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RESEARCH ARTICLE

STUDY OF PROTEIN ENERGY MALNUTRITION CASES IN SLUM AREAS OF RISHIKESH

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ABSTRACT

Objective: To see the prevalence of malnutrition and its severity.

Setting & Design: A cross-sectional survey of the nutritional status at HIHT, Rishikesh Branch.

Participants: All the patients between the age group of 6 months-6 years who attended pediatrics OPD were included in this study.

Results: In the present study 27.38 % children were under weight for their age. Nearly 52% cases were stunted indicating chronic malnutrition, while 17.84% showed wasting therefore a significant number of children failed to gain appropriate weight and height for their age when compared to standard measurements. However, most of them gained weight appropriate for their own height, which itself was not optimum. In children 6 months-6 years 28.48% had malnutrition according to mid upper arm circumference.

Conclusion: It was recognized that wide spread malnutrition prevalent among the poor socio-economic groups of our population is largely attributed to economic factor. However it cannot be denied that social and cultural factors also contribute

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INTRODUCTION

A reduced protein intake over an extended period of time leads eventually to depletion of the tissue reserve (decreased proteins in the body) and then to lowering of blood protein levels. W.H.O. has defined PEM as a range of clinico pathological conditions arising from coincidental lack in varying proportions of protein and calories, occurring more frequently in young children and commonly associated with infections. In the whole world 150 millions children are under weight and more than 20 millions suffer from severe malnutrition. Out of them 2/3 are lives in the Asian Sum continent. In India PEM is the major health problem. (1,2). Nutritional marasmus and kwashiorkor are two extreme forms of malnutrition. Such extreme forms are rare; most cases suffer from mild and moderate nutritional deficit. Undernutrition is classified by WHO into moderate and severe forms as shown in Table 1. Reference values for weight for height are provided in Table 2. (2)

Patho- physiology of malnutrition

Malnutrition affects virtually every organ system. Dietary protein is needed to provide amino acids for synthesis of body proteins and other compounds that have a variety of functional roles. Energy is essential for all biochemical and physiologic functions in the body. Furthermore, micronutrients are essential in many metabolic functions in the body as components and cofactors in enzymatic processes. (4) In addition to the impairment of physical growth and of cognitive

and other physiologic functions, immune response changes occur early in the course of significant malnutrition in a child. These immune response changes correlate with poor outcomes and mimic the changes observed in children with acquired immune deficiency syndrome (AIDS).

Table 1. WHO Classification for severity of undernutrition

	Moderate Under nutrition	Severe Under nutrition
Symmetrical oedema	No	Yes ^a
Weight for height (measure of wasting)	SD score ^b -2 to -3 (70-79% of expected ^d)	SD score < -3 (<70 % of expected)
Height for age (measure of stunting)	SD score ^b -2 to -3 (85-89% of expected ^d)	SD score < -3 (<85 % of expected)

a. This includes kwashiorkor and marasmic kwashiorkor.

Observedvalue–expectedvalue.

b. SDscore = Standard deviation freference population

c. Median (50th percentile of NCHS standards).

Loss of delayed hypersensitivity, fewer T lymphocytes, impaired lymphocyte response, impaired phagocytosis secondary to decreased complement and certain cytokines, and decreased secretory immunoglobulin A (IgA) are some changes that may occur.(5,6) Kwashiorkor and marasmus are 2 forms of PEM that have been described. The distinction between the 2 forms of PEM is based on the presence (kwashiorkor) or absence (marasmus) of edema. Marasmus involves inadequate intake of protein and calories, whereas a

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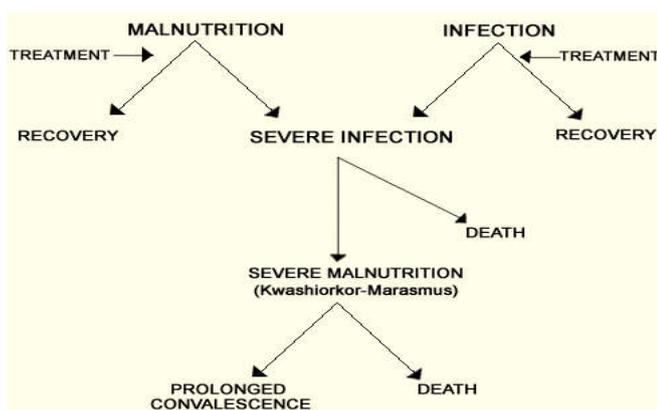
child with kwashiorkor has fair-to-normal calorie intake with inadequate protein intake. Although significant clinical differences between kwashiorkor and marasmus exist, some studies suggest that marasmus represents an adaptation to starvation whereas kwashiorkor represents a dysadaptation to starvation.

