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ORIGINAL ARTICLE

Frequency of Hematological Malignancies Based on Bone-Marrow Aspiration and Trephine Biopsy in Patients Presenting to Tertiary Care Hospital

KOMAL IQBAL[1], ZARMINA HUSSAIN[2], SAIRA NASR MALIK[3], ANSA KALSOOM RAHMAN[4], MASHAL RIAZ[5], HAMEEDA QURESHI[6], MOHTASIM BILLAH[7], ASSAD ULLAH[8]

[1]Assistant professor (hematology), Bacha Khan Medical College Mardan
[2]Assistant Professor (hematology), Bacha Khan Medical College Mardan
[3]Assistant Professor (hematology), Khyber medical college/ KTH Peshawar
4Assistant Professor (Hematology), Kabir Medical College/MMC-General Hospital
[5]Lecturer hematology, Bacha Khan Medical College Mardan
[6]Associate Professor, Northwest General Hospital and Research Center, Peshawar
[7]Professor (pathology), Bacha Khan Medical College Mardan
[8]Veterinary Officer, Civil Veterinary Hospital Gumbat, kohat, KP Pakistan
Corresponding author: Zarmina Hussain, Email: zarmiina@hotmail.com

ABSTRACT

Background: Hematological disorders are found commonly in the general population existing on both ends of the spectrum with minute disorders like iron deficiency anemia to as severe as bone marrow infiltration

Objective: To assess the frequency of hematological malignancies based on bone-marrow aspiration and trephine biopsy in patients presenting to tertiary care hospital

Methodology: The current study was cross-section descriptive study carried out at the Pathology department of Bacha Khan Medical College, Mardan from April 2013 to October 2021. Bone-marrow aspiration and trephine biopsy was done for all the patients. Data regarding gender, age, clinical examination and diagnosis was recorded on a proforma designed for this research. Results were analyzed by using IBM SPSS (version 23).

Results: In our study, a total of 182 patients were included. The mean age (±SD) in the current study was 41 (12.6) years. Based on the malignant hematological disorder, acute myelogenous leukemia was diagnosed in 15 (23.08%) patients, acute lymphoblastic leukemia in (23.08%) patients, chronic myeloid leukemia in 14 (21.54%) patients, acute leukemias in 3 (4.62%) patients, Myeloproliferative neoplasms in 6 (9.23%) patients, Lymphoproliferative disease in 11 (16.92%) patients while plasma cell myeloma was diagnosed in 1 (1.54%) patients.

Conclusion: Our study concludes that acute myelogenous leukemia (AML) and acute lymphoblastic leukemia (ALL) is the most common hematological malignancies in Bacha Khan Medical College followed by chronic myeloid leukemia (CML) which is the second highest malignancies in Bacha Khan Medical College in this specific time.

Keywords: hematological malignancies, bone-marrow aspiration, trephine biopsy

INTRODUCTION

Hematological disorders are found commonly in the general population[1, 2] existing on both ends of the spectrum with minute disorders like iron deficiency anemia to as severe as bone marrow infiltration [3-6] Although hematological disorders vary among the developed and developing countries, worldwide and predominantly in the developing countries, anemia is a common disorder[7]. In any age group hematological malignancies present primarily with anemia[8]

In most clinical setups, the most frequently met hematological disorders are Megaloblastic anemia, idiopathic thrombocytopenia purpura, aplastic anemia, and leukemias [1] . All of which can be detected through bone marrow investigation. Bone marrow investigation not only assists in the diagnosis, staging and prognosis of hematological malignancies[9] ,it also reveals infections in many cases and aids in establishing the diagnosis of storage diseases[10.] Moreover, it confirms chromosomal abnormalities[11, 12] and helps in diagnosing metastatic non-hematopoietic malignancies related with bone marrow[13] Furthermore, the interpretation of cytopenias and hematopoiesis which remain unidentified can also be made through bone marrow investigation[14].It also remains productive in the diagnostic assessment of Pyrexia of unknown origin (PUO)[15]

For bone marrow examination; Aspiration and trephine biopsy are the two methods that can be adopted. While Bone marrow aspiration (BMA) is a simpler, more consistent, and a fast method for evaluation of marrow that can be done from sternum with patient lying on his back, and pillow under the shoulder, ideally it is avoided due to the increased risk of damage to the vital organs associated with sternal aspirate. In children up to 2 years of age, BMA can also be done from tibia[16]

BMA being a safe invasive procedure, makes up for the more routinely employed modality in hospitals for the diagnosis and management of hematological disorders [7, 8, 17]Bone marrow aspiration not only gives an insight about the cytological and numerical features of marrow cells that are suitable to further assessment by molecular and flow cytometric methods and cytogenetics, it is also well able to decipher any unexplained cytopenias and leukemias. With little to no risk of bleeding, it can safely be done in cases of severe thrombocytopenia[8].However, BMA has a drawback relating to its low sensitivity in diagnosis of lymphoma and solid tumor metastasis [18, 19]

