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SOCIO-ECONOMIC FACTORS PREDISPOSING UNDER FIVE-YEAR-OLD CHILDREN TO SEVERE PROTEIN ENERGY MALNUTRITION AT THE MOI TEACHING AND REFERRAL HOSPITAL, ELDORET, KENYA
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ABSTRACT

Background: **Malnutrition is one of the leading causes of morbidity and mortality in children aged five years and below. Risk factors for severe protein energy malnutrition (PEM) have been identified as ignorance, family size, mothers and fathers education, poverty, residence, chronic infections, and congenital defects or malformations. The role of such social factors as the caretaker, extended family, homestead surroundings, and family cohesiveness have not been studied in Kenya.**

Objective: **To determine the social and economic factors that predispose children to severe PEM as seen at the Moi Teaching and Referral Hospital (MTRH), Eldoret.**

Design: **Prospective and case control study.**

Setting: **The MTRH, Eldoret, Paediatric wards, outpatient and MCH clinics over a 12 month period (June 2001 to June 2002).**

Subjects: **Sixty six children aged 3 to 36 months with severe PEM attending the MTRH outpatient clinics and those admitted in the Paediatric wards were age-matched with 66 controls.**

Methods: **A standard pretested questionnaire was used to interview caretakers with severely malnourished children and age-matched controls. The children were weighed after interviewing the caretakers. The data was entered on a computer and analysed using the statistical package for social sciences (SPSS) programme.**

Results: **The social risk factors for PEM were single mothers (Odds Ratio) OR 14.93, p= 0.00001), young mothers aged 15-25 years (OR 3.95, p= 0.00020), the child's living conditions such as living in a temporary house (OR 3.627 p= 0.00257), caretaker who was not married to the child's parent (OR 0.10, p= 0.00005) and not staying with both parents in the past six months (OR 0.28606, p=0.00101). The economic risk factors were father's lack of ownership of land (OR 0.401, p= 0.01732), cattle (OR 0.24, p=0.00022), not growing maize (OR 0.15, p=0.00013), not growing beans (OR 0.36, p=0.00484) and ownership of small piece of land by grandfather (OR 6.00, p= 0.02274). Other risk factors were incomplete immunization (OR 3.87, p= 0.00151) and female sex (p=0.03721).**

Conclusion: **Poverty, social conditions under which the child was living, sex of the child and incomplete immunizations were risk factors for the severe protein energy malnutrition.**

INTRODUCTION

Malnutrition is any disorder of nutrition(1). It may be due to deficient or excess nutrients. The former leads to deficiency states such as kwashiorkor, marasmus, marasmic-kwashiorkor when severe and underweight when mild(1). The prevalence of protein energy malnutrition (PEM) in the developing countries is 40% while in the developed countries it ranges from 2% to 10%(2,3). Several social, economic and medical factors have been studied and shown to cause severe PEM(4-17). The factors that have been found to be important in predisposing to PEM in the high income countries include chronic diseases and congenital disorders(7-17).

In one study in Uganda, the socio-economic risk factors were found to be young age of the caretaker, living in mud walled house, lack of breast feeding, failure to complete immunization, no land ownership, and no ownership of livestock(18). Though these could appertain in Kenya, they have not been studied. It has been noticed that most of the malnourished children in the Kenyan hospitals have such history as poverty, single mothers, step-parents, displacement by clashes, birth out of wedlock, mother and child staying separate from the father due to working conditions and sharing of income with the extended families. These are believed to be more common than congenital defects and chronic illnesses in Kenya and other developing countries.

The objective of our study was to study the social factors though we also looked at the economic factors

MATERIALS AND METHODS

Design: This was a prospective case control study.
Study site: The study was conducted in the paediatric wards and paediatric outpatient clinics of the Moi Teaching and Referral Hospital, Eldoret, Kenya. The two paediatric wards have a bed capacity of 100. Children attend the paediatric outpatient and the MCH clinics daily except over the weekends and public holidays.

The hospital is situated in Eldoret town about 350 km Northwest of Nairobi. It has a good infrastructure including roads, an international airport, several banks, two universities, several textile factories, and a dairy industry. The surrounding areas are farmlands where maize, beans, wheat, and tea are grown.

Study population: Children aged 3 to 60 months admitted to the paediatric wards or attending the paediatric outpatient and MCH clinics.
Inclusion criteria: Children aged 3 to 60 months who were admitted to the paediatric wards or attended the outpatient clinics with severe malnutrition were age-matched with children of normal nutritional status attending the clinics or admitted to the wards.

Exclusion criteria: Children whose parents or caretakers did not consent to the study. Children with chronic diseases, malignancies or any physical or mental condition that could have predisposed them to severe malnutrition.

