ORIGINAL ARTICLE

THE EFFECT OF DROUGHT IN SOUTH EAST ETHIOPIA: STUDY OF PEDIATRIC ADMISSIONS TO GODE HOSPITAL

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ABSTRACT

BACK GROUND: ***The East African region of the continent, particularly Ethiopia experienced prolonged drought during 1997-2000 resulting in severe food shortage especially in southeast part of the country. As a result people, mostly children suffered from malnutrition, which is associated cause of death for more than half of all under-five mortality in developing countries. The aim of this study was to describes the profile and outcome of pediatric admissions to Gode Hospital during the relief activities in the year 2000.***

PATIENTS AND METHODS: ***A cross-sectional study was conducted on 323 children admitted to Gode Hospital, Somali regional state, during April to August 2000 with the objective of analyzing the profile and outcome of pediatric admissions among people with long standing food shortage in drought affected area***.

RESULTS: ***A total of 323 children were admitted to the ward during the stated period of which 98% were under-five children with male to female ratio of 1.4:1; 23% percent of the admissions were underweight and 64% severely malnourished. Females were more prone to severe protein energy malnutrition than males. Pneumonia, gastroenteritis and sepsis were common related diseases complicating protein energy malnutrition in 51%, 32% and 28% of admitted children respectively. All were managed in the ward with a specialized case management for malnourished children and discharged after a median hospital stay of 12 days. The over all mortality was 18% with case fatality rate of 23% for severe protein energy malnutrition.***

CONCLUSION: ***It is clear from this study that children aged 2 years and below, moreover girls, were affected and died from severe forms of protein energy malnutrition. Compared to high case fatality rate (49%) in previous reports, it is shown as well a specialized management somehow decreased deaths in severely malnourished children complicated by infections and other diseases.***

Key Words: *Drought, Protein Energy Malnutrition, Gastroenteritis, Pneumonia*

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INTRODUCTION

The Eastern part of African Continent was hit by recurrent drought during 1997 – 2000. Ethiopia, in addition to existing economic problem, as part of the region, experienced prolonged drought and famine that caused considerable crop failure and livestock damage resulting in severe food shortage, especially in the Southeastern part of the country where majority of the community are pastorals. Due to this long-standing food shortage, most of the people in the area, especially children, suffered from malnutrition and other related disease conditions. In drought-affected area, Protein Energy Malnutrition (PEM) specifically marasmus has been prevalent (1). Even in the absence of natural disasters, malnutrition is prevalent in developing countries; and is among the leading causes of childhood morbidity and mortality that plays a prominent role in the complex of humanitarian emergencies today (2, 3). A well-established causal relation exists between malnutrition and diarrhea; mortality from diarrhea, acute respiratory tract infection and measles was consistently high in malnourished children (3,4). Majority being from developing countries approximately 12 million children younger than five years of age die every year. And in 1990's it was suggested that malnutrition was associated cause in about half of all deaths in developing countries (3-7). A review of literatures that have appeared from developing countries over the past five decades showed case fatality rates of 4.4% to 49% among malnourished children in feeding centers and hospitals (8).

Globally, child mortality rates have been halved over the last few decades. Nevertheless, progress has been uneven and mortality rates have increased in some countries due to natural and man made catastrophes (9), like the situation in Ethiopia.

Though many parts of the country experienced prolonged drought in the past there is no report on its effect on the people, particularly on children from southeast part of Ethiopia. This paper describes the profile and outcome of pediatric admissions to Gode Hospital during the relief activities in the year 2000.

PATIENTS AND METHODS

This cross-sectional study was conducted in Gode Hospital, Somali regional state, Southeastern Ethiopia during the 2000 drought, where the Government and international community provided relief activities like dry ration distribution, opening of feeding centers and strengthening existing health units. In Gode zone, there were about 5 therapeutic feeding centers managing severely malnourished children, which is run by different humanitarian organizations. The Gode Hospital pediatrics ward, which runs by World Vision Ethiopia (WVE), was acting as a referral center for children who were acutely ill to be managed in therapeutic feeding centers. A pediatrician, a nutritionist and 6 clinical nurses staffed the ward, which was arranged to accommodate for 50 patients at a time. This study was done on all children admitted to the pediatrics ward during the relief activity from April 25 to August 20, 2000.

