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Original Research Article

Bone marrow disease profile in geriatric patients: An institutional study

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ABSTRACT

Introduction: For the diagnosis and treatment of numerous hematological and non-hematological disorders in patients of all ages, a bone marrow examination is a crucial investigation. Due to the growing elderly population and the paucity of published studies on bone marrow disorders that only affect the elderly, age-related health conditions are becoming more prevalent. In our study, we enrolled elderly patients >60 years old who had a bone marrow examination at GMC Jammu's pathology department.
Aim: To study the profile of various hematological and non-hematological lesions diagnosed on Bone Marrow aspiration and/or Trephine biopsy in Geriatric age group 2. To summarize an approach for evaluation of anemia in elderly patients for better management.
Materials and Methods: The study was conducted in two parts; a Retrospective study for 4 years and a prospective study of 1 year. It included all the patients >60 years of age who had undergone Bone marrow examination in the hematology section of the Department of Pathology.
Results: 200 bone marrow aspirations and 40 trephine biopsies, as well as peripheral blood smears and biopsy imprint smears, were all examined. Aplastic anemia, Megaloblastic anemia, Iron deficiency anemia, chronic disease-related anemia, and ITP were among the non-malignant hematological disorders that affected 50.5% (n=101) of the patients; various hematological malignancies affected 40.5% (n=81) of the patients; and non-hematological malignancies affected 1% (n=2) of the patients. 1% (n=2) of the cases were insufficient, and 7% (n=14) of the cases in which BMA and/or BMB were used for lymphoma staging and follow-up did not show any signs of marrow infiltration.
Conclusion: With the growing elderly population in India, it is important to pay more attention to diagnosing and treating easily treatable conditions like anemia as well as enhancing the general health of geriatric patients the elderly, bone marrow aspiration.

1. Introduction

For patients of all ages, a bone marrow examination is a critical step in the identification of numerous hematological and non-hematological illnesses. The increase in the world's geriatric population has prompted researchers to design studies into health issues in this age range. According to the Census 2011, India has 104 million older people (60+ years), constituting 8.6% of the total population.[1]

Chronic illnesses and malignancies are more prevalent in the elderly due to physiological structural and functional changes brought on by ageing. Age-related physiological deterioration, contemporary lifestyle, and hereditary variables all interact to produce the prevalence of haematological malignancies in older people.[2] In addition to the immune system's decreased effectiveness with age, the bone marrow also becomes less effective for proper blood cell replacement. Chromosomal abnormalities resulting from clonal mosaicism are present in about 2-3% of elderly people.

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Physical function may be impacted by anaemia, which the World Health Organization (WHO) defines as a haemoglobin concentration below 12 g/dL for women and below 13 g/dL for men. The activation of the sympathetic and renin-angiotensin-aldosterone systems, increased peripheral arterial vasodilation, and anemia's effects on myocardial function all influence the development or progression of diseases like heart failure and renal failure.[3]

Grading of Anaemia as per WHO criteria are as under[4] Gangadharan V et al., (2016).

	Levels of haemoglobin
Mild	11-12.9g/dl (Male) 11-11.9g/dl(Female)
Moderate	8-10.9g/dl
Severe	<8g/dl

According to epidemiological studies, older people have anaemia in a third of cases for which there is no known cause. Older people's "unexplained" anaemia may be brought on by a long-term pro-inflammatory state, reduced renal function, inadequate erythropoietin (EPO) production, inadequate bone marrow response to EPO, intrinsic defects in bone marrow cell proliferation and differentiation and reduced erythrocyte survival.[5]

Cytological evaluation, with morphology analysis and obtaining a differential cell count as key elements, is the main goal of aspiration of the marrow. A trephine biopsy is helpful when aspiration yields a dry or bloody tap because it can shed light on the structure, cellularity, fibrosis, and distribution pattern of abnormal infiltrates. The highest diagnostic accuracy for diagnosing different haematological disorders is for BMB (99.2%), but BMI is also significantly more accurate (83.7%) than BMA (77.5%).[6]

2. Material and Methods

Patients who had been referred for a bone marrow aspiration or bone marrow trephine biopsy at Government Medical College of Jammu and were older than 60 years old were the subjects of our study. It was divided into two phases: a retrospective study lasting four years, beginning on October 31, 2020, and ending on November 1, 2016, and a prospective study lasting one year, beginning on November 1, 2020, and ending on October 31, 2021.

