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Original Research

Clinical Evaluation and Outcomes of Mesenteric Lymphadenopathy in Children: A Cross-Sectional Analysis

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Abstract

Objectives: This study aimed to evaluate the etiology, clinical characteristics, and outcomes of mesenteric lymphadenopathy (ML) in children, with an emphasis on its clinical significance and management strategies.

Methods: This cross-sectional, single-center study was conducted between July 2016 and May 2017 and included pediatric patients aged 1 month to 18 years diagnosed with ML via abdominal ultrasonography. Patients with malignancies, acute infections, ongoing corticosteroid or antibiotic treatment, or incomplete follow-up were excluded. Data collection included demographic, clinical, and laboratory findings. Statistical analyses were performed using IBM SPSS Statistics version 25. The Mann–Whitney U test was used for comparisons of numerical variables between groups, while the chi-square and Fisher's exact tests were applied for categorical variables. A p-value less than 0.05 was considered statistically significant.

Results: A total of 106 patients were included with a median age of 7.4 years (range: 8 months–16.4 years), of whom 55.7% were male. The majority (63%) were aged 6–11 years. Abdominal pain was the most common symptom (64.2%), and 99.1% of the ML cases were localized in the right lower quadrant. At 1-month follow-up, lymph node sizes regressed to normal in 71.7% of cases, while 28.3% remained pathological. Antibiotic use did not significantly affect lymph node regression. At 6 months, no new symptoms or diagnoses were reported in the 91 patients contacted. ML was most often idiopathic (76.4%), with secondary causes including gastrointestinal and respiratory infections, acute abdomen, and Familial Mediterranean Fever.

Conclusion: In children, ML is predominantly benign and self-limiting, and in most cases, it resolves without medical intervention. Although its association with symptoms such as abdominal pain may cause anxiety in parents, careful monitoring of patients can prevent unnecessary interventions. This study underscored the importance of conservative management and highlighted the need for further research with larger cohorts and extended follow-up periods to explore rare etiologies and long-term outcomes.

Keywords: Abdominal pain, children, lymph node enlargement, mesenteric lymphadenopathy, pediatric ultrasonography

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In children, peripheral lymphadenopathies are often detectable during physical examinations, while abdominal lymphadenopathies are typically identified during abdominal imaging.[1] Mesenteric lymphadenopathy (ML) is the most frequently observed form of abdominal lymphadenopathy on ultrasonography (US), although its clinical significance is often overlooked.[2-4] Radiologically, ML is defined as the presence of three or more lymph nodes with a short axis greater than 5 mm, while mesenteric lymph nodes with a short axis less than 5 mm are considered normal.[5-8] ML is further classified as primary when no associated pathology is identified and secondary when it coexists with other abnormalities.[4,5]

Although ML is often not considered a disease, MLs are frequently identified in patients presenting with abdominal pain during diagnostic evaluation.[9,10] Despite this condition being self-limiting and having a recovery time of approximately 1 month, the duration and course can vary depending on the underlying pathology.[10] ML has been associated with a wide range of conditions, including acute appendicitis, lymphoma, and intussusception.[11-13] Common etiologies for ML include viral infections (e.g., adenovirus), gastroenteritis, HIV, Yersinia enterocolitica, and tuberculosis.[2,14-16] It has also been observed in inflammatory conditions, such as inflammatory bowel disease and Familial Mediterranean Fever (FMF).[17] While malignancies are rarely the underlying cause of isolated ML in children, affected patients are frequently referred to pediatric oncology clinics. This can lead to significant parental anxiety, unnecessary procedures, and increased healthcare costs.

ML is often encountered as a benign condition in childhood and, in most cases, does not even require treatment. This study aims to evaluate the etiology, clinical characteristics, and management of enlarged mesenteric lymph nodes detected on US in pediatric patients. Additionally, we assess the outcomes, including the incidence of malignancies, to better understand the clinical relevance of ML and guide appropriate management strategies.