Sampling: Consecutive patients who met the inclusion criteria were included in the study until the sample size of 66 in each arm was achieved. The sample size was calculated assuming that 75% of the control mothers would be educated while 50% of the mothers of the cases would be educated(18). The power of study was 80% with a 2- tailed significance level of 5% (95% confidence interval). The sample size was found to be 132 (66 cases and 66 controls). For each case an age matched child with normal weight for age was looked for in the wards or the outpatient clinics.

The National Centers for Health Chart was used to determine their expected weight for age. The Wellcome classification was used to determine the nutritional status of the children.

Data collection methods: The study tool was a standard questionnaire with open ended and close-ended questions. The questionnaire had questions on socio-demographic, economic factors and child's profile such as age, sex, weight, breastfeeding information and weaning practices. The caretakers were interviewed before the children were weighed. Medical students who were trained in administering the questionnaire and taking anthropometric measurements before the beginning of the study collected the data. The data was collected for about one year between June 2001 and June 2002.

Measurement of weight: The weight was taken using the Salter scale weighing up to 25 kilograms. The child was weighed without clothes. The child was suspended in a plastic bag until the feet were off the ground. The weight was read and recorded to the nearest 50 grams.

Data management: The data collected was entered into a computer using the Statistical Package for Social Sciences (SPSS) programme. The data was cleaned and analysed. Cross-tabulations were done comparing various factors between the cases and the controls. Odds ratios were computed and the chi-square used to determine the significance of the differences. The significant p-value was less than 0.05.

Ethical considerations: The research protocol was reviewed and approved by the Institutional Research and Ethics Committee of the Moi Teaching and Referral Hospital. The study was explained to the caretakers and verbal consent obtained. The children were treated in the wards and clinics according to the standard management of their conditions by the attending clinicians.

RESULTS

Demographic data: A total of 132 children (66 cases and 66 controls) and their mothers were included in the study. The mothers' age ranged from 16-42 years with a mean of 26.3 ± 4.5 SD. Most mothers were aged between 21-30 years. Some characteristics of the children are shown in Table 1. The cases had a mean age of 19.1±13.8 months with a range of 3 to 58 months. The controls had a mean age of 20.9±10.5 months with a range of 3 to 60 months. The factors associated with severe PEM seen in Table I are female sex and lack of completion of immunizations. The demographic characteristics are summarised in Table 2, which shows that most mothers with children with severe malnutrition were single, young, and had primary level of formal education.

Economic factors: The economic risk factors are presented in Tables 3, 4 and 5. Table 3 demonstrates that the cases had more parents who earned little, spent a small amount of money on food, did not have land of their own and their grandfathers had small acreage of land. Table 4 shows that most cases did not grow maize or beans and did not keep cattle or sheep. Table 5 shows that most of the cases lived in temporary (mud walled with grass-thatched roofs) houses, did not have tap water, and were from single parent families. Factors such as ethnicity, number of family members, and the number of rooms in the house were not statistically significant.

Social circumstances of the children: There were 31(47.7%) of the cases and 14(20.9%) of the controls that had not been staying with both parents in the six months preceding the interview. The data on the child's social circumstances in the last six months is shown in Table 6. The reasons for not staying with both parents were either father was working away from home 22(50%) or child was born out of wedlock and was staying with a single mother 11(25%) or child was born out of wedlock and was left with the grandparents five (11.4%) or parents were separated four (9.1%) or parents were divorced two (4.5%).

On the extended family (non nuclear family members staying in the same household as the child), 19(28.8%) of the cases and 17(25.8%) of the controls had extended family members. There were one to six extended family members in 15 (78.9%) of the cases and in 16 (94.1%) of the controls. This was not significant (OR 0.23, p = 0.19). When these families were asked if they shared the money available for food

with these extended family members 21(32.3%) of the cases compared to 17(25.4%) of the controls said that they did. This was also not significant (OR 1.40, p=0.38).

Welcome classification of nutritional status: There were 38(57.6%), 19(28.8%), and nine (13.6%) cases of marasmus, kwashiorkor and marasmic-kwashiorkor respectively rural and urban dwellers. It was not within the scope of this study to delve into the reasons for these. They may form research questions for another study. Maize is the staple food in this area and it is used both for subsistence and income. Beans are used mainly for consumption but also sold for income. The cattle are the common animals kept for their milk and beef. The products are consumed and sold for income. Dairy farming is one of the sources of income for the population in this district.

