

Management Outcomes of Lymphadenopathy among the Children

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Abstract

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Background: Lymphadenopathy refers to the enlargement of lymph nodes due to various causes, and its appropriate management is crucial for optimal patient outcomes.

Objective: To analyze the onset of lymphadenopathy (LAP) in children in terms of gender and age, explore its clinical manifestations and the specific lymph node areas affected, identify prevalent causes, and assess the outcomes of various treatment approaches.

Patients and Methods: This cross-sectional study conducted between October 2021 and March 2023 at Rapareen Teaching Hospital for Children in Erbil City, which examined the lymphadenopathy in 40 children . The study included children aged 0-15 years with a lymphadenopathy diagnosis. Data collection involved recording demographic information, lymphadenopathy site and characteristics, clinical symptoms, antibiotic usage and response, reactive diagnoses, and treatment outcomes. Additional laboratory measurements were also taken. The collected data were analyzed using descriptive statistics, statistical tests, and logistic regression analysis. The study adhered to ethical principles, obtained informed consent, and ensured data confidentiality.

Results: The mean age of the children was $3.397 \pm (2.192)$ years. 23 (59%) children had a single lymphadenopathy, and 16 (41%) had multiple lymphadenopathies. The most common site of lymphadenopathy with a frequency of 10 (25%) was in the posterior cervical region, while 7 (17.5%) was observed in the submental area. 38 (95%) children received antibiotic treatment. Out of this number, 23 (60.5%) responded positively to the treatment, while 15 (39.5%) did not respond.

Conclusion: The results of this study showed that in the patients who were treated with antibiotics, the drug was able to lead to some degree of recovery.

Keywords: Lymphadenopathy; Lymph node; Management ,Children

Introduction

Lymphadenopathy refers to the enlargement or swelling of lymph nodes, which are small, bean-shaped organs located throughout the body. Lymph nodes are important components of the immune system because they filter lymph fluid and trap

dangerous substances such as bacteria, viruses, and cancer cells [1, 2].

Lymphadenopathy can develop as a result of a variety of factors, including infections, autoimmune illnesses, cancer (such as lymphoma or metastatic cancer), and other

ailments. It might affect individual lymph nodes or several lymph nodes across the body [1, 3].

Lymphadenopathy can be classified based on location (localized vs. generalized), size, duration (acute vs. chronic), underlying cause, and involvement [1, 4, 5]. The affected lymph node regions in lymphadenopathy include the posterior cervical (neck), axillary (armpit), inguinal (groin), abdominal, retroperitoneal, mediastinal (chest), and supraclavicular (above the collarbone) lymph nodes [6, 7]. Posterior cervical lymphadenopathy is the most common type in the pediatric age group [8, 9].

Lymphadenopathy presents with various symptoms, such as tender or painful swollen lymph nodes, fever, fatigue, night sweats, and weight loss [9, 10]. Physical examinations, blood tests, imaging investigations (ultrasound or CT scans), and occasionally a biopsy of the afflicted lymph node are used by medical specialists to diagnose and pinpoint the source of it [5, 11]. The underlying cause and degree of lymphadenopathy determine the course of treatment. Antibiotics, antivirals, and antifungals are frequently used to treat infections.

Autoimmune-related lymphadenopathy may require immunosuppressive medications. Chemotherapy, radiation treatment, or surgery could be used to treat lymphadenopathy linked with cancer [1, 12, 13].

Accurate statistics on the epidemiology of lymphadenopathy are not available, but what is known is that most people with lymphadenopathy have a benign cause. Since age is an important aspect in describing the

epidemiology of lymphadenopathy, it may be divided into children and adults. In children, the majority of cases are benign, with reactive hyperplasia of the unknown cause being the most common, followed by granulomatous infections, cancer, and dermatopathic lymphadenopathy. Although most of the cases of lymphadenopathy in children are benign and self-limiting, identifying the underlying reasons is critical in order to commence appropriate therapy and management methods [1, 14].

