

Malnutrition in Diseased Children with Reference to Age, Sex, Socio-economic Status and Area of Living

SHAZIA ASHRAF, MUHAMMAD TARIQ JAVED[†], NAHEED ABBAS, HINNA AYSHA[‡] AND SADAF HAMEED

Departments of Home Economics (Food and Nutrition), [†]Veterinary Pathology, University of Agriculture, Faisalabad-38040, Pakistan; [‡]Paediatric Ward, Allied Hospital, Faisalabad-38040, Pakistan

[†]E-mail: mtjaved@fsd.paknet.com.pk

ABSTRACT

The study was carried out on a total of 100 children of school going age (4-12 years). Of these, 85 were diseased malnourished and 15 were apparently healthy. These were grouped on the basis of age (4-6, 7-9, 10-12), socio-economic status (low and middle class), sex and area of living (industrial and non-industrial). Results revealed non-significant differences in mid arm circumference, per cent weight and body mass index between sexes in diseased malnourished children of all the three degrees. Mid arm circumference was significantly ($P<0.05$) or relatively lower in children of 4-6 and 7-9 years of age than 10-12 years of age in those suffering from 1st and 2nd degree of malnutrition. However, the difference was non-significant between age groups in 3rd degree malnutrition. Per cent weight and body mass index showed non-significant differences between age groups in each degree of malnutrition. Results also showed that 2nd degree of malnutrition was more prevalent (46.4%) than 1st (17.5%) and 3rd (23.7%). Further, in overall higher ($P<0.001$) number of cases of malnutrition among diseased children were observed in those belonged to low (90.0%) than middle socio-economic status (10.0%) and was the same in all the three degrees of malnutrition individually. The data also revealed that malnutrition was more prevalent ($P<0.001$) in diseased children lived in non-industrial than industrial area. The diseases more frequent in these children were diarrhoea (25.8%) and fever + vomition (30.9%).

Key Words: Malnutrition; Children; Age; Sex; Socio-economic status

INTRODUCTION

Majority of population in the developing countries suffer from malnutrition or under-nutrition (Tull, 1996). Malnutrition results from consuming too little food or a shortage or imbalance of key nutrients (Swaminathan, 1998). Individual's nutritional status varies on the basis of person's living situation, available food supply, health and socio-economic status (Williams, 1994). Well-nourished people were much more likely to be alert both mentally and physically. On the other hand, persons who do not get enough of the nutrients have great risk of physical illness and signs of malnutrition develop in them. The later appear when nutritional reserves get depleted including macronutrient (mainly protein) and micronutrients (Zn, Cu and Fe etc.).

It has been urged that nutrition policies for overcoming malnutrition in different countries should be based on knowledge of the nutritional status and patterns of diets consumed by the population, available food resources and socio-economic factors. The assessment of nutritional status of a patient is important and approach of nutritional assessment involves anthropometrical observations, biochemical tests, clinical observations and diet evaluation.

Keeping in view the importance of malnutrition with reference to socio-economic status, living condition and other factors, the present study was planned to record occurrence of malnutrition and its level with reference to age, sex, socio-economic status and area of living and also the anthropometrical measurements in children of different degrees of malnutrition in different groups.

MATERIALS AND METHODS

The study was conducted on children admitted in paediatric wards of Allied and National Hospitals of Faisalabad and Outdoor Patient Department, Allied Hospital. Children included in the study were randomly selected from those suffering from some common diseases and had developed signs of malnutrition.

A total of 100 children of 4-12 years of age were randomly selected for the study. Of these, 85 were suffering from some common diseases including diarrhoea, pneumonia, jaundice, gastroenteritis, while 15 apparently healthy children were also selected. These subjects were grouped on the basis of socio-economic status, age, sex and area of living. The area of living included residency in industrial or non-industrial areas. Socio-economic status included low (maximum earning of 5,000 per month or below) and middle class (minimum earning of 5,000 and maximum earning of 15,000 per month). Three age groups were made including 4-6, 7-9 and 10-12 years. History from family members of these children was obtained including age, sex, disease suffering, duration of illness, family income, etc. Anthropometrical measurements were also recorded which included height, body weight and mid arm circumference. Per cent weight of each child was calculated by dividing the actual weight with the target weight at that age. Children were classified into three degrees of malnutrition according to their weight by using the Gomez classification (Hamil *et al.*, 1979).

1st degree malnutrition: If weight was 75-90% of the target or expected weight.

2nd degree malnutrition: If weight was 60-75% of the target or expected weight.

3rd degree malnutrition: If weight is below 60% of the target or expected weight.

Body mass index of each child was also calculated by following formula (Garrow, 1981).

$$\text{Body Mass Index} = \frac{\text{Weight}}{(\text{Height})^2}$$

The data thus collected were subjected to chi square test and analysis of variance of techniques and means were compared by using LSD (least significance difference) and DMR (Duncan's new multiple range) tests by using SAS statistical software.

RESULTS AND DISCUSSION

The data on occurrence of degree of malnutrition in children of different ages showed that 1st and 3rd degree of malnutrition were relatively more prevalent in children of 10-12 years of age, while 2nd degree in children of 7-9 years of age (Table I).

