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TO DESCRIBE VARIOUS RISK FACTORS ASSOCIATED WITH SEVERE ACUTE MALNUTRITION AMONG HOSPITALIZED CHILDREN OF EITHER GENDER FROM 6–59 MONTHS OF AGE

Medical Science

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ABSTRACT

BACKGROUND: Severe acute malnutrition is a major public health issue. It affects an estimated 8.1 million under-five children in India . Nearly 0.6 million deaths and 24.6 million disability adjusted life years are attributed to this condition. Diarrhea and pneumonia account for approximately half the under-five deaths in India and malnutrition is believed to contribute to 61% of diarrheal deaths and 53% pneumonia deaths . India is at the epicenter of this crisis despite the country's recent economic growth. Strong scientific evidence exists on synergism between under nutrition and child mortality due to common childhood morbidities including diarrhea, acute respiratory infections, malaria and measles. In severe acute malnutrition, the case fatality rates related to these morbidities are excessively high. The aim of our study was to describe various risk factors responsible for severe acute malnutrition in children from 6 -59 months of age.

Methods: The present study was conducted in the Post Graduate Department of Pediatrics, SMGS Hospital, Government Medical College, and Jammu on children of either gender from 6–59 months of age admitted in hospital from 1 November 2013 to 31 October 2014.A total of 120 children were taken up for study. Out of these 57 children had weight for height/length above -2 SD/Z score of WHO growth standards. These were taken as controls. Rest 63 children with inclusive criteria like weight for height/length <-3 SD/Z, visible severe wasting, presence of bipedal edema and /or mid upper arm circumference <11.5 cm were categorized under severe acute malnutrition cases and studied.

Results: out of 120 children 63 (52.50%) had severe acute malnutrition and 57 (47.5%) were taken as controls. Most cases were seen in age group 12-18 months 20 (31.75%) followed by 18-24 months 10 (15.87%). In controls most were in age group 18-24 months 20 (35.09%) followed by 12 - 18 months 10 (17.54%). In total study males were 63 (52.50%) and females 57 (47.50%). Among cases 43 were males (68.25%) and 21 females (31.75%) and in controls 20 were males (35.09%) and 37 females (64.91%). Marasmic-Kwashiorkar were 31 (49.21%) followed by marasmic 22 (34.92%) followed by kwashiorkor 10 (15.87%). Variables found to be significant risk factors and co-morbidities for severe acute malnutrition include mother illiterate in 77.77% cases, father illiterate 58.25%, father labourer or unemployed in 68.255 caeses, large family > 5 siblings 93.65%, household income < Rs 200/day in 52.385 cases, birth order >3 35.09%, low birth weight 76.19%, lack of breastfeeding 82.53%, deprivation of colostrums 60.32%, received prelacteal feeds 74.6%, breastfeeding < 9 months 49.2%,put to breast after 1 hour in 79.84%, improper dilution 55.88%, incomplete vaccination in 60.38% cases, drug addiction in 12.69% cases.

Conclusion: We infer that preventive measures against the above mentioned significant risk factors associated with severe acute malnutrition would go a long way in reducing the severe acute malnutrition and in turn the morbidity and mortality of severe acute malnutrition.

KEYWORDS

SEVERE ACUTE MALNUTRITION, MARASMUS, KWASHIORKAR

INTRODUCTION:

Severe acute malnutrition is a major public health issue. It affects an estimated 8.1 million under-five children in India **(1).** Nearly 0.6 million deaths and 24.6 million disability adjusted life years are attributed to this condition. Diarrhea and pneumonia account for approximately half the under-five deaths in India and malnutrition is believed to contribute to 61% of diarrheal deaths and 53% pneumonia deaths **(2).** India is at the epicenter of this crisis despite the country's recent economic growth **(3)**. Strong scientific evidence exists on synergism between under nutrition and child mortality due to common childhood morbidities including diarrhea, acute respiratory infections, malaria and measles. In severe acute malnutrition, the case fatality rates related to these morbidities are excessively high.Severe acute malnutrition is defined as: (i) Weight/height or Weight/length < -3 Z score, using WHO Growth Charts; or (ii) presence of visible severe wasting; or (iii) presence of bipedal edema of nutritional origin; or (iv) mid-upper arm circumference (MUAC) <115 mm **(4)**.

