Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/jspvaw85

TO STUDY THE SPECTRUM OF VITAMIN A DEFICIENCY IN PAEDIATRICS PATIENTS IN TERTIARY HEALTH CARE CENTRE.

Dr. Monika Mahilong[1], Dr. Deepak Kumar Tandon[2*], Dr. Pankaj Goyal[3]

[1]Associate Professor, Department of Ophthalmology, Indira Gandhi Memorial Medical College, Uttar Bastar Kanker, Chhattisgarh
[2]Assistant professor, Department of Pediatrics, Abhishek I Mishra Memorial Medical College and Research (AIMMMCR), Durg, Chhattisgarh
[3]Senior Resident, Department of Pediatrics Surgery, SMS Medical College, Jaipur

[*]**Corresponding Author:** Dr. Deepak Kumar Tandon
[*2]Assistant professor, Department of Pediatrics, Abhishek I Mishra Memorial Medical College and Research (AIMMMCR), Durg, Chhattisgarh

ABSTRACT

Background- Vitamin A deficiency disorder spectrum had the unique distinction of being one of the most important causes of 'Preventable Blindness' the world over, and Xerophthalmia still remains a problem in the developing countries. Aim of our study to study the spectrum of vitamin-A Deficiency in paediatrics patients in tertiary health care centre.

Methods and materials- This is a cross-sectional observational study conducted by the Department of ophthalmology and paediatrics at Indira Gandhi Memorial Medical College, Chhattisgarh. All the children between 12-59 months of age seeking medical attention or routine immunisation were included for a period of 2 year from August 2022-24. Children with prior vaccination outside Chhattisgarh, Children who were already part of previous study and Children whose parents/guardian were not willing to participate were excluded. A total of 400 children were included in this study.

Results: Vitamin A deficiency signs was noted in 2 (0.5%) children belonging to 24-35 months age group. Vitamin A supplementation with 1 dose in last 6 months was received by only 134 (33.5%) children, indicating very low VAS coverage. 28 (7%) children were having moderate wasting while 3 (1%) children were having severe wasting. 21 (5%) children were having moderate stunting and 2 (0.5%) were having severe stunting. No children received full 9 doses of vitamin a. Reason for partial or no VAS coverage in majority (56.5%) cases was unawareness about 9 doses of vitamin A supplementation as well as its importance.

Conclusion- Vitamin A supplementation (VAS) is one of the most cost-effective interventions for reducing childhood mortality, and improving vitamin A status is associated with a significant reduction in all cause childhood mortality. Similarly, in our study, we found that VAS significantly reduces the episodes of major and minor illness in under 5 children and a significant proportion of children with wasting had not receive VAS appropriately.

Keywords- wasting, stunting, Vitamin A supplementation, deficiency, immunization.

INTRODUCTION:

Vitamin A is an important micronutrient for maintaining normal growth, regulating cellular proliferation and differentiation, controlling development, and maintaining visual and reproductive functions[1]. An estimated 2.8 million preschool-age children are at a risk of blindness from Vitamin A Deficiency and the health and survival of 251 million others are seriously compromised[2].Vitamin A deficiency disorder spectrum had the unique distinction of being one of the most important causes of 'Preventable Blindness' the world over, and Xerophthalmia still remains a problem in the developing countries[3].The overall prevalence of Vitamin A Deficiency (VAD) in India is up to 6% and in some backward pockets it is up to 12%[4].However, Biochemical (Sub-Clinical) Deficiency continues to be more common in our country[4].

Vitamin A prophylaxis programme was started in 1970 and was integrated with immunization programme in 1992. It is warranted if the prevalence of VAD is above 0.5%[4].

In India, however the coverage of vitamin supplementation (VAS) for children aged 12-59 months was low at 20.2% for one dose in 6 months according to National Family and Health Survey (NFHS) III (2005-2006)[5] and there are wide variations in coverage among different states of India. For Chhattisgarh coverage of VAS for children aged 12-59 months had 17% for one dose in last 6 months according to NFHS III (2005-2006)[5] study data. There are very few studies showing VAS coverage in Chhattisgarh.

