Original Research Paper

Volume - 13 | Issue - 02 | February - 2023 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Paediatric Medicine

NUTRITIONAL STATUS (STUNTING, WASTING, UNDERWEIGHT, ANAEMIA, VITAMIN A DEFICIENCY) AMONG CHILDREN OF 0-2 YEARS AGE GROUP IN A HOSPITAL OF BIHAR

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ABSTRACT **Research question:** Nutritional Status of Children 0-2 years of age. **Background and objective:** the main objective of this study was to obtain precise information on the prevalence of malnutrition, anemia and vitamin A deficiency in children of 0-2 year age group and identification of population group at risk of in greatest need for assistance. The purpose of nutritional assessment is to develop a health care program that meets the need defined by that assessment. **Results:** Out of total 370 children included in the study, 53.5% were males and 46.5% were females, and majority (37.25%) of them belonged to 0 to 6 months age group. The prevalence of underweight was 39.73%, stunting 35.68% and wasting 18.10%. Prevalence of pale conjunctive was 30.54% and was more in female child. Male children were more underweight and stunted then female children where as female children were more wasted than male children.Prevalence of anemia was 54.6% and was more in male child.Prevalence of anemia was 54.6% and was more in male child. Prevalence of conjunctival xerosis was 5.41 %, Bitot's spot was 2.70% and corneal xerosis was 1.89%.

KEYWORDS :

Introduction:
Malnutrition is a major public health concern affecting a significant number of school age children influencing their health, growth and development, and school academic performance. Malnutrition continues to affect a large proportion of children in the developing world. Ascertaining this information about nutritional status is an important step to inform public health policy and to design appropriately targeted interventions that will effectively address the problem of childhood malnutrition.[1]

When children are born malnourished and underweight they are much more likely to suffer from serious infections and to die from common childhood illnesses such as diarrhoea, measles, pneumonia and malaria etc. Malnutrition impedes motor, sensory, cognitive and social development. The most damaging effects of under nutrition occur in the first two years of life and these damages are irreversible, hence need for dealing with malnutrition in the first two years crucially important.[2]

Nutritional assessment in the community is essential for accurate planning and implementation of intervention programs to reduce morbidity and mortality associated with under-nutrition. Causes of malnutrition are complex, multidimensional and interrelated. In children, malnutrition is most likely to strike those who lack nutritionally adequate diet, are not protected from frequent illnesses and do not receive adequate care. [3]

Anemia is extremely common in young children in many developing countries including India. It is often due to a number of concurrent factors, including nutritional deficiencies (Wadsworth, 1959), bacterial and parasitic infections and genetic abnormalities. Iron needs are high in early childhood because of rapid increases in the total number of red blood cells and in the muscle mass which occur with normal development.[4]

The signs of vitamin A deficiency are: Bitot's spots, conjunctival xerosis, corneal xerosis, keratomalacia, xerosis of skin and follicular hyperkeratosis (type 1). The clinical signs of vitamin A deficiency vary with age (McLaren, 1963). Keratomalacia is principally seen in infancy and the pre-school age group, often associated with protein-calorie malnutrition, while Bitot's spots and conjunctival xerosis are more common in school children.[4]

Aims and objectives: To study the nutritional status of 0 to 2 years age group children and identification of population group at risk or in greatest need of assistance in a tertiary care hospital.To study the prevalence of anemia and vitamin A deficiency in children of 0-2 years age group.To study and assess the feeding practices and environmental factors associated with malnutrition and their influence on it.

Methodology:
Study site: The study was conducted in Department of Pediatrics, Nalanda Medical College and Hospital, Patna, Bihar.

Study population: All the children of 0-2 year age group visiting the hospital.

Study design: A prospective, descriptive, observational study.

Sample size with justification: Sample size was calculated according to the formula designed by Dawson-Saunders and Trapp (1994).

$$n = \frac{z^2 pq}{d^2}$$

n is sample size
z= 1.96 (at 95% confidence interval)
p= prevalence, q=(100-p), d=precision of study

Recent previous studies show prevalence of malnutrition to be 40%. Thus assuming a prevalence of malnutrition of 40%, 95% CI and a relative precision of 5%, a sample size of 368 individuals was arrived. Sample size taken-370 (rounded off).