During first six months of life, 20-30% of children are already malnourished, often because they were born low birth weight. The proportion of under-nutrition starts rising after 4-6 months of age because of introduction of unhygienic foods that causes infections such as diarrhea. Late introduction of complementary feeding and inadequate food intake leads to increasing predisposition to under-nutrition **(5).**The extent of weight loss and growth rate varies with severity of malnutrition. In early stages, there is failure to maintain weight or growth rate, but as it becomes progressive, there is loss of weight associated with loss of subcutaneous fat and muscle mass with dysfunction of many vital organs which lead to variety of clinical features. With increasing severity, there is increasing failure in the homeostatic mechanisms of the body and damage to the immune defenses which may result in infections, shock and death **(6)**.Globally, an estimated 165 million children under-five years of age, or 26%, were stunted (*i.e.* height-for-age below –2SD), an estimated 101 million children under-five years of age, or 16% were underweight (*i.e.*, weight-for-age below –2SD) and an estimated 52 million children under-five years of age, or 8%, were wasted (*i.e.,* weight-for-height below –2SD) in the year 2011. Although the prevalence of stunting and underweight among children under-five years of age worldwide has decreased since 1990, overall progress is insufficient and millions of children remain at risk. Proper nutrition contributes significantly to declines in under-five mortality rates. Improving nutritional status is essential for achieving the Millennium Development Goals (MDGs) **(7)**.

Children who are chronically malnourished exhibit behavioral changes such as irritability, apathy, decreased social responsiveness, anxiety and attention deficits. In addition, infants and young children who have malnutrition frequently demonstrate delayed achievement of motor skills, delayed mental development, and may have permanent cognitive deficits **(8)**. The degree of delay and deficit depends on the severity and duration of nutritional compromise and the age at which malnutrition occurs. In general, nutritional insults at younger ages have worse outcomes **(9)**.

MATERIAL AND METHODS:

The present study, a observational study, was conducted in the Post Graduate Department of Pediatrics, SMGS Hospital, Government Medical College, Jammu on children of either gender from 6–59 months of age admitted in hospital from 1 November 2013 to 31 October 2014 to describe various risk factors associated with severe acute malnutrition .A total of 120 children were selected. Out of these 57 children had weight for weight/height above -2 SD/Z score of WHO growth standards. These were taken as controls. Rest 63 children with inclusive criteria were selected.

Case definition of severe acute malnutrition as oultlined by WHO was used (any one of the following):

- weight for height/length or weight/length <-3 SD/Z,
- visible severe wasting(of nutritional origin),
- presence of bipedal edema and /or mid upper arm circumference <11.5 cm

Inclusion criteria Children age 6 months to 59 months both male and female with WHO case definition on admission were included in the study.

Exclusion criteria children with acute secondary problems like cerebral palsy, meningitis, infiltrative disorders, congenital malformations, chronic systemic disease were excluded.

Methods A thorough history including following risk factors was taken:

- **Socioeconomic factors –** family type (nuclear /joint), place of residence(rural./urban), maternal/ paternal illiteracy, income, parental loss (death, desertion, divorce), family size, number of children below 5 yrs of age, birth order, drug addiction in the family, parental knowledge on nutrition.
- **Feeding practices –** initiation of breast feeding within 1 hour of birth, prelacteal feeds, deprivation of colostrum, exclusive breast feeding, duration of breast feeding, mixed or bottle feed, improper dilution, complementary feeding (time of initiation, frequency, amount, consistency)
- **Medical problems –** low birth weight , chronic/ recurrent diarrhea, recurrent respiratory tract infections, measles, tuberculosis, otitis- media, pneumonia, whooping cough.
- **Immunization –** complete or incomplete.
- **Detailed anthropometric measurements:** including height/ length, weight, mid upper arm circumference by uniform measuring tools was done and then plotted on standard WHO growth charts. Length was measured by infantometer, height by stadiometer, to the nearest mm. Weight using a standard electronic weighing scale kept on firm horizontal surface which weighs up to the difference of 1 gm. MUAC was measured by flexible measuring tape wrapped around the mid-upper arm (between the shoulder and elbow) to measure its circumference, measured to the nearest 0.1cm..With the left arm bent, string was used to find the midpoint of the arm between the shoulder and the tip of the elbow. MUAC was then measured on the left upper arm while the arm was hanging down the side of the body and relaxed.
- Detailed general physical and systemic examination was done.
- All children were subjected to appropriate investigations like complete blood counts, blood sugar, serum electrolytes, serum protein, urine routine, blood and urine culture, stool routine, PBF for malaria parasite, chest x ray, gastric aspirate for AFB, HIV serology in cases of high index of suspicion .
- A questionnaire was used to interview the caregivers of the study population and all information was collected.