Aims- to study the spectrum of vitamin-A Deficiency in paediatrics patients in tertiary health care centre**.**

METHODS & MATERIALS

This is a cross-sectional observational study conducted by the Department of ophthalmology and paediatrics at Indira Gandhi Memorial Medical College, Chhattisgarh. All the children between 12-59 months of age seeking medical attention or routine immunisation were included for a period of 2 year from August 2022-24. Children with prior vaccination outside Chhattisgarh, Children who were already part of previous study and Children whose parents/guardian were not willing to participate were excluded.

A total of 400 children were included in this study. The parents were interviewed to elicit the details of their children like present complaints, history of past minor illness, treated on OPD basis and major illness requiring hospitalisation in last 1 year, symptoms of vitamin A deficiency, dietary history to assess the nutrition status and vaccination history including vitamin A supplementation status using a self-administered pretested questionnaire. If child had not received any dose or full dose of vitamin A then reason for incomplete coverage was also asked from the parents.

The clinical examination was done by the investigator to collect data on anthropometry, general physical examination, head to toe examination for vitamin A deficiency signs and systemic examination, to arrive at an appropriate diagnosis. Then child's weight for height (W/H) and height for age (H/A) was compared with WHO growth charts (figure 16) for under 5 children and nutritional status was interpreted based on z score. Their nutritional status was assessed as per following WHO criteria–

Table 1:

Malnutrition	W/H (wasting)	H/A (stunting)
No	>-2 z score	>-2 z score
Moderate	-2 to -3 z score	-2 to -3 z score
Severe	<-3 z score	<-3 z score

The child was managed as per the diagnosis. Those children who had received last dose of vitamin A, 6 months back were given 2 lakhs International Unit of vitamin A. The parents/guardians were counselled about vitamin A supplementation schedule and its importance.

Statistical methods:
Descriptive statistical analysis was carried out in the present study. Frequency Analysis or Crosstab Technique was used for most of the tables. Fisher Exact test was used to find the significance of study parameters on categorical scale between two or more groups. SPSS (Statistical Package for Social Sciences) version 20.0, was used for the analysis of the data, frequencies, standard deviation.

RESULTS:
Of 400 sample taken, about 39.3% belongs to the age group 12-23 months, 19.5% belongs to the group 24-35 months, 18.5% belongs to 36-47 months and 22.8% of the sample belongs the age group 48-56 months. The average age had 29.18 months with standard deviation 15.23 and the range had 12-59 months. 51.5% of children were male and 48.5% were female.

We found 92.3% of children had no wasting, 7.0% had moderate wasting and only 0.8% had severe wasting. In group A, 89.8% had no wasting, 8.9% had moderate wasting and only 1.3% had severe wasting. In group B, 93.6% had no wasting, 5.1% had moderate wasting and only 1.3% had severe wasting. In group C, 94.6% had no wasting, 5.4% had moderate wasting and none of the children had severe wasting. In group D, 93.4% had no wasting, 6.6% had moderate wasting and none of the children had severe wasting. About 94.3% of patients had no stunting, 5.3% had moderate stunting and only 0.5% had severe stunting.

We also found majority (99.5%) of children had no vitamin A deficiency and only 0.5% had vitamin A deficiency. No signs of vitamin A deficiency was seen in children from group A, group C and group D. In group B, about 97.4% of the children had no vitamin A deficiency and only 2.6% had vitamin A deficiency.

Of 400 samples, 34.3% of children had no major illness in last year. About 46.0% of the cases had one major illness in last year, 18.8% had two and 1.0% had three episodes of major illness in last one year. In group A, 45.9% had one major illness, 21.7% had two and 1.9% had three major illnesses in last year. In group B, 53.8% had one and 12.8% had two major illnesses in last year. In group C, 44.6% had one and 21.6% had two major illnesses in last year. In group D, 40.7% had one major illness, 16.5% had two and 1.1% had three episodes of major illness in last year.

