IDRC PROJECT ON

EFFECT OF DEWORMING AND VITAMIN A ADMINISTRATION ON SERUM VITAMIN A LEVELS IN PRESCHOOL CHILDREN

VINODINI REDDY
K. VIJAYARAGHAVAN
KEWAL KUMAR MATHUR

R E P O R T

NATIONAL INSTITUTE OF NUTRITION
Indian Council of Medical Research
Jamai-Osmania P.O., Hyderabad-500007

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Vitamin A deficiency is a problem of public health magnitude in several developing countries, contributing as it does to irreversible blindness among preschool children. Primary dietary deficiency is, perhaps, the most important cause for the deficiency of the vitamin. The most rational method to control and prevent vitamin A deficiency is, therefore, to ensure that the habitual diets of children contain adequate amounts of the vitamin. This calls for extensive and continuous efforts in the field of education and rural development and can take a long time. In view of the seriousness of the problem of blindness due to vitamin A deficiency, based upon community studies, the National Institute of Nutrition, Hyderabad recommended that as a short term measure a massive oral dose of vitamin A (200,000 IU) be administered once in six months to children between the ages of 1 and 5 years, to control blindness arising from vitamin A deficiency[1,2]. Such a programme was initiated in India on a national scale in 1970. It is now in operation in almost all the States in the country covering about 25 million out of about 100 million preschool children. Similar programme is in operation in Bangla Desh and Indonesia. Evaluation of this programme has generally shown that the prevalence of ocular signs of vitamin A deficiency such as Bitot spots came down in areas where the programme has been implemented effectively[3]. Recent studies have shown that this programme can bring about significant reduction in Keratomalacia also.[4]

In many areas where vitamin A deficiency is widespread, intestinal parasitism, particularly ascariasis, is also widespread. Clinical studies have shown that absorption of vitamin A is impaired in children suffering from ascariasis[5]. It has been suggested that in areas where ascaris infestation is common, periodic deworming of children may be necessary for the maximal absorption of vitamin A.

A study was, therefore, undertaken to determine whether deworming would augment the beneficial effects of massive dose of vitamin A.

General objectives

To determine the relationship between ascariasis and vitamin A deficiency and to assess whether deworming will augment the beneficial effects of massive dose vitamin A programme.

Specific objectives

1. To compare vitamin A status of children with and without ascariasis.
2. To determine serum vitamin A levels in children following the massive dose of vitamin A.
3. To determine whether serum vitamin A is maintained at higher levels, if children are dewormed prior to the administration of vitamin A.

MATERIALS AND METHODS

Selection of Study area

The study area was initially selected in the rural area near Hyderabad. But a preliminary survey showed that the incidence of ascariasis was as low as 2.6% and hence the area was abandoned.

Subsequently three slums in Hyderabad were selected. Examination of random stool samples from preschool children showed that the prevalence of ascariasis was high. Jhanuma slum which had the highest prevalence was selected for the study.

Study area

Jhanuma slum is situated at the foot hill of Falaknama Palace in old Hyderabad city, about 15 kms. from the National Institute of Nutrition. The

slum is an aggregation of thatched huts, small brick walled, tiled/tin roofed houses, huddled together with small lanes and bylanes separating them. The total population of the slum was about 17,000. A part of the slum was situated in a low lying area, a dried up pond, with marshy areas scattered between the houses; and a part of it had pucca houses which were once the stables, gifted to the soldiers of the former Nizam and their descendents. Proper drainage facilities were lacking in a majority of the houses. A few public taps were present. Since there were no proper facilities for disposal of wastes, the surroundings were often unclean and insanitary.

It was mostly inhabited by Muslims, belonging to low socio-economic strata who were dependent either on rickshaw pulling or casual labour and some had clerical jobs. A 'purdah' system prevailed in the area wherein the ladies refrain from moving out of their houses, and if at all they have to, they do it wearing a black gown from head to toe covering even the face. Their young children are not allowed to move out either and are often seen urinating, defaecating and playing in small open spaces in or around their houses. The personal hygiene was rather poor.