2.1. Criteria for inclusion

All patients over the age of 60 who had a bone marrow test (aspiration, biopsy, or both) in our department were included in this study.

The archives of the hematology section of the Department of Pathology at GMC Jammu were searched for the Hematoxylin & Eosin stained sections of the bone marrow biopsy and the May Grunwald Giemsa and Perl's Prussian blue stained smears of the bone marrow aspiration. The slides were restained, remounted as required, and examined under a microscope after that. Patients in the geriatric age group who were referred to our department for a BMA and/or a trephine biopsy were included in the prospective study. In our department, the posterior superior iliac crest was the preferred location. Bilateral trephine biopsy was carried out as needed. Hematoxylin and eosin (H&E) was used to stain the biopsy sample, while the bone marrow aspiration material was stained with May-Grunwald Giemsa (MGG) and Perls Prussian blue stain.

Where special stains were required, they were applied.

3. Results

200 bone marrow aspirations, 40 trephine biopsies, peripheral blood smears, and biopsy imprint smears were all examined. Two patients declined to have a biopsy. In the current study, we found that 64% of the patients were in the 60–69 age range. The study group was composed of 65% men, with a male to female ratio of 1.85:1. Table 1 lists the indications for bone marrow testing in elderly patients.

In our study; out of 200 cases, 1%(n=2) cases were inadequate; 7%(n=14) cases in which BMA and/ or BMB was performed for staging of lymphoma and for follow up, no evidence of marrow infiltration was seen. 50.5% (n=101) patients were of different non-malignant haematological disorders given in (Table 2). 40.5%(n=81) patients were of various haematological malignancies and 1%(n=2) cases were of non-haematological malignancies (Table 3).

Forty elderly patients who underwent a bone marrow biopsy were evaluated. In 35 (87.5%) cases, the results of the BMA and the bone marrow biopsy were highly correlated. Biopsy served as a diagnostic tool in 4 cases of dry tap on aspiration. As shown in Table 4, there is one instance where the results of the biopsy and aspiration are inconsistent.

In 2 cases, the bone marrow aspirate yielded less cellularity (diluted with blood) and the patients refused for trephine biopsy so the bone marrow study was not possible.12 cases of NHL (for staging), 2 cases of follow up of multiple myeloma and acute leukaemia had normal bone marrow study.

4. Discussion

Our study's goal is to assess the distribution of haematological and non-haematological disorders in elderly patients. While a biopsy is useful for examining the distribution and architectural pattern of marrow elements, a bone marrow aspiration is useful for analysing the morphology of individual cells. Brynes RK et al (1978).[7] Elderly patients (those older than 60) were included in this study. According to studies by Bhasin et al. (2011), Tilak v

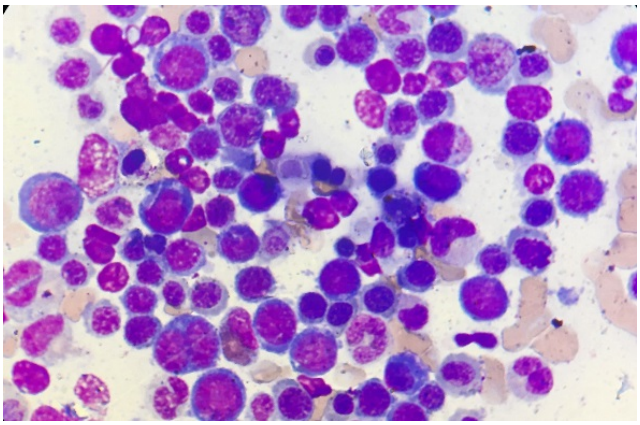

Figure 1: BMA Smear showingMegaloblastic erythropoiesis in Megaloblastic anemia (1000x,MGG Stain)

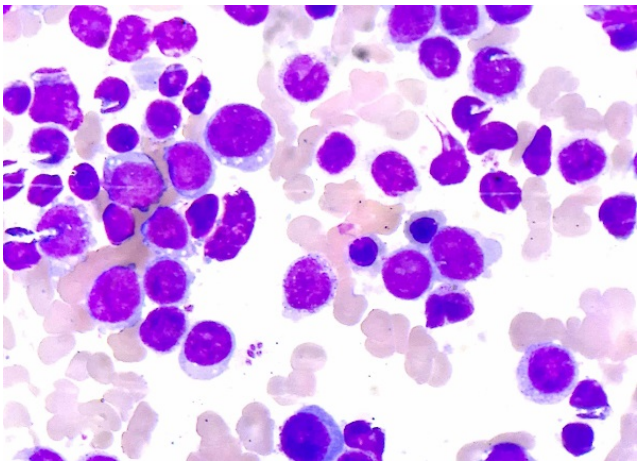

Figure 2: BMA smear in a case of AML-M4 (1000x MGG Stain)

