Frequency of Common Etiologies of Pancytopenia Seen on Bone Marrow Aspiration

Zohra Samreen,[1] Abdul Baqi Durrani,[1] Muhammad Kamran Taj[2]

ABSTRACT

Background: Pancytopenia is a relatively common hematological entity. It is a striking feature of many serious and life-threatening illnesses, ranging from simple drug-induced bone marrow hypoplasia, megaloblastic anemia to fatal bone marrow aplasias and leukemias. The severity of pancytopenia and the underlying pathology determine the management and prognosis therefore exact diagnosis may be life saving and have good impact on pancytopenia patients.

Objectives: To determine frequency of common etiologies of pancytopenia seen on bone marrow aspiration.

Material and Methods: Cross sectional study design was used for research and the study was conduct at Department of Medicine Unit- I, Bolan Medical Complex Hospital Quetta. Total sample size calculated was 100 with confidence level of 95%, level of significance 5% and power of test 80%. Patients fulfilling the inclusion criteria were selected followed by their detailed history and physical examination. Blood samples collected were sent for appropriate investigations.

Results: Pancytopenia is a clinical condition in which there is reduction in the number of the RBC, WBC and platelets. As a large number of proportion for pancytopenia are treatable, reversible therefore accurate diagnoses and timely involvement may be lifesaving and will have positively impact of the morbidity and mortality on these susceptible patients. Most frequent causes of pancytopenia seen on bone marrow aspiration were aplastic anemia (44%) followed by leukemia (30%), malaria (12%), hepatitis (8%) and tuberculosis (6%).

Conclusion: Bone marrow aspiration is relatively a very safe invasive procedure and principally permits cytological assessment, since the principal of pathology controls the management and diagnosis of the patients.

Key words: *Etiologies, Pancytopenia, Bone, Marrow, Balochistan*

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INTRODUCTION

Pancytopenia is defined as a reduction in all three types of cellular components in peripheral blood and this involves anemia, neutropenia, and thrombocytopenia[1]. It is a significant clinico-hematological being encountered in our daily clinical apply[2]. There are changeable trends in its clinical outline, hematological change, treatment modalities and result[3]. Pancytopenia is a symptom of several serious and life threatening diseases with a wide differential diagnosis. It should be supposed on clinical grounds when a patient presents with prolonged fever, pallor and a tendency to bleed. The pancytopenia causes varies in different populations depending on the differences in nutritional status, climate, age patterns and the prevalence of infections[4]. It is not a disease thing but a triad of findings that may result from a number of disease processes - primarily or secondarily affecting the bone marrow[5]. The bone marrow is the largest and most widely distributed organ in the body. It is the principle site for blood cell formation. The variety of disorders primarily and secondarily involving the bone marrow may manifest with peripheral pancytopenia[6]. The cause of pancytopenia is diagnosed by bone marrow aspiration and it is extremely helpful in the evaluation of pancytopenia[7]. Common etiologies of pancytopenia are malaria followed by tuberculosis, leukemia, aplastic anemia and hepatitis[8-10]. The importance of pancytopenia and the primary pathology determine the management and prognosis of the patients. In Quetta (Balochistan), the causes of pancytopenia are not well defined and pancytopenia often creates a diagnostic dilemma for the treating physician, so the study was conducted to evaluate the different causes and to correlate the bone marrow aspirate result. Rational of this study was to see the diagnostic reliability of bone marrow aspiration in diagnosing different causes of pancytopenia, thus prompt therapy can be provided to patients after diagnosis. Thereby, this information will help in arrangement the diagnostic and therapeutic approach in patients with pancytopenia.

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MATERIAL AND METHODS

The cross sectional study was performed in Department of Medicine Unit- I, Bolan Medical Complex Hospital Quetta. Total sample size calculated was 100 with confidence level of 95%, level of significance 5% and power of test 80%. The patients who were newly diagnosed pancytopenia i.e. within a week time after clinical presentation and all age group patients were included in study. Those patients who were on cancer chemotherapy, cytotoxic/anti metabolic drugs and taking radiotherapy were excludes from study. Patients presenting to medicine outpatient department of Bolan Medical Complex Hospital fulfilling the inclusion criteria were selected followed by their detailed history and physical examination. Informed consent was taken from all the patients. Informed consent was taken from all the patients. After taking informed consent for the process of bone marrow aspiration patients were laid in left lateral position and under sterilized condition bone marrow aspiration done from posterior iliac crest. 20ml syringe was used and approximately 0.3ml of bone marrow was aspirated. Bone marrow aspirated smears were stained with Giemsa stain for microscopy and when required special stains such as periodic acid-Schiff and myeloperoxidase stain were used. Samples collected were sent for appropriate investigations. Data of patients diagnosed as having malaria, tuberculosis, leukemia, aplastic anemia and hepatitis was collected only.