Baseline survey

A door to door survey was conducted and preschool children in the age group of 1-5 years were enumerated. Five hundred and seventeen children were enumerated of which four hundred and eighty seven children were registered for the study. The rest were left out, since their parents did not want to participate in the study.

A baseline survey was conducted to asses their nutritional status. The following investigations were carried out:

1. Nutritional anthropometry - height and weight were recorded using standardized methods and equipment[6].
2. Clinical examination was conducted and signs of vitamin A deficiency, B-complex deficiency, anaemia and PEM were recorded.
3. Morbidity - during the preceding one month was recorded with an emphasis on measles.
4. Finger prick blood samples were collected in heparinized tubes and brought to the National Institute of Nutrition where serum was separated and vitamin A level estimated by microfluorometric method[7].
5. Fresh samples of stools were collected in special boxes and brought to the Institute for microscopic examination. Ascaris ova and other parasites were detected by concentration method[8].

After the baseline survey, the children were assigned, randomly, into four groups, matched for age, anthropometry, serum vitamin A and worm infestation and the following treatments were given:

Group A - Oral administration of L-tetramisole (50 mg) followed three days later by a massive dose of 200,000 IU of oral vitamin A.

Group B - Massive dose of vitamin A of 200,000 IU orally.

Group C - L-tetramisole (50 mg) orally.

Group D - Placebo.

Repeat survey

After 6 months and 12 months, heights and weights were measured, clinical status was assessed and morbidity for the preceding one month was recorded. Finger prick blood samples were collected and serum vitamin A levels were estimated; stool samples were examined for the presence of ascaris ova and other parasites. The treatments were repeated.

Results

Baseline survey:

Anthropometry - The mean heights and weights are presented in Table 1 and are compared with those of earlier studies carried out in and around Hyderabad[9-11]. These children appeared to be better off.

When the distribution of body weights according to Gomez classification[12] was examined, only about 14% had weights less than 75% of the standard (Table 2), as compared to about 50% reported earlier.

Deficiency signs:

Table 3 shows the percent prevalence of different deficiency signs. While no frank cases of kwashiorkor were encountered during the study, 6.7% of the children exhibited one or more signs of Protein Energy Malnutrition (PEM). In view of the known investigator bias with respect to Conj..xerosis, only Bitot spots were considered as objective signs of vitamin A deficiency. Only 0.4% of the children manifested Bitot spots, a figure much lower than reported earlier, either among rural communities or slum children. About 7% of the children had signs of B-complex deficiency (Angular stomatitis and Chelosis).

Parasitic infestation:

The incidence of ascariasis and giardiasis was high in the areas studied. Among the 451 stool samples examined, 40% had ascaris ova, 32% giardiasis, 9% Entamoeba histolytica, 1% E.Vermicularis, 1% Tape Worm (Table 4).

Serum vitamin A:

The mean serum vitamin A level was 19.2/ug/dl. The distribution of serum vitamin A levels, however, indicated that about 13% had deficient levels, another 45% had

low levels. About a little less than 40% had normal serum levels (Table 5).

Relationship between ascariasis and serum vitamin A levels:

Apparently, there were no differences in serum vitamin A levels between children with and without ascariasis. The mean serum vitamin A levels in children with ascariasis was 19.1±8.45/ug whereas in children without ascariasis it was 18.0±7.11/ug. These differences were not statistically significant (Table 6).

Relationship between ascariasis and malnutrition:

A significant correlation (P/0.01) was found between ascaris infestation and weights of children (Table 7). The children with ascariasis were lighter than those without.

Effect of Deworming:

The prevalence of ascariasis which was a little over 30% initially showed a considerable decline both at the end of six months (17.9%) and 12 months (10.5 and 11.1%) in groups A and C, which received L-tetramisole. In the remaining groups, there was practically no change (Table 8).