Lymphadenopathy is a frequent ailment in children, and understanding how it is controlled and been critical for healthcare practitioners to give appropriate therapy. However, there has been little research on this subject, particularly in Erbil, making our study critical in bridging this knowledge gap. This study may provide significant insights into the prevalence, etiology, and treatment choices for lymphadenopathy in children, which might inspire future research and improve healthcare practices. The aim of this research was to analyze the onset of lymphadenopathy (LAP) in children in terms of gender and age , explore its clinical manifestations and the specific lymph node areas it affected, identify prevalent causes, and assess the outcomes of various treatment approaches.

Patients and Methods

Study Design and Population

This cross-sectional study was conducted between October 2021 and March 2023 on 40 children with lymphadenopathy referred to Rapareen Teaching Hospital for Children in Erbil City.

Inclusion and Exclusion Criteria

The criteria for entering the study were children aged 0-15 years with a diagnosis of lymphadenopathy, and having informed consent were included. Patients with incomplete medical records, a history of malignancy, immunodeficiency, or chronic disease, or those who did not perform necessary diagnostic tests were excluded from the study.

Data Collection

Data collection encompassed various demographic and clinical parameters. Gender, age, and duration of lymphadenopathy were recorded for each participant. The site of lymphadenopathy was classified into submental, axilla, posterior cervical, submandibular, or supraclavicular regions. Additionally, the number of lymphadenopathy nodes (single or multiple) and their corresponding sizes were documented. Clinical symptoms such as mass, fever, rigor, sore throat, and weight loss were assessed. Information on whether the children received antibiotics and their response to the antibiotics was also collected. Reactive diagnoses, including lymphadenitis, malignancy, tuberculosis (TB), infectious mononucleosis (IMN), and cytomegalovirus (CMV), were documented. Lastly, the outcome of the lymphadenopathy management was categorized as cured, exit from the study, or ongoing treatment.

Furthermore, additional laboratory measurements were obtained, including the size of the second and third lymphadenopathy nodes, white blood cell count (WBC) measured in $\times 10^4/L$, erythrocyte sedimentation rate (ESR) in mm/hour, and C-reactive protein (CRP) levels in mg/dL.

Broad spectrum antibiotics have been used, mainly amoxicillin and clavulanic acid 200mg,400mg and ceftriaxone vial 500mg which found to give the best outcome in the management.

Statistical Analysis

After collecting the data, the data were entered into SPSS version 26 and analyzed. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study participants. Associations between variables were examined using appropriate statistical tests such as chi-square or Fisher's exact tests. Logistic regression analysis was performed to identify predictors of treatment response and outcomes.

Results

In this study, 40 children with a mean age (3.397 ± 2.192) with lymphadenopathy were investigated. 34 (85%) children were below 5 years old, and 6 (15.4%) children were above 5 years old. The sex distribution of the children showed that 28 (70%) were boys, and the rest were girls Table (1).

Table (1): Demographics Characteristics of Children

Characteristic		Mean (± SD) or N (%)
Age group	Age (year)	3.397 ± (2.192)
	≤ 5	34 (85%)
	> 5	6 (15.4%)
Sex	Male	28 (70%)
	Female	12 (30%)

Clinical characteristics showed that the duration of lymphadenopathy in children was $12.65 \pm (6.792)$ days. 24 (60%) children had a single lymphadenopathy, while 16 (60%) children had multiple lymphadenopathies. The mean size of the lymphadenopathy was 2.75 ± 0.554 centimeters. The mean size of the second lymphadenopathy was 2.812 ± 0.543 centimeters, and the mean size of the

third lymphadenopathy was 2.6 ± 0.418 centimeters. The mean white blood cell count (WBC) in children was 13780.08 ± 5777.951 per X10 power 10/L. The mean erythrocyte sedimentation rate (ESR) was 49.33 ± 23.845 mm/hour, and the mean C-reactive protein (CRP) was 14.007 ± 14.534 mg/dL Table (2).