Table I. Per cent occurrence of degree of malnutrition in children of various groups

Age Groups	Malnutrition degree			Overall
	1 st	2 nd	3 rd	
Age Groups				
4-6 years	23.5	20.0	34.8	26.1
7-9 years	29.4	48.9	26.1	34.8
10-12 years	47.1	31.1	39.1	39.1
Significance Level		(P<0.05)		
Sex				
Male	64.7	40.0	56.5	53.7
Female	35.3	60.0	43.5	46.2
Socio-economic status				
Low	94.1	88.9	87.0	90.0
Middle	5.9	11.1	13.0	10.0
Significance Level		(P<0.001)	(P<0.001)	(P<0.001)
Area of Living				
Industrial	29.4	17.8	4.3	17.16
Non-industrial	70.6	82.2	95.7	82.84
Significance Level		(P<0.001)	(P<0.001)	
Overall	17.5	46.4	23.7	

Values in each divided column is significant at the given level

This showed that malnutrition occurred in relatively elder children. The results also indicated that malnutrition was relatively more common in males than females (Table I), which might be due to genetic differences as may be the males encounter diseases more frequently than females resulting into lower values for parameters considered in assessment of malnutrition or the male are brought to the hospital early and are given the importance. All the three degrees of malnutrition were more prevalent in children of low socio-economic status (Table I), which suggested that unhygienic conditions and nutritional deprivation were the

probable contributor and were responsible for higher occurrence of malnutrition. The data with respect to malnutrition and place of living suggested less prevalence of malnutrition in children belonging to cities than those living in towns and villages (Table I). This might be due to that people living in cities are more aware of the hygiene, as well as they consult doctors early, and the development of malnutrition is prevented.

Present results showed that malnutrition was more prevalent (P<0.001) in children of non-industrial than industrial area (Table I). This might not be real difference as greater population live in non-industrial zone and in fact it is the relative occurrence, while proportionate occurrence might be the same.

Age. Results with respect to mid arm circumference and per cent weight showed significantly (P<0.05) lower values in malnourished than apparently healthy children in each age group (Table II).

Table II. Means of mid arm circumference, per cent weight and body mass index of children of different ages in different degrees of malnutrition

Age Groups	Malnutrition degree			Control
	1 st	2 nd	3 rd	
Mid arm Circumference				
4-6 years	14.42± 1.17	13.38± 1.02	11.56± 2.12	14.50± 0.50
	Aba	Bab	b	Ca
7-9 years	12.30± 4.02	14.06± 1.08	12.33± 2.65	15.87± 0.25
	Bb	Bab	b	Ba
10-12 years	16.06± 1.39	15.32± 1.35	13.55± 1.79	17.30± 0.83
	Aab	Ab	c	Aa
Overall Mean	14.57± 2.81	14.32± 1.35	12.54± 2.24	16.12± 1.30
Per cent Weight				
4-6 years	80.50± 2.64	68.88± 6.84	52.12± 7.27	96.33± 6.35
	b	c	d	a
7-9 years	79.60± 2.30	68.40± 4.07	50.50± 5.54	113.25± 15.34
	b	c	d	a
10-12 years	79.50± 2.87	65.82± 2.65	48.33± 10.50	106.00± 15.14
	b	c	d	a
Overall Mean	79.77± 2.53	67.69± 4.49	50.21± 8.17	106.0± 14.13
Body Mass Index				
4-6 years	12.77± 2.11	13.61± 1.88	12.64± 1.90	15.25± 1.36
7-9 years	10.96± 5.41	13.20± 2.32	11.75± 2.58	17.58± 0.94
	b	b	b	a
10-12 years	15.15± 2.19	13.90± 2.15	11.54±	17.02± 2.13
	ab	b	2.08 c	a
Overall Mean	13.36± 3.71	13.50± 2.17	11.98± 2.12	16.76± 1.77

Values with different small letters in a row and with different capital letters in a column are statistically significant at P<0.05

This suggested that these parameters were good indicators of degree of malnutrition as the values for these parameters were further lowered in severe degree of malnutrition in each age group (Table II). Mid arm circumference was significantly or relatively lower in children of 4-6 and 7-9 years of age than 10-12 years of age in those suffering from 1st and 2nd degree of malnutrition. However, non-significant difference was observed between age groups in third degree malnutrition. The per cent weight, however, showed non-significant difference

between age groups in each degree of malnutrition. This indicated that mid arm circumference was affected more in children of younger ages with milder degrees of malnutrition. The data on body mass index also suggested the same, in which also the values were significantly ($P<0.001$) or otherwise lower in severe degree of malnutrition in each age group, while between age groups non-significant difference was observed. It has previously been reported that mid arm circumference, per cent weight and body mass index decreased in malnourished children and considered as indicator of severity of malnutrition (Kepezynaka & Brozezinski, 1961).

Sex. Mid arm circumference showed significant ($P<0.05$) difference between malnourished and apparently healthy children only in males but not in females, where the values were lower in malnourished males (Table III). However, per cent weight and body mass index were significantly ($P<0.05$) lower, both in male and females suffering from malnutrition (Table III). It has been reported that these parameters get affected due to malnutrition and decrease in values occur (Rankinen *et al.*, 1995).

