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Original Article

Evaluation of Epidemiological Risk Features and Hematological Parameters in the Lymphoma Patients in the Larkana Region

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ABSTRACT

Background: Hodgkin lymphoma (HL) is a type of lymphatic cancer that is distinctly characterized and classified into various subtypes, with varying prognoses based on the stage at diagnosis and treatment modalities. Despite advances in treatment, the specific demographic and clinical factors influencing treatment outcomes and the incidence of side effects, such as chemotherapy-induced anemia and neutropenia, remain under-explored, particularly in diverse regional settings.

Objective: This study aims to evaluate the epidemiological risk features and hematological parameters of lymphoma patients in the Larkana region, with a focus on the impact of chemotherapy on these parameters.

Methods: A case-control study was conducted over twelve months at Linar Hospital in Larkana, involving 40 participants aged between 10 and 70 years. Informed consent was obtained, aligning with ethical standards akin to the Declaration of Helsinki. Two types of blood samples were collected pre- and post-chemotherapy for hematological analysis including total leukocyte count, hemoglobin, and platelet levels, which were assessed using Complete Blood Count (CBC) containers with EDTA. Statistical analysis was performed using Microsoft Excel 2010 and SPSS Version 23, utilizing descriptive statistics and the Student's t-test.

Results: The study documented a decrease in mean hemoglobin levels from 11.42 ± 1.74 g/dL before chemotherapy to 10.65 ± 1.55 g/dL after ($p = 0.001$), mean white blood cell count from 7.30 ± 2.6 × 10^3/uL to 5.71 ± 2.1 × 10^3/uL ($p = 0.003$), and platelet count from 297.52 ± 116.2 × 10^3/uL to 230.2 ± 72.6 × 10^3/uL ($p = 0.001$). These findings indicate a significant hematological impact associated with chemotherapy.

Conclusion: The significant reduction in critical hematological parameters among lymphoma patients' post-chemotherapy highlights the need for rigorous monitoring and tailored management strategies to mitigate treatment side effects. The findings emphasize the importance of comprehensive patient care and support in improving treatment outcomes in lymphoma.

Keywords: Hodgkin lymphoma, chemotherapy, hematological parameters, lymphoma treatment, epidemiological risk, hematological toxicity, Larkana region.

INTRODUCTION

Hodgkin lymphoma (HL) is a form of cancer affecting the lymphatic system, primarily characterized by the presence of large malignant lymphoid cells known as Reed-Sternberg cells, which typically constitute less than 1% of the cells in affected tissues (1). The heterogeneity in the histologic findings of HL arises from the variable nature of the malignant cells and the response of the host (2). In the United States, it was estimated that in 2010, there were 8,490 new cases of HL and 1,320 deaths attributed to the disease (3). Historically, the 5-year survival rate in the 1960s was under 10% (4); however, advancements in combination chemotherapy regimens have significantly improved outcomes, with a reported 5-year survival rate of 85.2% for the period from 2000 to 2004 (5). Despite these advancements, gaps remain in our understanding of the clinical and demographic factors that influence disease presentation and outcomes in the US (5).

Recent epidemiological research has identified independent associations between factors such as age, gender, race, and geographic location and the incidence of HL (2). Notably, the incidence of HL among Asians in the US is markedly lower than in other races, with

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significant differences between US-born Asians and those born in Asia (6). Factors such as age, geographic location, social class, and temporal trends suggest an etiological role for infectious agents like the Epstein-Barr virus (EBV), while a genetic predisposition is indicated by familial aggregation and specific human leukocyte antigen (HLA) types (2, 7). A retrospective analysis of HL cases diagnosed from 1973 to 2007 in the US further explores the relationships between patient demographics, clinical features at diagnosis, and survival outcomes, utilizing data reported to population-based cancer registries.

Globally, cancer remains a leading cause of death, with lymphomas—a group of malignant lymphoid hemopathies characterized by lymph node or extranodal infiltration—posing significant challenges (9). In 2018, hematological malignancies, including lymphomas, accounted for approximately 12% of all cancer diagnoses, with lymphomas alone accounting for about 15,500 new cases (11). Lymphomas are categorized into two main types: Hodgkin's lymphoma, which arises from B-cells mutations, and non-Hodgkin lymphoma, characterized by the proliferation of B-lymphocytes or T-lymphocytes (10). Common clinical presentations of lymphoma include fever, night sweating, weight loss, loss of appetite, and lymphadenopathy, particularly in the cervical, axillary, and inguinal regions (14). The pressure effect of enlarged lymph nodes is also a typical manifestation.

