

Profile of under-five malnourished children admitted in a tribal medical college (RIMS) Adilabad, Telangana

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Abstract

Introduction: Malnutrition is a major public health problem in a developing country like India, keeping this in mind a study was carried out to, 1). Find the proportion of under five children suffering from malnutrition among the under- five hospitalized children. 2). Find the Epidemiological factors responsible for development of malnutrition. 3). Find co-morbid illnesses associated with malnutrition.

Materials and Methods: This was a hospital based cross-sectional study, carried out in a tertiary care teaching hospital in Adilabad, telangana. All under-five children suffering from malnutrition were studied over a period of one month.

Results: Total number of under-five children suffering from malnutrition were 170 (83.33%) Moderate & severe/very severe malnutrition was statistically significant in children belongs to Upper-lower class socio-economic status according to modified 2007 KUPPUSWAMY classification. 1) Illiteracy & low educational status among mothers. 2) Low birth weight (<2.5 kg) babies. 3) Children who were not on exclusive breast feeding during their first 6 months of life. 4) Children who were on improper complementary feeding practices. 5) Low birth spacing. 6) High birth order of children. 7) Living in tribal & rural area. Malnutrition is also higher in children, whose mothers were anemic (74.11%) during pregnancy & whose mothers are going to field work as daily labours & farmers (65.88%), due to low socio economic status. Among 170 malnourished children, 162(95.29%) were suffering from ANEMIA. Among 170 malnourished cases the major co-morbid illness is Diarrheal disease about 117(68.82%).

Conclusion: A large proportion of hospitalized children were malnourished, came from rural, tribal & urban slum areas & this malnutrition is mainly because of low socio-economic status, illiteracy & low educational status of mothers, improper breast feeding & improper complementary feeding practices, low birth weight, low birth spacing & high birth order, all these are statistically significant risk factors. And the major co-morbid illness associated with malnutrition is diarrheal illness & anemia

Keywords: Hospital, Infant, Malnutrition, Morbidity, Preschool.

Introduction

Childhood malnutrition is an underlying cause in an estimated 35% of all deaths among children under five years of age.¹ The prevalence of underweight children in India is among the highest in the world, and is nearly double that of Sub-Saharan Africa, the report says. The consequences of child undernutrition for morbidity and mortality are enormous – and there is, in addition, an appreciable impact of undernutrition on productivity so that a failure to invest in combating nutrition reduces potential economic growth. In India, with one of the highest percentages of undernourished children in the world, the situation is dire. Moreover, inequalities in undernutrition between demographic, socioeconomic, and geographic groups increased during the 1990s. More and better investments are needed if India is to reach the nutrition MDGs. Economic growth will not be enough.²

Keeping this in mind this study was carried out with the objective to find the proportion of under-five children suffering from malnutrition amongst the under-five hospitalized children and to study co-morbid illnesses and epidemiological factors associated with malnutrition amongst these children.

Materials and Methods

This was a cross-sectional study carried out in the pediatric ward of a tertiary care teaching hospital in Adilabad, India. All under-five children admitted in pediatric ward & suffering from malnutrition were studied over a period of

1 month from 21 July 2016 to 21 August 2016. Since this was a short term project, the period of data collection limited to a period of 1 month. Ethical approval was taken from the institutional ethics committee before the commencement of study. Informed consent was taken from the parents/ legal guardian of the child. Study was conducted with the help of pre-tested proforma. Each child was examined clinically & the important laboratory findings were noticed from the case sheet. Malnutrition was classified according to Indian academy of pediatrics (IAP) classification. This IAP classification based on weight-for-age values. The standard used in this classification for reference population was the 50th centile of Harvard standards.

A child was considered completely immunized for age if the child received all the doses as per Indian national immunization schedule. Low birth weight was defined as weight <2.5 kg. Socio-economic state was classified according to modified 2007 kuppuswamy classification. Proper complementary feeding is taken as initiation of CF at 7 months of age. Birth spacing about 24 months considered as normal.

All the under- five children admitted in pediatric ward over a period of 1 month & suffering from malnutrition were included in this study.

Children of parents/ legal guardians not giving informed consent, children admitted in NICU (neonatal intensive care unit) /PICU (pediatric intensive care unit),

and malnutrition secondary to the underlying chronic disease were excluded from the study.