Table (2): Clinical Characteristics of Children

Characteristic		Mean (± SD) or N (%)
Duration LPA* (days)		12.79 ± (6.818)
Number of LPA	Single	24 (60%)
	Multiple	16 (40%)
Size in cm		2.75 ± 0.554
Size of second LAP		2.812 ± 0.543
Size of third LAP		2.6 ± 0.418
WBC X10 power 10/L		13780.08 ± 5777.951
ESR mm/hour		49.33 ± 23.845
CRP mg/dl		14.007 ± 14.534

* Lymphadenopathy

Figure (1) provides a visual representation of the locations of lymphadenopathy in children. The posterior cervical region was identified as the most prevalent site, with a frequency of 25% (10 cases). Subsequently, the submental area exhibited the second-highest

occurrence of lymphadenopathy, accounting for 17.50% (7 cases). Additionally, the axilla and submandibular regions were identified as the third most common locations, each comprising 12.50% (5 cases) of the cases.

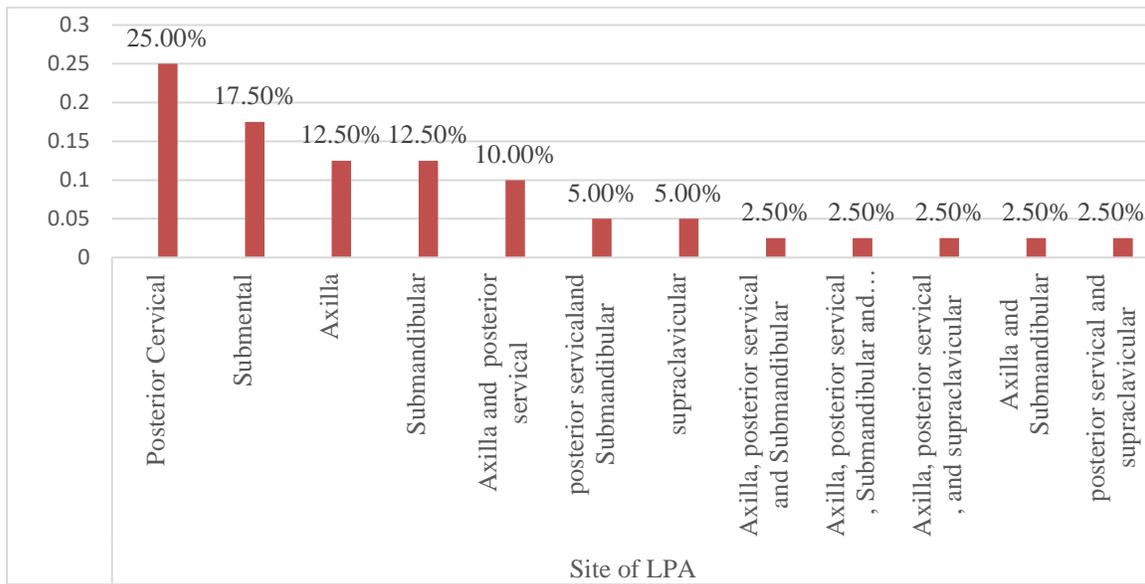


Figure (1): Site of LPA in children

The findings regarding the clinical presentation of the children under study revealed that the predominant clinical symptoms encompassed mass, fever, rigor, and weight loss, accounting for 17.50% (7 children). The second most prevalent clinical manifestation among the children was the co-

occurrence of mass and fever, representing 15.00% (6 cases). Additionally, the presence of rigor, weight loss, and fever, weight loss was observed in 12.50% (5 children). The remaining clinical symptoms are depicted in Figure (2).