The advancements in treatment and various chemotherapy protocols have not only increased the number of long-term survivors but have also emphasized the importance of identifying the late effects of lymphoma treatment, which is crucial for long-term patient follow-up (15). Although well-recognized symptoms such as lymphadenopathy and systemic B-symptoms (i.e., fever, night sweats, and weight loss) are integral to the diagnosis, there is surprisingly little empirical research on the symptom experiences of lymphoma patients undergoing treatment. Since 2000, several studies have begun to explore theories related to the sign and symptom experiences of these patients, noting that responses to symptoms and coping strategies can vary widely among individuals based on past experiences and future expectations (16).

MATERIAL AND METHODS

The study was designed as a case-control investigation conducted over a twelve-month period within the Larkana region. Participants included both male and female residents aged 10 to 70 years. Prior to inclusion, all participants were thoroughly informed about the study's objectives and the benefits of their involvement. Informed consent was obtained, ensuring voluntary participation and the use of their blood samples for research purposes, in accordance with ethical standards akin to the Declaration of Helsinki.

Blood samples were collected at Linar Hospital, situated in the Larkana region. Two types of blood samples were drawn for each participant: one for hematological analysis and another for assessment both before and after undergoing chemotherapy. For hematology, a 5-milliliter venous blood sample was drawn and treated with 0.2% Ethylenediaminetetraacetic acid (EDTA) to prevent clotting, and then placed in a CBC (Complete Blood Count) container. An additional 5-milliliter sample was collected, allowed to clot in a sterile tube, and subsequently utilized for biochemical tests.

Data analysis was conducted retrospectively using Microsoft Excel 2010 and SPSS Version 23. Descriptive statistics, including mean and standard deviation, were calculated for all hematological parameters. The differences in these parameters between pre- and post-chemotherapy conditions were analyzed using the student's t-test. A p-value of less than 0.05 was considered statistically significant, indicating meaningful differences attributable to the treatment. This methodological framework ensured robust data collection and analysis, fostering reliable and valid results.

RESULTS

Table 1: Distribution of Patients by Socio-Demographic Aspects

Variable	No. of Patients	N (%)
Gender Distribution		
Male	16	40.0%
Female	24	60.0%
Marital Status		
Married	37	92.5%
Unmarried	3	7.5%
Educational Status		
Literate	9	22.5%
Illiterate	31	77.5%
Age Wise Distribution		
10-20 Years	2	5.0%

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Variable	No. of Patients	N (%)
21-35 Years	15	37.5%
36-50 Years	16	40.0%
Above 50 Years	7	17.5%

Table 2: Signs and Symptoms

Sign and Symptoms	N = 40	(%)
Fever	27	67.5%
Weight Loss	26	65.0%
Appetite Loss	10	25.0%
Lymphadenopathy	40	100%
Fatigue	10	25.0%
Shortness of Breath (SOB)	8	20.0%
Night Sweat	8	20.0%

Table 3: Hematological Parameters of Patients with Lymphoma Receiving Chemotherapy

Name of Test	Time of Test	Means ± SD	Min	Max	P value
Hemoglobin (HB) (gm/dl)	Before	11.42 ± 1.74	8.4	16.6	0.001
	After	10.65 ± 1.55	7.8	14.1	
White Blood Cell (WBC) (×103/uL)	Before	7.30 ± 2.6	0.67	13.9	0.003
	After	5.71 ± 2.1	1.8	9.5	
Platelets (PLT) (×103/uL)	Before	297.52 ± 116.2	117	639	0.001
	After	230.2 ± 72.6	66	446	

In the study, the socio-demographic profiles of the participants revealed notable differences in gender, marital status, educational levels, and age groups (Table 1). Females constituted a majority of the participants, accounting for 60.0% (24 out of 40), while males represented 40.0% (16 out of 40). Most participants were married, with 92.5% (37 out of 40) reporting this status, and only a small fraction, 7.5% (3 out of 40), were unmarried. Educational attainment among the participants was predominantly low, with 77.5% (31 out of 40) being illiterate, while only 22.5% (9 out of 40) were literate. Age distribution varied, with the 36-50 year age group being the most represented at 40.0% (16 out of 40), followed by the 21-35 year age group at 37.5% (15 out of 40). The youngest age group, 10-20 years, and the oldest, over 50 years, were the least represented, constituting 5.0% (2 out of 40) and 17.5% (7 out of 40) of the sample, respectively.