Table III. Means of mid arm circumference, percent weight and body mass index of children of different sex of different degrees of malnutrition

Age Groups	Malnutrition degree			
	1 st	2 nd	3 rd	Control
Mid arm Circumference				
Male	15.22±1.08 ab	14.50±1.26 b	11.92±2.31 c	16.38±1.29 a
Female	13.26±4.49	13.31±1.44	13.35±1.94	15.33±1.15
Per cent Weight				
Male	79.81±2.75 b	66.72±5.06 c	49.46±7.33 d	105.55±14.64 a
Female	79.60±2.2 b	68.34±4.03 c	51.20±9.46 d	107.33±15.37 a
Body Mass Index				
Male	12.99±4.56 b	13.78±2.97 b	12.34±2.17 b	16.91±1.95 a
Female	14.02±1.26 b	13.31±1.44 b	11.51±2.06 c	16.30±1.25 a

Values with different small letters in a row are statistically significant at $P<0.05$

Socio-economic status. As in age, per cent weight, mid arm circumference and body mass index was also lower in malnourished children than apparently healthy children of each socio-economic status (Table IV). However, non-significant difference was observed between socio-economic status in each degree of malnutrition (Table IV). However, Underwood *et al.* (1987) reported lower values for these parameters in underprivileged children of low socio-economic status. The present study also suggested that malnutrition is condition of low and middle class and no case in high class was observed which though may occur but is rare.

Area of living. The results of mid arm circumference, per cent weight and body mass index showed significantly

($P<0.05$) lower values for these parameters in malnourished than apparently healthy children of each industrial and non-industrial area (Table V). This indicated that decrease in these parameters was independent of area of living and was related with severity of malnutrition (Table V). However, genetic differences do exist as Squali *et al.* (1997) reported lower values for height and weight for children of Khartoum than English children.

Present results indicated that diarrhoea and fever+vomition were the frequently encountered diseases leading to malnutrition or malnourished children suffered from these (Table VI). Von Wouwe (1995) and Squali (1997) also reported diarrhoea to be the more frequently observed disease among malnourished children.

Table IV. Means of percent weight, mid arm circumference and body mass index in children of different degree of malnutrition of different socio-economic status

Socio-economic Status	Malnutrition degree			
	1 st	2 nd	3 rd	Control
Per cent Weight				
Low	79.93±2.51 b	68.16±4.18 Ac	49.60±8.60 d	99.0±1.73 Ba
Middle	77.00±2.45 b	64.00±5.61 Bc	54.33±1.15 c	97.80±4.91 Ba
Mid arm Circumference				
Low	14.65±2.87 ab	14.35±1.40 ab	12.62±2.32 b	15.33±1.15 a
Middle	13.20±1.24 b	14.10±0.89 ab	12.00±1.73 b	16.50±1.45 a
Body Mass Index				
Low	13.35±3.83 b	13.59±2.14 b	11.84±2.20 b	16.17±1.02 a
Middle	13.45±1.25	12.81±2.49	12.94±1.38	15.89±1.52

Values with different small letters in a row and with different capital letters in a column are statistically significant at $P<0.05$

Table V. Means of mid arm circumference, per cent weight and body mass index of children residing in different areas in different degrees of malnutrition

Age Groups	Malnutrition degree			
	1 st	2 nd	3 rd	Control
Mid arm Circumference				
Industrial	14.70±5.01 b	13.75±0.84 bc	13.00±1.98 c	16.10±2.10 a
Non-industrial	14.51±1.52 b	14.44±1.41 b	12.52±2.28 c	16.13±1.29 a
Per cent Weight				
Industrial	82.00±1.41 Ab	67.62±3.29 c	53.00±2.31 d	99.61±12.16 a
Non-industrial	78.83±2.32 Bb	67.71±4.74 c	50.09±8.33 d	106.00±14.12 a
Body Mass Index				
Industrial	15.23±1.91 b	12.87±1.42 b	13.22±2.17 b	16.58±1.96 a
Non-industrial	12.58±4.05 b	13.63±2.29 b	11.92±2.15 b	16.67±1.77 a

Values with different small letters in a row and with different capital letters in a column are statistically significant at $P<0.05$

Table VI. Per cent occurrence of various diseases in children of different degrees of malnutrition

Disease	Malnutrition degree			Overall
	1 st	2 nd	3 rd	
Diarrhoea	29.4	24.4	39.1	25.8
Celiac disease	11.8	2.2	-	3.1
Cardiac Failure	17.6	13.3	4.3	10.3
Fever & Vomition	23.5	44.4	26.1	30.9
Muscular Dystrophy	5.9	-	-	1.0
Paralysis	5.9	-	4.3	2.1
Renal Failure	-	13.3	4.3	7.2
Diabetes	-	-	4.3	1.0
Mental Retardation	-	-	4.3	1.0
Meningitis	-	-	4.3	1.0
Malnutrition	5.9	2.2	8.7	4.1
		(P<0.001)	(P<0.001)	

Values in each column is significant at the given level

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