Table 1

Some baseline characteristics of the children

Variable	Cases(n=66) No. (%)	Control (n=66) No. (%)	p-value	Odds ratio	95% CI
Sex					
Male	28 (42.4)	41 (62.1)	0.02349*	0.44929	0.22-0.90
Female	38 (57.6)	25 (37.9)			
Complementation age (months)					
0-6	38 (64.4)	34 (54)	0.24137	1.54342	0.75-3.20
>6	21 (35.6)	29 (46)			
Severance age (months)					
0-12	35 (94.6)	29 (96.7)	0.68342	0.60345	0.05-7.00
>12	2 (5.4)	1 (3.3)			
Immunization					
Incomplete	24 (36.9)	9 (13.6)	0.00214*	3.70732	1.56-8.80
Complete	41 (63.1)	57 (86.4)			

*p-value is significant

Table 2

Some demographic characteristics of the parents

Variable	Cases (n=66) No. (%)	Controls (n=66) No. (%)	p-value	Odds ratio	95% CI
Marital status					
Single	21 (31.8)	2 (3)	0.00001*	14.93333	3.3-66.9
Married	45 (68.2)	64 (97)			
Mother's age (years)					
15-25	40 (62.5)	19 (29.2)	0.00020*	3.94737	1.9-8.3
26-50	24 (37.5)	45 (70.3)			
Maternal education (years)					
0-8	58 (87.9)	34 (51.5)	0.00001*	6.82353	2.8-16.5
9-16	8 (12.1)	32 (48.5)			
Paternal education (years)					
0-8	21 (39.6)	12 (18.5)	0.01085*	2.8944	1.3-6.7
9-16	32 (60.4)	53 (81.5)			
Mother's occupation					
Unemployed	37 (56.9)	31 (47)	0.25428	1.49194	0.7-3.0
Employed	28 (43.1)	35 (53)			
Father's occupation					
Unskilled	18 (36.7)	13 (20.6)	0.05887	2.23325	1.01-5.47
Skilled	30 (63.3)	50 (79.4)			

* p-value is significant

NB: Some of the variables did not add upto 66 because some mothers could not respond to the questions

Table 3

Economic characteristics of the families

Variable	Cases (n=66) No. (%)	Control (n=66) No. (%)	p-value	Odds ratio	95% CI
Father's income (Kshs) per month					
0-5000	25 (86.2)	31 (56.4)	0.00580*	4.83871	1.48-15.78
>5000	4 (13.8)	24 (43.6)			
Mother's income (Kshs) per month					
0-2000	55 (90.2)	45 (70.3)	0.00555*	3.87037	1.43-10.51
2001-5000	6 (9.8)	19 (29.7)			
Money used on food monthly					
0-2000	38 (82.6)	36 (56.3)	0.00366*	3.69444	1.49-9.16
2001 -8000	8 (17.4)	28 (43.8)			
Does father own land?					
Yes	23 (45.1)	43 (67.2)	0.01732*	0.40116	0.19-0.86
No	28 (54.9)	21 (32.8)			
Father's land size					
0-7	19 (86.4)	28 (63.6)	0.05456	3.61905	0.93-14.15
8-40	3 (13.6)	16 (36.4)			
Grandfather's land size					
0-7	21 (75)	3 (33.3)	0.02274*	6.00000	1.18-30.58
8-50	7 (25)	6 (67.7)			

Table 4

Land use

Variable	Cases (n=66) No. (%)	Controls (n=66) No. (%)	p-value	Odds Ratio	95% CI
Animals Owned					
Cattle					
Yes	34 (51.5)	54 (81.8)	0.00022*	0.23611	0.11-0.52
No	32 (48.5)	12 (18.2)			
Sheep					
Yes	15 (22.7)	26 (39.4)	0.03854*	0.45249	0.21-0.97
No	51 (77.3)	40 (60.6)			
Goats					
Yes	12 (18.2)	20 (30.3)	0.10420	0.5111	0.23-1.16
No	54 (81.8)	46 (69.7)			
Poultry					
Yes	26 (39.4)	29 (43.9)	0.59636	0.82931	0.41-1.66
No	40 (60.6)	37 (56.1)			
Crops Grown					
Maize					
Yes	43 (65.2)	61 (92.4)	0.00013*	1.15324	0.05-0.43
No	23 (34.8)	5 (7.6)			
Beans					
Yes	20 (30.3)	36 (54.5)	0.00484*	0.36232	0.18-0.74
No	46 (69.7)	30 (45.5)			

