Bone marrow aspiration cytology in Abubakar Tafawa Balewa University Teaching Hospital, Bauchi State, Nigeria: Indications and diagnostic utility

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Abstract

Bone Marrow Aspiration (BMA) cytology is an important diagnostic and monitoring tool where cytological details of the marrow elements are examined using light microscopy. Various hematological diseases are diagnosed and monitored by using BMA. This study aimed at reporting a 3-year BMA experience of Department of Hematology and Blood Transfusion of Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH) Bauchi. This was a retrospective study that involved the use of records of the bone marrow aspirates done from January 1st, 2016 to December 31st, 2018. The age, sex, indications for BMA, anatomical site and final bone marrow diagnosis were collated. The data was analyzed using SPSS Version 23.0 software. One hundred and three (103) bone marrow aspirations were performed during the period under review. Two third of the participants were males, with the median age of 40.0 years and a range of 5 months to 92 years. The commonest indication for BMA was recurrent anemia 45.6%, followed by splenomegaly, fever and lymphadenopathy with 11.7% each. While, the commonest diagnosis by BMA was megaloblastic anemia (28.2%). Mixed nutritional deficiency and Bone Marrow (BM) metastasis are the commoner BMA diagnoses with 12.6% each. Recurrent anemia is the commonest indication for BMA and nutritional anemias (megaloblastic and combined nutrients deficiency) are the commonest BMA diagnoses in Bauchi. Proper evaluation of patients by the clinicians before referral is recommended to ensure that only those that really need the procedure are subjected to it.

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Introduction

Bone Marrow Aspiration (BMA) cytology is an important diagnostic and monitoring tool.[1] It involves the use of BMA needle that gains access to the marrow cavity where the aspirate is obtained, smeared, stained with Rowmanosky stains and viewed under light microscope where cytological details of the marrow elements will be examined.[1,2] There are various sites for BMA depending on the age of the patient and accessibility to a prominent bone. Posterior superior iliac spine is tagged as the most preferred site. Other sites include anterior superior iliac spine, tibial tuberosity and sternum.[3]

Apart from the conventional light microscopy, other special diagnostic and monitoring techniques such as flow cytometry, cytogenetics and molecular genetic analyses can be done with the BMA aspirate to further substantiate the diagnosis of a particular disease condition. Despite the diagnostic utility of BMA, it is not without risks/complications. Complications such as pain, hemorrhage, infections and rarely artero-venous fistulae have been reported.[4] However, with an appropriately established indication, careful selection of aspiration site and a good aspiration technique by trained and experienced personnel these complications rarely occur. Irrespective of the indication, site used and staining technique employed, the recommended Turn- Around Time (TAT) is 24 hours as timely reporting can be lifesaving.[5]

Abubakar Tafawa Balewa University Teaching Hospital (ATBUTH) Bauchi is one of the tertiary health institutions in Bauchi State, North Eastern Nigeria. It is the only centre with fully functional hematological services in the State with clients drawn

from all the twenty Local Government Areas (LGAs) of the state as well as the neighboring Yobe, Plateau, Jigawa as well as other States of the federation like Nasarawa and Niger States. This study reported the 3-year BMA cytology experience of the Department Hematology and Blood Transfusion of ATBUTH Bauchi with emphasis on the indications and diagnostic utility so that clinicians will adequately evaluate patients before referral for BMA.

Materials and Methods

This was a retrospective study that involved the use of records of the bone marrow aspirates done from January 1st, 2016 to December 31st, 2018. The age, sex, indication for BMA, anatomical site and final bone marrow diagnosis were collated. The data was analyzed using SPSS Version 23.0 software.

Results

One hundred and three (103) bone marrow aspirations were performed during the period under review. Majority of the patients that had the procedure were males 70/103 (67.9%) and the commonest indication for BMA was recurrent anemia 47/103 (45.6%) followed by splenomegaly, fever and lymphadenopathy has 12/103 (11.7%) each as indicated in Table 1. The median (IQR) age of the participants was 40.0 (33.25) years with a range of 5 months to 92 years.

Right anterior superior iliac spine was the commonest site of BMA in this study (49.5%) while left anterior superior iliac spine is the least employed site for BMA in this study (2.9%) (Figure 1). No procedure related complication was recorded during the period under review. The commonest indication by age groups of less than 5 years, 5-18 years, 19-40 years and above 40 years remains the recurrent anemia 47/103(45.6%) while the least are the post chemotherapy and isolated thrombocytosis with 2/103 (1.9%) each (Table 2).