On the other hand, Bone marrow trephine biopsies (BMB) provide tremendous understanding of the overall bone marrow structure and spatial interactions between cells. Conditions like insufficient or an unsuccessful aspirate, evaluation of cellularity and bone marrow architecture call for a trephine biopsy, while diagnosing a suspected focal lesion and bone marrow fibrosis also depend on BMB[20] Besides, trephine biopsy is mandatory for the staging of lymphomas[21]

The processing of biopsy takes at least 48–72 hours and is a painful procedure. Hence, performing trephine biopsies in all patients may not be cost effective, or an efficient use of physician or laboratory staff time and efforts, and above all leads to patient discomfort[22] Also the Interpretation is reliant on multiple factors including quality of tissue section and availability of additional techniques like immunohisto-chemistry, special staining and a good coordination between[20] hematopathologists and histopathologists.

Nowadays, for a complete study of bone marrow, obtaining aspirate and trephine biopsy specimens are considered complementary. The frequency of different hematological diseases varies from region to region. Therefore, this study was conducted with a rationale to determine the frequency of various hematological disorders through bone marrow examination in our region.

MATERIALS AND METHODS

The current study was cross-section descriptive study carried out at the Pathology department of Bacha Khan Medical College, Mardan. The duration of study was 8 years from April 2013 to October 2021. Method of sampling was through non-probability sampling technique. In the current study, totally 182 patients were included. The inclusion criteria for our study were all the patients of both gender and all ages referred from outpatients department and wards (for bone marrow aspirate and trephine biopsy) by the clinicians after taking their detail history and examination and willing to take part in our study. The exclusion criteria for our study were all the patients with benign hematological disorders and patients not willing to take part in our study. The study approval was taken from the institutional review board of the hospital. After approval informed consent was signed from the enrolled patients and study main objective was explained to all the patients. A peripheral blood sample of 2ml was taken from all the patients in EDTA tubes and sent to the laboratory for the CBC, reticulocyte and peripheral smear examination. Bone-marrow aspiration and trephine biopsy was done for all the patients. Slides were prepared from the aspirate and examined under microscope. Data regarding gender, age, clinical examination and diagnosis was recorded on a proforma designed for this research. Results were analyzed by using IBM SPSS (version 23). For variables such as gender, frequency and percentages were determined while for other variables like age, means and standard deviation were calculated.

RESULTS

In our study, a total of 182 patients were included. The mean age (±SD) in the current study was 41 (12.6) years. The maximum age was 80 years while the minimum age was nine months. Based on hematological diagnosis, 65 (35.71%) patients were diagnosed as malignant while 117 (64.29%) patients were diagnosed as non-malignant. (Figure 1) Amongst the 65 malignant patients, 36 (55.38%) patients were male while 29 (44.62%) patients were female. (Figure 2) Distribution based on the malignant hematological disorder, acute myelogenous leukemia was diagnosed in 15 (23.08%) patients, acute lymphoblastic leukemia in (23.08%) patients, chronic myeloid leukemia in 14 (21.54%) patients, acute leukemias in 3 (4.62%) patients, Myeloproliferative neoplasms in 6 (9.23%) patients, Lymphoproliferative disease in 11 (16.92%) patients while plasma cell myeloma was diagnosed in 1 (1.54%) patients. (Figure 3)

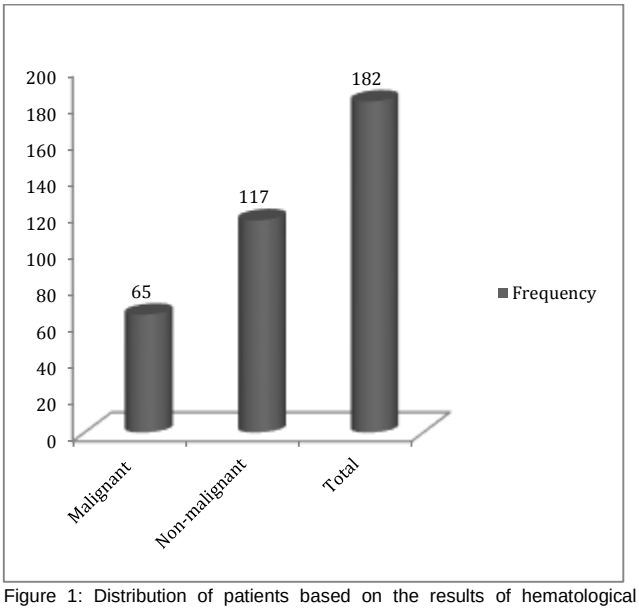

Figure 1: Distribution of patients based on the results of hematological diagnosis