Inclusion criteria: Children visiting Pediatric OPD who are not gaining height and weight.
Children admitted in indoor for acute illness.
Children up to two years of age.

Exclusion criteria:
Children having any chronic illness.
HIV exposed or infected patient.
Children with congenital abnormalities of GIT, CVS, Genitourinary system and CNS.
Very low birth weight and extremely low birth weight babies.
Babies with significant history of NICU stay (neonatal sepsis, respiratory distress syndrome, premature babies).

Methods employed for nutritional assessment are-
Clinical Examination:-to show anemia and vitamin A deficiency
Vitamin A deficiency - presence of

1. Night blindness
2. Bitot's spots or conjunctival xerosis
3. Corneal xerosis

4. Corneal opacity
5. Ulceration and necrosis of cornea (Keratomalacia)

Anemia – Presence of pallor.

Biochemical evaluation: Hemoglobin estimation for Anemia –Hemoglobin level was estimated using venous blood by automated complete blood count analyzer. According to WHO criteria children having hemoglobin concentration <11 g/dl were considered anemic. Anemia was further graded into three groups, mild anemia (Hb 10 to 10.9 g/dl), moderate anemia (Hb7 to 9.9 g/dl), severe anemia (Hb< 7 g/dl).

Analysis of blood sample: The samples were analyzed by using an automated hematologic analyzer.

Anthropometric measurement: Anthropometry is the single most portable, universally applicable, inexpensive and non-invasive method available to access the proportion size and composition of the human body. It is a simple valuable tool and the gold standard for evaluating the nutritional status. The body measurements used in this study are:-

Weight: Weight was recorded to the nearest of 0.1kg. The weighing scale was placed on the flat horizontal surface. The shoes or slippers were removed and child was made to lie on the weighing scale with minimum clothing. The weighing scale was calibrated regularly.

Height/Length: In children less than 2 years old length is measured in place of height. The infantometer was used to measure the length between 0 to 100 cm with a precision of 1 mm . Child was placed supine on the infant measuring board. Head was placed in the Frankfurt plane and fixed with headpiece by one assistant. Other side of the infantmeter which was movable was brought to rest firmly against the child's feet with soles flat on the board and the toes pointing directly upward.

Growth Standards: The WHO growth references and standards. Since the 1970s the WHO has published several version of growth references, recommended for international use to help assess children's growth and nutritional status. Thus far, there are three widely known and used versions. The 2006 WHO growth standards (for preschool children under 6 years of age). The 1978 WHO/NCHS growth references (for children up to the age 10), the WHO growth references (for children and adolescents up to age 19), and), and the 2006 WHO growth standards (for preschool children under 6 years of age).

Statistical analysis: Data entry and statistical analysis was performed with the help of SPSS version 17. Continuous variables were presented as mean and standard error of the mean (SEM), while categorical variables were presented as number and percentage. Chi-square test was used to compare difference in categorical variables and independent t-test for continuous variables between boys and girls. The P value <0.05 was considered significant and P <0.01 was considered highly significant and analysis of the data and Microsoft word has been used to generate graphs, table etc. length for age, weight for age, weight for length were calculated using WHO ANTHRO software and using WHO Reference 2006 values.

Results:

Out of total 370 children included in the study, 53.5% were males and 46.5% were females, and majority (37.25%) of them belonged to 0 to 6 months age group. The prevalence of underweight was 39.73%, stunting 35.68% and wasting 18.10%. Prevalence of pale conjunctive was 30.54% and was more in female child. Prevalence of anemia was 54.6% and was more in male child. Prevalence of conjunctival xerosis was 5.41 %, Bitot's spot was 2.70% and corneal xerosis was 1.89%.Male children were more underweight and stunted then female children where as female children were more wasted than male children.

The present study concludes that, the overall prevalence of anemia in children was 54.6%, of pale conjunctiva was 30.54%, of conjunctival xerosis was 5.41%, of Bitot's spots was 2.70% and of dry cornea was 1.89%

Table No. 1 Distribution of children-age and gender wise.

Age Group	Males		Females		Total	
	Number	%	Number	%	Number	%
0 to 6 months	76	20.5	62	16.75	138	37.25
7 to 12 months	46	12.5	43	11.5	89	24
13 to 18 months	37	10	30	8.25	67	18.25
19 to 24 months	39	10.5	37	10	76	20.5
Total	198	53.5	172	46.5	370	100

In the present study 53.5% children were males and 46.5% were females. Majority of them (37.25%) belonged to 0 to 6 months age group.