Table 2. NCHS/WHO Normalized reference values for weight-forheight/length(3)

Boys' -3SD	weight(kg) -2SD	Median	Length (cm)	Median	Girls' -2SD	weight (kg) -3SD
2.2	2.5	3.3	50	3.4	2.6	2.3
2.7	3.3	4.3	55	4.3	3.3	2.8
3.7	4.4	5.7	60	5.5	4.3	3.7
5.0	5.7	7.1	65	7.0	5.5	4.8
6.3	7.0	8.5	70	8.4	6.8	6.0
7.4	8.2	9.8	75	9.6	7.9	7.0
8.3	9.2	10.9	80	10.6	8.8	8.0
8.9	9.9	12.1	85	11.8	9.7	8.6
9.8	10.9	13.3	90	12.9	10.7	9.5
10.7	11.9	14.5	95	14.1	11.6	10.4
11.6	13.0	15.7	100	15.4	12.7	11.3
12.7	14.2	17.1	105	16.7	13.8	12.3
13.8	15.4	18.7	110	18.2	15.0	13.4

SD standard deviation score (or z score) Indian Academy of Paediatrics (IAP) takes a weight of more than 80% of expected for age as normal. Grades of malnutrition are: Grade I (71-80%), Grade II (61-70%), Grade III (51-60%) and Grade IV (< 50%) weight of expected value for that age. Alphabet K is postfixed in the presence of oedema.

In addition to PEM, children may be affected by micronutrient deficiencies, which also have a detrimental effect on growth and development. The most common and clinically significant micronutrient deficiencies in children and childbearing women throughout the world include deficiencies of iron, iodine, folate, vitamin D, and vitamin A. Although fortification programs have helped diminish deficiencies of iodine, vitamin A, and vitamin D in individuals in the United States, these deficiencies remain a significant cause of morbidity in developing countries. Micronutrient deficiencies and protein and calorie deficiencies must be addressed for optimal growth and development to be attained in these individuals. (7,8)



Thus we have conducted this study with the following
Aims and objective

To see the prevalence of malnutrition, its severity, age wise and sex wise distribution in the children between six months to six years.

MATERIALS AND METHODS

Malnutrition contributes significantly to deaths among children -- directly in its severe form, and indirectly in mild-moderate

form by potentiating effect on illnesses.⁹ A review of the literature over the past five decades indicates that the median case fatality from severe malnutrition has remained unchanged over this period (typically 20-30%).² "There is an urgent need for clear, accessible and authoritative information that is prescriptive rather than descriptive in order to aid rapid and appropriate decision-making."¹⁰ This study was done on the patient who came to the O.P.D. of Pediatric department of teaching Hospital of HIHT, Rishikesh. The hospital is a first-level referral center for common pediatric problems. The beneficiaries are mainly the slum-dwellers living near the holy Ganga River. This study was conducted from January 2009 to December 2009. Total No. of cases studied were 2538. Malnutrition was graded according to the Indian Academy of Pediatrics system, where Grades III and IV correspond to 50% or less, and 51-60% weight-for-age of the Harvard reference population. (11) Weight of small children and infants were recorded with a spring balance (Way Master, U.K.) with smallest gradation of 50 gms and weighing of older children was done by weighing machine (Libra U.K.) with small gradation of 500 gms.

Table 1. Prevalence of Malnutrition

Total patient studied		
Total patient studied	2538	%
6 months-6years	1529	60.24
6-12 years	1009	39.76
Malnourished	695	27.38

1. In our study of 1 year duration total number of O.P.D. patients was 2538
2. Out of which 1529 were between 6 months to 6 years.
3. Total malnutrition cases were 695(27.38%).

