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THE SIGNIFICANCE OF ANTHROPOMETRIC MEASUREMENTS TO PREDICT MORTALITY IN SEVERE PROTEIN ENERGY MALNUTRITION

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ABSTRACT

OBJECTIVES: *The significance of anthropometric measurement to predict mortality in severe protein energy malnutrition in children from 2 months to 5 years of age.*
STUDY DESIGN: *Descriptive.*
PLACE AND DURATION OF STUDY: *This study was conducted in the Department of Pediatrics Unit II Liaquat University Hospital, Jamshoro from 05-09-2006 to 05-09-2007.*
SUBJECTS AND METHOD: *One hundred patients from 2 month to 5 years who presented with severe protein energy malnutrition, having weight and height below three standard deviation were included in study and information regarding signs, symptoms, risk factors were evaluated and investigations was recorded on a proforma. Diagnosis was based on clinical signs and anthropometric measurement like height, weight, mid upper arm circumference and occipito-frontal circumference were taken which was compared with respective growth charts and standards. Measurements were then analysed to know their significance for outcome.*
RESULTS: *The study group comprised of 100 children ranging from 2 months to 5 years, 43% (n=43) were male, 57% (n=57) were female, the mean age of presentation 23.96 months. The mean age of presentation for female children was 25.33 months, while for male 22.14 months. Commonest age group was 37 months to 60 months in which 66% children were found. The16% (n=16) children out of 100 either died or left in serious condition against medical advise, comparative anthropometric measurement of those with good out comes versus poor out come showed that the mean height of poor out come is 70.94cm, the mean height of good out come is 69.43cm, mean weight of poor out come is 4506.25gm, the good out come is 5427.38gm, the mean muac of poor outcome is 87.81mm, while the mean muac of good out come is 93.33mm, the mean ofc of poor out is 41.19cm, while the mean ofc of good out come is 42.46cm. The mean weight for height of poor outcome versus good outcome is decreased which is statistically significant, while the muac and ofc are also decreased but are not statistically significant. Height and length have no effect on mortality in severe acute malnutrition.*
CONCLUSION: *Weight for height is the only reliable indicator to predict mortality at the time of admission in patients with severe acute malnutrition.*

KEY WORDS: Malnutrition, mortality, anthropometric measurement.

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INTRODUCTION

Severe acute malnutrition (SAM) is defined according to WHO as presence of oedema of both feet, and severe wasting (<70%weight-for-height/length or <-3SD[a)] or clinical signs of severe malnutrition.

Malnutrition is a disorder resulting from not having enough food or enough of right food, for a long time. It is associated with more than 50% of all childhood mortality in developing countries,[1] with the risk of mortality being 5 – 8 folds among severely compared to moderately malnourished children.[2] Child mortality continues to be a public health priority worldwide. During the 1990 world summit on children in New York, the world policy makers and researchers made commitment to improve the burden of the preventable deaths.[3] There is a variation of incidence of malnutrition in different countries, approximately 350,000 children under five year old in West African state of Niger are suffering from malnutrition.[4] The report by the US agency for International development showed more than one – fifth of young Palestinian children are malnourished, with 13% suffering from acute malnutrition putting it on the same level of Nigeria, Somalia and

Bangladesh.[5] In Iraq 12% are suffering from general malnutrition under 5 year, 8% from acute malnutrition and 23% from chronic malnutrition.[6] In Pakistan it is estimated that nearly 40% to 50% of children under 5 years are stunted,[7] 12% severe underweight, 13% moderate to severely wasted.[8]

Anthropometric measurements are commonly used for assessing growth and nutritional status of children. These include weight for age, height for age and weight for height. Although the prevalence of low weight for age and height for age are often used interchangeably to describe chronic malnutrition, they provide very different information on what the problem is, how it can be remedied and the age when this is possible. Low height for age reflects the cumulative effects of numerous insults experienced by children during infancy and early childhood. It begins at birth and continues through the initial 40 months, after which time it is irreversible. In contrast, low weight for age is reversible, and can reflect either acute or chronic malnutrition. Children with acute malnutrition require different nutrition and health interventions than those with chronic malnutrition.