Serum vitamin A levels:

At the end of six months, there was significant rise in serum vitamin A levels in all the groups and the rise was about twice in vitamin A treated groups (A or B) as compared to non-vitamin A groups (C and D) (Table 9). There was no further improvement in serum vitamin A levels at the end of 12 months in any of the groups. There was no difference in serum vitamin A levels of children in group A and B indicating that deworming did not augment the beneficial effect of massive dose of vitamin A. Similarly, simple deworming did not improve vitamin A nutritional status as compared to placebo. The annual

increment in serum vitamin A in ascariasis positive group was about 63-67% of that of ascariasis negative group in both vitamin A treated and not treated groups, though the differences were not statistically significant. In other words, the raise in serum vitamin A during the year in ascariasis positive group was about 33% less than that of ascariasis negative group.

Discussion

The results of the baseline study indicated that there was no association between ascariasis and serum vitamin A levels. This may not be surprising in view of the fact that the actual amount of vitamin A lost as a result of the worm ingesting may be too small. This would only mean that at the community level, atleast, the role of ascariasis in vitamin A deficiency is very limited. The massive dose of vitamin A brought about a significant rise in serum vitamin A levels, confirming the earlier findings. However, there were no differences in serum vitamin A levels between the two groups with and without deworming. It is also interesting to note that though L-tetramisole reduced significantly the incidence of ascariasis, there were no differences in the serum vitamin A levels between the group which received anthelminthic treatment and the placebo group. Thus deworming per se does not seem to improve vitamin A nutritional status. These results indicate that mass deworming, prior to administration of massive dose of vitamin A as a public health measure may not be warranted. Reports are, however, available to show that proper utilization of vitamin A could be demonstrated after exhaustive treatment of the parasitoses[13]. In the present study exhaustive treatment of parasitoses was not attempted. That worm load or deworming did not have any effect on the pre dose levels of vitamin A or after massive dose suggests that deworming is not necessary as a supportive measure for massive dose vitamin A programme. However, the necessity of deworming for the purpose of improving the nutritional status has to be considered

separately. But keeping the costs and personnel required, it is doubtful whether, for improving vitamin A nutritional status, deworming should be taken on a large scale.

During the study period, there was significant rise in serum vitamin A levels even in the placebo group. The reasons for such a rise are not clear. One of the reasons for this may be the utilization of the available medical services in these urban slum areas. No history of increased consumption of multivitamin tonics could, however, be obtained during a house to house survey.

Controversial reports are available wherein periodic deworming is linked to malnutrition. Gupta et al (1977)[14] showed that periodic deworming had a beneficial effect on the nutritional status of the child. Shah et al (1975)[15] and a study from National Institute of Nutrition[16] have shown that periodic deworming did not have a beneficial effect. In the present study, significant relationship was found between ascariasis and malnutrition. Though the stool positivity rates for ascariasis came down significantly, eradication of worms was not possible owing to the constant re-exposure. No comment can be made on the effect of periodic deworming on the nutritional status of the children as deworming was done only once in 6 months, allowing sufficient time for the ova to grow into adults, whereas in other studies deworming was done once in 1-3 months.

The magnitude of the problem of ascariasis was observed to be more in the urban slums than in the rural villages. Some of the factors responsible for the increased incidence in the slums may be

a) unhygienic surrounding
b) absence of open spaces around
c) the same space being utilized for defaecating and playing by children
d) crowded living.

Table-1

MEAN INCREMENTS IN AND HEIGHT AND WEIGHT OF CHILDREN IN VARIOUS GROUPS

Group	N	HEIGHT (cms)			WEIGHT (kgs)		
		Initial	Final	Annual increment	Initial	Final	Annual increment
A	126	83.38±9.87	93.02±8.67	7.79±2.56	10.82±2.21	12.53±2.19	1.71±7.90
B	122	85.12±10.67	93.02±9.89	7.90±2.36	10.75±2.23	12.56±2.44	1.80±1.26
C	90	85.55±9.71	93.60±8.94	8.05±2.56	10.70±2.44	12.69±2.17	1.9±0.78
D	83	85.35±10.50	92.93±9.55	7.52±2.04	10.82±2.09	12.45±2.16	1.61±1.17

