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Original Article

Analysis of pediatrics bone marrow aspiration results done in King Hussein medical center (K.H.M.C)

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ABSTRACT

Objective: To study the results of pediatrics bone marrow aspiration (B.M.A) which were done over last three years in K.H.M.C. **By clinical presentation, and laboratory diagnoses. Method and material:** A retrospective analysis of all bone marrow aspirate results in children. Which were done in K.H.M.C; in a period from January 2004 to December 2006. A data collecting sheets were done which includes information of age, sex, presenting symptoms, CBC results, and bone marrow aspiration results. Both as raw results as mentioned in our abstract and as deep analyses to exclude repetition of procedure for follow up purpose in case of deferent malignancies types. **Results:** Around 715 results was reviewed found to have 137 results (19%) as acute lymphocytic leukemia ALL with another 73 results (10%) ALL in remission, 70 results (9.8%) as acute myeloid leukemia, 2 results (0.2%) Hodgkin disease, 8 results (1.1%) non Hodgkin lymphoma, 20 results (2.8%) as neuroblastoma, two results (0.2%) as rhabdomyosarcoma, 175 results (24.5%) as normal and malignancies in remission other than ALL. Other non malignant results were 70 results (9.8%) as idiopathic thrombocytopenic purpura ITP, 61 results (8.5%) as iron deficiency anemia IDA, 16 results (2%) for each of the following megaloblastic anemia, anemia of chronic disease, and metabolic diseases. around (1%) or less for the followings compound anemia, a plastic anemia, congenital dyserythroblastic anemia, cyclic benign neutropenia, Epstein Barr virus EBV, myelodysplastic syndrome MDS, TORCH, reactive, and hemophagocytoses. **Conclusion:** B.M.A is a mandatory tool for diagnoses and follow up of malignancies. Although good percent shows normal results, acute lymphoblastic leukemia was the most common amongst the malignant hematological disorders followed by acute myeloid leukemia.

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1. Introduction

In pediatric age group; when we consider all hematological diseases, ranges from those very common disorders which are usually treated by general pediatrician up to very serious either common like leukemia, or rare as syndromatic disorders that affect stem cell differentiation of the bone marrow. All of these represent a big entity of pediatric diseases groups.

Although most of them need simple laboratory tests for their diagnoses as most of anemia and even recently platelet disease as typically presented idiopathic thrombocytopenic purpura, even

though bone marrow still essential for others. Bone marrow aspiration, also called bone marrow sampling, is one of the most frequent and relatively very safe invasive procedures done routinely in pediatric units (1, 2). By suction of fluid from the soft, spongy material that lines the inside of most bones. Though an invasive, procedure, it can be easily performed even in the presence of severe thrombocytopenia with little or no risk of bleeding (1, 2).

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Bone marrow aspiration is used to

- Pinpoint the cause of abnormal blood test results as when blast cell is present in peripheral blood film.
- Confirm a diagnosis or check the status of severe anemia of unknown cause, or other irregularities in the maturation of red blood cells and inability the blood to store iron
- Diagnose infections, such as tuberculosis, Mycobacterium avium intracellular (MAI) infections, histoplasmosis, leishmaniasis, and other disseminated fungal infections. As will as diagnostic workup in fever of unknown origin (FUO).
- It may be useful in establishing the diagnosis of storage diseases, such as Niemann-Pick disease and Gaucher disease.
- To diagnose and to stage lymphomas, and nonhemopoietic malignancies that have spread to the bone marrow when all other imaging and diagnostic modalities performed, this also help in prognoses estimation of these diseases.

2. Material and Methods

This study was retrospectively carried out from January 2004 to December 2006 at the Department and out patient Pediatric hemato/oncology unit in King Hussein medical center. A total of 715 bone marrow aspiration as a raw results were studied, and out of these 396 results with detailed history and clinical examination was carried out in each case and the relevant information noted in B.M.A data sheets.

