

## EVALUATION OF CLINICO-HEMATOLOGICAL PROFILE ON THE BASIS OF BONE MARROW ASPIRATIONS AMONG CHILDREN

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Received: 22/02/2015

Revised: 25/04/2015

Accepted: 15/05/2015

### ABSTRACT:

**Background:** The rationale for conducting the study on bone marrow aspiration lies in its critical role in providing detailed information that cannot be obtained through routine hematology examinations of blood samples alone. By performing bone marrow aspirations, clinicians can gain valuable insights into cellular morphology, hematopoietic activity, and the presence or absence of iron stores. **Material & Methods:** The present cross sectional, prospective study was carried out at department of pediatrics, at our tertiary care hospital. The study duration was of six months from January 2013 to June 2013. In this prospective study we enrolled 100 children of age group of 0-18 years requiring bone marrow examination for various hematological disorders and enrolled by simple random sampling. **Results:** In the present study, out of total enrolled participants, on the basis of laboratory diagnosis on the basis of bone marrow aspiration it was found that 52% of children had iron deficiency anemia, 22% of children had dual deficiency anemia, 16% of children had megaloblastic anemia, 3% children had ITP, 2% children had malaria, 1% children had lymphohistocytosis and 2% children had anemia of chronic diseases. All study participants (100%) had pallor, 32% children had fever, 2% children had icterus, 3% children had petechiae, 2% children had hepatomegaly and 2% children had splenomegaly. There was no mortality reported in present study. **Conclusion:** We concluded from the present study that, the most prevalent condition identified during our study through bone marrow examination was micronutrient deficiency anemia, with a particular emphasis on iron deficiency anemia.

**Keywords:** bone marrow aspiration, Iron deficiency anemia, megaloblastic anemia.

### INTRODUCTION:

The primary indication for conducting a bone marrow aspiration is to address inquiries that cannot be resolved through a routine hematology examination of a blood sample (1). It provides a thorough morphological assessment of cells, including a differential count and the myeloid to erythroid ratio, enabling an evaluation of hematopoietic activity (2). Abnormalities may manifest qualitatively through irregular cellular morphology or quantitatively through the presence or absence of iron stores, as determined

by Prussian blue staining (3). Additionally, bone marrow aspiration can reveal details about parasites or cell inclusions (4).

The rationale for conducting the study on bone marrow aspiration lies in its critical role in providing detailed information that cannot be obtained through routine hematology examinations of blood samples alone (5). By performing bone marrow aspirations, clinicians can gain valuable insights into cellular

morphology, hematopoietic activity, and the presence or absence of iron stores. This procedure allows for a more comprehensive assessment of various hematological conditions, enabling accurate diagnosis and guiding appropriate management strategies for patients (6). Additionally, bone marrow aspiration can help identify abnormalities such as parasites or cell inclusions, contributing to a better understanding of underlying pathologies. Therefore, conducting a study on bone marrow aspiration is essential to validate its utility in clinical practice and further optimize its diagnostic and therapeutic applications (7).

Hence the present study was conducted to evaluate the clinico-hematological profile of children on the basis of bone marrow aspirations at our tertiary care hospital.

## MATERIALS & METHODS

The present cross sectional, prospective study was carried out at department of pediatrics, at our hospital. The study duration was of six months from January 2013 to June 2013. A sample size of 100 was calculated at 95% confidence interval at 10% acceptable margin of error by epi info software version 7.3. In this prospective study we enrolled 100 children of age group of 0-18 years requiring bone marrow examination for various hematological disorders and enrolled by simple random sampling. Strict confidentiality was maintained with patient identity and data and not revealed, at any point of time.

The bone marrow sample is processed by preparing an aspirate smear, which is then stained using Romanowsky's stain for general cell morphology assessment and Prussian blue stain specifically for iron staining. Observations

are made by examining the stained slides under a microscope, allowing for the identification and documentation of pertinent findings related to cellular morphology, iron content, and any abnormalities present in the bone marrow sample. This standardized methodology ensures consistent and reliable evaluation of bone marrow samples for diagnostic purposes. All data were entered in the MS office 2010 spread sheet and Epi Info v7. Data analysis was carried out using SPSS v22. Qualitative data was expressed as percentage (%) and Pearson's chi square test was used to find out statistical differences between the study groups and sensitivity, specificity, positive predictive value and negative predictive value were calculated. If the expected cell count was < 5 in more than 20% of the cells then Fisher's exact test was used. All tests were done at alpha (level significance) of 5%; means a significant association present if p value was less than 0.05 and highly significant if p value less than 0.01.

