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Status of Lipid Profile in Severe Acute Malnutrition Aged 6 Months to < 5 Yrs Children

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ABSTRACT

Background: - Malnutrition makes a major contribution to the global disease burden, accounting for more than one-third of child deaths. Dyslipidemia is frequently associated with obesity, recent studies have found that intrauterine and/or early life malnutrition may predispose the fetus to metabolic disorders, also leading to changes in the lipid profile in childhood. This study was carried out to estimate the lipid profile of malnourished children against SD Z score.

Methods: This descriptive cross-sectional study was conducted on 100 children of SAM and 50 Non SAM children aged 6-59 months, over a period of 1 year at Balchikitsalaya Udaipur, Rajasthan, India. A written informed consent was taken from parents of all children who fulfilled the inclusion criteria. General examination and anthropometric data (Weight, Length and Mid Upper Arm Circumference) was taken. Blood samples were taken to measure the plasma levels of lipid profile (Total cholesterol, triglyceride, HDL-c, LDL-c and VLDL) at the time of admission.

Results: Out of 150 children, 100 were of SAM while 50 were of non SAM. In SAM children 54 (54%) were males and rest were females. In children with SAM 95 (95%) had weight for length/ height <-3sd, 62 (62%) MUAC <11.5cm and 23(23%) children had bipedal edema. Based on WHO weight for height/ length SD Z score, we found that more than half children were under <-3 and <-4 SD Z-score in SAM although extremes like <-5 SD, <-6 SD and <-7 SD Z scores were also noted in rest of the SAM children. Mean age of SAM children was 12.93±5.33 months, mean weight was 5.512±0.82 Kg, mean MUAC was 10.99±0.82 cm, length was 70.26±8.17 cm and BMI (kg/m^2) was 11.02±1.65.

When the lipid profile status was assed against SD Z score, we observed that mean lipid levels were normal in <-3 to<-6SD Z score. Lipid levels were significantly lower in edematous SAM as compared to non- edematous SAM.

Conclusions: Lipid profile levels does not vary with SD Z score but edematous SAM are having low lipid levels.

Keywords: SD Z score, Serum lipid, Severe Acute Malnutrition.

INTRODUCTION

Malnutrition makes a major contribution to the global disease burden, accounting for more than one-third of child deaths worldwide. Acute malnutrition arises as a consequence of a sudden/sharp period of food shortage and is associated with loss of body fat and wasting of skeletal muscles [1].

Severe acute malnutrition (SAM) is defined as severe wasting and/or bilateral pedal edema. Severe wasting

is extreme thinness diagnosed by a weight-for-length (weight/height) below <−3 SD of the WHO Child Growth Standards. In children ages 6-59 months, a mid-upper arm circumference (MUAC) <11.5 mm also denotes extreme thinness [2]. Forms of SAM include kwashiorkor, marasmus and marasmic kwashiorkor.

Dyslipidemia is frequently associated with obesity,[3] recent studies have found that intrauterine and/or early life malnutrition may predispose the fetus to metabolic disorders, also leading to changes in the lipid profile in childhood [4,5].

The present study was carried out to estimate the lipid profile of malnourished children against SD Z SCORE.

METHODS:

This descriptive cross-sectional study was conducted over a period of one year at Balchikitsalaya, Udaipur, Rajasthan, India. Total 150 children enrolled in study, out of them 100 were of severe acute malnutrition (SAM) and 50 of well nourished. A structured questionnaire was administered to the caregivers of each patient. Information obtained included socio-demographic characteristics such as age, gender, parent's educational status and occupation. Complete anthropometric assessment was done and categorized as SAM and Non SAM child. SAM was labelled in a child who fulfilled WHO criteria of SAM [6], in children of age 6 months to 5 years as:

1. Weight for height/length < - 3SD and/or
2. Mid upper arm circumference (MUAC) <11.5 cm and/or
3. Bipedal nutritional edema and/or

Following recruitment, samples for lipid profile were taken in plain vial and send to our central laboratory and routine investigations were also done. The lipid estimation was done with the methods of colorimetry [7,8,9]. Reports were collected within 24 hours and abnormality of lipid profile were assessed according to percentile chart [10].

STATISTICAL ANALYSIS

The sample size was calculated at a Confidence interval (CI) of 90% and allowable error of 15%. The permission was taken from the Institutional Ethical Committee. The results were then formulated and analyzed using standard software of biostatics (SPSS version 21) using the suitable statistical tests for statistical significance. The Z-test was used in ascertaining the significance of differences between two proportions with the p-value set at <0.05.