* p-value is significant

Table 5

Social characteristics of the families

Variable	Cases (n=66) No. (%)	Controls (n=66) No. (%)	p-value	Odds Ratio	95% CI
Type of house					
Temporary	57 (86.4)	42 (63.6)	0.00257*	3.61905	1.53-8.58
Permanent	9 (13.6)	24 (36.4)			
Water source					
Tap	21 (32.3)	30 (45.5)	0.12284	0.57273	0.28-1.17
Borehole	44 (67.7)	36 (54.5)			
Are you the parent of this child?					
Yes	62 (93.9)	65 (98.5)	0.17138	0.23846	0.03-2.19
No	4(6.1)	1(1.5)			
Type of family					
Monogamy	49 (74.2)	64(97)	0.00020*	0.09007	0.02-0.41
Single parent	17 (25.8)	2(3)			
No. of extend family members					
0-6	15 (78.9)	16 (94.1)	0.18886	0.23438	0.02-2.34
7-13	4 (21.1)	1 (5.9)			

*p-value is significant

NB: Extended family referred to non-nuclear family members that resided in the same household as the index child

Table 6

Child's social circumstances in the last six months

Variable	Cases (n=66) No. (%)	Controls (n=66) No. (%)	p-value	Odds ratio	95% CI
Does child stay with a step parent?					
No	45 (68.2)	63 (95.5)	0.00005*	0.10204	0.03-0.36
Yes	21 (31.8)	3 (4.5)			
Has child been staying with both parents in last 6 months?					
Yes	34 (51.5)	52 (78.8)	0.00101*	0.28606	0.13-061
No	32 (18.5)	14 (21.2)			
If No who has been staying with child?					
Mother	26 (86.6)	12 (100)	0.18358	0.68421	0.55-0.84
Other	4 (13.3)	0 (0)			
Residence					
Rural	24(36.4)	14 (21.2)	0.05456	2.12245	0.98-4.60
Urban	42(63.6)	52 (78.8)			

*p-value is significant

NB: Some respondents did not know who had been staying with the children in the last six months. Thus the number for this variable was not 66.

DISCUSSION

The demographic risk factors for severe PEM were single mothers, young age of the mother, mother's education and father's education ($p<0.04423$). These findings were similar to those reported previously except mother's education, which had been found to have no impact on the nutritional status of the child(18-21). A positive correlation between high maternal education and child's nutritional status could be explained on the basis of improved socioeconomic status, health facility utilization and enhanced mothers' empowerment in decision making(22-23). However other researchers have not demonstrated this and they found children to be severely malnourished inspite of the mothers' high levels of education(24). This may have been due to poor economic conditions prevailing in the country at the time that did not translate high levels of education into better socio-economic status because their were no jobs. The mothers who were young, single and less educated may have had poor knowledge on nutrition and hence the poor outcome. The single mothers did not have spouses from

whom they could have learnt. The fathers' education had an impact on the nutritional status of the children because of the resultant low income. This was different from previous studies(18).

Our study, showed that the economic risk factors included parents' low monthly incomes, low amount of money spent on food, lack of ownership of land by the father, small grandfather's land size for those whose fathers had no land, lack of ownership of cattle and sheep and not growing maize and beans either in their rural or urban, homes. Some people in Eldoret own land within the town where they grow crops and keep animals. The size of the fathers' land, keeping of poultry and goats were not risk factors. These were similar to previous findings except the grandfathers' land size. The lack of ownership of land by the child's father and ownership of a small piece of land by the grandfather were significant factors that applied to both rural and urban dwellers. It was not within the scope of this study to delve into the reasons for these. They may form research questions for another study. Maize and beans are used both for subsistence and income. The cattle are the common animals kept for their milk and beef. The products are consumed and sold for income.

Social risk factors were type of house and single parent family whereas the urban versus rural living was not a risk factor unlike the previous findings(18). This could have been because most of the patients in both cases and controls were from the slums of Eldoret with similar social amenities. The number of extended family members was not a risk factor. This was probably because most of the families did not share their money for food with the extended family members. There was no significant difference between the cases and the controls in the water source as most of them had boreholes.

We found that not staying with both parents and having stayed with step-parents in the last six months were risk factors. Step-parents have previously been found to cause child abuse, which may result in severe PEM(24).

The female sex and lack of completing immunizations were risk factors. Though breast feeding patterns are known to be significant determinants of nutritional status in children, our study did not show this(26,27).

CONCLUSIONS

This study confirmed that social factors such as not staying with both parents, living with a step-parent, living in a single parent family and being born out of wed-lock were risk factors for severe PEM. Economic risk factors included lack of ownership of land by the father, ownership of a small piece of land by the grandfather, low income of the parents and living in temporary houses. Lack of immunization and female sex were also risk factors.

RECOMMENDATIONS

Improvement of the socio-economic risk factors is needed to prevent nutritional deficiencies in children. Another study should be conducted to find out why lack of ownership of land by the father and ownership of a small piece of land by the grandfather are risk factors for PEM for both rural and urban dwellers.

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