Admission criteria to the ward were any serious clinical illness needing in-patient care and sever PEM with any one of the complications like persistent diarrhea, hypothermia, shock severe anemia, jaundice, lower respiratory tract infection and any other generalized or localized infection. Severe PEM was considered when there is weight for age deficit on Harvard curve with edema or weight for

age below 60% on Harvard curve, or weight for height below 70%.

In the ward, all children were managed according to the World Health Organization's "management of severe PEM: a manual for physicians and other senior health workers".

Discharge criteria were improvement from the clinical illness, disappearance of edema, improvement in appetite and demonstration of weight gain. On discharge all patients were sent back to respective feeding centers.

Of 370 pediatrics admissions during the stated period, 47 (12.7%) patients disappeared from the ward before completion of treatment and so excluded from the study, making 323 cases to be described.

Information was collected using a structured questionnaire trained nurses from records and patient caretakers after getting verbal consent. The variables included were: age, sex, admission weight and height, lowest weight in the ward, discharge weight, immunization status, nutritional status, other clinical illnesses, hospital stay and outcome. Weight and Length were taken using Salter scale (gm) and length board (cm) respectively. Data was entered in to a computer summarized and analyzed using EPI info statistical package and the results were described and compared with results from other parts of the world. Chi Square and P- value were used to compare findings.

RESULTS

During the study period 370 children were admitted to Gode Hospital pediatrics ward, of which 323 were included in the study. The median age of those children was 24 months ranging from 1 to 120 months and majorities 226 (70%) were in the age group of 24 months and below with only 7 (2.2%) older than 5 years. One hundred ninety (59%) of the study subjects were male making the male to female ratio 1.4: 1 (Table 1). When we see the pattern of admission by month; 12, 82, 132, 87, and 10 children were admitted during the months April, May, June, July and August respectively.

Table 2 shows the weight for age according to modified Wellcome classification of protein energy malnutrition and the weight for height percentage of the 323 children. For the former 41 (12.9%) children laid in the normal range, 72 (23%) were under weight, 159 (50.3%) were marasmic and the rest 44 (15%) had edematous protein energy malnutrition. Severe malnutrition (Kwashiorkor, Marasmus and Marasmic-Kwashiorkor) was found in 73% of the girls and only 58% of the boys with P-value <0.05. On the other hand when we look in to the level of wasting 297(92%) children had different degree of wasting, of which 174 (54 %) were severely affected. Severe wasting was found in 59% of the girls and 50% of the boys but P- value >0.05.

During their hospital stay, children with edematous PEM lost average weight of 461 grams per child in the first few days. On the other hand, the average weight gain for malnourished children was 46 gram per day per child; that is 9 gram per kilogram body weight/ child. As to the vaccination status of these children, 236 (73%) were vaccinated at least once against polio, 119 (37%) against measles and 77 (24%) none at all.

As shown in table 3, pneumonia was diagnosed in 165 (51%), Gastroenteritis in 102 (31.6%), septicemia in 91 (28.2%), malaria in 31 (9.6%) and dysentery and tuberculosis each in 20 (6.2%) children as complicating infection on the background of malnutrition.

The outcome of the study subjects is

presented on table 4. The over all mortality was 58 (18%) over 5 months; majority (44 out of 58) of the deaths were found to be among the age groups of 24 months and below. Thirty-two (55%) of the dead children were female. Fourteen (24%) and 34 (59%) of the deaths occurred in the first 24 and 96 hours of admission respectively. The case fatality rate was 17.5% and 47.9% for marasmus and edematous PEM respectively as shown in table 5. The median hospital stay was 12 days with a range of 1-43 days.

Table 1. Age and sex distribution of pediatric admissions, Gode Hospital, Ethiopia, 2000

Age (Months)	Sex		Total
	Male	Female	
	No (%)	No (%)	No (%)
<12	75 (39.5)	56 (42.1)	131 (40.6)
12– 23	62 (32.6)	33 (24.8)	95 (29.4)
24 – 35	29(15.3)	17 (12.8)	46 (14.2)
36 – 47	10 (5.2)	12 (9.0)	22 (6.8)
48 – 59	11 (5.8)	11 (8.3)	22 (6.8)
> 60	3 (1.6)	4 (3.0)	7 (2.2)
Total	190(58.8)	133(41.2)	323 (100)

Table 2. Nutritional status of pediatric admissions, Gode Hospital, Ethiopia, 2000

