Haematological profile of severe acute malnourished children admitted at our institution.

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Abstract

Background: Severe acute malnourished children are prone to deranged pathophysiology. Their haematological profile affected mild to severe degree. Our study was done to observe the haematological profile of severe acute malnourished children admitted at P.B.M. Hospital Bikaner, Rajasthan.

Material and methods: This prospective observational study was designed for severe acute malnourished 178 children. Duration of this study was one year from 01.01.2013 to 31.12.2013. This study was done in special views of haematological profile of severe acute malnourished children.

Results: Our study showed that oedematous malnourished children had anaemia more common than non-oedematous malnourished children. Microcytic hypochromic anaemia and dimorphic anaemia were more common in non- oedematous and oedematous malnourished children.

Conclusion: Our conclusion is that Microcytic hypochromic anaemia and dimorphic anaemia is common in severe acute malnourished children. So, our primary target should be prevent malnourishment and secondary should be early diagnosis and management of sequelae by proper monitoring to avoid complications.

Keywords: Anaemia, Haematological profile, Malnutrition, Non-oedematous malnutrition, Oedematous malnutrition, Severe acute malnourished.

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Introduction

Malnourishment is more prevalent in under developed and developing countries. Malnourished children have micronutrient deficiency also. Overall these severe acute malnourished children got altered genesis of hematopoietic cells by depletion of progenitor cells and leads to anaemia. Malnutrition is the major health problem for under five years children not only in India other countries of world. Malnourishment affects multi-organ physiology. In malnourished children haematopoiesis affected by autophagy mechanism, decreased haematopoietic cell growth, and altered extracellular matrix or vascular nodules. These changes lead to decrease red blood cell and white blood cell formation and compromised immune response. Thus these immune compromised children more prone for infection and mortality. Anaemia in malnourished children is due to poor intake of macro or micronutrients due to faulty feeding practices, late or non-weaning habits. Lack of macro or micronutrients in these children lead to live in deficient condition and body physiology adapt by compromising the haematological profile with poor immune system [1].

Materials and Methods

Our study is a prospective observational study. We did this study in department of paediatric medicine, at Sardar Patel medical college and associated group of hospitals, Bikaner (Rajasthan). This study was done from 01.01.2013 to 31.12.2013. We enrolled 178 severe acute malnourished children for this study according to WHO definition. We collect the data related to nourishment of children. We record the anthropometry, mile stone development, mid arm circumference, breast feeding pattern, weaning pattern, parental care history, types of food given, and base line blood investigations. These investigations were Complete Blood Count (CBC), Peripheral Blood Film (PBF), and mean haematological values [2].

Results

In this study 145 (81.46%) children were anaemic. Out of 145 sixteen children (8.99%) were severe anaemic and mild anaemia was present in 72 children (40.45%). There were 31 children who had oedematous malnourishment.

Anaemia was more common in oedematous malnutrition (93.55%, p<0.05) with more severity (p<0.01, median hemoglobin 5.7 gm%, range 2.59-12.4) (Table 1).

Anaemia	Total	%	Non-oedematous		Oedematous	χ^2	P-value	
			n=147		n=31			
			No.	%	No.	%		
Severe (<4 gm/dl)	16	8.99	9	6.12	7	22.58	8.477	<0.01
Moderate (4 gm/dl-7 gm/dl)	57	32.02	44	29.93	13	41.93	1.695	>0.05
Mild (7.1 gm/dl-10 gm/dl)	72	40.45	63	42.86	9	29.03	2.031	>0.05
Total	145	81.46	116	78.91	29	93.55	3.631	<0.05

Table 1. Showing presence of anaemia among study group.

Our study shows that among total 145 anaemic SAM children, microcytic hypochromic anaemia and dimorphic anaemia were more common. There was no significant difference in distribution of anaemia (RBC Morphology) in oedematous and non-oedematous malnutrition (Table 2).

Anaemia	Total (n=145)	%	Non-oedematous		Oedematous	
			No.	%	No.	%
Microcytic hypochromic	69	38.76	58	39.45	11	35.48
Dimorphic	45	25.28	37	25.17	8	25.8
Megaloblastic	19	10.67	16	10.88	3	9.68
Normocytic hypochromic	11	6.18	9	6.12	2	6.45
Microcytic normochromic	1	0.68	1	0.68	0	3.22

Table 2. Distribution of anaemia in study population according PBF expert with relation to nutritional diagnosis.

There were no significant difference of (total leucocyte count, platelet count, hematocrit value, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular haemoglobin concentrator, erythrocyte sedimentation rate, reticulocytes count, red cell distribution width) mean hematological values between oedematous and non-oedematous malnutrition (Table 3). There were no significant differences of mean biochemical values between oedematous and non oedematous malnutrition children in this study (Table 4).

Haematological parameters	Non-oedematous		Oedematous	Reference values (range)	
	Mean	SD	Mean	SD	
Haemoglobin (gm/dl)	8.13	2.46	8.39	2.76	42339
TLC (cells/mm3)	11526.93	7075.15	8912	3719.78	4-11 × 103
Platelet count (lac/liter)	2.96	2.01	1.63	1.29	1.5-4.1
HCT (%)	26.34	7.44	20.3	8.18	36-46
MCV (Femtoliter)	79.76	17.42	83.98	23.75	83-101
MCH (Pictogram)	25.01	6.29	25.86	7.81	27-32
MCHC (gm/dl)	30.23	4.13	28.66	4.75	31.5-34.5
ESR (mm/hr)	27.52	19.94	37.97	32.1	0-10

Reticulocytes count (%)	0.7	0.58	0.63	0.38	1% -2%
RDW (Femtoliter)	55.12	14.97	73.05	29.38	

Table 3. Mean values of hematological profile of study group.