Methods

Study Population and Patient Selection

A cross-sectional, single-center study was conducted at the Department of Pediatrics at the Sisli Hamidiye Etfal Training and Research Hospital between July 2016 and May 2017. This included all pediatric patients aged between 1 month and 18 years who had been diagnosed with ML through abdominal US during visits to the emergency department or any pediatric outpatient clinic. After completing the necessary tests at the relevant clinics, these patients were referred to our unit to obtain consent to participate in the study. Among the patients who consented to participate, those with a history of malignancy, acute infections, corticosteroid treatment, ongoing antibiotic therapy, and liver and kidney disease; those who had not attended follow-up visits; and those whose data were unavailable were excluded from the study (Fig. 1).

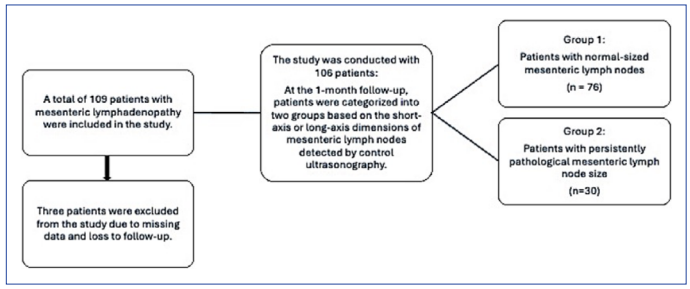

Figure 1. Flowchart of the included and excluded patients in the study.

The study was conducted in three phases. The first phase involved the inclusion of patients in the study, and the completion of physical examination, laboratory tests, and imaging studies for etiological evaluation. The second phase consisted solely of follow-up abdominal US conducted 1 month after the initial phase to evaluate the patients' ML status. The third phase involved no additional diagnostic tests; instead, it consisted of brief telephone interviews conducted 6 months later to assess the final outcomes of the patients. At the end of the interviews, information was gathered regarding ongoing complaints or new diagnoses. During this process, any new diagnoses received by the patients were recorded in a data form.

Data Collection

After the study was completed, demographic data (age, gender, symptoms, duration of symptoms, and presence of comorbidities), clinical data (body weight, height, body mass index (BMI), and physical examination findings), and laboratory data (sedimentation rate, procalcitonin, mean corpuscular volume (MCV), lactate dehydrogenase (LDH), uric acid, C-reactive protein (CRP), eosinophils, hemoglobin (Hgb), lymphocyte, neutrophil, and white blood cell counts) were analyzed for all patients. Peripheral blood smears performed simultaneously with the complete blood count were independently assessed by two physicians. Tuberculin skin tests (TSTs) and chest X-rays were planned for those with a history of contact with adults with pulmonary tuberculosis. The TSTs were performed using the appropriate technique at the tuberculosis dispensary. The transverse diameter of the induration formed 72 hours after administration was marked with a ballpoint pen and measured by a healthcare professional. The TST results were evaluated according to the thresholds recommended by the Tuberculosis Control Department of the Ministry of Health of the Republic of Türkiye.[18]

The patients included in the study were grouped by age into below 5 years, 6–11 years, and 12–18 years. Their body mass indices were categorized according to World Health Organization (WHO) references[19]: severely underweight (<3rd percentile), underweight (3rd–15th percentile), normal weight (15th–85th percentile), overweight (85th–95th percentile), and obese (>95th percentile). Additionally, the CRP and sedimentation rate results were grouped according to the reference ranges of our center. For the CRP results, values above 5 mg/L were considered positive, while values below 5 mg/L were considered negative. For the sedimentation rate results, values above 20 mm/hour were considered positive, and those below were considered negative. White blood cell count, neutrophil, lymphocyte, and platelet counts were categorized according to age-specific reference ranges.