Anthropometric Indicators	Male No (%)	Female No (%)	Total	P-value
Wt for Age in percent				
>80	29 (15.8)	12 (9.0)	41 (12.9)	
60 – 80	49 (26.3)	23 (18.0)	72 (23.0)	11.8
< 60	86 (46.3)	73 (55.6)	159 (50.3)	(< 0.05)
60 – 80 + edema	5 (2.6)	2 (1.5)	7 (2.2)	
< 60 + edema	16 (8.9)	21 (15.9)	37 (12.1)	
Total	185 (58.5)	131(41.5)	316* (100)	
Wt for Ht in percent				
≥ 90	17 (8.9)	9 (6.8)	26 (8.0)	5.7
80-89	23 (12.1)	12 (9.0)	35 (10.8)	(> 0.05)
70-79	54 (28.4)	34 (25.6)	88 (27.2)	
< 70	96 (50.5)	78 (58.6)	174 (53.9)	
Total	190 (58.8)	133 (41.2)	323 (100)	

**Seven children are above 5 years to use Wellcome classification.*

Table 3. Other co-morbid diseases as a complication of malnutrition on 323 cases Gode Hospital, Ethiopia, 2000

Diagnosis	Number	Percent
Pneumonia	165	51.1
Gastroenteritis	102	31.6
Septicemia	91	28.2
Malaria	31	9.6
Dysentery	20	6.2
Tuberculosis	20	6.2
Measles	14	4.3
Other	7	2.2

N.B. *The total is greater than 323 since some patients have more than one complication.*

Table 4. Out come of 323 patients by age and sex, Gode Hospital, Ethiopia, 2000

Characteristics	Improved	Died	Total	P-value
	No (%)	No (%)	No (%)	
Age in months				
<12	105 (80.2)	26 (19.8)	131(100)	
12– 23	77 (81.0)	18 (19.0)	95 (100)	
24 – 35	40 (87.0)	6 (13)	46 (100)	
36 – 47	20 (91.0)	2 (9.0)	22 (100)	68.5
48 – 59	19 (86.4)	3 (13.6)	22 (100)	(> 0.05)
> 60	4 (57.0)	3 (43.0)	7 (100)	
Total	265 (82.1)	58 (17.9)	323 (100)	
Sex				
Male	164 (86.3)	26 (13.7)	190 (100)	5.9
Female	101 (76.0)	32 (24.0)	133 (100)	(= 0.05)

Table 5. Mortality by nutritional status, Gode Hospital, Ethiopia, 2000

Nutritional status	Admission	Died	Case fatality rate
Under weight	74	7	9.5
Marasmus	160	28	17.5
Edematous PEM	48	23	47.9

DISCUSSION

Though PEM can affect all age groups it is more frequent and prevalent among infants since their growth increases their nutritional requirements and when they live under poor hygienic conditions, frequently become ill with diarrhea and other infections. This is shown by this study where almost all studied children were less than 5 years and 85% of them were under 3 years of age, which was as well true in report from Chad (10). This study as well has shown, as there is male preponderance for malnutrition.

The long term intake of insufficient food in drought affected and arid areas predominantly results in marasmus than edematous PEM which is also evident in this study where 50.3% of studied children were marasmic: is significantly higher than the South African report (1,11). Compared to a report from Niger during the 1984 drought where the over all prevalence of children less than 80% median weight for height was 9.8 – 13.7%; it is very high (92%) in those children admitted to Gode Hospital who had different degree of wasting; majority (54%) being severely wasted showing the magnitude and acuteness of the problem (12,13). Compared to their proportion at admission, more girls had severe forms of PEM; probably males are cared better since they get the upper hand in this society.

Those children with edematous PEM lost weight in the first few days as expected and the daily weight gain per child is similar with other reports. Despite two National immunization Days and local measles vaccination campaign, less than 3 and 2 quarters of those children were vaccinated against polio and measles respectively and a quarter never vaccinated which is comparable with a report from Niger but much below the national coverage (13,14). This low EPI coverage might be explained by the mobile nature of the people looking for water and grass, as well might not give attention to vaccination in the presence of long standing food shortage.

The result of this study goes with reports from other parts of the developing world; showing pneumonia, gastroenteritis and septicemia were leading diseases complicating PEM and related causes of death (10,12,15,16,19).

The over all mortality in this study among hospitalized children goes with other reports (17,18) and the female predominance is likely to be due to the high proportion of severe PEM in girls. Most of the deaths occurred in the first few days of admissions, which can be explained by late arrival to the hospital.