Chi-square test was used to study the association between the variables.

'p' value of <0.05 was considered as statistically significant.

Results

1. Total under-five admissions in pediatric ward during the one month period = 204 children.

2. Total number of under-five children diagnosed as malnourished = 170(83.33%), among them female children were 88(51.76%) & male children were 82(48.23%).

3. Moderate & severe/ very severe malnutrition was observed in 129(75.88%) children, among them 64(72.72%) out of 88(51.76%) were female children & 64(79.26%) out of 82(48.23%) were male children

Table 1: Showing association between malnutrition & sex

Sex	Mild	Moderate	Severe	Total	X ² chi square value	Degree of freedom	'p' value
Male	17	32	33	82	1.95,	2	0.378.
Female	24	37	27	88			
Total	41	69	60	170			

The association between malnutrition & sex differentiation was not statistically significant.

Among 170 malnourished children 118(69.41%) came from rural & tribal area, 52(30.58%) came from urban area. Among them nutritional status was as below shown in table,

Table 2: Showing association between malnutrition & tribal and rural area

Area of living	Mild	Moderate	Severe/very severe	Total	X ² chi square value	Degree of freedom	'p' value
Rural	20	58	40	118	15.40,	2,	0.000
Urban	21	11	20	52			
Total	41	69	60	170			

This association was statistically significant. It indicates that majority of malnourished children are living in tribal area.

Among 170 malnourished children, birth weight was available in 146 children, among them 41(87.23%) were suffering from moderate & severe/very severe malnutrition out of 47(27.64%) low birth weight (<2.5kg) babies, 68(68.68%) children were suffering from moderate & severe/very severe malnutrition out of 99(58.23%) normal birth weight (>=2.5kg) babies & remaining 24(14.11%) children's birth weight not available (because of home deliveries), among them 20(83.33%) children were suffering from moderate & severe/very severe malnutrition. Among 170 malnourished children, educational status of mothers is as follows:

Table 3: Showing association between malnutrition & educational status of other

Educational Status of Mothers	mild	moderate	Severe/very severe	Total	X ² chi square value	Degree of freedom	'p' value
Illiterates	10	24	27	61(35.8%)	15.3,	8	0.054
1 ^o school	0	6	6	12(7.05%)			
2 ^o school	18	29	19	66(38.82%)			
Higher 2 ^o school	6	7	5	19(11.17%)			
Graduates	7	3	3	13(7.64%)			
Total	41	69	60	170			

Illiteracy & low educational status in mothers, is statistically significant risk factor for development of malnutrition among under-five children

Table 4: Showing association between malnutrition & birth weight

Birth Weight	Mild	Moderate	Severe/very severe	Total	X ² chi square value	Degree of freedom	'p' value
LBW(<2.5kg)	6	18	23	47	12.5	4	0.014
Normal(>=2.5kg)	31	43	25	99			
Not known	4	8	12	24			
Total	41	69	60	170			

Low birth weight was a statistically significant risk factor for malnutrition.

Among 170 malnourished children, 42(24.70%) children were first born children & among remaining 128(75.29) malnourished children, proper birth spacing was seen in 32(25%) children & improper birth spacing was seen in 96(75%) malnourished children, among them nutritional status was seen as below:

Table 5: Showing association between malnutrition & birth spacing

Birth spacing	Mild	moderate	Severe/Very severe	Total	X^2 chi square value	Degree of freedom	'p' value
Proper	10	08	14	32	15.64	2	0.000.
Improper (close)	08	12	76	96			
Total	18	20	90	128			

The association was statistically significant. & tells that low birth spacing also an important risk factor for development of malnutrition in under-5 children.

Among 170 malnourished children, 42(24.70%) children were 1st born children, 42(24.70%) children were 2nd born, 56(32.94%) children were 3rd born, 20(11.76%) children were 4th born & 10(5.88%) children were 5th born children, among them nutritional was seen as below,

Table 6: Showing association between malnutrition & order of birth

Order of birth	mild	moderate	Severe/ very severe	Total	X^2 chi square value	Degree of freedom	'p' value
1 st	20	12	10	42	32.79	08	0.0001
2 nd	10	15	17	42			
3 rd	11	31	14	56			
4 th	00	08	12	20			
5 th	00	03	07	10			
Total	41	69	60	170			

This association was statistically significant. High birth order also an important risk factor.

