EFFECT OF HOSPITALIZATION ON THE NUTRITIONAL STATUS OF UNDER FIVE CHILDREN

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ABSTRACT

Objectives: **A prospective study that was carried out to evaluate the nutritional status of children at hospital admission and again on discharge from hospital and correlate the changes in their nutritional status with selected socio-demographic variables.**

Methods: **The study included 293 children, aged 1-60 months admitted to Basrah Maternity and children Hospital from the first of November 2007 till the end of May 2008. Weight and height were measured by standard methods expressed in Z-scores for weight/age, height or length/age and weight/height according to World Health Organization Growth Standards. They were measured on admission and body weight and weight/height z score measured again on discharge, in addition to selected socio-demographic variables.**

Results: **The prevalence of wasting increased by hospital discharge and there is decrease in the frequency of well nourished children from 66.2% to 61.4% at discharge. Fourteen (7.2%) of well nourished children on admission progress to mild wasting on discharge from hospital, 21% of children with mild wasting initially deteriorated to moderate wasting, while 7.3% of children with moderate wasting progress to severe wasting on discharge. A significant association was reported between mother illiteracy, prolonged hospitalization, initial under nutrition and chronic diarrhea with weight loss during hospitalization.**

Conclusion: **The overall frequency of malnutrition has increased by discharge, and Prolonged hospitalization is associated with significant positive correlation with weight loss.**

INTRODUCTION

Illness and hospitalization are stressful experiences for child patients and their families. Children vary in their capacities to cope with the stress of hospitalization. A significant proportion of them, however, suffer from some degree of nutritional and emotional disturbances. Prolonged and repeated hospitalization increases the chance of later problems. [1] Childhood malnutrition is a disease of relevance and importance to public health; these children exhibit elevated morbidity and increased prevalence of hospital admissions. When admitted they are not generally subjected to anthropometric assessment and do not, therefore, receive nutritional support.[2,3] Hospital acquired malnutrition is caused by a reduction in the hospitalized children nutritional intake and increase in their calorie requirements as a result of morbidity.[2,4] There is an identified number of contributing factors to the widespread existence of under nutrition among hospitalized child and sometimes leads to exacerbation of his or her nutritional status.[5] Examples are interference with meal times by ward rounds, investigations and procedures.[6] 'Nil-by-mouth' orders may be used inappropriately or prolonged unnecessarily. A patient may be kept nil-by mouth all morning only to find that their treatment has been cancelled or delayed. In addition, many drugs cause anorexia, taste changes, nausea, vomiting or constipation, thereby reducing food intake. [6] The psychological outcome of hospitalized children remains little studied and poorly understood. [7] Children have been observed to be anxious, withdrawn, fearful, restless, and angry or demonstrate hostile behaviors.[8] The aim of the study was to assess the effects of hospitalization on nutritional status of hospitalized children and to correlate the changes in nutritional status with the age of the patient, duration of hospitalization, feeding pattern and type of disease.