Clinical presentations among the participants were dominated by symptoms commonly associated with lymphoma (Table 2). Lymphadenopathy was universally present, observed in 100% (40 out of 40) of the cases. Fever was the next most frequent symptom, affecting 67.5% (27 out of 40) of the participants, closely followed by weight loss in 65.0% (26 out of 40). Less common symptoms included appetite loss and fatigue, each reported by 25.0% (10 out of 40) of the participants. Shortness of breath and night sweats were the least common symptoms, each observed in 20.0% (8 out of 40) of the cases.

Hematological parameters before and after chemotherapy highlighted significant changes in blood profiles, with critical implications for treatment outcomes (Table 3). Hemoglobin levels showed a decrease from a mean of 11.42 ± 1.74 g/dL before chemotherapy to 10.65 ± 1.55 g/dL after treatment, with the initial and final values ranging from 8.4 to 16.6 g/dL and 7.8 to 14.1 g/dL, respectively. The white blood cell counts also decreased post-chemotherapy, from an initial mean of 7.30 ± 2.6 ×10^3/uL to 5.71 ± 2.1 ×10^3/uL, spanning from 0.67 to 13.9 ×10^3/uL before treatment to 1.8 to 9.5 ×10^3/uL afterwards. Platelets experienced a notable reduction, starting with a mean of 297.52 ± 116.2 ×10^3/uL before chemotherapy to 230.2 ± 72.6 ×10^3/uL after, with minimum and maximum values ranging from 117 to 639 ×10^3/uL before chemotherapy to 66 to 446 ×10^3/uL after. Statistically significant p-values (0.001 for both hemoglobin and platelets, and 0.003 for white blood cells) underlined the marked impact of chemotherapy on these hematological parameters.

DISCUSSION

Hodgkin lymphoma (HL) is distinguished into classical Hodgkin and nodular lymphocyte-predominant subtypes, with the classical form further classified into four subtypes: nodular sclerosis (NS), mixed cellularity (MC), lymphocyte-rich (LR), and lymphocyte-depleted (LD) (17). The absence of any patients diagnosed with the LD subtype in this study likely reflects its rarity, reported as less

than 1% in the population, compounded by the limited sample size of our study. The Ann Arbor classification with Cotswold modification remains the most adopted system for staging HL, reflecting over 50% of patients typically diagnosed at an early stage (18).

In this study, we observed a significant decrease in total leukocyte counts post-chemotherapy in patients with lymphoma, aligning with the expected reduction in neutrophil counts due to the cytotoxic effects of chemotherapeutic agents (19). Such a decrease highlights the prominent issue of chemotherapy-induced neutropenia, recognized as a severe hematologic toxicity of cancer treatment (20). Furthermore, our findings indicate significant reductions in hemoglobin and platelet counts post-chemotherapy, consistent with previous studies that documented similar hematological declines in patients undergoing chemotherapy (21).

The clinical implications of these findings are considerable. For instance, the prognosis of HL is notably influenced by the stage at diagnosis, where the 5-year overall survival rate for stages 1–2 is approximately 90%, compared to around 60% for stage 4 (18). These statistics underscore the importance of early detection and the potential impact of stage at diagnosis or treatment outcomes. Our study also underscores the pervasive impact of lymphoma and its treatment within the community. The common symptoms associated with lymphoma, such as fever, night sweats, weight loss, and lymphadenopathy, were exacerbated by chemotherapy, although some signs and symptoms tended to diminish over the course of treatment. Anemia, evident in both Hodgkin's and non-Hodgkin's lymphoma patients, emerged prominently as a chemotherapy side effect, warranting close monitoring and management.

Despite the insights provided, this study has limitations inherent to its design and execution. The small sample size and the study's regional focus might limit the generalizability of the findings. Additionally, the observational nature of the study precludes a definitive causal inference regarding chemotherapy and its hematologic effects. Future studies could benefit from a larger, more diverse cohort that could enhance the representativeness and robustness of the data. Moreover, longitudinal studies would allow for the assessment of long-term outcomes and the development of management strategies to mitigate the adverse effects observed.

CONCLUSION

This study not only documents significant hematological changes associated with chemotherapy in lymphoma patients but also emphasizes the need for vigilant monitoring and proactive management of these changes. Continued research into the optimization of therapeutic strategies and mitigation of treatment side effects is recommended to enhance patient care and outcomes. This study highlights the significant hematological changes, including reductions in white blood cell, hemoglobin, and platelet counts, experienced by lymphoma patients undergoing chemotherapy. These findings underscore the critical need for vigilant monitoring and management of anemia and other chemotherapy-induced side effects to improve patient outcomes. The study reinforces the importance of early detection and tailored treatment strategies in enhancing the prognosis of lymphoma patients, ultimately contributing to better healthcare practices and improved quality of life for affected individuals.

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