Signs of malnutrition (unit)	Presenting study	Arya AK, et. al. (2017)	Dwivedi D, et. al. (2017)	Khan S, et. al. (2020)
	Mean ± SD	**Mean ± SD**	**Mean ± SD**	**Mean ± SD**
Haemoglobin (gm/dl)	8.13 ± 2.46	7.17 ± 2.265	8.94 ± 0.26	8.703 ± 1.9271
TLC (103 × cells/mm3)	11.5 ± 7.0	12.1 ± 1.1	10.7 ± 7.0	11.9 ± 4.3
Platelet count (lac/liter)	2.96 ± 2.01	2.89 ± 1.32	2.74 ± 0.02	3.24 ± 2.07
HCT (%)	26.34 ± 7.44	21.27 ± 6.63	26.74 ± 0.79	20.17 ± 6.13
MCV (Femtoliter)	79.76 ± 17.42	73.70 ± 14.85	84.1 ± 1.94	72.70 ± 13.90
MCH (Pictogram)	25.01 ± 6.29	25.00 ± 5.85	28.86 ± 0.82	24 ± 5.25
MCHC (gm/dl)	30.23 ± 4.13	33.36 ± 3.00	34.45 ± 0.64	32.34 ± 2.9
ESR (mm/hr)	27.52 ± 19.94	-	-	-
Reticulocytes count (%)	0.70 ± 0.58	-	-	-
RDW (Femtoliter)	55.12 ± 14.97	39.62 ± 78.08	22.89 ± 0.75	-

Table 4. Comparative table of mean hematological values of this study group with Arya AK, Dwivedi D, Khan S, et al. studies.

Anaemia in malnourished children is due to poor intake of macro or micronutrients due to faulty feeding practices, late or non-weaning habits [3].

Lack of macro or micronutrients in these children lead to live in deficient condition and body physiology adapt by compromising the haematological profile with poor immune system (Table 5).

Parameters	Nutritional diagnosis				Unit
	Non-oedematous		oedematous		
	Mean	**SD**	**Mean**	**SD**	
RBS	73.38	18.85	71.68	17.55	mg/dl
Blood urea	35.05	26.97	35.77	21.75	mg/dl
Serum creatinine	0.88	0.34	0.94	0.72	mg/dl
SGOT	43.78	64.39	49.23	65.89	IU/L
SGPT	40.27	42.63	48.21	47.69	IU/L
Total protein	6.68	0.46	5.75	0.89	gm/dl
Serum albumin	3.53	0.43	2.98	0.68	gm/dl
Cholesterol	148.79	32.11	151.16	28.41	mg/dl
Calcium	9.74	0.83	9.58	0.76	mg/dl
Alkaline phosphate	237.52	168.51	246.35	137.64	IU/ L
Sodium	134.29	6.44	129.64	5.38	mEq/L
Potassium	3.69	0.71	3.41	0.84	mEq/L

Table 5. Mean values of haematological profile of study group.

Discussion

Malnutrition is a global health problem. It affects the physical and mental health of children of nation. In North West

Rajasthan children below 2 years are more affected population of severe acute malnourishment [4]. Various factors are here that affect the nutritional status of children in North West Rajasthan. These are lack of knowledge in caretakers about proper feeding and weaning practices, immunization. They are living in poor hygiene, overcrowded places and low socio-economic and education status [5]. Anaemia is the most commonly associated morbidity in severe acute malnourished children of this study. This study showed that total 145 children (81.46%) out of 178 have anaemia. Similar finding was found in Thakur et al study, in which 81.1% children were anaemic. In our study severe anaemia was present in 16 children (8.99%). 72 children (40.45%) had mild anaemia [6]. Anaemia is common in oedematous severe acute malnourished children (29, 93.55%, n=31) than non-oedematous children (116, 78.91%, n=147). We compare our results with three studies done at different area in severe acute malnourished children. All comparative data were shown in Table 4. We found that mean haemoglobin in all study and our study is 7 gm% to 8 gm%. We found that all red cell indices were decrease in our study and similar results were found Arya AK, et al., Dwivedi D, et al., Khan S, et al. studies. White cell counts were normal in all studies including this study [7]. Anaemia is the common comorbidity associated with severe acute malnourished children nearly all patients. They were moderate to severe anaemic [8]. We found 145 (81.46%) children out of 178 were anaemic. They were mild to moderate anaemic in our study [9]. Saka AO, et al. in 2012 concluded in their study that children with protein energy malnutrition had altered haematological profile. They had low haemoglobin, hematocrit, MCV, MCHC, MCH and platelets. White blood cell count was higher in their study. Our study showed low haemoglobin, hematocrit, MCV, MCHC, MCH and platelets. But, we found that white blood cell counts were normal [10].

Conclusion

We found that anaemia is the commonly associated comorbidity in severe acute malnourished children. This is due to deficient micro and macro nutrient intake. We concluded that microcytic hypochromic anaemia and dimorphic anaemia is common in severe acute malnourished children. So, our primary target should be prevent malnourishment and secondary should be early diagnosis and management of sequelae by proper monitoring to avoid complications.

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