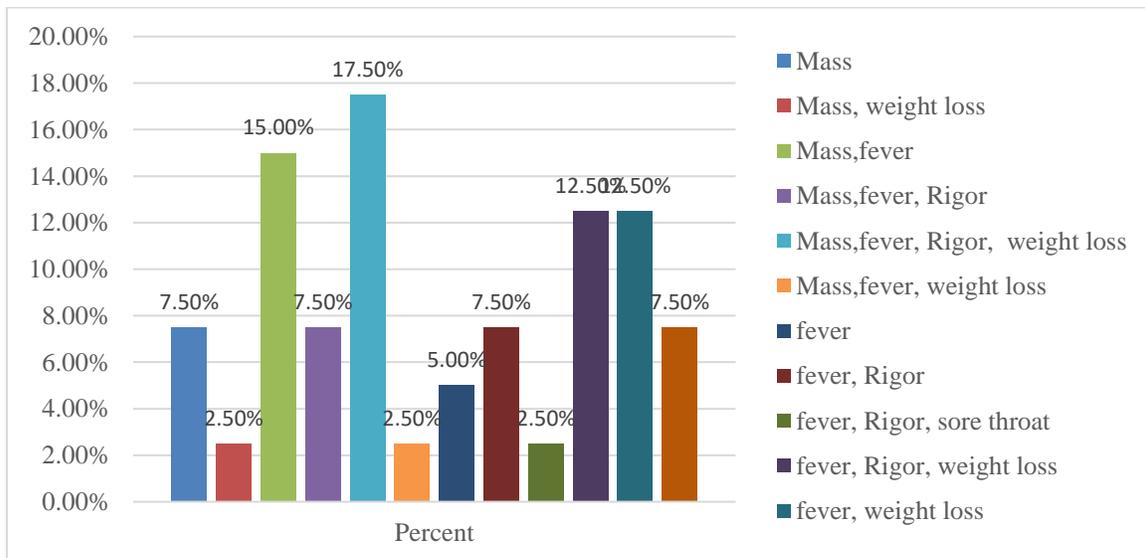


Figure (2): Clinical symptoms of LPA in children

Antibiotic therapy was the chosen as a treatment for children diagnosed with lymphadenopathy. The results of antibiotic treatment variables showed that out of the 38 (95%) children who received antibiotic treatment, 23 (60.5%) responded positively, while 15 (39.5%) did not show improvement. The final diagnosis of the examined children

revealed that 26 (65%) had Reactive Lymphadenitis, 5 (12.5%) had both Malignancy and TB, 3 (7.5%) had IMN, and 1 (2.5%) had CMV. Regarding the disease outcome, 34 (85%) children examined recovered, 5 (12.5%) children were still undergoing treatment, and 1 (2.5%) child dropped out of the study Table (3).

Table (3): Treatment method and disease outcome in children

Characteristic		Mean (± SD) or N (%)
Antibiotics	Yes	38 (95.5%)
	No	2 (5%)
Respond to Antibiotics	Yes	23 (60.5%)
	No	15 (39.5%)
Diagnosis	Reactive Lymphadenitis	26 (65%)
	Malignancy	5 (12.5%)
	TB	5 (12.5%)
	IMN	3 (7.5%)
	CMV	1 (2.5%)
Outcome	Cured	34 (85%)
	Exit	1 (2.5%)
	still on treatment	5 (12.5%)

In this study, we examined the factors that can potentially influence the response to antibiotic treatment and the final outcome of the disease using logistic regression analysis, as presented in Table 4. Among these factors, the age of the child was found to have a significant impact. Specifically, as the child's age increases, the positive response to treatment decreases, with an odds ratio (OR) of 0.65 (95% confidence interval (CI): 0.43 - 0.99, $p = 0.04$). Furthermore, observed a positive effect of the duration of limited physical activity (LPA) on treatment response. Increasing the duration of LPA was associated with an increased response to treatment, with an odds ratio (OR) of 1.22 (95% confidence interval (CI): 1.02 - 1.53, $p = 0.03$).

Another influential factor on treatment response was lymphadenopathy size, which had a positive effect with an odds ratio (OR) of 1.25 (95% confidence interval (CI): 1.10-1.60, $p = 0.04$). Increasing the white blood cell count (WBC) also had a significant impact on treatment and response to treatment, with an odds ratio (OR) of 1.15 (95% confidence interval (CI): 1.05-1.32, $p = 0.05$). In this study, the only factor that had a significant effect on the disease outcome was erythrocyte sedimentation rate (ESR), where an increase in ESR influenced the final outcome of the disease, with an odds ratio (OR) of 1.13 (95% confidence interval (CI): 1.01-1.25, $p = 0.02$) Table (4).