Throughout the developing world, children fail to grow in length and weight in a remarkably similar age-specific pattern, despite vast differences in the prevalence of low wt/age and ht/age between the regions. Faltering in length extends through the first 3 to 4 years of life. In contrast, faltering in weight is concentrated between 3 and 12 months. After 12 months of age, a child may be stunted and of low wt /age, but his wt/ht ratio improves. In other words, weight gain can be adequate even while the process of stunting continues for another two years. While failure to gain weight is a signal of inadequate nutrition, adequate weight gain does not necessarily mean that a child is growing normally.

Thus the differences in the degree of growth failure in weight and height have implications for assessing the true prevalence of chronic malnutrition. This is also important for monitoring trends or evaluating the effects of interventions. Weight distribution, when corrected a tendency toward over weight among children who are stunted. There is a need to shift the focus from wt/age to ht/age and wt/ht for assessing malnutrition and identifying populations that could benefit from interventions.[9]

However these parameters noted at the time of admissions can predict mortality.

MATERIAL AND METHODS

Children from 2 months to five years of age attending the Department of Pediatrics Unit II, Liaquat University of Medical and Health Sciences Jamshoro were included in the study. A proforma was designed and mothers were interviewed for variables, detailed examination, anthropometric measurements recorded a, patients managed according to WHO protocols and outcome recorded.

Duration: One year from 05-09-2006 to 05-09-2007

Sample Size: One hundred cases.

SAMPLE SELECTION:

Inclusion criteria:

Age from 2 months to five years both male and female with severe protein energy malnutrition, weight for height below three standard deviation.

Exclusion criteria:

Patients with acute secondary problems like meningitis, infiltrative disorder.

Data collection procedure:

After informed consent of parents or attendant of patients a total of 100 patients of severe malnutrition were enrolled, who fulfilled the inclusion criteria. A thorough history including, socioeconomic status, feeding pattern, including breast feeding and weaning practices, nutritional assessment of children, history of vaccination, chronic or recurrent diarrhea, worm infestation, recurrent respiratory tract infections including pneumonia and whooping cough, tuberculosis and measles infection. Severe malnutrition was labeled according to WHO definition criteria as presence of oedema of both feet, and severe wasting (<70%weight-for-height/length or <-3SD[a)], or clinical signs of severe malnutrition[10],by checking height and weight of every case and hospitalized children. Special emphasis was given to measure weight , height or length, MUAC and OFC by uniform measuring tools. These were then plotted on standard WHO growth charts. All children were treated according to WHO, 10 steps standard management protocols. All the information was collected on a proforma and computerized. Patients were followed up until they were discharged well(Good outcome) or died or left against medical advice(Both summed as poor outcome) in pre carious condition as they were not improving. Those with poor outcome had sepsis as the main secondary cause of death with or without persistent diarrhoea.

Data analysis:

The collected data was analyzed with computer program SPSS version 10.0. The mean and standard deviation were estimated for quantitative data and frequency and % were calculated for qualitative data. The results presented in shape of tables.

Permission from ethical committee:

The permission of investigate and treat the children with malnutrition was taken from ethical committee, LUMHS and consent from the parents of patients were taken before including them in our study.

RESULTS

Age and sex distribution:

A total of 100 children ranging from 2 months to 5 years were identified as a severe malnutrition in one year study duration. Out of them 43% (n=43) were male and 57% (n=57) were female. Malnutrition was more common in female sex as compared to male.

