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ETIOLOGICAL EVALUATION OF PANCYTOPENIA IN CHILDREN AND ADULT PATIENTS BASED ON BONE MARROW BIOPSY

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ABSTRACT

To assess the etiological background of pancytopenia based on bone marrow biopsies in children and adult patients was conducted at tertiary care hospitals of Hyderabad Pakistan. It is a retrospective study in which 134 pancytopenic patients from both pediatric and adult groups were included. Clinical background and microscopic findings of bone marrow biopsies were examined. In children age group, it was assessed that acute lymphoid leukemia was most striking cause (25%), followed by infection related changes (21.66%), reactive bone marrow (11.66%), and megaloblastic anemia (10%).While in adult age group the most widespread cause of pancytopenia was megaloblastic anemia (24.32%), followed by infection related changes (17.56%), hypocellular bone marrow (8.1%) and others. Urgent evaluation of pancytopenic patients is very necessary at earlier stage before it turns in to diverse and dangerous etiological changes.

Keywords: Pancytopenia, adult, children, bone marrow, etiology.

INTRODUCTION

Pancytopenia is a conspicuous characteristic of several serious and life threatening diseases and complications. It may occur due to several disorders ranging from simple drug-induced bone marrow hypoplasia and megaloblastic anemia to serious aplastia and hematological malignancies. Peripheral pancytopenia is decline in all three major constituents of blood to levels less than lower normal limit which may cause reduction in hemoglobin (anemia), reduction in white blood cells (leucopenia) and reduction in platelets (thrombocytepenia). Thus, one can say that it is not a disease itself, but rather a triad of findings (Jain and Naniwadekar, 2013). Pancytopenia is caused by either a failure of production of haematopoietic progenitors called aplastic anemia, or peripheral devastation of cellular element either due to infection, immune-mediated damage or hypersplenism (Memon, et al., 2008). Determination of the core pathological cause of pancytopenia is essential as it establishes the management and prognosis of the patients. Bone marrow examination is extremely useful in the evaluation of pancytopenia (Vaidya, 2015). Bone marrow aspiration plays a significant role in recognizing the etiology of pancytopenia (Malik, et al., 2016). Principle reason of this study is to assess the etiological background of patients with pancytopenia.

MATERIALS AND METHODS

It was a retrospective study, conducted in tertiary care hospitals at Hyderabad Pakistan in the duration of one year. Total 134 patients were recruited for study and were divided in two groups: Adult group age (>12 years) and pediatric group age (<12 years). Out of 134 patients, 74 (55.22%) were in adult group and 60 (44.77%) were in pediatric group (Table–2). This study contains pediatric group and adult age group. Pediatric group ranged from 4 months to 12 years (Mean 4.46 years). Other group included was adult group, ranging from 14 to 96 years (Mean 40.01 years. Complete medical history was taken including age, sex, status of smoking, status of alcohol, history of treatment and history for other symptoms. Detailed general physical and systemic examination of patients was performed. All patients were evaluated for routine complete blood count; reticulocyte count and bone marrow biopsy of patients were done and reviewed for exact etiology causing pancytopenia. Blood count was measured using Sysmex X-100 analyzer. Data was analyzed on SPSS Version 20.0 and frequencies for age, gender, etiological background were measured.

RESULTS

Total (n=134) pancytopenic patients were selected for this study and bone marrow biopsy was performed. Out of 134 patients (n=81), (60.4%) were male and (n=53), (39.6%) were female (Table–1). Inclusion criteria was patients having pancytopenia with hemoglobin <10g/dl, total leukocyte count <4000/cumm and platelets <100,000/cu mm. Patients receiving any medication for respective disease or chemotherapy for malignancy or on follow – up were not included in this study.

Table – 1: Frequency of gender

Gender	Frequency	Percent
Male	81	60.4
Female	53	39.6
Total	134	100

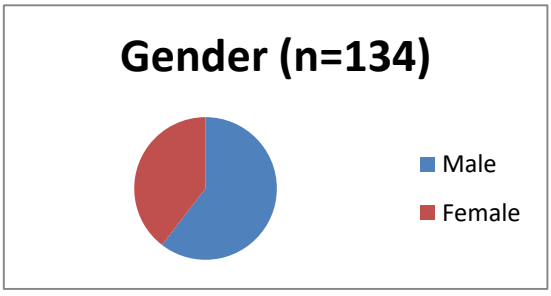
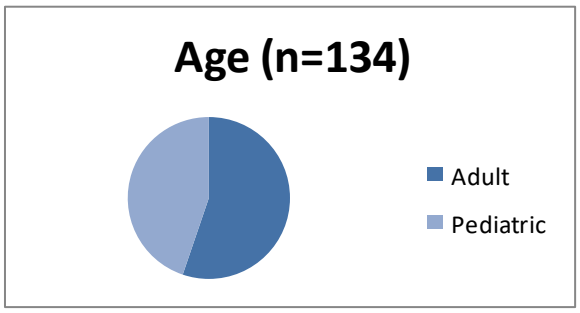


Table – 2: Frequency based on age group

Age Group	Frequency	Percent
Adult	74	55.2
Pediatric	60	44.8
Total	134	100



In pediatric group, male to female ratio was 1.60:1 (66.66%/ 38.33%) respectively. While in adult group, male to female ratio was 1.46:1 (59.44%/ 40.54%) respectively. In pediatric group, most frequent reason (Table–3) of pancytopenia was acute lymphoblastic leukemia (25%), followed by infection related changes (21.66%), reactive bone marrow (11.66%), megaloblastic anemia (10%) and others.