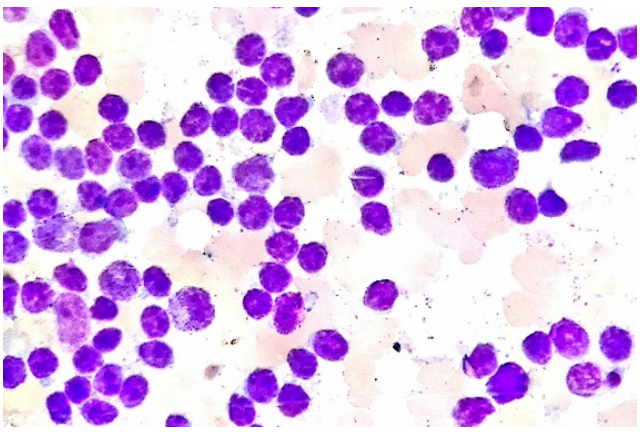

Figure 3: BMA smear in the case of Chronic Lymphocytic Leukaemia (400x MGG Stain)

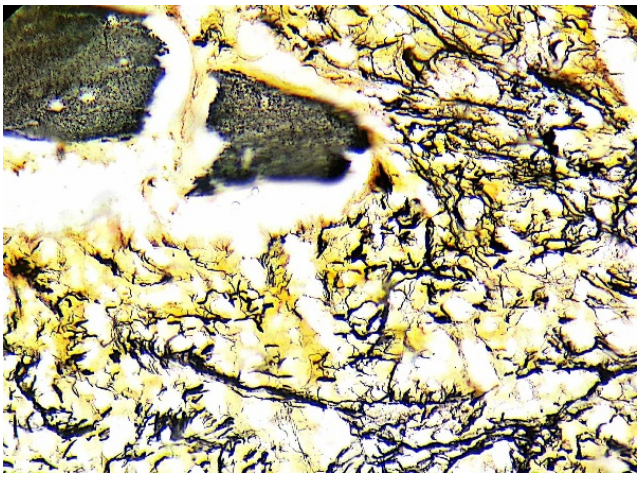

Figure 4: Bone marrow trephine sections showing IncreasedReticulin Fiber thickness (Grade-II) in the case of Myelofibrosis (400x Reticulin Stain)

Table 1: Indications of bone marrow examination in geriatric patients

Indications	Number of patients (n)	Percentage (% age)
Bicytopenia / Pancytopenia	82	41
Follow up /staging of Lymphoma	31	15.5
Acute leukaemia	24	12
Suspicion of Multiple Myeloma	15	7.5
Suspicion of Myeloproliferative neoplasms	12	06
Suspicion of Lymphoproliferative neoplasms	11	5.5
Refractory anaemia	08	04
Follow up cases of Multiple Myeloma	07	3.5
Organomegaly	07	3.5
Metastatic malignancy	02	01
Others(F/u c/o Leukaemia)	01	0.5
Total	200	100

Table 2: Distribution of non-malignant haematological disorders in all geriatric patients

Type of disorder	Number of patients
Megaloblastic anaemia	42 (21%)
Dual deficiency anaemia	29 (14.5%)
Iron deficiency anaemia	17 (8.5%)
Anaemia of chronic disease	06 (03%)
Aplastic anaemia	05 (2.5%)
Chronic ITP	01 (0.5%)
Haemophagocytic syndrome	01 (0.5%)

Table 3: Distribution of haematological and non-haematological malignancies in geriatric patients on BMA/or BMB (n=83).

Type of malignancy		Number of patients (n=83)
Haematological malignancy	Lymphoproliferative disorders	29 (14.5%)
	Acute leukaemia	25 (12.5%)
	Myeloproliferative neoplasms	14 (7%)
	Multiple myeloma	11 (5.5%)
	Myelodysplastic syndrome	02 (1%)
Non haematological malignancy	Metastatic deposits of Adenocarcinoma	02(1%)

Table 4: Discordance between bone marrow aspirate and biopsy.