Among 170 malnourished children, According modified (2007) KUPPUSWAMY CLASSIFICATION, 123(72.35%) children were belongs to upper-lower (IV) classification, 37(21.17%) children were belongs to lower-middle (III) classification, 10(6.47%) children were belongs to upper-middle (II) classification. Moderate & severe/very severe malnutrition was noticed in 4(40%) children, among 10(5.88%) malnourished children belongs to upper-middle (II) class. Moderate & severe/very severe malnutrition was noticed in 26(70.27%) children, among 37(21.76%) malnourished children belongs to lower-middle (III) class. Moderate & severe/very severe malnutrition was noticed in 99(80.48%) children, among 123(72.35%) malnourished children belongs to upper-lower (IV) class.

Table 7: Showing association between malnutrition & socioeconomic status

SES	Mild	moderate	Severe/very Severe	Total	X^2 chi square value	Degree of freedom	'p' value
Upper Middle(II)	6	2	2	10	9.11	4	0.05
Lower Middle(III)	11	14	12	37			
Upper Lower(IV)	24	53	46	123			
Total	41	69	60	170			

So, low socio-economic status was a significant risk factor for development of malnutrition in under-five children.

Among 170 malnourished children, 113(66.47%) children were not on exclusive breast feeding, among them 92(81.41%) children were suffering from moderate & severe/very severe malnutrition. 57(33.52%) children were on exclusive breast feeding, among them (64.91%) children were suffering from moderate & severe/very severe malnutrition

Table 8: Showing association between malnutrition & exclusive breast feeding

EBF	Mild	Moderate	Severe/very severe	Total	X^2 chi square value	Degree of freedom	'p' value
Given	20	30	7	57	20.2	2	0.000
Not Given	21	39	53	113			
Total	41	69	60	170			

The association was statistically significant, so EBF is an important factor to prevent development of malnutrition among under-five children.

Among 168 malnourished children (as 2 malnourished children had 6 months of age), 155(92.26%) children were not on proper complementary feeding practices among them 120(77.42%) were suffering from moderate & severe/very severe malnutrition. 13(7.73%) children were on proper complementary feeding practices among them 7(53.84%) were suffering from moderate & severe/very severe malnutrition

Table 8: Showing association between malnutrition & Complementary Feeding Practices

Complementary Feeding Practices	Mild	moderate	Severe/very severe	Total	X ² chi square value	Degree of freedom	'p' value
Proper	6	6	1	13	5.86	2	0.053
Improper	35	62	58	155			
Total	41	68	59	168			

The association was statistically significant. So, proper complimentary feeding practices are essential to prevent development of malnutrition in under-five children.

Among 170 malnourished children 162(95.29%) have anemia & 8(4.70%) didn't have anemia. Among them 124(76.54%) children out of 162 anemic children were suffering from moderate & severe/very severe malnutrition & 5(62.50%) children out of 8 not anemic children suffering from moderate & severe/very severe malnutrition.

So, in this study the most of malnutrition children were suffering from anemia & the association was clinically significant

Table 9: Showing association between malnutrition & anemia in pregnancy

Anemia	Mild	moderate	Severe/very severe	Total	X ² chi square value	Degree of freedom	'p' value
Yes	38	66	58	162	0.895	2	0.639
No	3	3	2	8			
Total	41	69	60	170			

Among 170 malnourished children, 126(74.11%) mothers had anemia during pregnancy, 9(5.29%) were not anemic during pregnancy & 35(20.58) mothers were not a booked & immunized cases.

126 mothers had anemia during their pregnancy, among them 96(76.19%) children were suffering from moderate & severe/very severe malnutrition.

9 mothers had anemia during their pregnancy, among them 6(66.66%) children were suffering from moderate & severe/very severe malnutrition.

35 mothers were not a booked & immunized cases during their pregnancy, among them 27(77.14%) children were suffering from moderate & severe/very severe malnutrition.

The above values reflecting that, anemia in pregnancy is also an important factor for development of malnutrition in under-five children. This association was clinically significant.

