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Correlation of Mesenteric Lymphadenitis Diagnosed by Ultrasound with Abdominal Pain in Pediatric Patients: A Prospective Observational Study

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العلاقة بين التهاب العقد اللمفاوية المساريقية المُشخَّص بالموجات فوق الصوتية وآلام البطن لدى الأطفال: دراسة رصدية مستقبلية

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Abstract:

Background: Mesenteric lymphadenitis is the inflammation of mesenteric lymph nodes, and is a frequent but often underdiagnosed cause of acute abdominal pain in children. It can be easily mistaken for acute appendicitis, which can result in unnecessary interventions. Because of its non-invasive, cost-effective, and radiation-free characteristics, ultrasound has become the imaging modality of choice, and the main criterion for the diagnosis is the short axis of the lymph nodes greater than 5 mm. **Designing the study**: A retrospective study of all children aged 0 to 19 with acute abdominal pain who underwent mesenteric lymphadenitis and underwent sonographic evaluation of the disease. Retrospective study of all children (0-19 years) with acute abdominal pain who were evaluated for mesenteric lymphadenitis and who had sonography performed. Methods: The study was a prospective observational study and included 100 children aged 5-16 years attending a private paediatric diagnostic imaging practice between January and August 2025. Demographic data, number of lymph nodes, size (long- and short-axis) and localization were systematically collected for all participants, who were subjected to high-frequency abdominal ultrasound. **Results**: Mesenteric lymphadenitis occurred in 67% of patients. The epigastric area was the most common area of involvement (76.5%). Largest lymph nodes were found to be 12-15 mm in the long axis and 5-7 mm in the short axis. 41% of patients presented within 24 hours of symptom onset. **Discussion**: Ultrasound is a safe and effective way to diagnose children with mesenteric lymphadenitis, which avoids unnecessary surgeries like appendicitis and helps differentiate the condition.

Keywords: Mesenteric lymphadenitis; ultrasound; pediatric; abdominal pain; lymph node enlargement.

الملخص

الخلفية :التهاب العقد اللمفاوية المساريقية هو التهاب يصيب العقد اللمفاوية في المساريقا، ويُعد سبباً شائعاً ولكنه غالباً ما يكون غير مشخص جيداً لآلام البطن الحادة لدى الأطفال .يمكن الخلط بينه بسهولة وبين التهاب الزائدة الدودية الحاد، مما قد يؤدي إلى تدخلات جراحية غير ضرورية .ونظراً لخصائص الموجات فوق الصوتية المتمثلة في كونها غير جراحية، وفعالة من حيث التكلفة، وخالية من الإشعاع، فقد أصبحت وسيلة التصوير المفضلة، والمعيار الرئيسي للتشخيص هو أن يكون القطر القصير للعقد اللمفاوية أكبر من 5 مم . **الطرق :**كانت الدراسة دراسة رصدية مستقبلية وشملت 100 طفل تتراوح أعمارهم بين 5 و16 عاماً ممن يراجعون عيادة خاصة لتشخيص الأشعة للأطفال بين يناير وأغسطس 2025 .تم جمع البيانات الديموغرافية، وعدد العقد اللمفاوية، وحجمها (المحور الطولي والقصير)، وموقعها بشكل منهجي لجميع المشاركين، الذين خضعوا لفحص البطن بالموجات فوق الصوتية عالية التردد . **النتائج :**حدث التهاب العقد اللمفاوية المساريقية لدى 67% من المرضى .كانت المنطقة الشرسوفية هي المنطقة الأكثر شيوعاً للإصابة (76.5%).وُجد أن أكبر العقد اللمفاوية يتراوح طولها بين 12-15 مم في المحور الطولي و5-7 مم في المحور القصير .راجع 41% من المرضى في غضون 24 ساعة من ظهور الأعراض . **المناقشة :**تُعد الموجات فوق الصوتية وسيلة آمنة وفعالة لتشخيص الأطفال المصابين بالتهاب العقد اللمفاوية المساريقية، مما يجنبهم العمليات الجراحية غير الضرورية مثل استئصال الزائدة الدودية ويساعد في التمييز بين الحالات.

الكلمات المفتاحية: التهاب العقد اللمفاوية المساريقية؛ الموجات فوق الصوتية؛ الأطفال؛ آلام البطن؛ تضخم العقد اللمفاوية .

1. Introduction

Mesenteric lymphadenitis is the inflammation and enlargement of mesenteric lymph nodes, a condition which is one of the most common, yet infrequently recognised, causes of acute abdominal pain in children and adolescents. It is clinically similar to acute appendicitis and includes periumbilical and right lower quadrant pain, fever, nausea and vomiting, causing a significant diagnostic challenge for the clinician [1, 6].