Table 2. Sex Distribution of malnourished Patient

Sex	No of patient	%
Female	426	61.3 %
Male	269	38.7 %
Total	695	100

4. Maximum numbers of patients were female (61.30%)
5. Out of total 695 cases, while 38.70% were male.
6. Ratio of female: Male was 1.57:1

Table 3. Distribution Of Sex By Age

Age/Sex	6mo-2 years		2yrs-4yrs		4yrs-6yrs		Total
	No	%	No	%	No	%	
Female	96	22.53 %	122	48.82 %	208	48.82 %	426
Male	63	23.42 %	102	38.66 %	104	38.66 %	269
Total	159	22.88 %	224	44.89 %	312	44.89 %	695

7. Maximum No. of cases of malnutrition were seen among the age Group of 4-6 years (44.89 %) and
8. Maximum number of female suffering from malnutrition lies in this group (48.82 %).

Table 4. Nutritional Status according to IAP classification

Grade 1	71.80 %	252(36.26 %)
Grade 2	61.70 %	219 (31.52 %)
Grade 3	51.60 %	157 (22.58%)
Grade 4	< 50 %	067(09.65%)
Total	-----	695(100.00%)

9. Maximum No. of children (36.26%) was in the 1st grade of malnutrition
10. Minimum No. of children Were in grade IV (09.65%).

Table 5. Nutritional status according to water low classification

Grade 1	Normal	%	Malnourished (%)
Height for Age	330	47.48	365[52.52(STUNTED)]
Weight for Height	571	82.16	124[17.84(WASTED)]
M.A.U.C.	497	71.52	198 (28.48)

11. When height for age considered as measures 52.52% cases shows evidence of stunting.
12. When weight for height considers then 17.84% cases were wasted.
13. Mid upper arm circumference was found lower than standard in 28.48% cases.

Table 6. Nutritional status by sex/IAP classification

IAP grade	Boys		Girls		Total	
	No	%	No	%	No	%
1	92	34.20	160	37.56	252	36.26
2	94	34.94	125	29.34	219	31.52
3	63	23.42	94	22.06	157	22.58
4	20	07.43	47	11.03	67	09.69
Total	269	99.99	426	100.00	695	100.00

14. Maximum no. of patient in all grade were female and 37.56% were in grade-I where as 29.34% in grade-II.

Table 7. Nutritional status by sex/water low classification

Height for Age	Male		Female		Total	
	No	%	No	%	No	%
Normal	186	69.14	144	33.80	330	47.48
Stunted	83	30.86	282	66.20	365	52.52
Total	296	100	426	100	695	100
Weight for Height	Male		Female		Total	
	No	%	No	%	No	%
Normal	221	82.16	350	82.16	571	82.16
Wasted	48	17.84	76	17.84	124	17.84
Total	269	100	426	100	695	100

15. 66.2% female were stunted while only 30.86% male were stunted. Wasting were seen equally (17.84%) in both sexes.

Table 8. Distribution Age/By Grade

Age	6m-2 y		2-4		4-6			
	No	%	No	%	No	%	No	%
1	59	23.41%	97	38.49%	96	38.10%	252	36.26
2	43	19.63	108	49.31	68	31.06	219	31.52
3	54	34.39	12	07.64	91	57.97	157	22.58
4	3	4.48	7	10.45	57		67	9.65
Total	159	22.88	224	32.32	312	44.07	695	100.00

16. Maximum percentage (85.07%) cases of grade IV malnutrition were seen in the age of 4-6 years.

Table 9. Nutritional Status according to family size

Status of nutrition	Small family (1-2)		Medium family (2-4)		Large family (>4)		Total
	No	%	No	%	No	%	
Grade 1	48	46.15	81	30.80	123	37.50	252
2	33	31.73	114	43.35	72	21.95	219
3	14	13.47	45	17.10	98	29.88	157
4	09	08.65	23	08.75	35	10.67	67
Total	104	14.96	263	37.84	328	47.19	695

17. The number of cases of PEM was increased as family size increases.

Table 10. Nutritional Status according to caste

Grade	Bangali		Brhamin		Pahari		Vanish		Lower caste		Total
	No	%	No	%	No	%	No	%	No	%	
1	78	30.95	18	07.14	32	12.70	29	11.51	95	37.70	252
2	93	42.46	09	04.11	21	09.59	17	07.76	79	36.07	219
3	36	22.93	19	12.10	38	27.20	11	07.01	53	33.76	157
4	21	31.34	09	13.43	11	16.42	07	10.45	19	28.36	67
Total	228	32.80	55	07.92	102	14.68	64	09.21	246	35.39	695