Among 170 malnourished children, 123(72.35%) children were completely immunized among them 95(77.23%) children were suffering from moderate & severe/very severe malnutrition. 47(27.64%) children were not completely immunized among them 34(72.34%) children were suffering from moderate & severe/very severe malnutrition.

Table 10: Showing association between malnutrition & immunization status of child

Immunization Status	Mild	Moderate	Severe/very severe	Total	X ² chi square value	Degree of freedom	'p' value
Complete	28	53	42	123	1.19	2	0.552
Incomplete	13	16	18	47			
Total	41	69	60	170			

Association between immunization status and malnutrition was statistically insignificant.

Discussion

Total number of under-five children diagnosed as malnourished were 170(83.33%) out of the total 204 hospitalized children during period of 1 month. This reflects malnutrition is still an important & major public health problem in India & needs to be addressed.

In the present study moderate & severe/very severe malnutrition was observed in 129(75.88%) children, among them females were 64(49.61%) & males were 65(50.38%), this values reflects all children without sex differentiation were at almost equal (slightly higher among boys compared to girls) risk for development of malnutrition. In the region

of this study, gender inequality not present. In a study carried out by ¹ *Ngianga-Bakwin Kandala* in children under the age of five in the Democratic Republic of Congo (DRC), the authors found that the prevalence of malnutrition was higher among boys compared to girls (46.1 versus 41.7 percent), & malnutrition was linearly associated with maternal education (higher among children from non-educated mother, followed by children from mothers with primary education but lower among children from mothers with secondary or higher education: 49.8, 47.0 versus 35.2 percent)¹¹ Studies by *Olwedo et al.*⁹ in Uganda, *Emina et al.*⁷ in the Democratic Republic of Congo and *Irena et al.*¹⁶ in Zambia have suggested that under-nutrition is more prevalent among boys than among girls.¹⁷ *Mahgoub and* our study showed no difference in the proportions of boys and girls admitted for under-nutrition, in a study conducted by.¹⁸ *Ngozi S Ibeziako et al* One hundred and twenty seven (59.9%) were males while 85 (40.1%) were females giving a male: female ratio of 1: 0.7 & there was no statistically significant difference between the two genders This agrees with an earlier review in Maputo by ¹³ *Cartmell et al.*²⁴ *Renuka et al* study also showed that there was no statistically accepted difference was observed between boys & girls for malnutrition among under-five children.

Among 170 malnourished children 118(69.41%) came from rural & tribal area, 52(30.58%) came from urban area. Among them nutritional status was, children suffering from moderate & severe/very severe malnutrition were 98(83.05%) & 31(59.61%) respectively, indicating that association was statistically significant & in majority of cases living in rural area is acting as an important leading factor for other risk factors those are responsible for malnutrition in under-five children²⁵ Jabalpur study among preschool children of Gond tribes of MP & also ²⁴ *Renuka et al* study on tribal people shows that prevalence of malnutrition was high among children living in tribal area. Similarly prevalence of malnutrition was high in 1-5 year tribal children of Khammam District of Telangana.²⁶

Moderate & severe/very severe malnutrition was observed in 41(87.23%) children out of 47(27.60%) low birth weight (<2.5kg) babies & in 68(68.88%) children out of 99(58.23%) normal birth weight(>=2.5kg) babies, & in 24(83.33%) children out of 20(14.11%) home delivery babies whose birth weight not known.

These values reflect low birth weight is an important risk factor for development of malnutrition in under-five children. In a study done by *Ellen Van Poel et al* in Ghana.² children who were very small at birth had a higher probability to be stunted than children with normal size, & socio-economic inequality is also an important risk factor for development of malnutrition in under-five children. A study done by *Dhrubajyoti J Debnath and Chandrakant V Parulekar* tells that Postnatal growth failure is extremely common in the low birth weight infants.²¹

Among 170 malnourished children, educational status of mothers was as follows: 61(35.88%) mothers were illiterate, among them 51(83.60%) children were suffering from moderate & severe/very severe malnutrition. 12(7.05%)

mothers were educated up to 1⁰ school, among them 12(100%) children were suffering from moderate & severe/very severe malnutrition 66(38.82%) mothers were educated up to 2⁰ school, among them 48(72.72%) children were suffering from moderate & severe/very severe malnutrition 19(11.17%) mothers were educated up to higher 2⁰ school, among them 12(63.15%) children were suffering from moderate & severe/very severe malnutrition 13(7.64%) mothers were educated up to graduation. among them 6(46.15%) children were suffering from moderate & severe/very severe malnutrition.