Pathophysiology is reactive hyperplasia of the mesenteric lymph nodes, most often caused by viral/bacterial enteric infections, sometimes as a secondary process in systemic inflammatory diseases like Crohn's disease or other granulomatous diseases [1, 12]. Although the disease has a selflimiting clinical course, the clinical overlap with appendicitis often leads to unnecessary surgical referral and in some cases, appendectomy, which have been reported to range from 10% to 20% in series of pediatric laparoscopies for suspected appendicitis [6, 11].

Over the years ultrasound has become the 1st modality of choice for the diagnosis of mesenteric lymphadenitis in children. The main benefits are: No exposure to ionizing radiation, widely available, low cost and it can be used to evaluate the structures inside the abdomen dynamically, in real time. The superficial lymph nodes can be evaluated with high-frequency linear transducers (7-12 MHz) and the sonographic findings of mesenteric lymphadenitis (defined as the presence of three or more enlarged, oval, hypoechoic nodes with a short axis diameter ≥5 mm) have been well validated in the literature [1, 3, 4, 10, 13].

In spite of the proven diagnostic value of ultrasound, the localization of involved lymph nodes and the patient population at risk of involvement are not thoroughly described in the regional literature. The present study was thus conducted to assess the sonographic characteristics and demographic data of mesenteric lymphadenitis in a group of Iraqi children with acute abdominal pain, focusing on the preventive use of ultrasound from unnecessary surgical procedures.

2. Aim of the Study

To assess the relationship between ultrasonographically confirmed mesenteric lymphadenitis and acute abdominal pain in children aged 5-16 years.

To evaluate the usefulness and accuracy of high-frequency abdominal ultrasound in the diagnosis of mesenteric lymphadenitis and its differential diagnosis from acute appendicitis.

3. Material and Methods

3.1 Study Design and Setting

The study will be conducted in a private paediatric diagnostic imaging clinic equipped with the latest high frequency ultrasound technology and will be a prospective observational study for a period of 8 months (January to August 2025). Ethical principles of Declaration of Helsinki were followed in the study protocol and all the procedures were approved by the clinic institutional review board [16].

3.2 Study Population

One hundred consecutive children aged 5-16 years with acute abdominal pain of ≤7 d who presented were selected for the study. The exclusion criteria included chronic or recurrent abdominal conditions, prior abdominal or pelvic surgery, recent abdominal trauma and clinical signs of an acute surgical abdomen (peritonitis or involuntary guarding) [6].

3.3 Data Collection and Ultrasound Protocol

Demographic data (age, sex, and length of time with symptoms before coming in for treatment) was collected via structured patient interviews and medical records. All the ultrasound examinations were done by a single senior radiologist who has vast experience in the field of paediatric abdominal imaging. Patients were studied in a supine position and a high frequency linear transducer (7–12 MHz) was used. Systematic transverse and longitudinal views were taken, paying careful attention to areas of greatest sensitivity. Short and long axis diameters of lymph nodes were measured and recorded and colour Doppler imaging was used to describe the vascularity of these nodes [2, 10].

Lymph nodes were deemed enlarged if the short axis diameter was ≥5 mm and mesenteric lymphadenitis was diagnosed if three or more lymph nodes in the mesenteric distribution were enlarged. The areas studied were epigastric, right and left lumbar, right iliac, right hypochondriac and hypogastric [1, 3, 4, 9].

3.4 Ethical Considerations

Parents/legal parents of all participants gave written informed consent before enrolment. All patient data were anonymized and securely stored and processed according to relevant privacy regulations [16].

4. Results

4.1 Demographic Characteristics

A total of 100 patients aged 5–16 years (mean age 9.2 years) were enrolled. There were more females than males (64% to 36%). The age group 6-11 years was the most affected age group (58% of the total cohort) indicating a higher susceptibility during early school age. Table 1 gives summary statistics on the demographic variables.

Table 1. Demographic Characteristics of the Study Cohort (n = 100)

Variable	Category	n (%)
Sex	Female	64 (64%)
	Male	36 (36%)

Age group (years)	5–11	58 (58%)
	12–16	42 (42%)
Mean age	9.2 years	—

TNR = Times New Roman; values are expressed as frequency (percentage).

4.2 Lymph Node Status

Mesenteric lymphadenitis was confirmed ultrasonographically in 67 patients (67%), while the remaining 33 patients (33%) showed no evidence of mesenteric lymphadenopathy. Table 2 summarizes the distribution of lymph node status across the cohort.