## RESULTS

In the present study, we enrolled 100 children of age group of 0-18 years requiring bone marrow examination for various hematological disorders by simple random sampling. Out of the total enrolled children 52% were males and 48% were females. Mean weight of study participants was  $22.7 \pm 4.2$  kg. Out of total, 22% were in group of less than five years, 26% were in the age group of 5-10 years, 28% were in the age group of 10-15 years and 24% were in the age group of 10-15 years. (Table 1)

In the present study, out of total enrolled participants, on the basis of laboratory diagnosis on the basis of bone marrow aspiration it was found that 52% of children had iron deficiency

anemia, 22% of children had dual deficiency anemia, 16% of children had megaloblastic anemia, 3% children had ITP, 2% children had malaria, 1% children had lymphohistocytosis and 2% children had anemia of chronic diseases. There was no mortality reported in present study. (Table 2)

**Table 1: Distribution of study participants according to study parameters.**

Parameters		No. of patients
Gender	Male	52%
	Female	48%
Age group	Less than 5 years	22%
	5-10 years	26%
	10-15 years	28%
	15-18 years	24%

**Table 2: Distribution of study participants according to laboratory diagnosis on the basis of bone marrow aspiration.**

Range of Hb (g/dl)	No. of patients
Iron deficiency anemia	52%
Dual deficiency anemia	22%
Megaloblastic anemia	16%
ITP	3%
Malaria	2%
Lymph histiocytosis	1%
Anemia of chronic diseases	2%

In the present study, out of total enrolled participants, on the basis of clinical presentation it was found that all study participants (100%) had pallor, 32% children had fever, 2% children had icterus, 3% children had petechiae, 2%

children had hepatomegaly and 2% children had splenomegaly. (Table 3)

**Table 3: Distribution of study participants according to clinical presentation.**

Parameters	No. of patients
Fever	32%
Pallor	100%
Icterus	2%
Petechiae	3%
Hepatomegaly	2%
Splenomegaly	2%

## DISCUSSION

In the present study, we enrolled 100 children of age group of 0-18 years requiring bone marrow examination for various hematological disorders by simple random sampling. Out of the total enrolled children 52% were males and 48% were females. Mean weight of study participants was  $22.7 \pm 4.2$  kg. Out of total, 22% were in group of less than five years, 26% were in the age group of 5-10 years, 28% were in the age group of 10-15 years and 24% were in the age group of 10-15 years. Similar findings were reported in a study conducted by J N Githang et al conducted to assess the children requiring bone marrow examination for various hematological disorders and found that a total of 97 bone marrow examinations (BME) from patients aged two months to 13 years. The peak age group for undergoing BME was between six to eight years, comprising 24% of all patients. The most common indication for performing BME was unexplained anemia, which was cited in 26% of the request forms (8).

In the present study, out of total enrolled participants, on the basis of laboratory diagnosis on the basis of bone marrow aspiration it was found that 52% of children had iron deficiency anemia, 22% of children had dual deficiency anemia, 16% of children had megaloblastic anemia, 3% children had ITP, 2% children had malaria, 1% children had lymphohistocytosis and 2% children had anemia of chronic diseases. There was no mortality reported in present study. Similar findings were reported in a study conducted by Srikanth M Shastry et al conducted to assess the children requiring bone marrow examination for various hematological disorders and found that Bone marrow aspirates from 110 patients were analyzed in the study. Among the non-hematological group, nutritional anemia accounted for the highest number of cases. Within nutritional anemia, megaloblastic anemia emerged as the most common disorder (9).

In the present study, out of total enrolled participants, on the basis of clinical presentation it was found that all study participants (100%) had pallor, 32% children had fever, 2% children had icterus, 3% children had petechiae, 2% children had hepatomegaly and 2% children had splenomegaly. Similar findings were reported in a study conducted by Oussama Abla et al conducted to assess the children requiring bone marrow examination for various hematological disorders and found that bone marrow aspirations are vital procedures in diagnosing hematological malignancies and nonmalignant diseases in children. During BMA, bone marrow particles are collected for analysis, which includes microscopic morphologic evaluations and differential counts (10).

## CONCLUSION

We concluded from the present study that, the most prevalent condition identified during our study through bone marrow examination was micronutrient deficiency anemia, with a particular emphasis on iron deficiency anemia. Moreover, in resource-limited settings such as ours, bone marrow aspiration serves as the preferred investigation method in cases of severe anemia to either confirm nutritional deficiency anemia or exclude hematological malignancies.

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