Of 400 samples, 16.8% of children had no minor illness in last year. About 21.5% of the cases had one minor illness, 24.5% had two minor illness, 28.0% had three minor illness, 8.5% had four minor illness and 0.8% had five minor illness in last one year.
We found 11.8% of children had not received vitamin A. About 78.5% of children had received 1-2 doses, 6.8% had received 3-4 doses, 3.0% had received 5-7 doses and not a single child had received full 9 doses of vitamin A. In group A, 80.9% of the children had received 1-2 doses. In group B, 71.8% had received 1-2 doses and 21.8% had received 3-4 doses. In group C, 74.3% had received 1-2 doses, 5.4% had received 3-4 doses and 10.8% had received 5-7 doses. In group D, 83.5% had received 1-2 doses, 6.6% had received 3-4 doses and 4.4% had received 5-7 doses.

Table 2: Relationship between Vitamin A Supplementation and Grades of Wasting -

Grades of Wasting	Vitamin A Supplementation			Total
	No Coverage	Partial Coverage	Full Coverage	
No	34 (72.3%)	218 (94.0%)	117 (96.7%)	369 (92.3%)
Moderate	11 (23.4%)	13 (5.6%)	4 (3.3%)	28 (7.0%)
Severe	2 (4.3%)	1 (0.4%)	0 (0.0%)	3 (0.8%)
Total	47 (100.0%)	232 (100.0%)	121 (100.0%)	400 (100.0%)

p-value = 0.000

This table shows the relationship between vitamin A supplementation and grades of wasting. Here the p-value is less than the significance level 0.001; the relationship between vitamin A supplementation and grades of wasting is significant. The table reveals that the moderate and severe malnutrition is significantly high in no coverage (23.4% and 4.3%) compared to partial coverage (5.6% and 0.4%) and full coverage (3.3% and 0.0%).
The relationship between vitamin A supplementation and grades of stunting is not significant

Table 3: Relationship between Vitamin A Supplementation and Frequency of Major Illness -

Major illness in last year	Vitamin A Supplementation			Total
	No Coverage	Partial Coverage	Full Coverage	
0	2 (4.3%)	75 (32.3%)	60 (49.6%)	137 (34.3%)
1	13 (27.7%)	116 (50.0%)	55 (45.5%)	184 (46.0%)
2	29 (61.7%)	40 (17.2%)	6 (5.0%)	75 (18.8%)
3	3 (6.4%)	1 (0.4%)	0 (0.0%)	4 (1.0%)
Total	47 (100.0%)	232 (100.0%)	121 (100.0%)	400 (100.0%)

P-value = 0.000

This table shows the relationship between vitamin A supplementation and frequency of major illness. Here the p-value is less than the significance level 0.05; the relationship between vitamin A supplementation and major illness is significant. The table reveals that the presence of major illness is significantly high in no coverage (95.7%) compared to partial coverage (67.7%) and full coverage (50.4%).

Figure 1: Relationship between Vitamin A Supplementation and Frequency of Major Illness –