The overall commonest diagnosis by BMA was megaloblastic anemia 29/103 (28.2%) and also the main diagnosis in patients 18years and above. Mixed nutritional deficiency and BM metastasis follow the megalobalstic anemia as second most common BMA

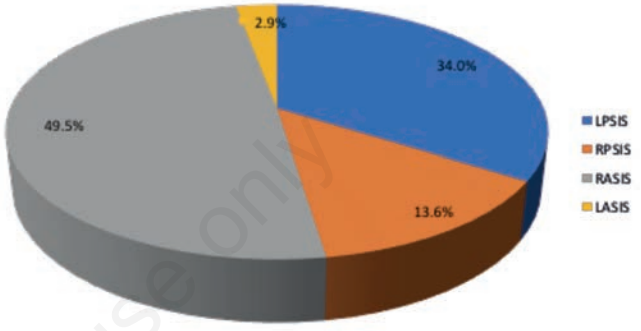

Figure 1. Site of bone marrow aspiration.

Table 1. Distribution of age of the participants and indication for bone marrow aspiration.

Indication	Sex		Total (%)
	Male	Female	
Recurrent anemia	29	18	47 (45.6)
Splenomegaly	8	4	12(11.7)
Pancytopaenia	6	3	9 (8.7)
Chronic back pain and pathologic fracture	7	2	9 (8.7)
Fever, lymphadenopathy	8	4	12 (11.7)
Histologic diagnosis of lymphomas	2	0	2 (1.9)
Abdominal pain and leucocytosis	6	2	8 (7.9)
Post chemotherapy (remission assessment of Hematological malignancies)	2	0	2 (1.9)
Thrombocytosis	2	0	2 (1.9)
Total	70	33	103 (100)

Table 2. Distribution of indication for bone marrow aspiration by age group.

Indication	<5 years	5-18 years	≥18-40 years	>40 years	Total
Recurrent anaemia	1	4	17	25	47
Splenomegaly	0	1	6	5	12
Pancytopaenia	0	1	6	2	9
Chronic back pain and pathologic fracture	1	0	2	6	9
Fever and generalized lymphadenopathy	1	6	4	1	12
Histologic diagnosis of lymphomas	0	0	0	3	3
Abdominal swelling and leucocytosis	0	1	0	6	7
Postchemotherapy (remission assessment)	0	0	0	2	2
Thrombocytosis	0	1	0	1	2
Total	3	14	35	51	103

diagnoses with 13/103 (12.6%) each (Table 3).

Comparing the indications for BMA and diagnosis, the most common indication was recurrent anemia and the commonest BMA diagnosis was megaloblastic anemia. However, 8/103 (7.8%) of the BMA performed were normal (Table 4).

Discussion

This study determined the indications and diagnostic utility of bone marrow aspiration being an important pillar in the diagnosis of hematological conditions. The age distribution of the patients ranges from 5 months to 92 years with a median age of 40 and there is male preponderance in this study. This is similar to what was obtained in various studies done within and outside Nigeria.[6-9] Awwalu *et al.* in Zaria Northwestern Nigeria reported an age range of 1-78 years with male preponderance.[6] Elgesie *et al.* in a study done in Jos, Northcentral Nigeria found an age range of 3-77 years.[7] Khan *et al.* and Gohli *et al.* both in India reported age ranges between 1-80 and 1-78 years respectively and also of male

Table 3. Bone marrow aspiration diagnosis by age group.

Diagnosis	<5 years	5-18 years	>18-40 years	>40 years	Total
Mixed nutritional deficiency	0	2	7	4	13
Chronic lymphocytic leukemia	0	0	0	7	7
Megaloblastic anaemia	0	2	12	15	29
Aplastic anaemia	0	0	1	0	1
Acute Myeloid Leukemia	0	2	6	1	9
Multiple Myeloma	0	0	0	1	1
BM Metastasis	2	6	1	4	13
CML	0	0	3	6	9
Essential Thrombocythaemia	0	0	0	1	1
ITP	0	0	0	1	1
Hypersplenism	0	1	2	0	3
ALL	1	1	0	7	9
MDS	0	0	1	1	2
Hairy Cell Leukemia1	0	0	0	1	1
IDA	0	0	0	1	1
Normal BM	0	0	2	1	3
Total	3	14	35	51	103

ALL-Acute Lymphoblastic leukemia, AML-Acute Myeloid Leukemia, CML-Chronic Myeloid Leukemia, ITP-Immune Thrombocytopaenic Purpura, MDS-Myelodysplastic SAyndrome, IDA-Iron Deficiency Anaemia, BM-Bone Marrow.

Table 4. Bone marrow aspiration diagnosis by indication.