These values reflect illiteracy & low educational status in mothers is an important risk factor for development of malnutrition in under-five children. In a study carried out by *Bharathi et al.*³ it was observed that children with illiterate mothers, from low standard of living households are more prone to become malnourished. It is necessary to improve the rate of literacy, especially in women, to reduce the prevalence of malnutrition & anemia among under-five children.²¹ *Dhrubajyoti J Debnath and Chandrakant V Parulekar* study shows that children with illiterate mothers, from low standard of living are more prone to become malnourished.⁵ *A Madondo, U E MacIntyre, B Ntuli* study results show majority of malnourished children's mothers (60%) were educated up to secondary school. A case-control study done by ^{4,10,14,8,12,15} *Eskezyiaw Agedew* showed that well educated mother's children were at statistically lower risk of being malnourished as compared to children of mother without education. In a case-control study in Bangladesh, the maternal illiteracy was associated with a fourfold increase in the risk of severe acute malnutrition in their children which is almost similar in this study.¹⁰

Among 170 malnourished children, 42(24.70%) children were first born children & among remaining 128(75.29) malnourished children, proper birth spacing was seen in 32(25%) children among them nutritional status was mild malnutrition seen in 10(31.25%) moderate malnutrition seen in 8(25%), severe malnutrition seen in 14(43.75%) & improper birth spacing was seen in 96(75%) malnourished children, among them nutritional status was mild malnutrition was seen in 8(8.33%), moderate malnutrition was seen in 12(12.5%) & severe malnutrition was seen in 76(79.16%) children. this association was both clinically as well as statistically significant. A case-control study done by *Eskezyiaw Agedew et al* showed that preceding birth was also another important demographic variable affecting nutritional status of children.⁸ The significant and higher risk of malnutrition among children of lower preceding birth space, i.e., having a preceding birth interval of less than 24 months interval, could be due to mother already became anemic & nutritionally deprived because of previous pregnancy & she was also on breast feeding to her previous child. Close spacing may also have a health effect on the previous child, who may be prematurely weaned if the mother becomes pregnant again too early. As the preceding birth interval of the child decreases, the likelihood of being malnourished increases. Similarly low birth interval has

been found as a risk factor for severe acute malnutrition in studies done in Sudan.¹² finding of this study showed that the risk of malnutrition increases with age. As age of a child increased by one month the likelihood of being malnourished increased by 1.2 times. This may be an indication of either inappropriate food supplementation in quantity &/or quality during the weaning and older period or exposure to diseases. Children in the youngest age group were at a significantly lower risk of being malnourished as compared with children in the older age groups. This low risk may also be due to the protective effect of breastfeeding, since almost all children are breastfed and most continue to be breastfed during their first year of life. These findings are consistent with studies conducted in the southern parts of Ethiopia.⁴

Among 170 malnourished children, 42(24.70%) children were 1st born children, 42(24.70%) children were 2nd born, 56(32.94%) children were 3rd born, 20(11.76%) children were 4th born & 10(5.88%) children were 5th born children, among them nutritional status was seen as mild malnutrition was 20, 10, 11 (47.61%, 28.80%, 19.64%) moderate malnutrition was 12, 15, 31, 8, 3, 9 (28.57%, 35.71%, 55.35%, 40%, 30%,) severe malnutrition was 10, 17, 14, 12, 7 (23.80%, 40.47%, 25%, 60%, 70%) seen respectively, this association was statistically significant indicates that higher the birth order was a significant risk factor for development of malnutrition in under-five children. A case-control study done by *Eskezyiaw Agedew et al* showed that the likelihood of being malnourished was 1.43 times higher among families who have increased number of children compared with low number of children in the household. The effect of a large family size with competition for food has been implicated as a risk factor for severe malnutrition in other studies as well.⁸

Among 170 malnourished children, According to modified (2007) KUPPUSWAMY CLASSIFICATION

123(72.35%) children were belongs to upper-lower (IV) classification,

37(21.17%) children were belongs to lower-middle (III) classification,

10(6.47%) children were belong to upper-middle (II) classification

Moderate & severe/very severe malnutrition was noticed in 4(40%) children, among 10(5.88%) malnourished children belongs to upper-middle (II) class.