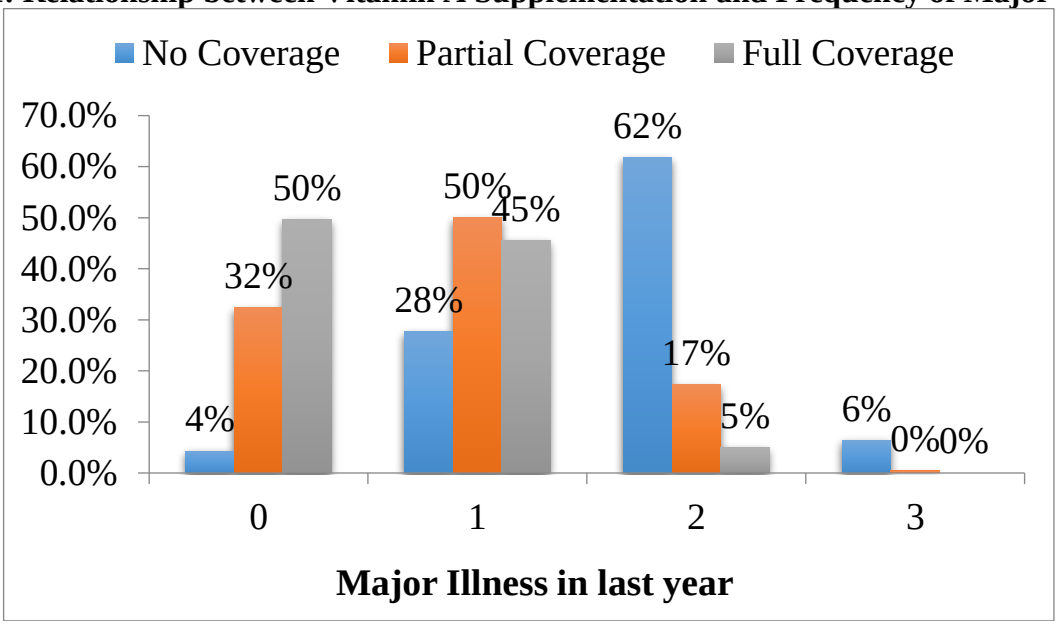
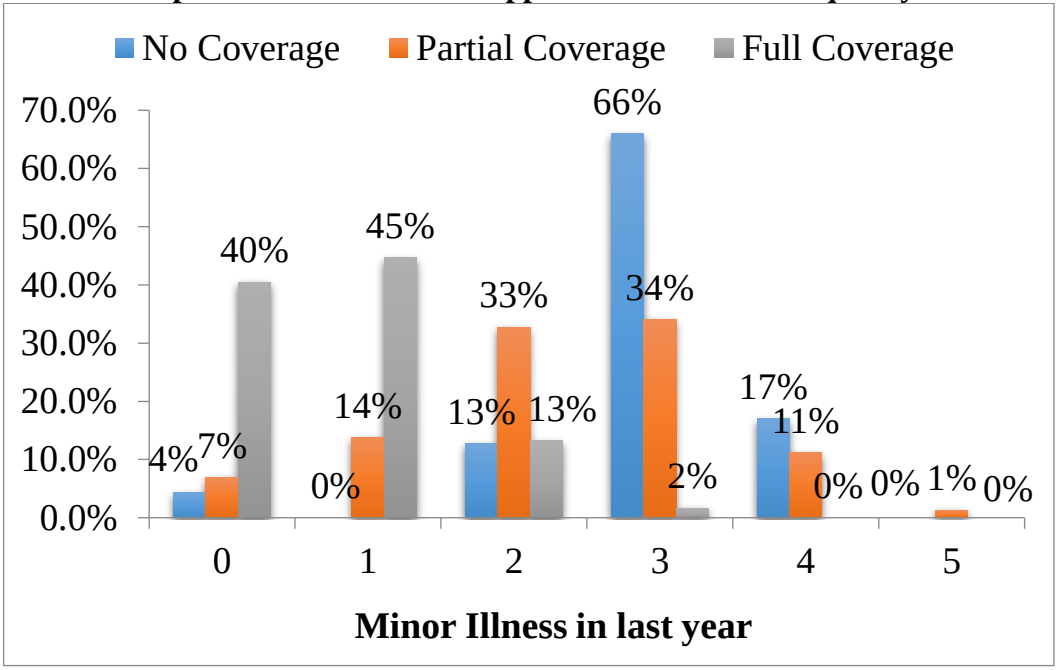


Table 4: Relationship between Vitamin A Supplementation and Frequency of Minor Illness –