RESULTS

In the present study 100 patients with pancytopenia were included. Among these 65 (65%) were males and 35 (35%) females as shown in Table-1. The results also showed that patients with age 21-40 were highly affected by pancytopenia (45%) followed by > 41 years (40%) and < 20 years (15%).

Bone Marrow finding in Aplastic Anemia

Aplastic anemia was the first common cause in our study. Aplastic anemia accounts for 44% of cases of pancytopenia in the current sequence. Bone marrow (BM) finding showed myelopoiesis, hypocellularity with suppression of erythropoiesis, megakaryopoiesis with relative lymphoplasmacytosis and presence of increased fat with fibrosis (Figure-1).

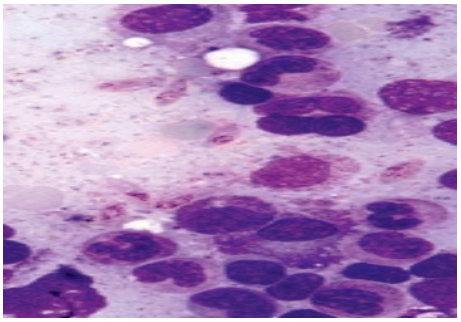


Figure-1: Bone marrow showing hypocellularity with increased fat and reactive lymphoplasmacytosis

Bone Marrow finding in Tuberculosis

In our study it is reported TB with a six-month history of fever associated with fatigability, dizziness, and cough. During this study, we found epithelioid cell granuloma with Langhans' giant cells, hemophagocytosis and focal necrosis consistent with tuberculosis on bone marrow examination (Figure-2).

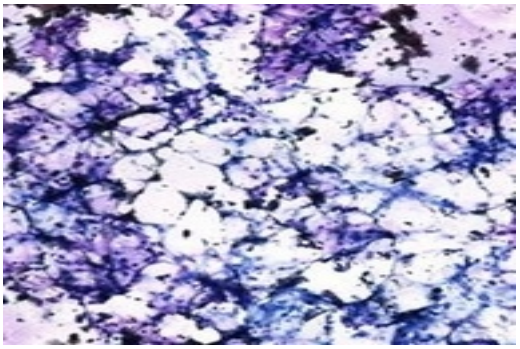


Figure-2: Bone marrow aspiration showing hypocellular marrow fragments and a few haematopoietic cells

Table 1: Distribution of patients with pancytopenia

Age group (years)	Female	Male	Total no. of cases	Percentage
<20	4	11	15	15%
21-40	19	26	45	45%
>40	12	28	40	40%
Total	35 (35%)	65 (65%)	100	100%
p<.10				

Bone Marrow finding in Malaria

The malaria was the third common cause of pancytopenia in our study. Malaria accounted for 12% of cases in our research which is the commonest causes in subcontinent countries. As malaria is endemic in our part world, once the diagnosis of malaria is established the clinician treat the acute illness without advising bone marrow examination. Bone marrow (BM) finding showed numerous gametocytes of *P. felciparum* (Figure-3).

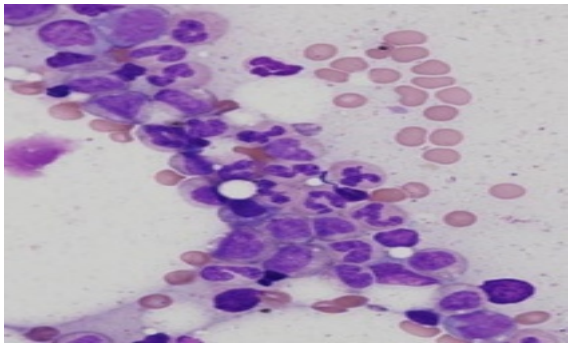


Figure-3: Bone marrow aspirate showing numerous gametocytes of*Plasmodium falciparum.* No ring forms are seen*(May Grunwald Giemsa stain;×1,000)*

Bone Marrow finding in Hepatitis

Bone marrow examination in Hepatitis infected patients can be a applicable test for hematologic evaluation, particularly for patients with severe pancytopenia and sudden alterations in peripheral cell counts. Hepatitis accounts for 8% of cases of pancytopenia in the present study. Bone marrow (BM) finding showed myelopoiesis, hypocellularity with suppression of erythropoiesis, and megakaryopoiesis with relative lymphoplasmacytosis (Figure-4).