RESULTS:

Out of 150 children, 100 were of SAM while 50 were of well nourished. In SAM children, 54 (54%) were males and rest were females (Table 1). In children with SAM, 95 (95%) had weight for length/ height <-3sd, 62 (62%) had MUAC <11.5cm and 23 (23%) children had bipedal edema (Table 2). Based on WHO weight for height/ length SD Z score, we found that more than half children were under <-3 and <-4 SD z-score in SAM although extremes like <-5 SD, <-6 SD and <-7 SD Z scores were also noted in rest of the SAM children (Table 3).

Mean age of SAM children was 12.93±5.33 months, mean weight was 5.512±0.82 kg, mean MUAC was 10.99±1.18 cm, length was 70.26±8.17 cm and BMI (kg/m^2) was 11.02±1.65 (Table 4).

When the lipid profile was assessed against SD Z score, we observed that mean lipid profile were normal in <-3 to<-6sd z score (Table 5). Lipid levels were significantly lower in edematous SAM as compared to non- edematous (Table 6).

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Table 1: Age and Sex wise Distribution of Study Population

	Case (SAM)					Control				
Age (months)	**Male**		**Female**		**Total**	**Male**		**Female**		**Total**
	No.	%	No.	%	No.	No.	%	No.	%	No.
6-<12	31	70.45%	13	29.55%	44	13	50%	13	50%	26
12-<24	23	42.59%	31	57.41%	54	12	63.16%	7	36.84%	19
24-<60	0	0.00%	2	100.0%	2	2	40%	3	60%	5
Total	**54**	54%	46	46%	100	27	54%	23	46%	**50**
Mean±SD	12.04±4.11		13.98±6.36		12.93±5.33	13.33±5.55		13.42±4.82		13.38±5.13

Table 2: Distribution of study population on basis of SAM criteria

Age (month)	**WFH/L <-3SD**	**MUAC <11.5**	**Edema**			
			1+	**2+**	**3+**	**Total**
6-<12	43	28	2	3	1	6
12-<24	50	32	8	8	0	16
24-<60	2	2	0	1	0	1
Total	**95 (95%)**	**62 (62%)**	**10 (10%)**	**12 (12%)**	**1 (1%)**	**23 (23%)**

Table 3: Distribution of study population according to weight for length/height (WHO SD Z Score)

SD Z- SCORE	**SAM**	
	No. of children	**%**
Mean to <-2SD	13	13%
<-3SD	32	32%
<-4SD	28	28%
<-5SD	21	21%
<-6SD	5	5%
<-7SD	1	1%
Total	**100**	**100%**

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Table 4: Basic Anthropometric Variables in SAM Patients

Values	SAM (100)		Control (50)	
	Mean	SD	Mean	SD
Weight (kg)	5.512	0.82	8.68	1.03
Height (cm)	70.26	8.17	73.96	15.26
MUAC (cm)	10.99	1.18	12.3	0.44
BMI (kg/m^2)	11.02	1.65	15.77	0.86

Table 5; Mean Lipid Profile With SD Z Score

	Cholesterol		Triglyceride		HDL		LDL		VLDL	
SD Z-Score	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<-2	84.62	13.72	45.38	19.70	30.62	9.74	40.31	11.47	14.23	4.92
<-3	94.19	30.55	73.28	38.09	35.44	8.71	54.91	19.87	21.41	8.09
<-4	109.86	25.40	90.86	37.27	43.75	19.23	56.75	22.68	23.54	7.19
<-5	115.38	36.10	95.57	30.85	42.90	12.26	61.10	25.87	23.38	9.85
<-6-7	98.83	14.84	81.00	32.34	36.67	4.93	51.67	13.76	20.33	6.38
ANOVA	0.97		0.94		0.86		0.98		0.97	