Bone marrow aspiration diagnosis	Bone marrow biopsy diagnosis	Number of cases
Normoblastic erythropoiesis	Multiple myeloma	01

et al (2013), Srijanaki M et al (2016), and Shrivastava et al. (2016), the majority of cases were in the 60–69 age range (2013).[8–11] However, Dharamrajan et al. (2006)[12] found that the age group of 70 to 79 years had the highest number of cases and Tay et al., (2011).[13] found highest number of cases in the age group of 75-84 years.

In our study of 200 cases, we found an overall Male predominance (65% male, 35% females) with a male to female ratio of 1.85:1. Male predominance was also seen in the study by Thyagaraja K et al., (2019), Bhasin et al., (2011), Tilak V et al., (2013), and Shrivastava et al., (2013).[1,8,9,11] In the present study, the most common indication for Bone marrow examination was Cytopenia in 41%(n=82) cases which is similar to the studies conducted by Sulakshana SM et al., (2015), Manion EM et al., (2008).[14,15]

Among the non-malignant haematological disorders, most common diagnosis was Megaloblastic Anaemia 21%(n=42), followed by dual deficiency anaemia 14.5%(n=29) and Iron deficiency anaemia 8.5%(n=17). Sharma D et al., (2019)[16] in their study found IDA as the most common anaemia. IDA was comparatively less frequent in our study, as it may be treated on outpatient basis, and bone marrow examination was not done routinely in Iron deficiency anaemia. We found 3% (n=6) cases of Anaemia of chronic disease(ACD). However, Raina A et al., (2014)[17] in their study found 34 patients of ACD. In a study done by Davenport J et al., (1996)[18] ACD is considered to be the commonest cause of anaemia in the world. 2.5%(n=5) cases of Aplastic anaemia were diagnosed which was similar to the study done by Gulati A et al., (2017).[19]

1 case of chronic ITP was diagnosed, bone marrow in this case showed megakaryocytic hyperplasias. One case of Haemophagocytic syndrome was diagnosed on Aspiration showed Bicytopenia, leucocytosis on peripheral blood smear. Bone marrow aspiration showed increased histiocytes and haemophagocytosis.

Among the malignant disorders (haematological and non-haematological) lymphoproliferative disorders were the commonest. We found 7.5%(n=15) cases of Non-Hodgkins lymphoma. Out of 15, 8 cases were diagnosed on aspiration alone and in 7 cases both aspiration and biopsy were diagnostic. 7% (n=14) cases of CLL were diagnosed.

In the present study 12.5%(n=25) cases of Acute leukemias were encountered, out of which 23 were classified as AML and in 2 cases further classification was not possible.

7% (n=14) cases of myeloproliferative neoplasms were diagnosed in our study. Out of 14 cases in our study,10 cases were of CML, 2 each of Primary myelofibrosis and polycythemia vera. In suspected cases of Myelofibrosis where bone marrow aspiration yielded dry tap, bone marrow trephine biopsy becomes the necessary tool for final diagnosis.

We found 5.5% (n=11) cases of Multiple myeloma. 9 cases of our study were diagnosed on aspiration, in 1 case aspiration was followed by trephine biopsy. We observed discordance in one case between aspiration and biopsy in which biopsy was diagnostic and aspiration showed normal marrow study with plasma cells <5%.

In our study 1%(n=2) cases of MDS was observed which is comparable to the study by Tilak V et al., (2013), Chandra H et al., (2019),[5,20] Metastasis of non-haematological malignancy to Bone marrow was observed in 2 cases (1%), supporting the fact that bone marrow examination is an important tool in diagnosing non-haematological malignancies also.

5. Conclusion

As the population of elderly people is rising in India; it requires greater attention to evaluate and manage common treatable conditions like anaemia and improve the quality of health in geriatric patients.

We conducted this study to look for the trends of haematological and non-haematological disorders diagnosed on bone marrow aspiration and/ or biopsy in geriatric population in this region. In our study, Nutritional anaemia was the commonest reflecting the poor socio-economic background and the need for nutritional therapy in our region.

6. Ethical Standard

All procedures performed in the study were in accordance with the ethical standards of the institutional research

committee.

7. Patients Consent

Informed consent was obtained from all patients.

8. Conflict of Interest

All authors declare that they have no conflict of interest.

9. Source of Funding

None.

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