Radiological Imaging of Mesenteric Lymph Nodes

Abdominal US was performed by an experienced radiologist with a 1–6 MHz curved array for general abdominal examination; in addition, a 5–14 MHz linear array transducer (Aplio 500; Canon Medical Systems, Tokyo, Japan) was used specifically to detect enlarged mesenteric lymph nodes. Each lymph node was measured in two dimensions (short axis and long axis) and was assessed at the root of the mesentery. A short-axis size greater than 5 mm was considered pathological.[20-22] The number of enlarged nodes and their location, size, and other significant findings were recorded. Following the measurements, mesenteric lymph nodes were evaluated for their long-/short-axis ratios and counts (1 node, 2–3 nodes, 4–5 nodes, >5 nodes). The lymph nodes were further classified based on their short-axis dimensions (normal or pathological), and these findings were categorized for analysis.

Ethical Statement

This study was approved by the Institutional Ethics Review Board for Clinical Research of the Sisli Hamidiye Etfal Training and Research Hospital (approval date: 07.06.2016, no: 679). Written informed consent was obtained from the parents before the patients were included in the study. The study was designed and conducted in accordance with the ethical principles outlined in the 1975 Declaration of Helsinki.

Statistical Analysis

The statistical analyses for this study were performed using IBM SPSS Statistics version 25 (IBM Corp., Armonk, NY, USA). The normality of the distribution of numerical variables was assessed using the Shapiro–Wilk test, and it was determined that the variables did not follow a normal distribution ($p<0.05$). Therefore, nonparametric tests were used. For comparisons of numerical variables between the two groups, the Mann–Whitney U test was employed. Numerical variables were reported as medians and interquartile ranges (Q1–Q3). For categorical variables, the distribution across groups was evaluated using the chi-square test. When the expected cell frequency was less than 5, Fisher's exact test was applied. A p-value less than 0.05 was considered significant for all statistical analyses.

Results

A total of 109 cases with ML were identified during the study period. Three patients were excluded due to a lack of follow-up. A total of 106 patients with a median age of 7.4 years (ranging from 8 months to 16.4 years), 59 of whom were male (55.7%), were included in the study (Table 1).

Table 1. Distribution of descriptive characteristics of all patients

Characteristics	Frequency
Gender	
Female	47 (44.3%)
Male	59 (55.7%)
Age (years)	7.4 (0.67–16.4)
Symptoms	
Abdominal pain	68 (64.2%)
Other gastrointestinal symptoms	36 (34%)
Other peripheral lymphadenopathies	2 (1.9%)
Duration of symptoms (days)	7(1–2190)
Mesenteric lymphadenopathy localization	
Right lower quadrant	105 (99.1%)
Left lower quadrant	1 (0.9%)
Long-axis diameter of the lymph node (mm)	13(6–25)
Short-axis diameter of the lymph node (mm)	6 (3–10)
Long-to-short-axis ratio of the lymph node	2.14 (1.29–3.43)
Lymph node count groups	
1 node	1 (0.9%)
2–3 nodes	45 (42.5%)
4–5 nodes	1 (0.9%)
>5 nodes	59 (55.7%)
Size classification based on short axis	
Normal	20 (18.9%)
Pathological	86 (81.1%)
Lymph node size classification based on short axis measured during follow-up ultrasonography	
Regressed to normal size	76 (71.7%)
Not of normal size	30 (28.3%)

Data are given as median (min–max) or n (%).

The most common age group was 6–11 years (63%), while the least common was 12–18 years (7.5%). Based on BMI percentiles, nine patients (8.5%) were categorized as very underweight, 22 (20.8%) as underweight, 58 (54.7%) as normal weight, 14 (13.2%) as slightly overweight, and three (2.8%) as obese.

Regarding the units that first evaluated the patients, 64 cases (60.4%) were referred from the pediatric emergency clinic, 34 (32.1%) from pediatric subspecialty clinics, six (5.7%) from pediatric inpatient services, and two (1.9%) from pediatric surgery clinics.

The median leukocyte count of the patients was 9250/mm^3 (Q1–Q3: 4140–21,090/mm^3) and the median lymphocyte count was 2750/mm^3 (Q1–Q3: 640–9070/mm^3). The median CRP level was 1.95 mg/L (Q1–Q3: 0.75–0.151 mg/L). Considering the normal values based on age range, 13 patients (12.3%) had leukocytosis, 22 patients (20.8%) had neutrophilia, 38 patients (35.8%) had positive CRP, seven patients (6.6%) had positive procalcitonin, and 15 patients (14.2%) had positive sedimentation. A PPD test was performed on three patients, none of whom showed a positive result.

