Epidemiology of Anaemia Necesitating Bone Marrow Aspiration Cytology in Jos

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SUMMARY

Objective: The study aims at investigating, identifying and classifying the various causes of anaemia necessitating bone marrow aspiration cytology in our environment.

Methodology: A retrospective review of all bone marrow aspiration cytology reports of patients referred to Haematology and Blood Transfusion department of the Jos University Teaching Hospital between January 1st 2005 and December 31st 2008 on account of anaemia was carried out.

Results: The commonest cause of anaemia was acute leukaemia (n=45: 24.3%); followed by combined megaloblastic and iron deficiency anaemia (nutritional deficiency anaemia) (n=34: 18.4%); and bone marrow failure (Aplastic anaemia) (n=20: 10.8%). Bone marrow aspiration cytology alone failed to identify causes of anaemia in a few patients (n=6: 3.2%).

Conclusion: The study provides a valuable insight into the causes of anaemia in our environment. In contrast to the general opinion that iron deficiency is the commonest cause of anaemia, acute leukaemia was found to be the commonest cause of anaemia in this environment followed by deficiency of nutritional factors and bone marrow failure. Lack of laboratory facilities has hindered further investigation of causes of anaemia in this environment. More emphasis should be placed on identifying and managing the specific cause of anaemia rather than the current broad based approach to management. Public enlightenment on the need for early presentation to hospital and thorough investigations is necessary as early diagnosis affects positively the overall outcome of haematological diseases.

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Key words: anaemia, bone marrow aspiration cytology, epidemiology.

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INTRODUCTION

Anaemia is common worldwide and particularly so in developing countries. Understanding anaemia is vital to its proper diagnosis and management.

Anaemia may be defined as a clinical condition that is characterized by a reduction in the haemoglobin concentration of blood below the lower limit of the normal reference range for an individual's age, sex and geographical location[1,2]. Anaemia on its own is a sign of an underlying disorder and not a diagnosis[3]. The diagnosis of the cause of anaemia is the focus of attention in the care of many patients. One of the special investigations often indicated in the diagnosis of anaemia is bone marrow aspiration and/or biopsy. Bone marrow aspiration often affords a more complete picture of the reaction of the haemopoietic tissue to anaemia than can be gained from peripheral blood smear alone. The architecture of the bone marrow is better appreciated in a biopsied material of bone marrow and is indicated in a number of conditions where aspiration alone is insufficient to define the pathology[4,5].

This study aims at investigating, identifying and classifying the various causes of anaemia necessitating bone marrow aspiration cytology in our environment.

METHODOLOGY

This is a retrospective study spanning a period of 4years from January 1st 2005 to December 31st 2008 carried out at the Jos University Teaching Hospital. Bone marrow aspiration report records of patients referred to Haematology department of the Jos University Teaching Hospital, Jos, between January 1st 2005 and December 31st 2008 were retrieved. Only patients' reports in which anaemia was the indication for bone marrow aspiration were studied. The data was manually collated and subsequently analysed.

RESULTS

A total number of one hundred and eighty five (185) cases were incorporated into the study. One hundred and eleven (111), 60% were males, aged between 3 and 77years. Seventy four (74), 40% were females, aged between 4 and 80years, giving a male: female ratio of 1.5:1. Table 1 shows the age and sex distribution of all the cases studied. Table 2 summarizes the various diagnoses of the causes of anaemia and the gender distribution. The cause of anaemia from this review include acute leukaemia put together (n=45: 24.3%), followed by combined megaloblastic and iron deficiency anaemia (n=34: 18.4%), bone marrow failure (Aplastic anaemia) (n=20: 10.8%) and then megaloblastic anaemia (n=20: 10.8%).Table 3.