The case fatality rate for severe PEM found in this study is similar with the median case fatality rates from different parts of the world during the past 50 years (7,17); on the other hand, the case fatality rate for edematous PEM lies in an "unacceptable" range where as "poor" for marasmus according to WHO grouping of severe under nutrition (19,20). The over all mortality and the case fatality rate appears high despite specialized case management since the denominator for this study is comprised of critically ill children referred from therapeutic feeding centers.

In conclusion, it is clear from this study that PEM and related diseases and death from it, in emergency settings, affect young children especially under 2 years where massive food shortage exists. Similarly, girls have suffered from severe forms of PEM with high mortality than boys. Though not in the acceptable range, it is shown that specialized integrated case management can some how decrease deaths compared to previous reports from developing countries (case fatality rate 49%) even in children who are fragile,

severely malnourished and mostly complicated by infections. It is recommended that respective bodies should prevent the occurrence of severe malnutrition by providing adequate food during such natural disasters. After the development of malnutrition, it is recommended to initiate early treatment before the development of severe PEM since the outcome of its management is not rewarding.

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REFERENCES

1. Bekele S, Gebremedhin M, Haile Mariam B, Maffi M, Vahlquist B, Woldegebriel Z. Study of the shelter population in Wollo. *J. Trop Pediatr* 1977; 23: 25 – 36.
2. Deonis M, Monteiro C, Akre J, Clugston G. The worldwide magnitude of protein energy malnutrition; and over view from the WHO global data base on child growth *Bull WHO.* 1993; 71:703
3. Rice AL, Sacco L, Hyder A, Black RE. Malnutrition as an underlying cause of childhood deaths associated with infections diseases in developing countries. *Bull WHO.* 2000; 78:1207 – 1220.
4. Barness LA, Curran JS. Nutrition. In: Behrman, Keilgman and Arvin eds. Nelson Text Book of Pediatrics 15th ed. Philadelphia, W.B. Saunders company, 1996: 166-169
5. Pelletier DL et al. A methodology for estimating the contribution of malnutrition to child mortality in developing countries. *J Nutrition*. 1994; 124: 2106 – 2112
6. Schroeder DG, Brown KN. Nutritional status as a predictor of child survival: summarizing the association and quantifying its global impact. Bull. WHO, 1994; 72: 569 – 579.
7. Bellamy C. The state of the world's children 1998. Oxford, England, oxford university press, 1988, 131. Focus on nutrition.
8. Schofield C, Ashworth A. Why have mortality rates for severe malnutrition remained so high? *Bull. WHO* 1996; 74:223 – 229.
9. Claeson M, Bos ER, Mawj T, Pathmanathan I. Reducing child mortality in India in the new millennium. *Bull. WHO*. 2000; 78:1192 – 1189.
10. Renaudin P. evaluation of the nutritional status of children less than 5 years of age in Moundou, Chad: Correlations with hospital morbidity and mortality. *Med Tropical*. 1997; 57 49 –54.
11. Lazarus T, Bhana K. Protein energy malnutrition and associated variables among indian pre-School children in a selected area of Natal. SA Medical Journal. 1984; 65:381 – 384.
12. Eshetu M, Ashagre YK. Correlates of nutritional status of under-five children in Southern Ethiopia, 1997; (Unpublished).

13. Rapid Nutritional status evaluation during drought conditions - Republic of Niger. *MMWR*. 1986; 35 (23): 384-386.
14. Federal Democratic republic of Ethiopia, Ministry of health. Health and health related indicators. 1991.
15. Adefungi JA, Murray C, Evans T. Causes of death in Africa: a review. (Unpublished) 1996.
16. Robinson D. The IMCI. *Africa Health*. 1996; 18 (6): 20.
17. Gernaat HB, Dechering WH, Voorhoeve HW. Mortality in severe protein energy malnutrition at Nohelenge, Zambia. *J Trop. Pediatr* 1998; 44:211 – 217.
18. Schofield C, Ashworh A. Severe malnutrition in children: High case fatality rate can be reduced. *Africa Health*. 1997; 19 (6): 17 –18.
19. Hendricks RG. Protein energy malnutrition. In: R.G. Hendricks, D.G.D. Barr and T.S. Mathews (Eds). Pediatrics in the tropics 1st ed. England. Oxford Black well scientific publications. 1991; 119 – 131
20. Management of severe malnutrition and manual for physicians and senior health workers. WHO, Geneva, 1999; 1-10.