Table–3: Etiological background of pancytopenia Pediatric group

Disease	No. of cases	(%)
Acute lymphoblastic leukemia	15	25%
Infection related changes	13	21.66%
Reactive bone marrow	7	11.66%
Megaloblastic anemia	6	10%
Aplastic anemia	3	5%
Nieman – Pick Disease	3	5%
Acute myeloid leukemia	2	3.33%
Visceral leishmaniasis	2	3.33%
Hypersplenism	2	3.33%
Hypocellular bone marrow	2	3.33%
Metastasis	1	1.66%
Pure red cell aplasia	1	1.66%
Lymphoproliferative disorder	1	1.66%
Gaucher's disease	1	1.66%
Hemophagocytic syndrome	1	1.66%

While in adult group (Table–4), most common etiology was megaloblastic anemia (24.32%), followed by infection related changes (17.56%), hypocellular bone marrow (8.1%) and others.

Table–4: Etiological background of pancytopenia Adult group

Disease	No. of cases	(%)
Megaloblastic anemia	18	24.32%
Infection related changes	13	17.56%
Hypocellular bone marrow	6	8.1%
Acute lymphoblastic leukemia	5	6.75%
Multiple myeloma	5	6.75%
Anemia of chronic disease	4	5.4%
Reactive bone marrow	4	5.4%
Acute myeloid leukemia	3	4.05%
Metastasis	3	4.05%
Mixed deficiency anemia	2	2.7%
Chronic myeloid leukemia	2	2.7%
Aplastic anemia	2	2.7%
Fibrosis	2	2.7%
Plasmacytosis	2	2.7%
Chronic lymphoid leukemia	1	1.35%
Myelodysplastic syndrome	1	1.35%
Lymphoproliferative disorder	1	1.35%

DISCUSSION

Different studies have been done on patients with pancytopenia. Different regions have different population and variety of etiology of pancytopenia based on their clinical background. The major cause of pancytopenia was malaria and hypersplenism >45%, trailed by megaloblastic anemia 14.7% and other hematological malignancies (Hamid and Shukry, 2008). Another study performed in 5 year duration on 244 patients who were evaluated by clinical background and bone marrow aspiration biopsy and the frequent etiology found was hypoplastic bone marrow 27.04%, after which megaloblastic anemia was prominent cause 20.08% and other hematological disorders and malignancies (Rahmani, et al., 2016). A study was performed on 205 patients of pediatric group only in 6years duration, in that study it was found that aplastic anemia was 28.3% as most common etiology, followed by hematological malignancies 23.9%, megaloblastic anemia 19.5% and other hematological disorders (Jan, et al., 2013). A study on 62 patients on their clinical background found that megaloblastic anemia 41.9% was most widespread cause of pancytopenia, followed by acute myeloid leukemia 27.45 and other hematological disorders and malignancies (Makheja, et al., 2013). Another study, was performed on 88 patients and revealed megaloblastic anemia 40.90 as major etiological reason, followed by aplastic anemia 31.88% and other hematological malignancies (Aziz, et al., 2010). A study on 106 patients, revealed that megaloblastic anemia 26.42% was the most common cause of pancytopenia, followed by hypersplenism 24.53% and other hematological disorders and malignancies (Subrahmanyam and Padma, 2015).

Another study was performed on 50 patients, revealed hypoplastic bone marrow (22%) as most common cause, followed by megaloblastic anemia 18% and myelodysplstic syndrome 18% with other hematological malignancies (Devi, et al., 2008). A study was performed a study on 50 pancytopenic patients, showing aplastic anemia 26% as common cause, followed by erythroid hyperplasia 22% and other hematological disorders (Desalphine, et al., 2014). A study performed on 104 patients, found megaloblastic anemia 74.04% as most common cause, followed by aplastic anemia 18.26% (Gayathri, 2016). Study on 50 patients with pancytopenia revealed megaloblastic anemia 44% as most common cause, followed by aplastic anemia (14%) and other hematological disorders (Jha, 2008). Other study performed on 817 adult patients revealed that megaloblastic anemia 31.9% was most common cause, followed by acute leukemia 30.5% and other hematological disorder (Mallik, et al., 2016). Various etiologies had been discovered depending upon regional distributions and age of patient's. Various other studies performed in Pakistan, India and other countries are in favor on this study. Other etiologies found in adult group were acute lymphoblastic leukemia 6.75%, multiple myeloma 6.75%, anemia of chronic disease 5.4%, reactive bone marrow 5.4%, acute myeloid leukemia 4.05%, metastasis secondary to distant

tumor 4.05%, mixed deficiency anemia 2.7%, chronic myeloid leukemia 2.7%, aplastic anemia 2.7%, fibrosis 2.7%, plasmacytosis 2.7% and chronic lymphoid leukemia 1.35%. While in pediatric age group, other etiologies found were reactive bone marrow 11.66%, megaloblastic anemia 10%, aplastic anemia 5%, Niemann–Pick disease 5%, acute myeloid leukemia 3.33%, visceral leishmaniasis 3.33%, hyper-splenism 3.33%, hypoplastic bone marrow 3.33%, metastasis secondary to distant tumor 1.66%, pure red cell aplasia 1.66%, lymphoproliferative dis-order 1.66%, Gaucher disease 1.66% and hemophagocytic syndrome 1.66%. Our studies have also proved megaloblastic anemia as most common causes of pancytopenia in adult group and acute leukemia in pediatric group and it is correlated study with other researchers.

CONCLUSION

It is concluded from present study that evaluation based on bone marrow biopsy plays more important role than peripheral counts. Complete medical history and relevant investigation help in determining the exact cause. Accurate diagnosis of pancytopenia will reduce mortality and morbidity by treating after appropriate diagnosis. Patients turn into good prognosis because many treatment modalities respond better to specific targeted therapy.

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