Table No. 2 Prevalence of Wasting in children age group 0 to 2 years.

Sl. No.	Wasting (Weight for Length <-2 SD or Z score<-2)	Males) (n=198		Female (n=172)		Total(n =370)	
		Number	%	Numbe	%	Number	%
1	Absent (Wt for length >-2SD)	163	82.32	140	81.40	303	81.89
2	Present (Wt. for length < -2SD)	35	17.68	32	18.60	67	18.10
3	Chi-square test	Values		P Value		Associ ation	
4	Pearson Chi-square	0.0534		0.8171 82		Not signific ant	
5.	Fisher exact test statistic	0.8924 95		>0.05		Not signific ant	

In the present study overall prevalence of wasting was 18.10%. Prevalence of wasting in female children (18.60%) was more compared to male children (17.68%) which was statistically insignificant ($p > 0.05$).

Table No. 3 Prevalence of Underweight in children age group 0 to 2 yrs.

Sl. No.	Underweight (Weight for age <-2SD or Z score <-2)	Males (n=198)		Female (n=172)		Total(n=370)	
		Number	%	Number	%	Number	%
1	Normal (Z score >-2)	114	57.58	109	63.37	223	60.27
2	Underweight (Z score <-2)	84	42.42	63	36.63	147	39.73
3.	Chi-square test	Values		P Value		Association	
4.	Pearson Chi-square	1.2915		0.255779		Not significant	
5.	Fisher exact test statistic	0.2871 57		>0.05		Not significant	

In the present study overall prevalence of underweight was 39.73%. Prevalence of underweight in male chidren (42.42%) was higher as compared to female children (36.63%) which was statistically insignificant ($p > 0.05$).

Table No. 4 Prevalence of Stunting in children age group 0 to 2 years.

Sl. No	Stunting (Length for age <-2 SDor Z Score <-2)	Males (n=198)		Female (n=172)		Total(n=370)	
		Number	%	Number	%	Number	%
1	Normal (Z score >-2)	115	58.08	123	71.51	238	64.3 2
2	Stunted (Z score <-2)	83	41.92	49	28.49	132	35.6 8
3	Chi-square test	Values	P Value	Associati on			

4	Pearson Chi-square	7.2352	0.007149	Significant			
5	Fisher exact test statistics	0.008928	<0.05	Significant			

In the present study overall prevalence of stunting was 35.68%. Prevalence of stunting in male children (41.92%) was higher as compared to female children (28.49%) which was statistically significant (p<0.05).

Table No. 5 Distribution of children according to prevalence of anemia

Sl.No.	Hemoglobin (g/dl)	Males (n=198)		Females (n=172)		Total (n=370)	
		Number	%	Number	%	Number	%
1	11 g/dl [Normal]	86	43.44	82	47.67	168	45.4
2	<11 g/dl[ANEMIC]	112	56.56	90	52.33	202	54.6

In the present study overall prevalnce of anemia was 54.6%. The prevalence of anemia in male child was more (56.56) compared to female (52.33) which ws statistically not significant (p value >0.05).

Table. No. 6 Association between gender and anaemia in study group

	MALES	FEMALES	Marginal Row Totals
NO ANEMIA	86 (89.9) [0.17]	82 (78.1) [0.2]	168
ANEMIA	112 (108.1) [0.14]	90 (93.9) [0.16]	202
Marginal Column Totals	198	172	370 (Grand Total)

The chi-square statistic is 0.6675. The p-value is 0.413908. This result is not significant at p<0 .05.

Table No. 7 Distribution of children according to prevalence of grades of anemia

Sl. No.	Grades of Anemia	Males (n=198)		Female (n=172)		Total (n= 370)	
		Number	%	Number	%	Number	%
1	Mild Hb(g/dl) (10to10.9)	54	27.27	43	25.0	97	26.23
2	Moderate Hb(g/dl) (7 to 9.9)	43	21.72	40	23.26	83	22.43
3	Severe Hb (g/dl) (<7)	11	5.56	11	6.40	22	5.94
4	No Anemia Hb 11 g/dl	90	45.45	78	45.34	168	45.40

In the present study overall prevalence of mild anaemia was 26.23%, moderate anaemia was 22.43% & severe anaema was 5.94%.