Table 2. Lymph Node Status on Abdominal Ultrasound (n = 100)

Lymph Node Status	n (%)
Positive (Mesenteric lymphadenitis confirmed)	67 (67%)
Negative (No lymphadenopathy)	33 (33%)

4.3 Anatomical Distribution of Enlarged Lymph Nodes

Among the 67 patients with confirmed mesenteric lymphadenitis, the epigastric region was the predominant site of lymph node enlargement, identified in 52 patients (76.5%). This finding is noteworthy, as the right lower quadrant is conventionally considered the classic anatomical territory for mesenteric lymphadenitis. The complete distribution of affected regions is presented in Table 3.

Table 3. Anatomical Distribution of Enlarged Mesenteric Lymph Nodes (n = 67)

Anatomical Region	n	%
Epigastric	52	76.5%
Right Lumbar	7	10.3%
Right Iliac	5	7.4%
Left Lumbar	2	2.9%
Right Hypochondriac	1	1.5%
Hypogastric	1	1.5%

4.4 Lymph Node Dimensions

Long-axis measurements were predominantly within the 12–15 mm range, with the highest frequency observed at 15 mm or greater. Short-axis measurements in the majority of positive cases ranged between 5–7 mm, consistent with mild-to-moderate reactive enlargement. These

dimensions are within the range reported for reactive non-malignant lymphadenopathy in children.

4.5 Duration of Symptoms Before Presentation

Forty-one percent of patients presented within the first 24 hours of symptom onset, highlighting the acute nature of the complaints in this cohort. A further 27% presented within 2–3 days, 14% within 4–5 days, and 18% after one week or longer. The symptom duration distribution is summarized in Table 4.

Table 4. Duration of Symptoms Prior to Presentation (n = 100)

Duration Before Presentation	n	%
≤1 day	41	41%
2–3 days	27	27%
4–5 days	14	14%
≥1 week	18	18%

5. Discussion

The present study shows that mesenteric lymphadenitis is a very common cause of acute abdominal pain in paediatrics, accounting for 67% of the study population. The incidence of mesenteric lymphadenitis is similar to that of other prospective series that report mesenteric lymphadenitis as one of the most common nonsurgical diagnoses in children with acute abdominal pain [5, 6].

There is a demographic predominance of females (64%) and the number of cases in the age group 6–11. Such patterns have been described in the literature, but the genetic or other biological explanations for these patterns are not fully understood. Theories that have been put forward include sex-specific differences in immune reactivity and greater exposure to enteric pathogens during early school age years [5, 8]. More studies should be conducted to better understand the exact mechanisms behind this demographic predilection, which should include microbiological and immunological analyses.

The characteristic finding in the present study was that lymphadenitis was more frequent in the epigastric region (76.5%) than in the right lower quadrant that is seen in the classic mesenteric lymphadenitis. This is in keeping with mounting evidence that the condition could have a wider anatomical distribution than has been previously recognised, and emphasises the need to undertake a thorough ultrasound examination of the upper and lower abdomen in children in whom the condition is suspected [1, 12]. Therefore, a likely large proportion of cases, clinically significant, may be missed if only the right lower quadrant is evaluated sonographically.

The measurements of the lymph nodes obtained in this study (long axis 12-15mm and short axis 5-7mm) correspond with the previously published norm and pathological reference ranges for reactive mesenteric lymphadenopathy (MAL) in children [4, 9, 13]. The use of the short-axis diameter criterion ≥5 mm as the main criterion of diagnosis allowed the reliable distinction of the pathological nodes from incidental findings of non-pathological nodes, clinically insignificant.

High presentation rate (41% in first 24 hours) reflects the severity and distress caused by the symptoms with the urgent need for medical help. This pattern is further underscoring the need for timely and accurate imaging evaluation to direct clinical care and to avoid unnecessary

surgical consultation and/or appendectomy due to the overlap in diagnosis with appendicitis [6, 11].

One of the limitations of the present study is that it was conducted at a single centre and lacked a follow-up plan to document clinical resolution and/or to confirm the non-surgical nature of the condition over time. In addition, there is no control group to allow for direct estimation of sensitivity and specificity of ultrasound testing in this population. Future multicentre studies with clinical follow up and laboratory markers (C-reactive protein and white blood cell count) would add to the evidence base.

6. Conclusion

In the present cohort, 67% of children with acute abdominal pain had mesenteric lymphadenitis, which is a frequent and important cause of acute abdominal pain in children. Abdominal ultrasound is an accurate, radiation-free, non-invasive diagnostic tool which is useful for the appropriate diagnosis of enlarged mesenteric lymph nodes, thereby preventing unnecessary surgery in the diagnosis of acute appendicitis. The unexpected high percentage of epigastric involvement seen in this study underscores the need for thorough abdominal scanning protocols which go beyond the traditional right lower quadrant. The use of ultrasound to diagnose patients early, in children with acute abdominal pain, should be seen as a crucial part of the pathway of the clinical management.

Compliance with ethical standards

Disclosure of conflict of interest

The authors declare that they have no conflict of interest.

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