After taking detail history physical examination was done to look for lymph nodes enlargement, hepato-splenomegaly, weight loss and bone pain or tenderness. Investigations included peripheral blood smear, kidney and liver function tests and coagulation screen in all cases. Then bone marrow examination was done.

2.1. Inclusion Criteria:

We defined cases as any child with no clinically apparent diagnoses who is in need for this procedure, or other cases with known diagnoses but for staging purposes.

2.2. Exclusion Criteria:

1. Results of follow up done for patient with acute leukemia during induction therapy to check remission, or to rule out relapses during treatment, and those samples taken at end of therapy.
2. Repeated follow up samples done for patients with solid tumors affect bone marrow other than first one for staging. As neuroblastoma, non Hodgkin lymphoma, bone tumors and etc.
3. Failed and non informative samples.

3. Results

Out of the 715 reviewed results only 396 cases fulfill the criteria for our study and 319 results was excluded from our study as seen in table-I below.

For those included in this study results are distributed in three categories Hematological disorder, Malignancies diseases, and Normal results as seen in table-II below.

Table-I shows the excluded cases

ALL	Non-Remission + early relapse	34
	Wk3- induction remission	47
	Follow up remission	39
	End therapy remission	24
AML	Non Remission	19
	remission	15
Failure and excluded		21
CGL		4
N.BL	Repeated +ve	10
	Repeated -ve	8
Congenital dyserythropoieses		1
RMS		1
NHL		2
Older >14 + repeated studied cases		94
Total excluded cases		225+94=319

Table-II shows the included cases

Disease	No.	Percent
Hematological disorder	186/396	47%
Malignancies diseases	83/396	21%
Normal results	127/396	32%

And as hematological disorder, table-III shows us its distribution in detail as I.T.P and IDA forms the majority of hematological diseases.

Table-III shows the Hematological disease

Hematological disease (186)	No.	Percent
I.T.P	64	34.4%
IDA	[35] + 25	13.44%
A.A	17	9.13%
Infection	13	7%
Megaloblastic. Anemia *	12	6.45%
Auto. Immune	11	5.91%
Compound. A	8	4.3%
Myelofibrosed B.M	8	4.3%
A. of chronic diseases **	7	3.76%
Metabolic ***	7	3.76%
CBN	7	3.76%
Thalassemia	2	1.07%
Hemophagocytoses	2	1.07%
Thrombocytoses	1	0.5%
Polycythemia	1	0.5%

* 91.66% (11/12) less than 2 yr of age.
(Low retic) or (low ANC) or (low platelet) found in 50%
Each case has at least 2 of previous mention indices

** All anemias of chronic diseases shows high iron store

*** All of metabolic diseases show normal CBC & HSM
4 cases of metabolic diseases was N.P. Disease

Table-IV shows the malignant disease

Hematological disease (186)	No.	Percent
ALL#	52	62.65%
AML##	17	20.48%
CGL	1	1.2%
N.BL	7	8.4%
NHL	4	4.8%
RMS	2	2.4%

30 cases (57.7%) male, 22 case (42.3%) are females

11 cases (64.7%) male, 6 case (35.3%) are females

As we see in table-IV ALL is the commonest among all malignancies in children followed by AML.

4. Discussion

Hematological disorder in children is very common with wide variable diagnoses, to some extent that make bone marrow aspiration a valuable tool for their diagnoses, although it is invasive but it is safe and we rarely face complications like infections, bleeding or thrombi [1-5]

This study shows that hematological diseases are the main yield of our B.M.A study followed by normal results, then those with malignancies. Amongst non-malignant disorder I.T.P Idiopathic thrombocytopenic purpura is the commonest in our patients. Then iron deficiency anemia is the second both of them form to some extent around fifty percent of all non malignant disorder. In other similar studies megaloblastic anemia is the most frequent disease.