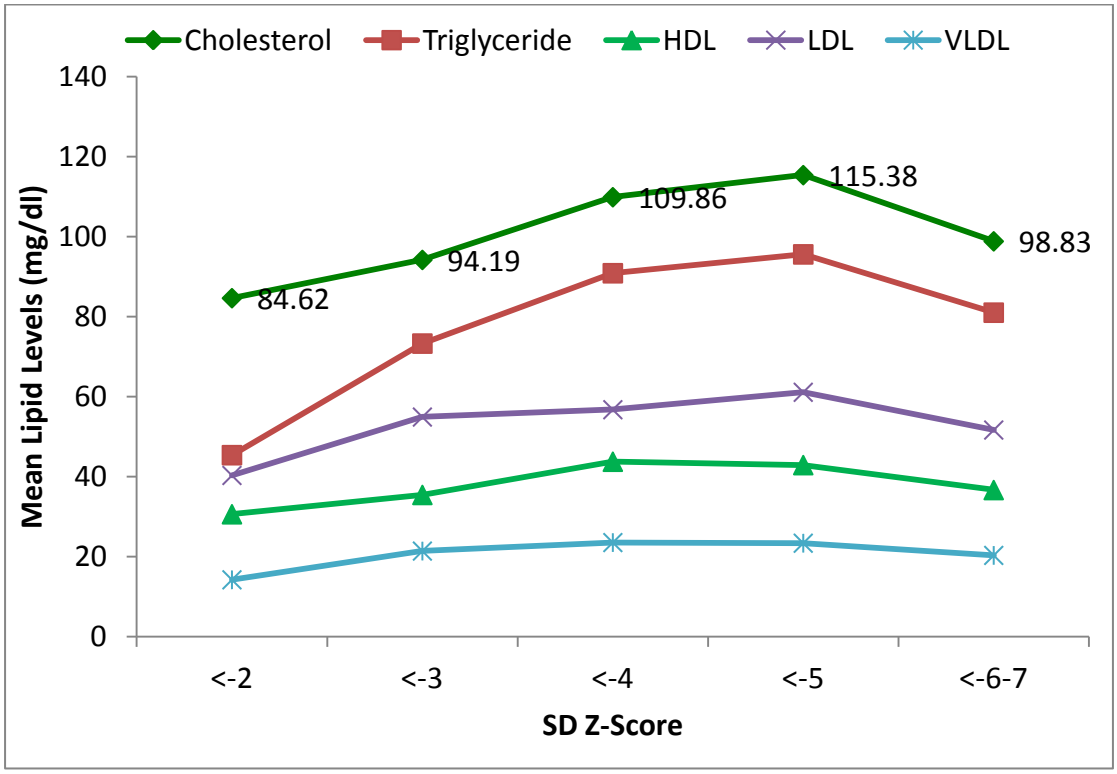

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TABLE-6; Comparison of Serum Lipid In Edematous And Non Edematous SAM

	Edematous SAM	Non Edematous SAM	P value
Cholesterol	79.95±8.76	109.11±30.36	<0.001
TG	40.78±20.22	91.35±43.21	<0.001
HDL	32.43±8.62	40.67±14.76	<0.001
LDL	42.30±10.6	58.31±22.62	<0.001
VLDL	12.90±3.71	25.81±8.08	<0.001

DISCUSSION-

In our study, when the lipid profile was assessed against SD Z score. we observed that mean lipid profile was normal in <-3 to<-6sd z score.

Lipid levels were significantly lower in edematous SAM as compared to Non edematous.

In our study, the serum total lipid levels at the time of admission in marasmic group were found to be significantly higher than in the kwashiorkor group. This observation was consistent with the findings reported by other studies [11-16]. It suggested that similar to mechanism controlling proteins and carbohydrate homeostasis in the marasmic infants probably to maintain a balanced source for lipids as a result of which the plasma levels of total lipids remain within normal limits. Kwashiorkor is the severest form of malnutrition, as serum lipids are maximally disturbed. Marasmus is the compensated form of malnutrition where lipid profile is minimally disturbed.

Schwartz et al[11], Cravioto et al[12] and MacDonald et al[13] reported low level of total lipids in kwashiorkor cases at the time of admission, whereas Van der Sar et al[17] reported variable levels in kwashiorkor. Contrary to our findings other studies reported normal level of total lipids in marasmus groups at the time of admission [14-16].

Serum cholesterol concentrations show a U-shaped relationship with mortality, and low levels have been associated with increased mortality However, sensitivity and specificity to monitor malnutrition are low [18]. Children with kwashiorkor break down fat and oxidize fatty acids less efficiently than do children with marasmus; this factor may explain the better survival rate in marasmus [19].

LIMITATION:

This study was to assess lipid levels at the time of admission. We did not follow clinical outcome. Hence determination of the lipid profile of patients with SAM immediately on admission and follow up will help in correlation of lipid with morbidity and mortality.

From this study we recommend that the lipid profile is to be done in all children of SAM and to be correlated with severity of morbidity and mortality.

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