Minor illness in last year	Vitamin A Supplementation			Total
	No Coverage	Partial Coverage	Full Coverage	
0	2 (4.3%)	16 (6.9%)	49 (40.5%)	67 (16.8%)
1	0 (0.0%)	32 (13.8%)	54 (44.6%)	86 (21.5%)
2	6 (12.8%)	76 (32.8%)	16 (13.2%)	98 (24.5%)
3	31 (66.0%)	79 (34.1%)	2 (1.7%)	112 (28.0%)
4	8 (17.0%)	26 (11.2%)	0 (0.0%)	34 (8.5%)
5	0 (0.0%)	3 (1.3%)	0 (0.0%)	3 (0.8%)
Total	47 (100.0%)	232 (100.0%)	121 (100.0%)	400 (100.0%)

This table shows the relationship between vitamin A supplementation and frequency of minor illness. Here the p-value is less than the significance level 0.05; the relationship between vitamin A supplementation and minor illness is significant. The table reveals that the presence of minor illness is significantly high in no coverage (95.7%) and partial coverage (93.1%) compared to full coverage (59.5%).

Figure 2: Relationship between Vitamin A Supplementation and Frequency of Minor Illness –



DISCUSSION:

The present study included 400 children aged 12-59 months of Chhattisgarh attending a tertiary care hospital in Kanker, which caters primarily to the population of Chhattisgarh, which is the most densely populated district of state of Chhattisgarh. The children were divided into 4 groups based on their age-

Group A – 12-23 months,
Group B – 24-35 months,
Group C – 36-47 months,
Group D – 48-59 months,

The mean age had 29.18 months with Standard Deviation (SD) of 15.23 months. In 43 trials of VAS included in a Cochrane systematic review 2010, the mean age had 30.5 months[6].

Nutritional status of our children:

In our study, we found that **7.8%** children aged 12-59 months were suffering from wasting, out of which 0.8% suffered from severe wasting and 7% suffered from moderate wasting which is comparable to NFHS-III data of Chhattisgarh[5], which showed that, **11.8%** of 12-59 months aged children are suffering from wasting. Out of 11.8% children, 2.9% were severely wasted while 8.9% were moderately wasted. But it is quite lower than India's percentage of wasting in under 5 aged children as per UNICEF data of 2014, i.e 20%[8].

Table- 5 Comparison of our data of stunting with NFHS-III (2005-06) data[5] –

Age-group (in months)	Height for Age (Indicator of Stunting)			
	Severe (below -3 z score)		Moderate (between -2 to -3 z score)	
	Our data	NFHS-III	Our data	NFHS-III
12-23	0.6%	17.2%	4.5%	36.6%
24-35	0%	19.4%	5.1%	41.3%
36-47	0%	18.4%	5.4%	46.9%
48-59	1.1%	23.9%	6.6%	46.0%
Total	**0.5%**	**19.7%**	**5.3%**	**42.7%**

In our study, we found that 5.8% children aged 12-59 months of Chhattisgarh were stunted, out of which, 0.5% children were severely stunted while 5.3% children were moderately stunted which had quite lower than the NFHS-III data of Chhattisgarh[5], according to which 62.4% children were stunted, 19.7% children were severely stunted while 42.7% were moderately stunted. Our data had also lower than the UNICEF's (2014) data of stunting for India that is 48%[8].

This discrepancy in our data and NFHS/UNICEF data might be accounted by the fact that the hospital in which the study had done is a private hospital, hence it caters to children of higher socioeconomic status and hence, better nutritional status.

Vitamin A Supplementation status:

Out of 400 children, it had observed that only 33.5% children had received a dose of vitamin A in last 6 months, whereas a study by Semba using NFHS III (2005-06) data showed that VAS coverage of Chhattisgarh achieved had 17% while overall coverage of India had 20.2%[5].

