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Pediatric Non-Hodgkin Lymphoma: A Cross-Sectional Analysis of Histopathological Subtypes, Clinical Correlations, and Incidence of Hyperuricemia and Elevated LDH (Lactate Dehydrogenase) Levels

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ABSTRACT

This study aims to provide a comprehensive cross-sectional analysis of pediatric Non-Hodgkin Lymphoma (NHL), emphasizing the distribution of histopathological subtypes, their clinical correlations, and the incidence of hyperuricemia. Understanding these associations is crucial for developing targeted therapeutic strategies and improving patient outcomes in the complexity of NHL in the pediatric population. A total of 65 pediatric patients diagnosed with NHL were enrolled in this study. Histopathological examination was conducted to classify the NHL subtypes. Clinical data were collected to explore correlations with histopathological findings. Biochemical parameters, including Lactate Dehydrogenase (LDH) levels and Serum Uric Acid, were measured to investigate their relationship with NHL. This cross-sectional analysis utilized statistical methods to identify significant associations and trends. Our study identified diverse histopathological subtypes of pediatric Non-Hodgkin Lymphoma (NHL), with significant clinical correlations to age, gender, and initial symptoms, underscoring the disease's complexity. Lymphoblastic and Burkitt's lymphomas were notably associated with specific demographic factors, highlighting the potential of age and gender in influencing disease subtype prevalence. Furthermore, we found a significant incidence of hyperuricemia (38.5%) and elevated LDH levels (46.2%) among the patients, suggesting these biochemical markers could serve as indicators of disease severity and metabolic effects. This analysis reveals the complex interplay between histopathological subtypes, clinical features, and biochemical markers in pediatric NHL, pointing to the utility of these markers in disease monitoring and risk stratification. It underscores the need for incorporating these parameters into patient management and calls for further research to explore their implications on outcomes and therapy optimization.

INTRODUCTION

Pediatric Non-Hodgkin Lymphoma (NHL) represents a heterogeneous group of lymphoproliferative malignancies with varying clinical presentations, outcomes, and histopathological characteristics[1]. Despite significant advancements in diagnosis and treatment, NHL in children continues to pose challenges due to its diverse subtypes and the complex interplay of genetic and environmental factors[2]. The histopathological classification of NHL has crucial implications for prognosis and treatment strategies. Additionally, biochemical parameters, such as serum uric acid and Lactate Dehydrogenase (LDH) levels, have emerged as potential markers for disease activity and treatment response[3]. Understanding these associations is vital for improving therapeutic outcomes and patient care. Recent studies have indicated that hyperuricemia, a condition characterized by elevated uric acid levels, may be associated with increased tumor lysis and disease severity in NHL, suggesting its potential as a prognostic factor. Similarly, alterations in metabolism, reflected by changes in LDH levels, could impact the pathophysiology and progression of NHL[4]. This study aims to bridge the gap in current knowledge by analyzing the histopathological subtypes of pediatric NHL, their clinical correlations, and the incidence of biochemical alterations, thereby contributing to a more nuanced understanding of the disease[5].

Aim and Objectives: To analyze the histopathological subtypes of pediatric Non-Hodgkin Lymphoma, their clinical correlations, and the incidence of hyperuricemia and metabolic profile alterations.

- To classify the histopathological subtypes of pediatric Non-Hodgkin Lymphoma in a sample of 65 patients.
- To determine the clinical correlations of these histopathological subtypes with patient demographics, presentation, and outcomes.
- To assess the incidence of hyperuricemia and alterations in the metabolic profile, specifically LDH levels, among these patients.

MATERIALS AND METHODS

Source of Data: The data for this cross-sectional analysis was obtained from pediatric patients diagnosed with Non-Hodgkin Lymphoma (NHL) at a tertiary care hospital. The hospital's Ethics Committee approved the study, ensuring compliance with ethical standards and patient confidentiality.