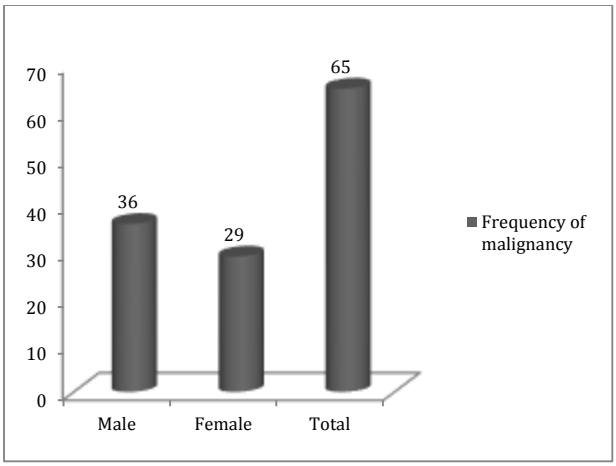

Figure 2: Gender wise distribution of malignant patients

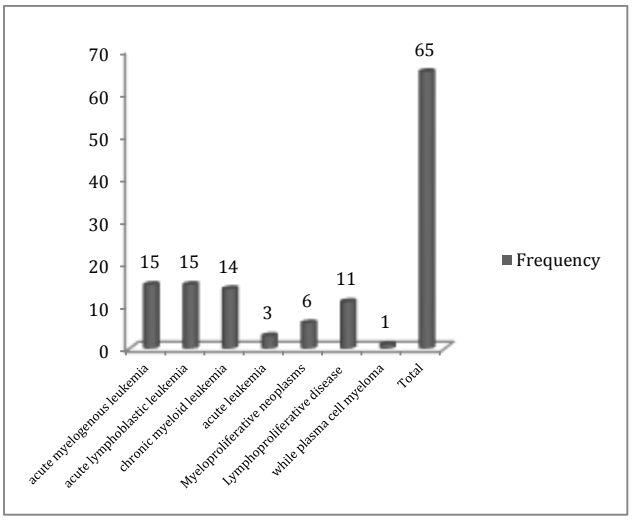

Figure 3: Distribution based on the frequency of malignant hematological disorder

DISCUSSION

Hematological diseases are prevalent among the general public [1, 2]. In the general population, a wide variety of hematological diseases may be found ranging from mild problems such as such as iron deficiency anemia to severe condition, such as bone marrow infiltration [3-5, 23]. Most hematological illnesses may be definitively diagnosed with a bone marrow aspiration and biopsy, which is one of the most useful diagnostic procedures available [24]. It is a common invasive procedure used in hematology used routinely [25]. Following this treatment, reports of bleeding, infection, or any other complications are very uncommon [26].

In our study, a total of 182 patients were included. The mean age (±SD) in the current study was 41 (12.6) years. The maximum age was 80 years while the minimum age was nine months. Based on hematological diagnosis, 35.71% patients were diagnosed as malignant while 64.29% patients were diagnosed as non-malignant. Amongst the 65 malignant patients, 55.38% patients were male while 44.62% patients were female. Distribution based on the malignant hematological disorder, acute myelogenous leukemia was diagnosed in 15 (23.08%) patients, acute lymphoblastic leukemia in (23.08%) patients, chronic myeloid leukemia in 14 (21.54%) patients, acute leukemias in 3 (4.62%) patients, Myeloproliferative neoplasms in 6 (9.23%) patients, Lymphoproliferative disease in 11 (16.92%) patients while plasma cell myeloma was diagnosed in 1 (1.54%) patients. A

previous study was carried out by Mehwish Sajjad et al. on 333 patients refereed to the hematology department for the bone marrow aspiration and biopsy. In their study 292 case were malignant while 41 cases were non malignant. There were more male participants as compared to female participants in their study. In their study Acute lymphocytic leukemia was diagnosed in majority of the patients (n=63) followed by Acute myeloid leukemia and Chronic myeloid leukemia. These findings are in accordance with our findings [27]. A comparable research published by Zeeshan et al. found that amongst 24.76% of the patients whose bone marrow was tested, acute lymphoblastic leukemia was the most prevalent hematological malignancy, which is in line with our findings [28]. In line with our analysis, a previous study also found that acute leukemia was more common than chronic leukemia [29]. A previous study carried out by Fazlur Rahim et al. also reported comparable reports to our findings. They reported that amongst the malignant patients diagnosed in their study, acute lymphoblastic leukemia was observed in 76 (17.92%) cases, followed by acute myeloid leukemia in 27 (6.36%) patients [30]. Other studies in China and India reported lower prevalence of acute lymphoblastic leukemia as compared to our study [31, 32]. A previous study was carried out by Harish Chandra et al. on malignant patients. There were more male in their study than females. They reported acute lymphoblastic leukemia in only 17% of the patients while reported myeloproliferative neoplasm in majority (49%) of their patients which is not in accordance with our study [33].

Limitation of the study: As the current research was only done at a single institution, it may not have accurately represented the total number of cases of hematological malignancies in the country.

CONCLUSION

Our study concludes that acute myelogenous leukemia (AML) and acute lymphoblastic leukemia (ALL) is the most common hematological malignancies in Bacha Khan Medical College followed by chronic myeloid leukemia (CML) which is the second highest malignancies in Bacha Khan Medical College in this specific time. Hematological disorders may be effectively diagnosed by using bone marrow aspiration and trephine biopsy. As a result, it plays a crucial diagnostic role in the hematological workup.

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