The mean age of presentation was 23.96 months. The mean age of presentation for female children was 25.33 months. While

TABLE – 1
Age distribution in groups

S. No	Age in months	No of children	%
1	2 – 12	6	6
2	13 – 36	28	28
3	37 – 60	66	66
	Total	**100**	**100**

Table – 2
Sex, mean age & out come

Sex	No of children	Mean age	Improve	Death/LAMA
Male	43	22.14	32	11
Female	57	25.33	52	5
Total	**100**	**23.96**	**84**	**16**

STASTICS OF HT, WT, MUAC, OFC

Compared with outcome (Table-3)

		N	Mean	median	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum	p-value
							Lower Bound	Upper Bound			—-
Ht of the pt in cm	Poor out come	16	70.94	68.50	12.00	3.00	64.54	77.33	56	97	0.615
	Good out come	84	69.43	69.00	10.75	1.17	67.09	71.76	44	94	—
	Total	100	69.67	—-	10.91	1.09	67.50	71.84	44	97	—
Wt of the pt in gms	Poor out come	16	4506.25	4500.00	1557.98	389.49	3676.06	5336.44	2400	7500	0.042
	Good out come	84	5427.38	5200.50	1653.43	180.40	5068.57	5786.20	2500	9500	—-
	Total	100	5280.00	—-	1665.82	166.58	4949.47	5610.53	2400	9500	—-
Muac In mm	Poor out come	16	87.81	90.00	15.49	3.87	79.56	96.07	55	110	0.196
	Good out come	84	93.33	92.50	15.55	1.70	89.96	96.71	65	140	—-
	Total	100	92.45	—-	15.60	1.56	89.36	95.54	55	140	—-
OFC In cm	Poor out come	16	41.19	39.00	3.83	.96	39.14	43.23	36	47	0.178
	Good out come	84	42.46	43.00	3.38	.37	41.73	43.20	34	50	—-
	Total	**100**	**42.26**	**—**	**3.47**	**.35**	**41.57**	**42.95**	**34**	**50**	**—-**

*Significance p-value less then 0.05

for male 22.14 months. Commonest age group was 37 months to 60 months in which 66% children were found. The out come 84% (n=84) were improve, 32 were male, 52 were female & 16% (n=16) are either died or left in serious condition against medical advice ,11 were male 5 were female as shown in (Table1 -2).

DISCUSSION

Malnutrition is a problem for the persons who suffer it, and for the future of the societies to whom they belong. It is important to know its magnitude in order to formulate solutions. The World Health Organization (WHO) released new Child Growth Standards in 2006 to replace the current National Center for Health Statistics (NCHS) growth reference [9].

Severe malnutrition in childhood presents a serious humanitarian and public health challenge[11]. Multiples social malpractices, poor socioeconomic status, poor nutritional believes and practices, infections and various congenital abnormalities of child can lead to malnutrition in child leading to poor growth and development of these children.

CAUSES OF DEATH OF SEVERE PEM WITH SECONDARY DIAGNOSIS (TABLE- 4)

N-16

	NO OF PATIENTS	NO OF DEATHS	
Persistent Diarrhea	61	5	31.25%
Persistent Diarrhea with septicemia	4	4	25%
Septicemia	2	2	12.5%
Renal failure	1	1	6.25%
Malaria	8	1	6.25%
Measles	8	1	6.25%
Tuberculosis	28	1	6.25%
Pneumonia	57	1	6.25%

Thus a nation provides ill and poorly developed generations. Thus we conducted this study for the significance of anthropometric measurements to predict the mortality in severe protein energy malnutrition.

Mortality rates in SAM are also high even in large hospitals. It is important to prevent these deaths and to know factors which can warn about poor outcome. In our study out of 100 cases that belong to the age group 2 months to 5 years, 43% of them were male while 57% were female. Mean age of presentation was 23.96 months. As non-availability of food is one of the major causes of malnutrition in third world countries. Family set up in these countries is such that one family member is earning and remaining all depends on his earning. His earning is not sufficient to full fill basic needs of life including food, education, health and other stuff needed for living that's why majority of people have to compromise on diet and as a result they eat just to kill the hunger[12].

