children.

Valecha J et al conducted a retrospective study to evaluate the incidence of enlarged mesenteric lymph nodes detected via ultrasound in pediatric patients presenting with abdominal pain.<sup>[15]</sup> The study found that the incidence of enlarged lymph nodes increased with age, peaking around ages 5–8 years. The transverse diameter of the lymph nodes was generally larger than the anteroposterior diameter, with most

nodes measuring 10–14 mm in transverse diameter and 4–8 mm anteroposteriorly. On the basis of these findings, the authors concluded that mesenteric lymphadenitis, often viral and self-limiting, can mimic appendicitis and present diagnostic challenges. Accurate ultrasound diagnosis can typically prevent unnecessary surgical intervention. Similar characteristics of enlarged mesenteric lymphnodes in children presenting with abdominal pain were also reported by the authors such as Maheswari K et al,<sup>[16]</sup> and Sabal S et al.<sup>[17]</sup>

The analysis of the etiological classification of mesenteric lymphadenitis in children revealed bacterial infections (37.5%), viral infections (12.5%) and miscellaneous causes (47.5%) as the primary etiologies. Among bacterial cases (n=30), urinary tract infection (UTI) was the most common which was found in 66.7% of cases, with tuberculosis and enteric fever each accounting for 16.7%. Within the miscellaneous category (n=38) functional abdominal pain was predominant (65.8%) followed by constipation (21.1%) and gastrointestinal infections (13.2%). Grazyna Sikorska-Wisniewska et al conducted a cross-sectional study to investigate the etiological factors and clinical features associated with mesenteric lymphadenopathy in hospitalized children.<sup>[18]</sup> Ultrasonographic patterns included densely grouped lymph nodes in 51.2% of cases and nodes exceeding 10 mm in the long axis in 66.9% of cases. Etiological evaluation revealed that acute diarrhea, celiac disease, and viral infections (notably cytomegalovirus) were frequent causes, while autoimmune factors and malignancies were less common. Elevated inflammatory markers, detected in 33.1% of patients, further supported an infectious or inflammatory etiology in a subset of cases. On the basis of these findings, the authors concluded that mesenteric lymphadenopathy in children is often multifactorial, frequently involving infectious, gastrointestinal, and immunologic etiologies, and thus requires comprehensive diagnostic work-up to identify the underlying cause. Similar etiologies were also reported by the authors such as Sivit CJ et al,<sup>[19]</sup> and Benetti C et al.<sup>[20]</sup>

## CONCLUSION

Recognizing mesenteric lymphadenitis as a distinct clinical entity in pediatric patients with abdominal pain is essential. Comprehensive evaluation for potential etiological agents is crucial, as identifying a specific cause enables targeted treatment. Making an early and accurate etiological diagnosis in these cases is essential for appropriate treatment and prevention of complications associated with delayed diagnosis.

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