Table (4): Logistic regression model for Response to Antibiotic/ Outcome

Variable	OR, CI:95%	P- value
Response to Antibiotic		
Age	0.65, 0.43 – 0.99	0.04
Sex	Male	1.03, 0.23 - 4.52
	Female	1
Duration LPA* (days)	1.22, 1.02 – 1.53	0.03
Site of LPA	-	1
Size in cm	1.25, 1.10 – 1.60	0.04
Clinical symptom	-	1
WBC X10 power 10/L	1.15, 1.05 – 1.32	0.05
ESR mm/hour	0.92, 0.84 – 1.01	0.10
CRP mg/dl	1.15, 0.951 – 1.408	0.145
Outcome		
ESR mm/hour	1.13, 1.01 – 1.25	0.02

Discussion

It is crucial to handle lymphadenopathy in children appropriately as it is a common finding during routine pediatric examinations [15, 16]. The cause of lymphadenopathy in a child can range from a benign and transient finding, such as lymphadenopathy following upper respiratory infections, to a serious and variable diagnosis of malignancy. Therefore, having sufficient knowledge about proper evaluation and disease management can be highly beneficial [17].

Pecora *et al.* (2021) conducted a study aimed at examining the clinical manifestations of lymphadenopathy in children and providing an appropriate management and treatment approach. It should be noted that, in addition to the fact that most cases of lymphadenopathy in children are self-limiting, the more severe cases of the disease should be given more attention. When managing and treating the disease, attention should be paid to taking a thorough history and physical examination, which will enable correct diagnosis and appropriate treatment initiation. Given that in

most cases, an antibiotic treatment is used to treat the disease, appropriate treatment algorithms in this regard can be important and necessary [14].

In a study conducted in Canada by Long *et al.* (2020) with the aim of describing the clinical features and management of acute lymphadenopathy and identifying risk factors for the disease's complications, the medical records of children under 17 years of age with less than 2 weeks of lymphadenopathy were used. Of the 1023 health records, 567 participants with acute lymphadenopathy were analyzed. Most children with acute lymphadenopathy were treated with oral antibiotics. They did not need to be readmitted to the emergency department or undergo surgical drainage, which is in line with the results of the present study [18].

In the present study, the treatment method used was antibiotics (except for chronic and malignancies cases), which showed to be effective in treating lymphadenopathy in children. In the evidence-based study conducted by Eskander *et al.* (2022), it was shown that antibiotics can be used in the

treatment process. This finding is consistent with the present study because the clinical results of the number of people who were treated with antibiotics were satisfactory and beneficial [19].

In the present study, the most common sites of lymphadenopathy were Posterior cervical and Submental. In the study conducted by Neven et al. (2020), the Submandibular and Posterior cervical were identified as the most important sites of lymphadenopathy [20]. In another study conducted, the Submandibular was the most common site [21]. In the present study, the most common symptoms in children were Mass, Fever, Rigor, and Weight Loss, while in the study conducted by Kang et al. (2016) in South Korea, the most common symptom was fever [22].

In the evaluation and treatment of the disease, a range of clinical symptoms such as lymph node size, location of the nodes, presence of pain and tenderness in the patients, and adhesion of the lymph nodes should be taken into consideration [5].

It should be noted that antibiotic treatment compared to surgical methods significantly reduces the duration of stay of children in the hospital. For this reason, it is recommended that the best treatment method for children is antibiotic treatment [23, 24].

Conclusions

The treatment strategy can be different depending on the type of lymphadenopathy. The results of this study showed that in the patients who were treated with antibiotics, the drug was able to lead to some degree of recovery, so it can be used in the treatment and management of children's lymphadenopathy.

Recommendations

Lymphadenopathy is a common finding in clinical practice of physicians. The most serious task is to differentiate benign conditions from malignant disorders which require urgent attention and management.

A good history and thorough physical examination with Judicious use of investigations may avoid unnecessary stress and anxiety for patients and their parents, while expediting diagnosis and therapy where appropriate.