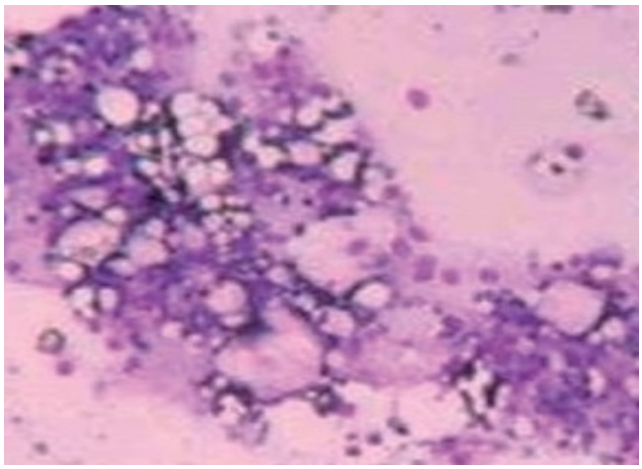


Figure 4: Bone marrow aspirate showing hypocellularity with suppression of erythropoiesis

Bone Marrow finding in Leukemia

Leukemia accounts for 30% of cases of pancytopenia in the present study. Fragments in the aspirated marrow are usually fleshy and numerous. A bloody tap is not uncommon and occasionally a dry tap occurs. Blast cells are the predominant cells comprising 30-95% of the total marrow cells (Figure-5).

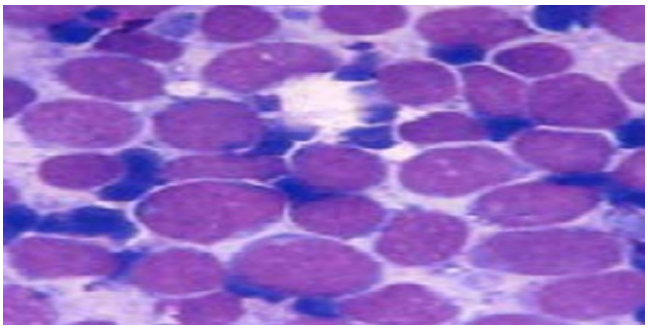


Figure 5: Bone marrow aspirate showing Blast cells

DISCUSSION

Pancytopenia is a clinical situation in which there is reduction in the number of the RBC, WBC and platelets. As a great amount of causes for pancytopenia are treatable and reversible, accurate diagnoses and timely intervention maybe lifesaving and will certainly have impact on the morbidity and mortality in these vulnerable patients. Knowing the correct etiology is thus vital for exact and timely treatment and for prognostication. As the etiologies of pancytopenia are different, so is the prognosis. The general physicians who are not hematologists are improbable to be as well versed in the specific constellation of findings that distinguish individual hematologic entities. The stringent diagnostic criteria and a general conceptual framework for ascertaining the cause of pancytopenia is therefore very valuable and a demand of time.

The most frequent causes of pancytopenia seen on bone marrow aspiration was aplastic anemia (44%), similar findings are reported by Kishor et al[11]. The second common cause of pancytopenia reported in the present study was leukemia (30%), similar result were reported by several researchers[12]. The third common cause of pancytopenia was malaria (12%), similar results are reported by Ashok[13]. The fourth common cause of pancytopenia revealed in the present study was hepatitis (8%) and the fifth common cause of pancytopenia was tuberculosis (6%), similar data are reported by Tareen[10].

Bone marrow (BM) findings showed numerous gametocytes of *P. falciparum*, similar finding were observed by kakkar et al[14]. During this study, hemophagocytosis, epithelioid cell granuloma with Langerhans' giant cells and focal necrosis were seen consistent with tuberculosis on bone marrow examination. Hepatitis accounted for 8% of cases of pancytopenia in the present study. Bone marrow (BM) results showed hypocellularity with suppression of erythropoiesis, myelopoiesis, megakaryopoiesis with relative lymphoplasmacytosis, similar finding were observed by Weinzierl and Arber[15].

CONCLUSION

Pancytopenia is a general entity. However, it has usual inadequate interest in the Indian subcontinent. A study of pancytopenia using simply existing diagnostic techniques is therefore significant. Age and sex distribution of patients with pancytopenia in this study was consistent with the findings in other studies. Aplastic anemia was the commonest cause of pancytopenia in the present study. Most other studies have reported aplastic anemia as the commonest cause. The hematological parameters and bone marrow morphological features in patients with aplastic anemia, leukemia, hepatitis, tuberculosis and malaria in the present study were comparable to the findings by other authors.

A comprehensive clinical, hematological and bone marrow study of patients with pancytopenia usually helps in identification of the underlying cause. However, in view of a wide array of etiological factors, pancytopenia continues to be a challenge for hematologists.

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