Additional findings other than ML were observed in 37 (34.9%) cases, including hepatosplenomegaly, surgical findings, and other anomalies (Table 2).

In the management of patients with ML, 64 cases (60.4%) were recommended for follow-up without antibiotic therapy, 36 (34.0%) were prescribed outpatient antibiotics, and 6 (5.7%) were admitted to the hospital and started on antibiotics. One patient (0.9%), initially recommended for follow-up only, was later started with antibiotics during follow-up.

Etiological evaluation based on medical histories, physical examinations, and laboratory findings identified no specific cause in 81 cases (76.4%) (Fig. 2).

Table 2. Additional USG findings in mesenteric lymphadenopathy cases

Finding	Number of Cases (n) Total: 37	Percentage (%)
Hepatosplenomegaly	12	32.4
Appendix diameter > 6 mm	7	18.9
Intussuscepted bowel segment	4	10.8
Aperistaltic bowel loop	1	2.7
Free fluid in the abdomen	4	10.8
Pelvic ectasia	3	8.1
Increased renal parenchymal echogenicity	2	5.4
Hepatic hemangioma	1	2.7
Adnexal simple cystic lesion	1	2.7
Accessory spleen	2	5.4

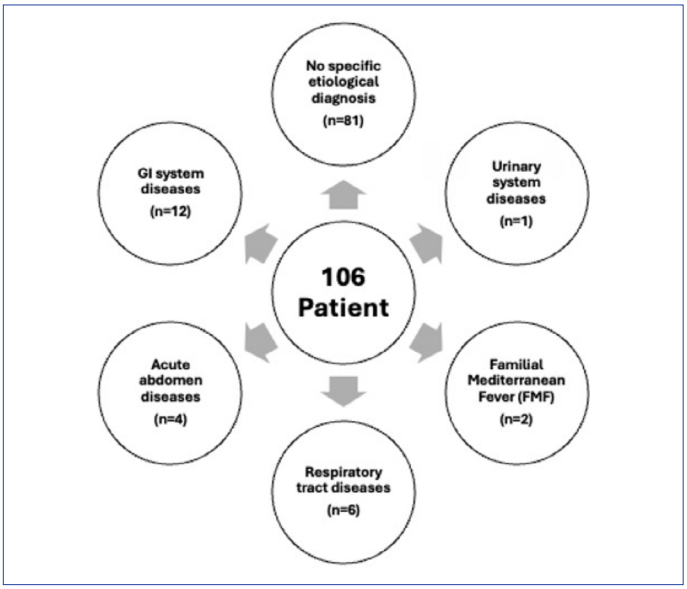

Figure 2. Distribution of the initial diagnoses based on the evaluation of the patients' medical histories, physical examinations, and laboratory results.

In the analysis of patients grouped based on short-axis lymph node measurements (pathological vs. normal), statistically significant differences were observed in sedimentation rate, eosinophil count, and CRP levels between the groups (Table 3). No statistically significant differences were observed between the groups with pathological and non-pathological short-axis lymph node sizes in terms of age, duration of symptoms, leukocyte count, neutrophil count, lymphocyte count, hemoglobin, MCV, platelet count, lactate dehydrogenase, procalcitonin, and uric acid ($p>0.05$).

Follow-up US conducted 1 month after the initial evaluation showed that 76 patients (71.7%) exhibited regression of mesenteric lymph node sizes to within normal limits, while 30 patients (28.3%) continued to display pathological lymph node dimensions (Table 4).

In the third phase, 91 patients were contacted by telephone, and no new diagnoses or findings were reported based on the information provided by their families. One patient with submandibular lymphadenopathy continued to follow up at the pediatric oncology clinic. Communication could not be established with the remaining 14 patients.