Table. No. 8 Association between gender and severity of anemia.

Gender		Haemoglobin				Total
		Severe	Moderate	Mild	No Anaemia	
Male	Count	11	43	54	90	198
	Percent	5.56%	21.72%	27.27%	45.45%	100.0%
Female	Count	11	40	43	78	172
	Percent	6.40%	23.26%	25.0%	45.34%	100.0%
Total	Count	22	83	97	168	370
	Percent	5.94%	22.43%	26.23%	45.40%	100.0%
Chi-square test	Value	Df	P value	Association		
Pearson Chi-square	0.3879	1	0.942733	Not significant		

Prevalence of mild anaemia was more in males (27.27%) than females (25.0%) while prevalence of moderate and severe anaemia in females (23.26%, 6.40%) was more than that in males (21.72%, 5.56%). But the association was not significant (p value >0.05).

Table No. 9 Distribution of children according to conjunctival manifestation

Sl. No.	Conjunctiva	Male (n=198)		Female(n=172)		Total (n=370)	
		Number	%	Number	%	Number	%
1	Normal	128	64.65	109	63.37	237	64.05
2	Pale Conjunctiva	59	29.79	54	31.40	113	30.54
3	Conjunctival Xerosis	11	5.56	9	5.23	20	5.41

The above table shows that Prevalence of pale conjunctiva was more in female (31.40%) compared to male children (29.79%). Overall prevalence of pale conjunctiva was 30.54%. Pale conjunctiva depicts anemia clinically. Presence of other conjunctival abnormality like conjunctival xerosis was 5.41%. The difference was not statistically significant (p >0.05).

Table no. 10 Association between gender and conjunctival manifestations

Results			
	males	females	Row Totals
Normal conjunctiva	128 (126.83) [0.01]	109 (110.17) [0.01]	237
Pale conjunctiva	59 (60.47) [0.04]	54 (52.53) [0.04]	113
Conjunctival xerosis	11 (10.70) [0.01]	9 (9.30) [0.01]	20
Column Totals	198	172	370 (Grand Total)

The chi-square statistic is 0.118. The p-value is .942706. The result is not significant at p< .05.

No association was found between gender and conjunctival manifestations.

Table No. 11 Distribution of children according to Bitot's spots .

Sl.No.	Bitot's spot	Males (n=198)		Female (n=172)		Total (n= 370)	
		Number	%	Number	%	Number	%
1	Absent	192	96.97	168	97.68	360	97.30
2	Present	6	3.03	4	2.32	10	2.70

In the present study Bitot's spot was seen more in male children (3.03%) comaprd to female children (2.32%) and statistically it was found to be insignficant (p > 0.05). The overall prevalnce of Bitot's spot was 2.7%.

Table no. 12 distribution of children with Bitot's spots.

	Males	females	Marginal Row Totals
Normal conjunctiva	192 (192.65) [0]	168 (167.35) [0]	360
Bitot's spots present	6 (5.35) [0.08]	4 (4.65) [0.09]	10
Marginal Column Totals	198	172	370 (Grand Total)

The chi-square statistic is 0.1738. The p-value is 0.676729. This result is not significant at p< .05.

Table No. 13 Distribution of children according to corneal manifestation

Sl.No.	Cornea	Males (n=198)		Female (n=172)		Total(n=370)	
		Number	%	Number	%	Number	%
1	Normal Cornea	194	97.98	169	98.26	367	98.11
2	Corneal Xerosis	4	2.02	3	1.74	7	1.89

In the presnet study 98.11% of chidren had normal cornea. Dry cornea ws seen more in male children (2.02%) compared to female children (1.74%) and statistically it was found to be insignificant (p>0.05).Corneal opacity and corneal ulceration were not found in any child.

Table no. 14 distribution of children with corneal manifestations.

	Males	Females	Marginal Row Totals
Normal cornea	194 (194.25) [0]	169 (168.75) [0]	363
Corneal xerosis	4 (3.75) [0.02]	3 (3.25) [0.02]	7
Marginal Column Totals	198	172	370 (Grand Total)

The chi-square statistic is 0.0378. The p-value is .845886. This result is not significant at p< .05.