The VAS coverage of 70% with one dose of vitamin A in the past 6 months, among 6-59 months old children is required in order to achieve a significant reduction in U5MR[79]. Hence, this data reveals that there is still a large lacuna in VAS, to the target population.

Table 6: Comparison of our VAS data with NFHS III (2005-06) data[5] –

Age groups	Percentage of children received one dose of VAS in last 6 months		
	Our data	Chhattisgarh	India
12-23 months	60.5%	25.7%	41.4%
24-35 months	21.8%	22.5%	Not available
36-47 months	16.2%	14.5%	16.4%
48-59 months	11%	11.3%	9.4%

Similar to most of the studies on VAS coverage in India, this study showed decrease in VAS coverage with age. The higher VAS coverage of 33.5% seen in our study as compared to 17% of the state of Chhattisgarh, can be explained by the fact that district of Chhattisgarh had a higher literacy rate and better socio-economic indicators as compared to the other districts of Chhattisgarh, hence, there is better utilization of health services. Still, it had seen in our study, that only 30.3% children had

received adequate doses of VAS as per the age and 11.8% of our children had not receive even a single dose of VAS. Therefore, it can be concluded that there is a poor implementation of Vitamin A Prophylaxis Program, with poor utilization and inadequate timing & continuity of this program in almost all the states of India due to poor organizational quality, social unaccountability and lack of awareness of this program.

In our study, 56.5% children did not receive adequate VAS because of unawareness of care taker about VAS program while 63% children didn't receive due to unavailability of vitamin A at the time of contact with the health center and another 7% remain deprived of adequate VAS because of improper knowledge and wrong belief about VAS.

Vitamin A Deficiency (VAD):

In our study, only 2 (0.5%) children had clinical signs of VAD out of 400 children examined for VAD signs which is similar to our finding of very low proportion of our children having malnutrition. While, according to a study[9] done in 2007, out of 208,379 (with median = 1094 and IQR = 283.0 - 8978.0) pre-school aged children of rural India screened for Vitamin A deficiency disorders, 12,510 (with median= 80 and IQR = 36.5 - 201.0) children were found to be suffering from clinical vitamin A deficiency. With this background information, median prevalence of vitamin A deficiency disorders in Indian preschool-age children had determined to be **7.0%** and inter-quartile range (IQR) = 3.3-9.3%. This implies that there were ~1.7 million vitamin A-deficient preschool-age children[9].

Relationship of VAS with malnutrition:

Our results revealed that wasting (moderate and severe) is significantly high (p-value = 0.00) in children having no VAS coverage as compared to children with partial or full VAS coverage. Whereas stunting had no significant relation (p-value = 0.107) with VAS coverage.

This can be explained by the fact that these children with wasting and stunting might not had received adequate doses of vitamin A because of unawareness about the VAS program or unaffordability, presumably because of the fact that caretakers of these children were from poor socioeconomic status and not well educated.

A study done in Bangladesh, had in contrast to our finding, that study found a significant relationship in between VAS and stunting whereas no relationship had been found in VAS and wasting[10].

Relationship of VAS with morbidity:

We found that relationship between VAS coverage and morbidity (measured in terms of episodes of major and minor illness) had significant as the P-value had 0.00 which had less than the significance level of 0.005. Hence, it can be concluded that children with partial or full coverage had lesser number of episodes of major as well as minor illness. This is similar to various studies which had shown that VAS decreases the incidence as well as the severity of diarrheal and lower respiratory tract infection infections, especially in malnourished children.

VAS is one of the most cost-effective interventions for reducing childhood mortality and improving VAS status is associated with 24% reduction in all cause childhood mortality[7]. Our study had a hospital-based study conducted in a Private Tertiary Care Hospital catering to children of Chhattisgarh mostly, hence, it is expected that caretaker of these children is concerned about the health of their children, but still in our study VAS coverage is very low. Therefore, it is quite obvious that in backward pockets of the state of Chhattisgarh, VAS coverage must be lower than our data. This reflects, that our Vitamin A Prophylaxis Program is not adequately covering the target population. Hence, there is a need to undertake comprehensive and well-designed national representative studies in rural, urban and slum settings of India, to estimate both clinical and biochemical vitamin A status as well as diet surveys to assess dietary pattern of vitamin A.