Diagnosis/ indication	Recurrent anemia	Splenomegaly	Pancytopaenia	Bones pain	Fever and lymphadenopathy	Histologically diagnosed lymphomas	Leucocytosis	Post chemotherapy	Thrombocytosis	Total
Mixed nutritional anemia	10	0	0	0	0	0	0	0	0	10
CLL	1	4	0	0	3	0	2	0	0	10
Megaloblastic anemia	21	1	3	0	0	0	0	1	0	26
Aplastic anemia	0	0	1	0	0	0	0	0	0	1
AML	2	0	4	1	3	0	0	0	0	10
MM	0	0	0	1	0	0	0	0	0	1
ALL	4	1	0	1	6	0	3	0	0	15
Normal BM	0	0	0	5	0	2	0	1	0	8
MDS	1	0	0	0	0	0	0	0	0	1
HCL	0	0	0	0	0	0	1	0	0	1
IDA	3	2	0	0	0	0	0	0	0	5
BM Metastasis	5	0	0	1	0	0	1	0	0	7
CML	0	2	0	0	0	0	1	0	1	4
ET	0	0	0	0	0	0	0	0	1	1
ITP	0	0	1	0	0	0	0	0	0	1
Hypersplenism	0	2	0	0	0	0	0	0	0	2
TOTAL	47	12	9	9	12	2	8	2	2	103

ALL-Acute Lymphoblastic leukemia, AML-Acute Myeloid Leukemia, CML-Chronic Myeloid Leukemia, CLL-Chronic Lymphocytic Leukemia, ET-Essential Thrombocythaemia, HCL-Hairy Cell Leukemia, ITP-Immune Thrombocytopaenic Purpura, MM-Multiple Myeloma, MDS-Myelodysplastic SAyndrome, IDA-Iron Deficiency Anaemia, BM-Bone Marrow.

preponderance similar to our findings.[8,9] However, Elmadhoun *et al* their study in Sudan found no difference in sex.[10] In contrast, Beddu-Addo *et al.* in Ghana reported a female preponderance.[11]

The commonest indication for bone marrow aspiration in our study was recurrent anemia (45.6%). This is similar to what was observed in various studies done in Zaria (North-western Nigeria), Enugu (South-eastern Nigeria) and Jos (North-central Nigeria) as well as in India.[6,9,12] However in a study done in Sudan, pancytopenia was the main indication (38.4%).[10]

In this study, most of the aspirations were done at the right anterior superior iliac spine (49.5%). This could be due to the prominence of the bone and the needle used was a very short one; it also minimizes the risk of repeated punctures and poor yield of the aspirate especially in obese patients that have difficulty to locate the posterior superior iliac spine.[13] The tibia was the preferred site in children aged less than 18- 24months while no case of using the sternum was recorded as this is the last choice of site due to the fatal risk of damage to the underlying structures such as the heart and major vessels.[13] The commonest finding of right anterior superior iliac spine in this study is in contrast to what was found in studies done at Zaria, Enugu, India and Sudan where the right posterior superior iliac spine was the commonest site for the bone marrow aspiration while the left anterior superior iliac spine was the least site used.[6,9,10,14]

The findings of megaloblastic anemia being the commonest diagnosis followed by mixed deficiency and bone marrow metastasis could be explained by the socioeconomic status of the people of Bauchi being the majority of the participants in the study as Northeastern Nigeria is the poorest geopolitical zone in the country based on the Nigeria National Poverty Profile by zones 2010 and this can translate to the poor nutritional intake.[15] The poor habit of overcooking our foods especially the vegetables that contain essential nutrients like folates which are easily destroyed is also an important factor. This finding agrees with what was obtained by Khan *et al*. and Gohli *et al*. in India.[8,9] These results is in contrast with the popular knowledge of Iron deficiency anemia being the commonest cause of anemia worldwide.[16]

However, the commonest BMA findings reported from Zaria and Enugu by Awwalu *et al.* and Adewoyin *et al.* were mixed nutritional deficiency and leukemia respectively.[6,12] Beddu-Addo *et al*. in Ghana found lymphoproliferative disorder (lymphoma) as the commonest, while acute leukemia was the commonest finding in Jos.[7,11] Normal bone marrow finding in this study was seen in 3% of cases, while higher values were recorded in Zaria, Ghana and India. This can be explained by the nature of requests and referrals to the Hematology unit by the clinicians.

Conclusions

Recurrent anemia is the commonest indication for BMA and nutritional anemias (megaloblastic and combined nutrients deficiency) are the commonest BMA diagnoses in Bauchi. We therefore recommend that BMA should be routine in suspected hematological conditions as well as proper evaluation of patients by the clinicians before referral to ensure that only those that really require the BMA are subjected to it in view of its invasive nature.

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