Discussion

Although MLs are commonly observed in otherwise healthy children, they are frequently a cause of concern for parents seeking medical attention. The threshold size for defining pathological mesenteric lymph node enlargement varies across studies. Setting a lower threshold for pathological enlargement could result in unnecessary diagnostic tests

Table 3. Distribution and statistics of numerical variables based on the status of pathological short-axis dimensions

Parameter	Groups		p*
	Non-Pathological Short Axis Size (n=16) Median (Quartiles 25%–75%)	Pathological Short Axis Size (n=90) Median (Quartiles 25%–75%)	
Eosinophil count (/mm^3)	175 (122–330)	110 (37–240)	0.012
C-reactive protein (mg/L)	0.15 (0–2.75)	3 (0.07–14.25)	0.016
Erythrocyte sedimentation rate (mm/hour)	8 (5.25–10)	10.5 (9–18)	0.001
Long-axis diameter of the lymph node (mm)	9 (7.25–11)	14 (12–15.4)	<0.001
Short-axis diameter of the lymph node (mm)	4 (4–4.5)	6 (6–8)	<0.001
Long-to-short-axis ratio of the lymph node	2.25 (1.81–2.65)	2.03 (1.82–2.4)	0.132

*The Mann–Whitney U test was used. A significance level of $p < 0.05$ was considered for statistical analyses.

Table 4. Distribution and statistics of variables based on the status of mesenteric lymph node sizes on follow-up ultrasonography

Parameters	Groups (N=106)		p
	Lymph node sizes regressed to normal on follow-up (n=76, 71.7%)	Lymph node sizes remained pathological on follow-up (n=30, 28.3%)	
Age (years)	7.55 (4.3–10.1)	7.55 (4.5–9.7)	0.664[c]
Gender			
Female	32 (42.1%)	15 (50%)	0.461[b]
Male	44 (57.9%)	15 (50%)	
Mesenteric lymphadenopathy localization			
Right lower quadrant	76 (100%)	29 (96.7%)	0.283[a]
Left lower quadrant	0 (0%)	1 (3.3%)	
Size classification based on short axis			
Normal	15 (19.7%)	5 (16.7%)	0.716[b]
Pathological	61 (80.3%)	25 (83.3%)	
Antibiotic Use Status			
Yes	29 (27.4%)	14 (13.2%)	0.074[a]
No	47 (44.3%)	16 (15.1%)	
Short-axis diameter of the lymph node (mm)	6 (5–7)	7 (5.87–8)	0.028[c]
Long-to-short-axis ratio of the lymph node	2.16 (1.9–2.5)	2 (1.75–2.23)	0.063[c]

a: The Fisher's exact test was used. b: The Pearson chi-square test was used. c: The Mann–Whitney U test was used. A significance level of $p<0.05$ was considered for statistical analyses.

and referrals, increasing anxiety for families and imposing an additional workload on physicians. Wang et al.[23], in an ultrasound-guided clinical study, reported that the size of mesenteric lymph nodes increases with age until 6 years and then decreases. Similarly, other studies have suggested that a short-axis diameter exceeding 8 mm, or even 10 mm, may define a pathologic mesenteric lymph node in children.[22] Nevertheless, consensus on the radiological definition of ML remains inconsistent across the literature.[10,22,24]

Sivit et al.[6], Watanabe et al.[7], and Simanovsky et al.[22] reported age-related increases in the size and shape of lymph nodes. Conversely, Vayner et al.[21] observed a significant decrease in the frequency of ML with increasing age. However, Karmazyn et al.[8] found no significant relationship between age and lymph node size. Similarly, our study did not identify a significant association between lymph node size and age. Notably, a statistically significant finding was that ML was most frequently observed in children in the 6–11 age group, while it was least common in the 12–18 age group. This finding aligns with the understanding that lymph node size in healthy children tends to decrease around puberty, reflecting normal maturation of the immune system. Variability across studies may stem from differences in inclusion criteria. Our study included children who had undergone US for various medical indications, which may differ from the criteria used in the aforementioned studies.