Table-2

GOMEZ CLASSIFICATION OF INITIAL WEIGHTS OF CHILDREN

Nutritional Grade	%
Normal	36.8
Grade I	49.6
Grade II	11.9
Grade III	1.7
N	421

Table-3

MORBIDITY AND SIGNS OF DEFICIENCY (%) IN DIFFERENT GROUPS

Deficiency/ Morbidity		Group A n=126		Group B n=122		Group C n=90		Group D n=80	
		Initial	Final	Initial	Final	Initial	Final	Initial	Final
PEM	Moon Face	-	0.8	-	3.3	2.2	2.2	-	-
	Emaciation	4.8	-	8.2	8.2	5.6	5.6	6.2	5
B-complex deficiency	Angular stomatitis	5.6	6.3	4.9	4.1	5.6	12.2	6.2	11.2
	Glossitis	-	1.6	3.3	7.4	-	4.4	5.0	5
Vitamin A deficiency signs	Bitot spots	0.8	-	-	0.8	1.1	1.1	-	-
Morbidity	Measles	-	0.8	2.5	1.6	1.1	3.3	-	3.8
	Res. Inf.	0.8	1.6	2.5	0.8	3.3	6.7	-	6.2
	Diarrhoea	-	0.8	-	-	-	1.1	-	1.2

Table-4

PREVALENCE OF PARASITES IN THE STOOLS OF PRE-SCHOOL CHILDREN IN THE BASELINE SURVEY

Total No.of stool samples	451	
	n	%
Ascariasis ova	180	40
Giardiasis	144	9
Entamoeba Histolytica	40	9
Enterobias vermicularis	4	1
Tape worm	4	1

Table-5

DISTRIBUTION OF INITIAL SERUM VITAMIN A LEVELS OF CHILDREN

Serum Vitamin A/ug/dl	%
Below 10 (deficient)	12.8
10-19 (low)	45.0
20-49 (normal)	38.7
> 50 (high)	3.0
N	360

Table-6

PERCENT DISTRIBUTION OF CHILDREN ACCORDING TO SERUM VITAMIN A AND ASCARIS INFESTATION

Ascariasis	Serum Vitamin A			Mean serum vitamin A /ug
	/10	10-19	> 20	
Positive	17.75	33.72	48.52	19.1±8.45
Negative	14.96	44.26	40.76	18.0±7.11

Differences not significant by X^2 test.

Table-7

RELATIONSHIP BETWEEN ASCARIASIS AND MALNUTRITION (1-5 yrs)

Ascariasis	N	% Weight for expected wt. for age			
		⩽60	61-75	76-90	> 90
Positive	132	4.9	19.2	49.5	26.4
Negative	336	1.2	11.9	52.1	34.8

Chi Square test significant at P⩽0.01

Table-8

PERCENT PREVALENCE OF ASCARIASIS IN DIFFERENT GROUPS OF CHILDREN

Group	Initial	6 months	12 months
A	33.3	17.9	10.5
B	37.3	31.6	30.6
C	31.5	17.9	11.1
D	34.6	38.5	32.5

Table-9

SERUM VITAMIN A /ug/dl AFTER TREATMENT

Group	Initial		6 monthly		12 monthly	
	N	Vitamin A /ug/dl	N	Vitamin A /ug/dl	N	Vitamin A /ug/dl
A	116	19.3±7.25 (4-40)	114	28.8±12.84** (11-73)	110	30.1±10.83** (20-94)
B	108	19.2±8.05 (5-55)	94	29.9±13.11** (10-68)	98	31.6±9.44** (20-73)
C	75	19.2±7.09 (7-42)	69	24.0±7.53** (8-39)	66	24.5±6.31** (10-36)
D	61	18.9±5.99 (8-32)	59	23.9±8.99** (9-46)	53	23.6±5.53** (13-37)

Figures in the parentheses are ranges

* P /0.01 compared to initial values

** P /0.001 compared to initial values

SIGNIFICANCE BETWEEN GROUPS AT DIFFERENT POINT OF TIME

	Initial	6 months	12 months
AB	NS	NS	NS
AC	NS	X*	XX
AD	NS	X	XX
BC	NS	XX**	XX
BD	NS	X	XX
CD	NS	NS	NS

* X:P /0.01

** XX:P /0.001

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