STATISTICALANALYSIS

The data was analyzed with the help of statistical program SPSS VERSION 17.0. CHI SQUARE test was applied to compare the proportions and p value <0.05 was considered as statistical significant. The odd's ratio (OR) > 1 is positively correlated with malnutrition and or <1 negatively correlated. Qualitative variables were represented as percentages.

RESULTS AND OBSERVATIONS:

Place of residence Rural	Cases		Controls		Unadjusted odd's ratio	95% C.I
	No.	%	No.	%		
	33	52.38	28	49.12	1.13	0.55-2.35
Urban	30	47.62	29	50.88	1	
SEX Male	43	68.25	20	35.09	3.9	1.184-8.56
Female	20	31.75	37	64.91	1	
Birth wt (kg) <2.5	48	76.19	5	8.77	31.91	11.34-105
> _2.5	15	23.81	52	91.23	1	
BIRTH ORDER >3	37	58.73	20	35.09	2.61	1.25-5.55
≤3	26	41.26	37	64.91	1	
Education Illiterate(Father) Illiterate(mother)	37 49	58.73 77.77	7 6	12.23 11.33	 11.59 28.55	4.49 – 33.72 10.59-87.13 7.87– 68.33
Father's occupation Labourer/unskilled /unemployed	43	68.25	5	8.77	21.64	
Others	20	31.74	52	91.22	1	

TABLE -2

MUAC (cm)	**Cases**	
	No.	**%**
10-10.5	16	25.39
10.5- 11	44	69.84
>11	3	4.76
Total	**63**	**100.00**
Nutritional diagnosis		
Kwashiorkor	10	15.87
Marasmus	22	34.92
Marasmic-Kwashiorkar	31	49.21
Total	**63**	**100.00**

Breast feed period (months) <9	**Cases**		**Controls**		Unadjusted odd's ratio	95% C.I.
	No.	**%**	**No.**	**%**		
	31	49.20	18	31.57	2.08	0.99-4.46
>9	32	50.79	39	68.42		
Time put to breast feeding after birth(hours) >1	50	79.36	11	19.29	16.26	6.796-41.93
<1	13	20.63	46	80.71	1	
Colostrums received No	38	60.32	18	31.56	3.25	1.54-7.04
Yes	25	39.68	39	56.14	1	
Any prelacteal feed Yes	47	74.60	6	10.53	9.96	4.59-23.01
No	16	25.40	51	89.47	1	

Immunization status	Cases	Controls	Unadjusted odd's ratio	95% C.I		
	No.	%	No.	%		
Incomplete immunization	38	69.31	19	33.34	3.01	1.43-6.46
Complete immunization	25	39.68	38	66.66	1	
Total	**63**	**100**	**57**	**100**		
Exclusive breast feeding No	52	82.53	6	10.52	38.23	13.76-120.7
Yes	11	17.47	51	89.48	1	
COMPLEMANTARY FEEDING Inadequate	44	69.84	5	8.78	23.28	8.43-75.08
Adequate	19	30.16	52	91.22	1	
NO OF SIBLINGS 5	59	93.65	10	26.31	65.08	20.57-253.7
<5	4	23.80	47	50.87	1	

Variables found to be significant risk factors and co-morbidities for severe acute malnutrition