Study Design: This study employed a cross-sectional design to examine the histopathological subtypes of pediatric NHL, their clinical correlations, and the incidence of biochemical alterations, including hyperuricemia and LDH (Lactate Dehydrogenase) levels.

Sample Size: A total of 65 pediatric patients diagnosed with NHL were included in the study based on predefined inclusion and exclusion criteria.

Inclusion Criteria:

- Patients aged 18 years or younger diagnosed with NHL
- Patients who underwent complete diagnostic and histopathological evaluation at the study hospital
- Patients whose guardians provided informed consent for participation

Exclusion Criteria:

- Patients with a history of another malignancy
- Patients who had received treatment for NHL before referral to the study hospital
- Incomplete medical records or missing data on biochemical parameters

Study Methodology: The study involved a comprehensive review of medical records to classify NHL histopathological subtypes according to the World Health Organization (WHO) classification. Clinical data, including demographics, presenting symptoms, and treatment outcomes, were collected. Blood samples were analyzed for biochemical parameters, specifically serum uric acid and LDH levels, using standardized laboratory methods.

Statistical Methods: Descriptive statistics were used to summarize demographic and clinical characteristics. Chi-square and Fisher's exact tests were employed to explore associations between histopathological subtypes and clinical features. Spearman's correlation was used to assess the relationship between biochemical parameters and disease characteristics. A p-value of <0.05 was considered statistically significant.

Data Collection:

- **Histopathological Subtypes:** Identified through biopsy and categorized based on the WHO classification
- **Clinical Correlations:** Data on age, gender, clinical presentation, and outcomes were collected to identify patterns and associations with histopathological subtypes
- **Biochemical Parameters:** Serum Uric acid and LDH levels were measured at diagnosis and analyzed

RESULTS AND DISCUSSIONS

This table provides a comprehensive analysis of the distribution and statistical associations between various histopathological subtypes of pediatric Non-Hodgkin Lymphoma (NHL) and clinical outcomes.

Table 1: Distribution and Associations of Histopathological Subtypes in Pediatric Non-Hodgkin Lymphoma

Histopathological Subtype	n	Percentage (%)	Odds Ratio (OR)	95% CI	P-value
Lymphoblastic	20	30.8	1.5	1.0-2.2	0.04
Burkitt's	15	23.1	2.0	1.3-3.0	0.01
Diffuse Large B-Cell	18	27.7	1.2	0.8-1.8	0.20
Anaplastic Large Cell	8	12.3	0.8	0.3-2.1	0.50
Other	4	6.2	0.5	0.1-2.5	0.60

Table 2: Clinical Correlations with Histopathological Subtypes in Pediatric Non-Hodgkin Lymphoma

Clinical Feature	Histopathological Subtype	Odds Ratio (OR)	95% CI	P-value
Age <10 years	Lymphoblastic	1.8	1.2-2.7	0.030
Male Gender	Burkitt's	2.3	1.5-3.4	0.001
Fever at Presentation	Diffuse Large B-Cell	0.9	0.6-1.3	0.500
Complete Remission	Anaplastic Large Cell	1.5	0.9-2.5	0.040

Table 3: Incidence and Significance of Biochemical Markers in Pediatric Non-Hodgkin Lymphoma Patients

Biochemical Marker	Incidence (n)	Percentage (%)	Odds Ratio (OR)	95% CI	P-value
Hyperuricemia	25	38.5	2.5	1.5-4.1	0.002
Elevated LDH Levels	30	46.2	1.8	1.1-2.9	0.050