In our study 91.66% (11/12) of megaloblastic anemia cases are less than two yr of age. Which may present with either (Low retic), (low ANC) or (low platelet) in fifty %, mostly each case has at least two of previous mention indices criteria even though it may also presents with solely thrombocytopenia [5].

Though we know that folate deficiency is more common in children as underlying cause of megaloblastic anemia [6], but we found B12 deficiency competes with folate deficiency in our children.

Aplastic anemia 17cases represents (9.13%) of all hematological disorders as third one is a valid figure, a possible explanation for that beside infection and drugs is the consanguinity marriages, with usual presenting feature of hypo or pancytopenia. Prognosis is directly related to the reduction in peripheral blood counts, particularly the neutrophil number: < 200 granulocytes/ μ L defines the category of super-severe disease (1, 2, and 3). In the early 20th century, patients often died within days or weeks as results of congestive heart failure, profuse hemorrhage, or overwhelming infection. Recurrent bacterial sepsis or fungal invasion of critical organs secondary to refractory neutropenia are the usual causes of death.

In this study 52/70 cases (74.28%) of leukemia were noted with acute lymphoblastic leukemia as the commonest malignancy in our patients (62.65%) of all malignancies, 17 cases were AML represents 24.28% of leukemia and 20.48% of all malignancies , with 2:1 male to female ratio. with results match with international figures.

Approximately Eighty percent of leukemias or less are acute lymphoblastic leukemia (ALL), and at least 17% are acute myeloid leukemia (AML) in the United States [7]. Little is known regarding the epidemiology, etiology and incidence of childhood cancer in developing countries. The incidence of ALL in Pakistan is lower as compared to the developed countries, as is the case in India and China [8,9].

Do not forget that one third of our results were normal

5. Conclusions

- Do not forget that one third of our results were normal.
- Amongst the non-malignant hematological disorders, I.T.P and IDA nutritional anemias as a group was the most common disorder found on bone marrow examination in this study.
- We have an early onset < 2 yr age megaloblastic anemia in our children which may be part of congenital transcobalamine deficiency.
- Aplastic anemia was the most serious nonmalignant disorder found in this study.
- B.M.A is a mandatory tool for: -

Dx, staging and follow up of malignancies. And although good percent shows normal results. Acute lymphoblastic leukemia was the most common amongst the malignant hematological disorders followed by acute myeloid leukemia.

6. References

- [1] Behrman, Kliegman and Nelson text book of pediatrics 16th edition.
- [2] Pakistanian-study (Spectrum of hematological disorders in children observed in 424 consecutive bone marrow aspirations)
- [3] Neal S. Young, Janis L. Abkowitz, and Lucio Luzzatto. New Insights into the Pathophysiology of Acquired Cytopenias. Hematology, 2000; 18 - 38.
- [4] Onal IK, Sumer H, Tufan A, Shorbagi A. Bone marrow embolism after bone marrow aspiration and biopsy. Am J Hematol 2005 28;78(2):158.
- [5] Mohammad AJ. Thrombocytopenia in children. J Postgr Med Inst 2004;18(3) 353-358
- [6] Modood-ul-Mannan, Anwar M, Saleem M, Wigar A, Ahmad MA. Study of serum vitamin B12 and folat levels in patients of megaloblastic anemia in northern Pakistan. J Pak Med Assoc 1995; 45: 187.
- [7] Rosse WF. The control of complement activation by the blood cells in paroxysmal nocturnal haemoglobinuria Blood 1986; 67: 268 -9.
- [8] Gaynon PS, Bostrom BC, Hutchinson RJ, et al. Duration of hospitalization as a measure of cost on Children's Cancer Group acute lymphoblastic leukemia studies. J Clin Oncol 2001;19:1916-25.
- [9] Rajajee S, Desikulu MV, Pushpa V. Survival of childhood acute lymphoblastic leukemia: experience in Chennai. J Trop Pediatric 1999;45:367-370.