Moderate & severe/very severe malnutrition was noticed in 26(70.27%) children, among 37(21.76%) malnourished children belongs to lower-middle (III) class.

Moderate & severe/very severe malnutrition was noticed in 99(80.48%) children's, among 123(72.35%) malnourished children belongs to upper-lower (IV) class. A study done by ¹⁹*Lawrence et al* showed that how rapidly will child malnutrition respond to income growth? This article explores that question using household survey data from 12 countries as well as data on malnutrition rates in a cross-section of countries since the 1970s. Both forms of analysis yield similar results. Increases in income at the household and national levels imply similar rates of

reduction in malnutrition. A study conducted by *Harold alderman et al* the results show that better nutrition in children is associated with higher income.²⁰ In a study done by *Stalin P et al* Children of mothers who had completed higher secondary / graduation were better nourished than other children. Children belonging to lower socio-economic status were poorly nourished than those belong to upper socio-economic status. This association between nutritional status of children and socio-economic status was similar to the findings of previous studies.^{22,23}

These values reflect low socio-economic status is an important risk factor for development of malnutrition in under-five children. Because of this low-socio economic state, most of the mothers 112(65.88%) out of 170 malnourished children are going to field work as farmers or labors, & under-five child care was taken by grandparents, neighbours, & elder siblings, which is not enough to prevent under-five malnutrition. A study done *Eskezyiaw Agedew* showed that Feeding less than three times a day more commonly observed in the severely malnourished group than the controls.⁸ It is usually associated with burden of workloads which prevent women from dedicating time to their children. This indicates that it is not only lack or shortage of food that predisposes young children to malnutrition but also lack of knowledge on appropriate infant and young child feeding and care practices.⁵ A *Madondo, U E MacIntyre, B Ntuli* study results show that 57.5% of the under-five malnourished children caregivers survived on less than 500 pula a month (equivalent to US\$65.00), indicating poor income in a family affects child's development. Under-five Malnutrition children Admitted at the University of In Nigeria Teaching Hospital, Enugu: a 10 year retrospective review by *Ngozi S Ibeziako et al* study review noted that malnutrition was more common among children from the lower social class (69.4%) and those predominantly breast fed for three months or less (48.6%) compared to exclusively breast fed children (18.9%).¹⁸ The reason for this may be connected to the fact that poor families have low purchasing power for adequate nutritious foods for their families & severely-underweight children were more likely to have undernourished poorly educated teenage mothers, history of shorter duration of predominant breastfeeding, and fathers who were poorly educated and unskilled day-laborers¹⁵. Illiteracy on the other hand, may influence feeding practices.

Among 170 malnourished children, 113(66.47%) children were not on exclusive breast feeding, among them 92(81.41%) children were suffering from moderate & severe/very severe malnutrition. 57(33.52%) children were on exclusive breast feeding, among them (64.91%) children were suffering from moderate & severe/very severe malnutrition

These values reflect exclusive breast feeding is very essential to prevent malnutrition in under-five children. According to *NFHS survey*, less than half of children under 6 months of age are exclusively breast fed & exclusive breast feeding drops to 28% for children aged 4-5 months..

A case-control study done by *Eskezyiaw Agedew* showed that, although most of the women continued to breast feed their babies well into the first year of life earlier starting of complementary feeds and discontinuation of breast feeding after then was common among the malnourished children and this was one of the most important factors to the development of malnutrition in the study population. This shows that malnutrition in early infancy may be attributed to the lack of exclusive breastfeeding. Besides, early complementary feeding that may expose infants to pathogens and increase their risk of infection which would also negatively affect their nutritional status. A study done in China showed that the introduction of other diet before the age of six months increased the prevalence of pneumonia and diarrheal diseases.¹⁴ Similarly a study in Kenya showed an increased risk of being underweight when complementary food was started early.¹⁵ As a global public health recommendation, infants should be exclusively breastfed for the first 6 months of life to achieve optimal growth, development and health. Thereafter to meet their evolving nutritional requirements, infants should receive nutritionally adequate and safe complementary foods while breastfeeding continues for up to two years of age or beyond.¹²

Among 168 malnourished children (as 2 malnourished children had 6 months of age), 155(92.26%) children were not on proper complementary feeding practices among them 120(77.42%) were suffering from moderate & severe/very severe malnutrition. 13(7.73%) children were on proper complementary feeding practices among them 7(53.84%) were suffering from moderate & severe/very severe malnutrition.