Table 1: Age and sex distribution of all cases

Age(yrs)	Male	Female	Total
0-9	12	4	16
10-19	21	7	28
20-29	26	9	35
30-39	16	18	34
40-49	9	6	15
50-59	7	10	17
60-69	13	6	19
70-79	7	13	20
80 +	0	1	1
Total	**111**	**74**	**185**

Table 2: Classification of causes of anaemia based on BMA cytology, clinical data and gender distribution

Diagnosis	No of cases	Male	Female
ALL			
L1	3	1	2
L2	16	12	4
L3	6	2	4
AML			
M0	2	2	0
M1	5	3	2
M2	7	3	4
M4	3	2	1
M5	3	3	0
CLL	10	4	6
CML	3	1	2
MF	2	2	0
NHL	1	1	0
M M	1	1	0
BL	5	4	1
AA	20	16	4
PRCA	1	0	1
Amegakaryocytic Thrombocytopaenia	1	0	1
MDS	6	1	5
MA	20	9	11
IDA	4	3	1
MA+IDA	34	26	8
Reactive Marrow	8	2	6
Normal Marrow	6	3	3
Systemic Disorders			
Renal	3	1	2
HEPATIC	3	3	0
HIV	5	2	3
Myelophysitic Anaemia1	0	1	
Undetermined	6	4	2

Key: ALL= acute lymphoblastic leukaemia, AML= acute myeloblastic leukaemia, CLL= chronic lymphocytic leukaemia, CML= chronic myeloid leukaemia, MF= Myelofibrosis, NHL=non-Hodgkin's lymphoma, MM=multiple myeloma, BL= Burkitt's lymphoma, AA= Aplastic anaemia, PRCA= pure red cell aplasia, MDS= Myelodysplastic syndrome, MA=megaloblastic anaemia, IDA= iron deficiency anaemia, HIV= human immunodeficiency virus.

Table 3: Causes of anaemia, male and female distribution

Causes of anaemia	M	F	Total	Percentage
Acute leukaemia	28	17	45	24.3
Megaloblastic + Iron Def. Anaemia	26	8	34	18.4
Aplastic Anaemia	16	4	20	10.8
Megaloblastic Anaemia	9	11	20	10.8
Chronic leukaemia	5	8	13	7.0
Reactive marrow	2	6	8	4.3
Myelodysplastic Syndrome	1	5	6	3.2
Normal marrow	3	3	6	3.2
Undetermined	4	2	6	3.2
Burkitt's lymphoma	4	1	5	2.7
Human Immunodeficiency Virus	2	3	5	2.7
Iron Deficiency Anaemia	3	1	4	2.2
Renal	1	2	3	1.6
Hepatic	3	0	3	1.6
Myelofibrosis	2	0	2	1.1
Multiple Myeloma	1	0	1	0.5
Non Hodgkin's Lymphoma	1	0	1	0.5
Myelophysitic anaemia	0	1	1	0.5
Pure Red Cell Aplasia	0	1	1	0.5
Amegakaryocytic Thrombocytopaenia	0	1	1	0.5
Total	**111**	**74**	**185**	**100**

DISCUSSION

The study sought to investigate the various causes of anaemia requiring bone marrow aspiration cytology, frequency of occurrence of each of the causes identified with their age and gender distribution. We observed from this study that the commonest cause of anaemia in this review was acute leukaemia which constitutes 24.3%. Of this, acute lymphoblastic leukaemia (ALL) is the commoner (13.5%) with the L2 subtype predominating. The second most common cause of anaemia was observed to be nutritional deficiency related combined megaloblastic and iron deficiency anaemia, constituting 18.4% of all the cases studied. This is followed closely by bone marrow failure (Aplastic anaemia) (10.8%) and then megaloblastic anaemia (10.8%) occupying the third and fourth most frequent causes of anaemia. In contrast to what is documented as the commonest cause of anaemia world wide, that is iron deficiency anaemia[6-9], mixed nutritional deficiencies occurred more frequently than single nutrient deficiency in this study. This confirms previous observations that nutritional deficiencies culminating in anaemia seldom occur singly[10-14]. Poverty and ignorance may contribute to this finding. Megaloblastic anaemia occurs even more frequently than iron deficiency anaemia alone in this study.