In our study, the most common symptoms associated with ML were abdominal pain, nausea, vomiting, fever, and loose stools, suggesting potential underlying infections, likely gastrointestinal in origin. Notably, no significant relationship was identified between lymph node size and specific symptoms. Similarly, in Simanovsky and Hiller's study[22], no significant difference was observed in the presence of lymph nodes of any size between the symptomatic and asymptomatic groups. However, a statistically significant association was reported between patients with abdominal pain and a lymph node size greater than 10 mm compared to those without abdominal pain. In contrast, Sivit et al.[6] examined patients with ML for whom no definitive diagnosis had been established and found that all cases presented with abdominal pain. Furthermore, the prevalence of ML was significantly higher in symptomatic patients than in asymptomatic patients.

In most previous studies, most MLs are located in the right lower quadrant.[6,8,21,22,25,26] This distribution likely reflected the anatomical predominance of mesenteric lymphatic tissue in the right lower quadrant (RLQ). Consistent with these findings, our study demonstrated that the majority of ML cases were located in the RLQ during the initial presentation, while a small proportion were identified in the left lower quadrant (LLQ). This highlights the RLQ as the primary region of interest when evaluating children with suspected ML.

In Vayner et al.'s study[21], follow-up abdominal ultrasounds and exams conducted 3–12 months later on 30 children with ML revealed resolution of lymphadenopathies and abdominal pain in eight cases, while persistent ML was observed in 22 cases. Similarly, our study observed a trend of lymph node size regression within the first month, though some cases remained unchanged or showed partial regression. Notably, follow-up US was not performed in patients whose lymph node size was already below the pathological threshold, suggesting a potential overdiagnosis of ML.

Regarding treatment, some patients were managed conservatively with follow-up alone, while others received antibiotic therapy. Interestingly, there was no significant difference in lymph node size at the 1-month follow-up between those treated with antibiotics and those who were not. This finding underscores the importance of careful patient selection for antibiotic use, given antibiotics' lack of apparent benefits in lymph node size reduction and the potential for antimicrobial resistance.

At the 6-month follow-up, most patients remained asymptomatic without new diagnoses or findings, while a few required continued monitoring. Some patients could not be reached for follow-up. These findings reinforce the notion that ML in children is generally a benign and self-limiting condition, often resolving without the need for prolonged follow-up or medical intervention.

Limitations

A limitation of our study is the relatively short follow-up period of 6 months, which may not have been sufficient to capture the full spectrum of chronic disorders that could manifest over a longer timeframe. Extended follow-up periods would provide a more comprehensive understanding of the natural history of ML and its potential progression to chronic or underlying systemic conditions. Additionally, the study was conducted in a single center with a relatively small population, which may limit the generalizability of the findings. The absence of a control group further restricted the ability to compare the study parameters with those of asymptomatic or healthy children, which could have strengthened the study's findings.

Conclusion

This study demonstrates that ML in children is generally a benign and self-limiting condition that often resolves without the need for medical intervention. Although its association with various clinical symptoms, such as abdominal pain, may cause parental anxiety and prompt diagnostic evaluations, the majority of cases regress spontaneously. Given the favorable prognosis in most cases, clinicians can reassure families and adopt a careful observation approach rather than unnecessary interventions. Future studies involving larger populations and longer follow-up periods may provide further insights into the long-term outcomes and rare etiological associations of this condition.

Disclosures

Ethics Committee Approval: The study was approved by the Sisli Hamidiye Etfal Training and Research Hospital Clinical Research Ethics Committee (date: 07.06.2016, no: 679).

Peer-review: Externally peer-reviewed.

Conflict of Interest: The authors declared no conflict of interest.

Authorship Contributions: Concept – B.Y, D.B.G., Z.Y.Y., A.O.; Design – B.Y, D.B.G., Z.Y.Y., A.O.; Supervision – B.Y, D.B.G., Z.Y.Y., A.O.; Materials – Z.Y.Y., D.B.G.; Data Collection and/or Processing – B.Y.; Analysis and/or Interpretation – B.Y.; Literature Review – B.Y., D.B.G., A.O., Z.Y.Y.; Writing – B.Y., D.B.G., A.O.; Critical Review – B.Y., D.B.G., A.O., Z.Y.Y.

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