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PATIENTS AND METHODS

A prospective study was carried out on patients admitted to pediatric wards of Basrah Maternity and Children Hospital to assess the nutritional status of children aged 1-60 months at admission and again at discharge from the hospital, from the first of November 2007 till the end of May 2008. Children were excluded if they were in the Nutritional Rehabilitation Ward, or have chronic diseases (e.g. congenital heart disease, cerebral palsy). Information were obtained from mothers through a direct interview including; age of the child, sex, address, type of feeding (breast feeding, formula, mixed) and type of solid and semisolid foods. In addition, birth weight, birth order, age of the mother, age of introduction of weaning foods, and vaccination status were recorded. Maternal and paternal education were coded as low (primary school or less), and high (at least 1 year of secondary schooling or higher). [9] The diagnosis was recorded from patient`s records. Children exhibiting dehydration at the time of admission were only weighed after hydration had been re-established. Anthropometric data height (ht) or length (L) and weight (wt) were taken within 48 hours of hospitalization and on discharge body weight was taken again within a maximum of 24 hours prior to discharge. The child anthropometric data (wt, L or ht) were applied to appropriate charts: wt/L or ht Z score, wt /age Z score, L or ht/age Z score which were estimated according to CDC/WHO normalized references and accordingly each child's measures were classified as follow:[10] Regarding weight/height: >-1 SD normal, -1 SD mild wasting, <-2 SD moderate wasting, <-3 SD severe wasting. For weight /age: >-1 SD normal, -1SD mild underweight, <-2 SD moderate underweight, <-3 SD severe underweight. Regarding height/age: >-1 SD normal, -1SD mild stunting, <-2 SD moderate stunting, < -3 SD severe stunting. The importance and details of the study were explained to the mothers before recruitment in the study. With respect to weight, the difference between weight at admission and weight at discharge was taken to determine weight gain or loss during the hospital stay. Percentage of weight variation during hospitalization is calculated by the analysis of data was done using the SPSS program, version 11. Comparison of proportions was performed using chi square, P-value of less than 0.05 was considered as statistically significant. Logistic regression analysis was done for selected variables to look for any association with percentage of variation in body weight during hospitalization.

RESULTS

At the start 340 patients were enrolled. As the study progressed, 47 patients were excluded; 3 died during hospitalization, due to severe malnutrition and septicemia, their ages were less than 24 months. The remainders were excluded because their weight was not measured at hospital discharge. A total 293 children were included in the study. One hundred fifty seven were males (53.5%) and 136 were females (46.4%); their ages ranged from 1-60 months (mean age was 21.6±15.1), 68% of them were ≤ 24 months. Out of 293 children, 155(52.9%) were from rural areas, while 138(47.1%) were from the center of Basrah. Maternal age at birth has ranged from 16 to 45 years, with a mean age of 26.6±7.6. Eighty seven (29.6%) of mothers were below 20 years of age. A significantly higher number of mothers, (72.3%) were of low education, compared to 175(59.1%) of fathers with low education. Among studied children; 70(23.8%) were the first born child to the family and 85(29.01%) were the forth and beyond in order. Birth weight was reported by mothers to be an average weight in 175(59.7%) of children, while 87(29.6%) were born with a low birth weight. The duration of hospitalization ranged from 2 to 20 days, with a mean of (10±6) days. Out of 293 children 81(27.6%) stayed in hospital for more than 9 days. Sixty-one (20.8%) of the children were on breast feeding,

15% mixed feeding (breast and formula), 12.2% breast feeding with added food, 11.6% on formula feeding with added food, 9.8% mixed feeding with added food, and 12.2% on solid and semisolid diet only. Ten diseases were recorded as the main diagnoses, the most frequent condition was acute diarrhea in 88(30.15%), followed by pneumonia 50(17%), bronchiolitis 30(11%), malnutrition 23(7.84%), visceral leishmaniasis 21(7.1%), chronic diarrhea 19 (6.4%), anemia 16(5.46%), urinary tract infection 12(4.09%), sepsis 10(3.38%), and meningitis 8(2.73%). Other miscellaneous causes were reported in 10(3.38%) of cases. Concerning anthropometric measures on admission; out of 293 children; only 179(61.2%) have normal weight for age measurements, thirty eight (13%) with mild underweight, 53(18%) with moderate underweight and 23(7.8%) with severe underweight, (Table-1). Regarding wt/ht or L; 194(66.2%) have normal weight for height measurements, 38(13%) with mild wasting, 41(14%) with moderate wasting and 20(6.8%) with severe wasting, (Table-1). Normal L or ht/age was present in 185 (63.1%); while 34(11.6%) with mild stunting, 52(17.7%) with moderate stunting, and 22(7.5%) with severe stunting, (Table-1).