Limitations:

1. This study had done in Chhattisgarh population, where well equipped health facilities are available for immunisation but other districts of Chhattisgarh are not having sufficient health facilities. Thus, our findings are not applicable for other districts of Chhattisgarh.
2. Parents were interviewed regarding number of episodes of minor/major illness in last year as well as number of doses of vitamin A received and the associated recall bias cannot be ruled out despite the relatively short interval of recall.
3. We recorded only those episodes of illness that brought the patient to health facility but there is a possibility that many episodes of minor illness goes unnoticed/untreated.
4. In our study we had not taken socioeconomic status, to compare it with malnutrition and VAS.

Recommendations:

1. Vitamin A deficiency should be given more importance and the parents should be advised regarding vitamin A rich foods.
2. As the major cause of poor VAS coverage had found to be unawareness about vitamin A schedule, so, whenever the parents are coming for routine immunisations or for routine check-up they should be counselled regarding VAS.
3. Vitamin A supplementation should be done in capsule form as chances of contamination as well as improper dosage are less.

CONCLUSION:

Vitamin A supplementation (VAS) is one of the most cost-effective interventions for reducing childhood mortality, and improving vitamin A status is associated with a significant reduction in all cause childhood mortality. Similarly, in our study, we found that VAS significantly reduces the episodes of major and minor illness in under 5 children and a significant proportion of children with wasting had not receive VAS appropriately.

In this study it had observed that Vitamin A supplementation coverage in under 5 aged children of Chhattisgarh, with 1 dose of vitamin A in last 6 months, had 33.5%, which indicates low VAS coverage in Chhattisgarh and Vitamin A supplementation coverage decreases with increasing age.

REFERENCES:

1. **Zile MH**. Vitamin A Deficiencies and Excess. In. Kliegman R, Stanton B, Geme J, Schor N, Behrman R, editors, Nelson Textbook of Pediatrics, 19th ed. Vol.1. New Delhi: Elsevier; 2012. p. 188-190.
2. Indicators for assessing vitamin A deficiency and their application in monitoring and evaluating intervention programmes. **World Health Organization**: Nutrition Report 1996;p. 1-3.
3. **Arlappa N, Laxmaiah A, Balakrishna N, Harikumar K, Brahmam GN.** Prevalence of clinical and sub-clinical vitamin A deficiency among rural preschool children of West Bengal, India. Indian pediatr. 2010;48:47-9.
4. Human vitamin and mineral requirements. **World Health Organization/Food and Agriculture Organization** of the United Nations: WHO Press. 2002:22-8.
5. **NFHS-III (2005-2006)** National Family Health Survey India. International Institute of Population Sciences (IIPS) and Macro International. Mumbai: 2007;1:292.
6. **Jones, Gareth**. How Many Child Deaths can we prevent this Year? The Lancet. 2003 July;362:65-71.
7. **Imdad A.** Vitamin A supplementation for preventing morbidity and mortality in children from 6 months to 5 years of age. Cochrane Database of Systemic Reviews. 2010;12:CD008524.
8. Focus on Nutrition. The State of the World's Children, **United Nations Children's Fund**. 1998:91.
9. **Pal R.** Vitamin A deficiency in Indian rural preschool-aged children. Ann. Trop. Med. Public Health. 2009;2:11-4.

10. **Semba RD, Pee S, Sun K, Akhter N, Bloem M**. Coverage of Vitamin A Capsule Programme in Bangladesh and Risk Factors Associated with Non-receipt of Vitamin A. Health Popul. Nutr. 2010 Apr;28(2):143-148.