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Ethical clearance: The study was conducted in accordance with the ethical principles of the Declaration of Helsinki. The study protocol was reviewed and approved by the institutional review board of the Raparen Teaching Hospital for Children. Informed consent was obtained from the participant's parents or legal guardians, and the confidentiality of the participants' data was guaranteed.

Conflict of interest: Nil

References

[1]Maini, R. and S. Nagalli, Lymphadenopathy, in StatPearls. 2023, StatPearls Publishing Copyright © 2023, StatPearls Publishing LLC.: Treasure Island (FL).

- [2] Ganachari, S., M. Bari, and P.K. Pegu, Lymphadenopathy and Its Homoeopathic Management: A Review. *Journal of Medical and Pharmaceutical Innovation*, 2021. 8(42): p. 10-12.
- [3] Gaddey, H.L. and A.M. Riegel, Unexplained lymphadenopathy: evaluation and differential diagnosis. *American family physician*, 2016. 94(11): p. 896-903.
- [4] Thabet A, P.R., Domachowske J, Acute and Chronic Lymphadenitis: Swollen glands. *Introduction to Clinical Infectious Diseases: A Problem-Based Approach*, 2019: p. 25-34.
- [5] Mohseni, S., et al., Peripheral lymphadenopathy: approach and diagnostic tools. *Iran J Med Sci*, 2014. 39(2): p. 158-70.
- [6] Wills, C., et al., Chronic Generalized Lymphadenopathy in a Child-Progressive Transformation of Germinal Centers (PTGC). *Children (Basel)*, 2022. 9(2).
- [7] Gosche, J.R. and L. Vick, Acute, subacute, and chronic cervical lymphadenitis in children. *Semin Pediatr Surg*, 2006. 15(2): p. 99-106.
- [8] Jandial, R., R. Bhagat, and K. Singh, Mischevious Lymph Node in Peadriatic Age Group. *JMSCR*, 2019. 7(7): p. 493-497.
- [9] Weinstock, M.S., N.A. Patel, and L.P. Smith, Pediatric cervical lymphadenopathy. *Pediatrics in review*, 2018. 39(9): p. 433-443.
- [10] Wheaton, L., A. Punnett, and J.M. Baker, A 17-year-old girl with fever and lymphadenopathy. *Paediatr Child Health*, 2018. 23(1): p. 3-5.
- [11] Perveen, W., et al., Ipsilateral axillary lymphadenopathy after COVID-19 vaccination in a young female; a case report and literature review. *Anaesthesia, Pain & Intensive Care*, 2022. 26(6).
- [12] Freeman, A.M. and P. Matto, Adenopathy, in *StatPearls*. 2023, StatPearls Publishing Copyright © 2023, StatPearls Publishing LLC.: Treasure Island (FL).
- [13] Ghoneima, A., et al., Human herpes virus 8-positive germinotropic lymphoproliferative disorder: first case diagnosed in the UK, literature review and discussion of treatment options. *BMJ Case Rep*, 2020. 13(9).
- [14] Pecora, F., et al., Management of infectious lymphadenitis in children. *Children*, 2021. 8(10): p. 860.
- [15] Starke, J.R., et al., Strengthening tuberculosis services for children and adolescents in low endemic settings. *Pathogens*, 2022. 11(2): p. 158.
- [16] Grant, C.N., et al., Lymphadenopathy in children: A streamlined approach for the surgeon—A report from the APSA Cancer Committee. *Journal of pediatric surgery*, 2021. 56(2): p. 274-281.
- [17] Bozlak, S., et al., Cervical lymphadenopathies in children: A prospective clinical cohort study. *International Journal of Pediatric Otorhinolaryngology*, 2016. 82: p. 81-87.
- [18] Long, M., et al., Paediatric acute lymphadenitis: Emergency department management and clinical course. *Paediatr Child Health*, 2020. 25(8): p. 534-542.
- [19] Eskander, P., C. Ohnoutka, and N. Long, Do children benefit from antibiotic treatment of asymptomatic cervical lymphadenopathy? *Evidence-Based Practice*, 2022. 25(9): p. 5-6.
- [20] Neven, Q., et al., Long-term outcome of surgical excision for treatment of cervicofacial granulomatous lymphadenitis in children. *Eur Arch Otorhinolaryngol*, 2020. 277(6): p. 1785-1792.