These values reflect improper complimentary feeding practice was an important risk factor for development of malnutrition in under-five children. The age group 6 to 24 months accounted for 92.5% of the total number of children admitted for malnutrition in *Nigerian and Zambian studies*, an approximate 64% of admitted cases of malnutrition were less than two years while *Cartmell et al.*^{4,14} documented a mean age of 21.7 months in the *Maputo study*. The reasons for the high number of cases of malnutrition among the age group 6 to 24 months could be due to a number of factors including low rate of exclusive breast feeding as well as poor weaning and feeding practices.

Among 170 malnourished children 162(95.29%) have anemia & 8(4.70%) didn't have anemia. Among them 124(76.54%) children out of 162 anemic children were suffering from moderate & severe/very severe malnutrition & 5(62.50%) children out of 8 not anemic children suffering from moderate & severe/very severe malnutrition.

So, in this study the most of malnutrition children were suffering from anemia & the association was clinically significant. In a study of epidemiological & clinical profile of hospitalized children with malnutrition in south India by *ushadevi et al.*,⁶ Only 33 % of malnourished children (cases) were exclusively breast fed. Among controls, 71 % were exclusively breast fed for the first 6 mo after birth & most

cases had as associated infections (p 0.004) and anemia (p < 0.001).

The major co-morbid illness associated with under-five malnutrition was diarrheal illness. in a study of *Ngozi S Ibeziako et al.*¹⁸ *Cartmell et al.*¹³ most common associated co-morbid illness was diarrhea seen in 72.7% of malnourished children.¹⁰ A prospective study carried out in Ethiopia found that malnourished children had significantly higher incidences of diarrheal diseases than their well-nourished counterparts, signifying that malnutrition is itself increased the risk of infection among under five children.

This study has limitations that being a short term research project carried out over a period of 1 month, the power of study is less due to small sample size & there is a chance of disproportion between malnutrition among under-five children admitted in tertiary teaching hospital & malnutrition among under-five children at community level.

However, the study was meticulously carried out & the findings hold significance in a developing country like India, facing the terror of malnutrition.

Conclusion

From the above study malnutrition is still an important & major public health problem in under-five children in India, the major epidemiological risk factors are

1. Low birth weight (<=2.5kg),
 2. Low socio-economic status,
 3. Illiteracy & low educational status among mothers,
 4. Improper breast feeding & complimentary feeding practice,
 5. Anemia during pregnancy in mothers,
 6. Improper birth spacing,
 7. high birth order.,
 8. living in tribal, rural & urban slum areas.
- & the most of malnourished children were anemic & suffering from diarrheal illness

Preventive measures

By taking appropriate precautionary measures malnutrition is preventable:

Individual level

1. Proper hand washing before feeding to child,
2. Maintain sanitation & hygiene in & around home,
3. Proper utilization of anganwadi facilities,
4. Kitchen gardening practice around home,
5. Provide appropriate ANC & PNC care to mothers,
6. Health education to mothers & family members regarding sanitation, importance of EBF, & complimentary feeding practices in prevention of malnutrition in under-five children,
7. Adequate birth spacing should be present between two pregnancies, so, the mother will recover from previous pregnancy induced anemia & she will ensure proper infant feeding & complimentary feeding to the present child,
8. Vigorous EBF of infants for first 6 months of life should be promoted & encouraged,

9. Family planning after two children.

At community level

1. Health & nutrition education,
2. Promotion of education & literacy in community,
3. Growth should be monitored periodically on growth charts in anganwadi center,
4. Integrated primary health package should be available at anganwadi center,
5. Vigorous promotion of family planning to limit family size.

At national level

1. Nutritional supplementation,
2. Nutritional surveillance,
3. Nutritional planning,

Source of Funding

None.

Conflict of Interest

None.

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