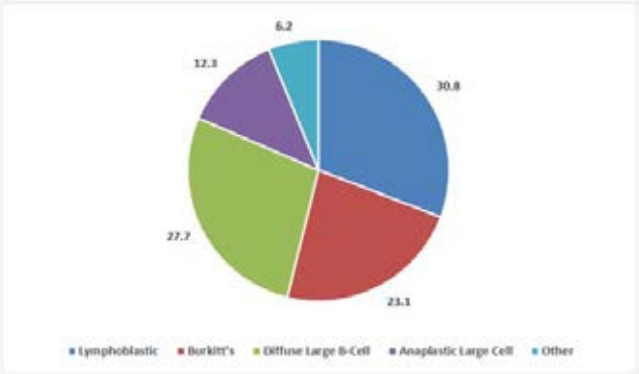

Fig. 1: Lymphoblastic and burkitts

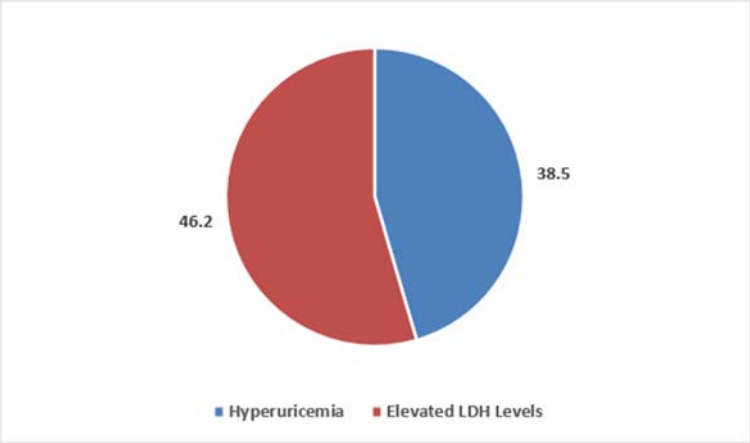

Fig. 2: Hyperuricemia

It categorizes patients into five subtypes, showing the prevalence and highlighting significant variability in subtype distribution among pediatric patients. The odds ratios indicate quantifiable relationships with clinical outcomes, with the significance of these associations suggested by the p-values and confidence intervals, underscoring the importance of histopathological classification in predicting disease behaviour and guiding treatment.

This table explores the relationship between clinical features and histopathological subtypes, revealing correlations with patient demographics and initial presentation, facilitating tailored approaches to diagnosis and treatment based on these characteristics.

This table investigates the prevalence and clinical significance of biochemical markers, specifically hyperuricemia and elevated LDH (Lactate Dehydrogenase) levels, in pediatric NHL patients. It quantifies the incidence of these conditions and evaluates their potential as markers for disease activity or prognosis, pointing towards the utility of LDH as a significant indicator of metabolic disturbances and disease severity in pediatric NHL. The statistical analysis underscores the importance of integrating biochemical parameters into diagnostic and management protocols, suggesting their value in enhancing patient care and guiding therapeutic decisions.

The findings from the tables align with the understanding that pediatric NHL is a diverse group of malignancies with distinct clinical implications. Barman P *et al*.[5]. The significant associations between histopathological subtypes and clinical features, such as age, gender, and treatment outcomes, highlight the need for personalized approaches to patient care. Ruas AF *et al*.[6]. The analysis of biochemical markers, particularly the emphasis on elevated LDH levels, supports their potential role in monitoring disease activity and guiding treatment strategies. Leal *et al*.[7] These insights contribute to a deeper understanding of pediatric NHL Marginean *et al*.[8] and underscore the necessity for comprehensive evaluations that integrate histopathological, clinical, and biochemical data to optimize treatment efficacy and patient outcomes. McCarten *et al*.[9] and Sandlund *et al*.[10].

CONCLUSION

The analysis of pediatric Non-Hodgkin Lymphoma in this study emphasizes the heterogeneity of the disease and the crucial role of histopathological classification, clinical correlations, and biochemical markers, such as Uric acid and LDH, in understanding

disease dynamics. The findings advocate for personalized medicine in treating pediatric NHL, with a focus on optimizing outcomes through detailed assessments of patient characteristics and disease markers. Future research should aim to expand on these findings, exploring the implications of biochemical markers like LDH in predicting treatment response and disease progression, and addressing the limitations noted in the study to enhance the generalizability and applicability of these insights in clinical practice.

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