We also observed that many of the patients (96.8%) sent for bone marrow aspiration (BMA) cytology, had the cause of their anaemia identified.(Table 2). This makes it a valuable procedure in investigating causes of anaemia in a resource poor country, provided experienced haematologists are available for interpretation. It was also observed that BMA cytology alone failed to identify the cause of anaemia in a few cases (n=6; 3.2%). Rather than being a limitation of the procedure, it actually suggests that all causes of anaemia are not always found in the

bone marrow. In as much as the cause of anaemia can be identified using BMA cytology in majority of cases, it is not an all sufficient procedure in investigating the causes of anaemia and so should be combined with other procedures such as; haemoglobin genotype or electrophoresis to identify equivocal cases of haemoglobinopathies, Coombs' tests (Antihuman globulin test) to identify immune mediated haemolytic anaemia, and red cell enzymes assay (e.g glucose 6 phosphate dehydrogenase[G6PD]) to detect enzymopathies, especially when it fails to do so.

CONCLUSION

The commonest cause of anaemia identified by bone marrow aspiration cytology in this study was acute leukaemia. Contrary to the general opinion that iron deficiency is the commonest cause of anaemia, acute leukaemia has been identified by bone marrow aspiration (BMA) cytology to be the commonest cause of anaemia in this environment followed by deficiency of nutritional factors and bone marrow failure.

The study provides a valuable insight into the causes of anaemia in our environment. Bone marrow aspiration cytology is a valuable procedure in investigating causes of anaemia. Lack of laboratory facilities has hindered further investigation of causes of anaemia in this environment. More emphasis should be placed on identifying and managing the specific cause of anaemia rather than the current broad based approach to management. Public enlightenment on the need for early presentation to hospital and thorough investigations is necessary as early diagnosis affects positively the overall outcome of haematological diseases.

REFERENCES

1. The red cell; basic aspects of anaemia. In: Firkin F., Chesterman C., Penington D., Rush B. (editors) (5th edition). de-Gruchy's clinical haematology in medical practise. Blackwell Scientific Publications, Oxford London Edinburgh, 1989: 17–36.
2. England J. M. The anaemias. In: J C Cawley (editor). Haematology. William Heinemann Medical Books Ltd, London. 1983: 24–39.
3. Kehinde M. O. Approach to the diagnosis of anaemia. *Niger Med J* 1995; **28:** 34–38.
4. Pasquale D., Chikkappa G. Comparative evaluation of bone marrow aspirate particle smears, biopsy imprints, biopsy sections. *Am J Haematol* 1986; **22:** 381–390.
5. Bartl R., Frisch B., Wilmanns W. Potential of bone marrow biopsy in chronic myeloproliferative disorders (MPD). *Eur J Haematol* 1993; **50:** 41–65.
6. Ganz T. Anaemia of chronic disease. In: Lichtman M A, Beutler E., Kipps T. J., Seligsohn U., Kaushansky K. and Prchal J. T. (editors) (7th edition). Williams haematology. Mcgraw-Hill Medical Publishing Division, New York. 2006: 565–570.
7. Krantz S. B. Pathogenesis and treatment of anaemia of chronic disease. *Am J Med Sci* 1994; **307:** 353–359.
8. Provan D., Weatherall D. Red cell II: acquired anaemias and Polycythaemia. *The Lancet* 2000; **355:** 1260–1268.
9. Stoltzfus R. Defining iron deficiency anaemia in public health terms: a time for reflection. J Nutr 2001; 131: 565s.
10. Beutler E. Anaemia resulting from other nutritional deficiencies. In: Lichtman M. A., Beutler E., Kipps T. J., Seligsohn U., Kaushansky K and Prchal J. T (editors)(7th edition). Williams haematology. Mcgraw-Hill Medical Publishing Division, New York. 2006: 555–563.
11. Foy H., Kondi A. Hypochromic anaemia in the tropics associated with pyridoxine and nicotinic acid deficiencies. *Blood* 1999; **13:** 1054–1063.
12. Clark N. G., Sheard N. F., Kelleher J. F. Treatment of iron deficiency anaemia complicated by scurvy and folic acid deficiency. *Nutr Rev* 1992; **50:** 134–148.
13. Hirase N., Abe Y., Sadamura S. *et al.* Anaemia and neutropaenia in a case of copper deficiency: role of copper in normal haematopoiesis. Acta Haematol (Basel) 1992; **87:** 195–204.
14. Carvalho N. F., Kenny R. D., Carrington P. H., Hall D. E. Severe nutritional deficiencies in toddlers resulting from health milk alternatives. *Paediatrics* 2001; **131:** E46.