- [21] Willemse, S.H., et al., Long-Term Outcome of Surgical Treatments for Nontuberculous Mycobacterial Cervicofacial Lymphadenitis in Children. *Journal of Oral and Maxillofacial Surgery*, 2022. 80(3): p. 537-544.
- [22] Kang, H.M., et al., Clinical Characteristics of Severe Histiocytic Necrotizing Lymphadenitis (Kikuchi-Fujimoto Disease) in Children. *The Journal of Pediatrics*, 2016. 171: p. 208-212.e1.
- [23] Romandini, A., et al., Antibiotic Resistance in Pediatric Infections: Global Emerging Threats, Predicting the Near Future. *Antibiotics (Basel)*, 2021. 10(4).
- [24] Fanelli, U., et al., Improving the Quality of Hospital Antibiotic Use: Impact on Multidrug-Resistant Bacterial Infections in Children. *Front Pharmacol*, 2020. 11: p. 745.

نتائج علاج اعتلال العقد اللمفية لدى عينة من الأطفال

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المخلص

خلفية الدراسة: يشير اعتلال العقد اللمفية إلى تضخم الغدد الليمفاوية لأسباب مختلفة ، كما أن إدارته المناسبة أمر بالغ الأهمية لتحقيق النتائج المثلى للمرضى.

اهداف الدراسة: لتحليل بداية اعتلال العقد اللمفية (LAP) لدى الأطفال من حيث الجنس والعمر ، واستكشاف مظاهره السريرية ومناطق العقدة الليمفاوية المحددة التي يؤثر عليها ، وتحديد الأسباب السائدة ، وتقييم نتائج مناهج العلاج المختلفة.

المرضى والطرائق: أجريت هذه الدراسة المقطعية في الفترة ما بين أكتوبر 2021 ومارس 2023 في مستشفى ربارين التعليمي للأطفال في مدينة أربيل، والتي فحصت اعتلال العقد اللمفية لدى 40 طفلاً. شملت الدراسة أطفالاً تتراوح أعمارهم بين 0-15 سنة مصابين بتضخم العقد اللمفية. تضمن جمع البيانات تسجيل المعلومات الديموغرافية، وموقع اعتلال العقد اللمفية وخصائصه، والأعراض السريرية، واستخدام المضادات الحيوية والاستجابة لها، والتشخيصات التفاعلية، ونتائج العلاج. كما تم أخذ قياسات مخبرية إضافية. وقد تم تحليل البيانات التي تم جمعها باستخدام الإحصاء الوصفي، والاختبارات الإحصائية، وتحليل الانحدار اللوجستي. التزمت الدراسة بالمبادئ الأخلاقية، وحصلت على موافقة مستنيرة، وضمنت سرية البيانات.

النتائج: بلغ متوسط عمر الأطفال $3.397 \pm (2.192)$ سنة. كان لدى 23 (59%) من الأطفال اعتلال عقد لمفية واحد ، و 16 (41%) لديهم اعتلالات عقد لمفية متعددة. كان الموقع الأكثر شيوعاً لاعتلال العقد اللمفية بمعدل 10 (25%) في منطقة العنق الخلفية ، بينما لوحظ 7 (17.5%) في منطقة تحت الذقن. تلقى 38 (95%) من الأطفال العلاج بالمضادات الحيوية. من هذا العدد ، استجاب 23 (60.5%) بشكل إيجابي للعلاج ، بينما لم يستجب 15 (39.5%).

الاستنتاجات: أظهرت نتائج هذه الدراسة أنه في المرضى الذين عولجوا بالمضادات الحيوية ، كان الدواء قادراً على تحقيق درجة معينة من الشفاء .

الكلمات المفتاحية: تضخم العقد اللمفية. عقدة لمفاوية؛ إدارة ، أطفال

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