18. The more incidence of PEM were seen in the lower caste followed by Bangali.

Table 11. Common Disease with malnutrition

S.N.	Name of disease	6mon-2yrs	2-4yrs	4-6yrs	Total
1	Pneumonia	67	63	183	313
2	Age	47	49	117	213
3	Chronic	44	73	86	203
4	Worm infestation	13	89	72	174
5	Pul tuberculosis	13	15	63	91
6	Anaemia	67	119	123	309
7	Vit deficiency	3	17	24	44
8	Other deficiency	31	36	45	112
9	Pleural effusion	6	3	5	14
10	C.h.f.	20	23	27	70

19. In our study the Acute and Chronic diarrhea were found in the maximum number of cases and this was followed by the pneumonia.

20. Anemia was also observed in more than half cases. (309)

Medical Care: (12,13,14)

- Following evaluation of the child's nutritional status and identification of the underlying etiology of the malnutrition, dietary intervention in collaboration with a dietitian or other nutritional professional were initiated.
- Children with edema were assessed carefully for actual nutritional status because edema may mask the severity of malnutrition. Children with chronic malnutrition were received caloric intakes more than 120-150 kcal/kg/d to achieve appropriate weight gain.
- Additionally, any micronutrient deficiencies were corrected for the child to attain appropriate growth and development.
- In mild-to-moderate cases of malnutrition, initial assessment and nutritional intervention were done in the outpatient setting.
- A patient with malnutrition was hospitalization based on the severity and instability of the clinical situation. Hospitalization of patients with suspected malnutrition secondary to neglect allows observation of the interactions between parent and child and documentation of actual intake and feeding difficulties.
- Mild and moderately under-nourished children are best treated in their own home surroundings. Domiciliary treatment of malnourished children by their mother is economical, offers in-built advantage of practical health education, and is associated with minimal recurrence risk.
- The parents are advised to increase the food intake of the child by all available means. The child should receive adequate amount of calories and protein in the diet, which should be prepared from the locally available, inexpensive foods.
- The child should be kept under surveillance by using a growth chart and effort should be made that he does not slip down to severe malnutrition

DISCUSSION

- In the present study 27.38% children were under weight for their age. Nearly 52% cases were stunted indicating chronic malnutrition, while 17.84% showed wasting therefore a significant number of children failed to gain appropriate weight and height for their age when compared to standard measurements. However, most of them gained weight appropriate for their own height, which itself was not optimum. 28.48% had malnutrition by mid upper arm circumference (MUAC) criteria.
- W.H.O. report of 1997 showed under weight prevalence among pre school children about 30%. Maximum number of children with malnutrition was seen in the group of 4-5 years, reflecting poor nutritional case of the older children. By MUAC criteria 13.81% boys and 34.82% girls had malnutrition. (2, 14). Case system in India has still important socio economic implications. Maximum children with malnutrition were seen among low socio economic group, followed by Bengali. Most stunted and wasted children were found in lower castes. (15, 16)
- A limited family size is important for the good nutrition and well being of family. 85.03% of malnourished children were from medium and large family, while only 14.96% children of small families were affected. (17)
- Malnourished children are more prone to develop various infections and other disease. In our study diarrhea,

anemia and pneumonia were commonly associated disease. (18-21)

5. In certain literature it has been mentioned that the total % of children with under nutrition as indicated by stunting, wasting and both of these combined is estimated to be more than 50%. The findings in this study are very close to these figures. (22,23)

Conclusions

- In conclusion, a significant number of children under study were suffering from malnutrition according to IAP, Waterlow and MUAC criteria.
- Female child had a higher percentage occurrence of overall and Grade I PEM. This may be because of the lack of attention that a girl child receives. The prevalence of overall and Grade I, II, III PEM was highest among children of illiterate mothers. Improper education and dearth of awareness among mothers results in poor health of a child.
- The children of labourers were affected most with overall and Grade I, II, III PEM. It is quite often seen that in labour class both the parents work through the day, resulting in the child receiving almost no attention.
- Medium and large sized family had more incidence than the small family. A number of factors affect acceptability and utility of food such as availability, cultural practices, economic condition and knowledge about health.
- Therefore importance of nutritional monitoring and removal of adverse factors is emphasized. The extent of malnutrition can be countered by educating the parents with respect to basic nutritional requirements of their children and encouraging them to consume locally available low cost nutritious foods.

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