Table 1. Initial Nutritional status of hospitalized children

Anthropometric Variables (total No. 293)	Normal No. (%)	Mild (-1 to- 2 SD) No. (%)	Moderate (< -2 to -3 SD) No. (%)	Severe (<- 3 SD) No. (%)
Wt/ Age Underweight	179 (61.2%)	38 (13%)	53 (18%)	23 (7.8%)
Wt/ Ht Wasting	194 (66.2%)	38 (13%)	41 (14%)	20 (6.8%)
Ht/ Age Stunting	185 (63.1%)	34 (11.6%)	52 (17.7 %)	22 (7.5%)

One hundred fifty (51.1%) of the 293 children that completed the study exhibited weight loss (mean loss 0.41±0.26 kg), while 27(9.2%) of them gained weight (mean gain of 0.23±0.16 kg), without change in their nutritional status. The weights of the remaining 116(39.5%) children remained unaltered during hospitalization. At the end of hospitalization the nutritional status of children admitted with severe malnutrition was unaltered; without improvement or increase in weight. Nutritional deterioration was observed in 3 of the 41(7.3%) children who had been moderately malnourished at admission passed to severe malnutrition, (Table-2). Children with mild malnutrition were the major victims of hospitalization; 8 of 38(21%) children who have been mildly malnourished on admission passed to moderate malnutrition. While among 194 patients who were well nourished on initial hospitalization; 14(7.2%) of them progressed to mild malnutrition. At the end of hospitalization there was an increase in the frequency of mild malnutrition from 12.9 to 15%, moderate malnutrition from 14 to 15.6% and severe malnutrition from 6.8 to 7.8%, (Table-2).

Table 2. Nutritional status of children during hospitalization according to weight for height Z score

Classification (No. 293)	Progress			
	Severe malnutrition No. (%)	Moderate malnutrition No. (%)	Mild malnutrition No. (%)	Normal No. (%)
Severe malnutrition (No. 20)	20 (100)			
Moderate malnutrition (No. 41)	3 (7.3)	38 (92.7)		
Mild malnutrition (No. 38)		8 (21)	30 (79)	
Normal (No. 194)			14 (7.2)	180 (92.8)
Total (No.293)	23 (7.8)	46 (15.6)	44 (15)	180 (61.4)

The percent of well nourished hospitalized children decreased from 66.2% to 61.4% at the end of hospitalization. The diseases most frequently responsible for the admissions of children who progressed with significant weight loss (>10% of initial body weight) were chronic diarrhea and malnutrition (around -12% of initial weight lost at the end of hospitalization) and they tended to spend more than 9 days at hospital, (Table-3).

Table 3. Percentage of variation in body weight during hospitalization according to disease

Diagnosis	Mean % of body weight loss	±SD
Anemia	-1	2.3
Bronchiolitis	-.58	2.2
Chronic diarrhea	-12.1	4.5
Acute diarrhea	2.9	1.6
Kala azar	-2.4	2.7
Malnutrition	-12	4.6
Meningitis	-1.9	2.2
Pneumonia	-1	2.5
Urinary tract infection	-0.9	2
Sepsis	-1	0.8
Others	-.6	1
Total	-1.3	3.6

The association of selective variables with percentage of weight loss during hospitalization using logistic regression analysis has revealed that there is a significant positive association of percentage of weight loss and duration of hospitalization ($P<0.05$), (Table-4). A significant negative association with the mother education was also reported ($P<0.01$). However, there were no significant associations of variation in body weight during hospitalization with age, sex, and residence of the child, father education, weight of the child at birth, duration of breast feeding, and age of introduction of weaning foods.