The feeding and patterns of feeding also play a vital role in development of malnutrition [13]. Poor ways of feeding, lack of awareness and education of proper timing of feeding including weaning, social believes and malpractices reading food, poor concentration of mother towards children due to multiple reasons including frequent pregnancies can lead to poor nutrition of children and results in malnutrition in child [14]. Diarrhea is an important cause of childhood morbidity and death [15] This may be due to infective including viral, bacterial and protozoal. Worm infestation can also lead to chronic diarrhea. Other causes include mucosal disease like celiac, lactose intolerance or congenital malformations of GIT. Chronic diarrhea leads to malabsorption of various nutrients that lead to reduced growth rates in these children. Here it is important to conduct studies to find out common causes of diarrhea in children by means of detailed history, clinical examination and investigations including laboratory, radiological, and invasive one in order to find out better and curable ways to treat such potentially curable disease.

Other important cause of childhood morbidity is recurrent respiratory tract infections including pneumonia, and tuberculosis. Recurrent RTI is common in this age group due to reduced immunity of children, poor nutrition, lack of good ventilation, overcrowding and incomplete treatment of such infections. This is the major cause of morbidity and mortality in this age group.

History of vaccinations was asked from these children, 66% were receiving in complete vaccination out of 100 cases, for six communicable diseases included in EPI.

Vaccination is an important way of prevention from major communicable diseases of childhood that is a major cause of morbidity, hospital stay and death in this age group.

The variables of HT, WT, MUAC OFC compare with outcome is shown in table No: 3.

Weight – for- height is the recommended index in nutritional assessments and is recommended as the most reliable measurement of acute malnutrition in famine and emergency situations.[16] Mid upper arm circumference is a relatively simple index, but with a fixed cutoff, it ignores age-related changes. Compared with weight-for-height, has a sensitivity of 24.6% and a specificity of 94.8%.[17.] MUAC has been reported to be a better predictor of childhood mortality in community settings than is weight-for-height[18] .

In our study, the mean height of the poor out come is 70.94cm. while the mean height of good outcome is 69.43cm and the p value is 0.615. There is difference between the mean heights, and the p value is not statistically significant for mortality.

The mean weight of the poor outcome is 4506.25gm. while the mean weight of the good outcome is 5427.38gm. The p value is 0.042. The mean weight of the poor out come is less than the good outcome and the p value is statistically significant for mortality in our study.

The mean mid upper arm circumference of the poor outcome is 87.81mm, while the mean MUAC of good outcome is 93.33 mm. the p value is 0.196. The mean MUAC of the poor outcome is less than the good outcome but the p value is not statistically significant to predict poor outcome.

The mean occipito-frontal circumference of patients with poor outcome is 41.19cm, while the mean OFC of those with good outcome is 42.46, the p value is 0.178. The OFC of the poor outcome is though less than the good outcome but the p value is not statistically significant to predict poor outcome.

Malnutrition has been well recognized to increased susceptibility to recurrent infections which in turn adversely affect nutrition and growth of the children. Severe PEM causes immune-depression and is an accepted risk factor in infection related morbidity and mortality in children [19] .

The majority of the patients 56.25 % died due to persistent diarrhea with septicemia, 12.5% due to septicemia alone, and 6.25% each from renal failure, measles, cerebral malaria, tuberculosis and pneumonia in our study. as shown in table 4 .

This study favors an idea that all malnourished children had growth failure, which can be avoided by availability of food and education in the community about its effective uses, early diagnosis and treatment of childhood infections and vaccinations for prevention of potentially lethal infective diseases. Patients of SAM admitted with lower z-scores of weight for height should be monitored closely to avoid mortality.

CONCLUSION

Malnutrition is a major cause of growth failure and death in children. Sepsis with or without persistent diarrhoea is major secondary cause of death. The mean weight for height is significantly decreased in patients of SAM and can predict mortality or poor outcome at the time of admission. Mid upper arm circumference and o f c are also decreased in patients with poor out come as compared to those with good outcome but decrease is not statistically significant. Length or height at the time of admission has no effect on outcome.

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