Discussion:

In the present study 53.5% of children were males and 46.5% were females. Majority (37.25%) of the children belonged to 0 to 6 months age group. Those children who came for vaccination also attend OPD. Major age group for vaccination is 0 to 6 months of age so, majority of children belong to 0 to 6 months of age.

Anthropometric Nutritional status was assessed by WHO criterion (SD classification and Z score) and also NCHS standard using weight for age, Length for age, weight for length. The result of present study shows the Prevalence of underweight was 39.73%, stunting was 35.68% and wasting was 18.10%. Boys were more malnourished than girls.

According to NFHS – 3, the prevalence of stunting, wasting and underweight were 45% ,23% and 40% respectively whereas according to NFHS – 4 prevalence of stunting, wasting and underweight were 38.5%, 21%, and 35.7% respectively which is comparable to present study.

There has been decrease in the prevalence of under nutrition during the past two decades but still the percentage is high enough to consider malnutrition as a major health problem. This decrease in prevalence of malnutrition can be attributed to 4 major factors such as improved antenatal care, reduction in low birth weight, nutritional supplement provision to children and infection control. Low birth weight is 'underweight at birth'. Antenatal care significantly reduces incidence of low birth weight (Florida prenatal health screen).[5]

Second set of factors are nutritional supplement and infection control. Evidence for this can be traced back to very famous 'Narangwal Study' from Punjab.[5]

Prevalence of stunting has been stagnant during last 15 years. The decrease in stunting is less as compared to underweight and wasting. Stunting is classically defined as chronic under nutrition, which is manifestation of energy deficit diet, namely hunger. Socio economic status is strongly associated with stunting. Childhood stunting may continue in adulthood and girls end up with lesser height gain. These findings can explain sustained high level of stunting in communities where stunted child of today become stunted mothers of tomorrow and give birth to stunted child. This vicious cycle can explain present phenomenon.

Lower prevalence of wasting is observed in present study. It has reduced to half from previous estimates. Lower Socio economic status, Immunized for age and diarrhoea in last 2 weeks increases risk of wasting. Lower socio economic status may be responsible for increased occurrence of diarrhoea in the group. The study by Shakur Ms et al(6), In Bangladesh showed Prevalence of PEM around 51.97% while Deshmukh PR and Dongre AR et al showed the prevalence of underweight and severe underweight for children 0-6 years were 47.4% and 16.9% respectively in their study.

Malnutrition is more common in India than in sub-Saharan Africa. One in every 3 malnourished children in the world lives in India.(7)The average rate of malnourishment for under 3 years in sub-Saharan Africa is 30 percent. India's corresponding rate is 37 percent. Bihar (54 percent), Orissa (54 percent) and Madhya Pradesh (55 percent) report child malnutrition rates higher than the maximum reported in sub-Saharan Africa by Angola (51 percent).[8]

India is the second most populated country in the world. Under-nutrition is highly prevalent in the country with 52% of children under 3 years being under nourished in 1990s. As late as 2006, prevalence of under nutrition was 40% in children under 5 years. At present prevalence of malnutrition is around 30%.[9]

In India the National Family Health Survey-I,II and III reported that both chronic and acute under nutrition was high in many states. Each year 27 million children are born in India. Around 10 percent of them do not survive to 5 years of age. In absolute figures, India contribute to 25 percent of the over 3.2 million under five deaths occurring worldwide every year. Nearly half of the under five deaths occur in Neonatal period. At the national level the mortality rate was estimated at 17 per 1000 under five children and the rate varies from 3.2 in Kerala to 24.3 in Madhya Pradesh. The rate for rural areas is about 19.1 and for urban areas 5.1. The mortality rate in female children is higher than the male children.[10]

The higher prevalence of malnutrition in infancy may be implicated to various factors viz. maternal nutrition, poverty, illiteracy, immunization, lack of exclusive breast feeding, poor weaning practices. After 6 months of age all infants need other food beside mother's milk. Delayed initiation of complementary feeding or inadequate feeding may lead to malnutrition. The mother is the first care giver and first teacher of the child at home hence the level of literacy definitely affects the well being of children and the family.

Suggestions: Detection of malnutrition at early stage so that mild and moderate cases may not progress to severe form of malnutrition.

Provision of safe water supply and proper sanitation.

Providing nutritional education to mothers regarding low cost, highly nutritive food stuffs.

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