Table 4. Logistic regression of different variables with percentage of weight loss during hospitalization

Variables	B*	SE**	P-value
Duration of hospitalization	1.0183	0.584	<0.05
Mother education	-1.9480	0.321	<0.01

B* regression coefficient. SE** Standard Error

DISCUSSION

There are problems concerning the frequency of hospital malnutrition, there are no studies on which to base the choice of a cutoff point for the percentage weight loss at which the term can be applied. Children can fall into malnutrition or worsen a preexisting state of malnutrition while in hospital and therefore it is very important to perform nutritional assessments during the hospital stay.[2] In Basrah, a study done by Hmood MA in 2006, has reported that 19.8% of studied children have moderate and severe wasting, and 18.4% were with moderate and severe stunting.[11] These figures are comparable to those reported in the current study. Ozturk et al, in Turkey have found that 31% of hospitalized children were malnourished and this percent is much more than the prevalence of malnutrition in general population,[12] while another study by Dogan, et al done in Turkey also reported that 27% of cases were stunted and 52.4% were underweight and 40.9% were wasted. [13] In this study 72.3% of mothers are of low education. This finding is similar to reported by Chisti, et al, in Bangladesh, who reported strong relationship between nutritional status of children and the level of mother`s education.[14] Nutritional illiteracy and mothers' erroneous beliefs may result in mothers having inadequate feeding practices that would contribute to malnutrition Other contributing factors like poor socio-economic variables, cultural beliefs, and lack of parental education, especially that of mothers, are all cited to affect a child's nutritional status in children.[14] A significant positive association was found between duration of hospitalization and the percent of weight loss, this is similar to that reported by Rocha, et al who reported that prolonged hospitalization is linked to weight loss in hospital.[2] However, these results are in contrast to those reported by Ozturk, et al [12], who didn't show any association between duration of hospital stay and the difference between admission and discharge data, this is probably because hospitalized children receive nutritional support as a supplementary treatment during hospitalization.[12] Another study by Ferreira, et al had reported that children who had the highest degrees of malnutrition deficit remained in hospital for longer periods of time, this longer period did not result in improvement in the outcome concerning the nutritional status of patients. [15] In this study children with acute diarrhea exhibit positive variation in body weight during hospitalization. This is probably due to most cases were viral in origin and self limiting and the dehydration is corrected by intravenous fluid and Oral Rehydration solution (O.R.S.) and resumed normal oral intake during the period of hospitalization. In this study around 51% of children lost weight, with most weight being lost by those with prolonged hospital stay and chronic diarrhea and malnutrition as the disease responsible for their hospitalization. Length of hospital stay was another factor associated with weight loss during hospitalization. Children at nutritional risk, either because they have preexisting malnutrition or because they were subjected to an imbalance between energy supply and demand, had a greater chance of prolonged hospitalization with an increased incidence of

infection, resulting in the onset or exacerbation of malnutrition.[2] Dietary care is of fundamental importance in the context of clinical treatment, irrespective of the disease responsible for admission, particularly in regions with high rates of child malnutrition. Ferreira et al.[15] have stated that adequate nutritional support contributes to reducing the prevalence and magnitude of malnutrition and improving clinical prognosis.[2,14] The fact that the nutritional status of children who had been admitted in a well-nourished state deteriorated while they were in hospital must stress the need for a culture that values the nutritional condition of hospitalized patients, in particular children, because of their increased nutritional vulnerability. [2] It also calls for dietary care during hospitalization. In this study 27 children (9.2%) showed a positive variation in weight but didn't change the nutritional status of these children. This result is similar to that reported by Ferreira et al, where the magnitude of the average negative variation(children who lose weight) was greater than the average of positive variation (children who gain weight). [15] It is important to point out that for the majority of children with initial malnutrition, such a diagnosis was not registered on the medical record, possibly indicating that the nutritional status of patients is not receiving consideration in relation to the treatment. [16] From this study it can be concluded that the overall frequency of malnutrition has increased by discharge ,this is evidenced by the decrease in the percent of well nourished children and prolonged hospitalization and low maternal education are associated with significant positive association with weight loss. It is recommended that careful nutritional evaluation of children on admission is essential. Special attention should be given to patients who have mild malnutrition on admission, since this population of patients seems to be at highest risk of adverse effect of hospitalization.

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