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Retrospective Analysis of Bone Marrow Examination in the Tribal Population of Northern Maharashtra: Clinical Indications, Peripheral Smear Correlation, and Diagnostic Value

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INTRODUCTION

- India, a large low-middle-income country, has an **8.6% tribal population**.
- Tribal communities face significant socioeconomic challenges, and limited healthcare access. Specifically, hematological services are largely unavailable, leaving many patients undiagnosed of haematological disorder.
- Bone marrow (BM) examination is crucial for accurate diagnosis, especially when basic hematological evaluations indicate its necessity. It also plays a key role in identifying the most prevalent hematological conditions that are frequently under-diagnosed within this group.

AIM

1. **Identify the Indications for Bone Marrow Aspiration and Biopsy**
2. **Evaluate the Value of Bone Marrow Studies in Accurate Diagnosis**
3. **Correlate Peripheral Blood Smear Findings with Bone Marrow Findings**

METHOD

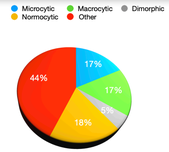
- **Study Design:** Retrospective Study
- **Patients:** Koli Mahadev & Dongar Koli tribe of Northern Maharashtra
- A retrospective study from May 2022 to April 2024 reviewed **67 patients**; **seven had missing data** and were excluded.
- The data comprised demographics, complete blood count (CBC), peripheral blood smear (PBS), and bone marrow aspiration and biopsy results.

RESULTS

- **Patient Demographics:** 60 patients (35 males, 25 females).
- **Indications for Bone Marrow Evaluation:**
  - Anemia: 31.6%
  - Pancytopenia: 25%
  - MDS/MPN: 13.3%
  - Other: 30.1%
- **Post-Evaluation Diagnoses:**
  - Microcytic anemia: 18.3%
  - Megaloblastic anemia: 15%
  - MDS: 8.3%
  - Multiple myeloma: 6.6%
- **Peripheral Blood Smear Findings:**
  - Microcytic RBCs: 18.3%
  - Macrocytic RBCs: 15%
  - Dimorphic RBCs: 5%
- **Bone Marrow Findings:**
  - Erythroid Hyperplasia: 38.3% (Microcytic: 18.3%, Megaloblastic: 15%, Dimorphic: 5%)
  - Myeloid Hyperplasia: 16.6% (MDS/MPN)
  - Prominent Megakaryocytes: 3.3% (ITP)
- **Morphological Patterns:**
  - Micronormoblastic (18.3%)
  - Macronormoblastic (15%)
- **Cellularity:**
  - Hypercellular (65%),
  - Normocellular (18.3%)
- **Diagnostic Accuracy:** Overall accurate diagnosis: 30%
- **Confirmation Rates:**
  - MPN (80%),
  - Plasma cell dyscrasia (75%),
  - Anemia (43.47%)

Diagnosis		PBS Finding	BM Aspiration	BM Biopsy	No. Of patients	% cases
Microcytic anemia		Micro + Normo	Hypercellular With EHP	Erythroid hyperplasia (Micronormoblastic)	11	18.3%
Megaloblastic anemia		Macro + Ovalo+ Hypersegmented Neutrophils	Hypercellular With EHP	Erythroid Hyperplasia (Macronormoblastic)	9	15%
Dimorphic anemia		Micro+Macro+Ovalo+Normo	Hypercellular With EHP	Erythroid hyperplasia (Micronormo & Macro)	3	5%
Near Normal with mild EH		Normo with Mild hypo	Mild EHP	Mild EH	11	18.3%
Multiple Myeloma /Plasma cell dyscrasia		Normo+Plasma cells+Rouleux formation	Hypercellular with Plasma cells	Hypercellular marrow with plasma cells	4	6.6%
Myelodysplastic Syndrome (MDS)		Blasts + nRBC	Hypercellular with Blast cells	Hypercellular marrow with Blasts	5	8.3%
Myeloproliferative Neoplasm (MPN)	Chronic Myeloid Leukemia (CML)	Normo with Mild hypo	Hypercellular with EHP	Hypercellular Marrow with few blasts	3	5%
	Essential Thrombocythemia (ET)	Normo with Mild hypo	Hypercellular with EHP	Erythroid Hyperplasia	1	1.6%
	Polycythemia vera	Normo with Mild hypo	Hypercellular with EHP	Erythroid Hyperplasia	1	1.6%
Immune thrombocytopenic purpura (ITP)		No Megakaryocyte	Near Normocellular with increase megakaryocytic	Mild Erythroid Hyperplasia with increase megakaryocytic	2	3.3%
No Opinion		Normo + Micro	Diluted	Crushed artifact	10	16.6%

CORRELATION OF PBS, BM ASPIRATION AND BM BIOPSY FINDINGS



DISTRIBUTION OF RBC MORPHOLOGY ON PBS

Indication	No of Cases	% Correlated with clinical diagnosis
Anemia	23	43.47%
Myelodysplastic Syndrome (MDS)	5	0%
Plasma cell dyscrasia (Multiple Myeloma)	4	75%
MPN- CML	3	100%
Immune thrombocytopenic Purpura (ITP)	2	50%
MPN- Essential thrombocytopenia	1	100%
MPN- Polycythemia vera	1	0%
Not specified	21	0%

INDICATION OF BONE MARROW

Parameters	Number	%
Bone Marrow cellularity		
Normocellular	10	16.6%
Hypocellular	0	0%
Hypercellular	35	58.3%
Bone Marrow Hyperplastic Lineage		
Erythroid Hyperplasia	23	38.3%
Myeloid Hyperplasia	10	16.6%
Megakaryocytic Hyperplasia	2	3.3%

DISTRIBUTION OF CELLULARITY & HYPERPLASTIC LINEAGE OF BONE MARROW

CONCLUSIONS

This study highlights the importance of making BM studies available in remote tribal areas, significantly impacting the overall tribal population by diagnosing potentially treatable hematological conditions.

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