Risk factors	Cases (%)	Odd's ratio	95% CI	p-value
Mother illiterate	77.77	28.55	10.59-87.13	<0.01
Father illiterate	58.25	21.65	7.87-68.33	<0.01
Father's occupation (labourer/unemployed)	68.25	21.64	7.87-68.33	<0.01
Large Family >5 siblings	93.65	65.08	20.57-253.7	<0.01
Drug addiction	12.69	8.03	0.30-4.05	0.02
Household income ≤Rs 200/day	52.38	3.48	1.79-8.46	<0.01
Birth order >3	35.09	2.61	1.25-5.56	<0.01
Medical factors				
Low birth weight	76.19	31.91	11.34-105	<0.01
Lack of exclusive breast feeding	82.53	38.25	13.76-120.7	<0.01
Deprivation of colostrums	60.32	3.25	1.54-7.04	<0.01
Received prelacteal feeds	74.60	9.96	4.59-23.23.01	<0.01
Breast feed period<9 months	49.20	2.08	0.99-4.46	0.05
Put to breast after first hour	79.36	16.26	6.79-41.93	<0.01
Inadequate complementary feeding	69.84	23.28	8.43-75.08	<0.01
Improper dilution	55.88	2.72	0.72-10.47	<0.01
Incomplete vaccination	60.31	3.01	1.45-6.46	<0.01

***Significant p value less than 0.05**

DISCUSSION:

A total of 120 children were taken up for study. Out of these 57 children had weight for height/length above - 2 SD/Z score of WHO growth standards. These were taken as controls. Rest 63 children fulfilling the inclusive criteria were included in the study.(10) Sex-wise distribution of the cases in our series showed slight male preponderance (68.25%). (11,12,13).

Out of the total cases of SAM cases, marasmi-kwashiorkar was the most common type of PEM seen in 49.21% of cases, followed by marasmus in 34.92% and kwashiorkar in 15.87% of cases. Low birth weight is defined as the birth weight of <2.5 kg. Low birth weight (LBW) is an attributable risk factor for increased child malnutrition, morbidity and mortality. In our study, LBW emerged as a significant risk factor for severe acute malnutrition. (15,16)**.** Birth order more than 3, large family size (number of siblings >5) has been associated with increased risk of SAM. In our study, it emerged out to be a significant risk factor.(13,15,16).

Low literacy status of parents emerged as an independent risk factor for occurrence of severe acute malnutrition with odd's ratio of 28.55 and 11.59 ($p<0.01$) and for maternal illiteracy and father's illiteracy respectively.(10) Sociodemographic determinants like socioeconomic status, family type (nuclear/joint), occupation of the parents (labourer/unemployed), low household income (≤Rs 200/day) and parental loss/desertion/divorce were focused in this criterion. The only statistically significant factor was father's occupation and low household income. A child who was malnourished was 21 times at risk of having a father who is either a labourer or unemployed (OR = 21.64, $p<0.01$). Also household income ≤Rs 200/day was found to be significantly associated with severe acute malnutrition (OR = 3.48, $p<0.01$) as income insecurity leads to food insecurity forcing family members to consume poor food quality and /or amount.

During the critical period of early infancy, proper breast feeding and complementary feeding practices play critical roles. The hygienic and nutritional risks associated with bottle feeding and artificial milk are well known. Factors such as initiation of breast-feeding after 24 hours of delivery (20% cases and 48% controls) and exclusive breast feeding for less than six months (82.53% cases) was found to be significantly associated with SAM in our study (OR = 16.26, $p<0.01$) and (OR = 38.28, $p<0.01$), respectively. Also factors like inadequate complementary feeding (OR = 23.28, $p<0.01$), feeding by bottle (OR = 11.77, $p<0.01$), improper dilution (OR = 2.72, $p<0.01$). (12,13,15)**.** The severely acute malnourished children are more likely to receive prelacteal feeds (74.60% cases) (OR = 9.96, $p<0.01$) and lack of intake of colostrum (60.32% cases) (OR = 9.93, $p<0.01$). This was found to be significantly higher among children with severe acute malnourishment than controls. (2).Vaccination is an important way of prevention from major communicable diseases of childhood which is a major cause of morbidity, hospital stay and death in this age group. Lack of immunization or incomplete immunization has got an important role in children with severe acute malnutrition. This study shows that children within incomplete vaccination status (60.31% cases) had high association with SAM (OR = 8.73, $p<0.01$).(15)**).**

CONCLUSION

We infer that preventive measures against the above mentioned significant risk factors would go a long way in reducing the morbidity and mortality of severe acute malnutrition.

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