3.2 Estimation of Zinc deficiency, under nutrition and morbidities especially ARI, Diarrhoea and Fever in school children of Rajasthan-

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OBJECTIVES

1. Estimation of extent of Zinc deficiency in school children of Rajasthan
2. Estimate the prevalence of under nutrition and morbidities especially ARI, diarrhoea and Fever
3. To facilitate the health functionaries in the reduction of the Zinc deficiency disorders in school children of Rajasthan

PROGRESS

This project has been initiated recently. Sampling has been done in detail. According to WHO/UNICEF/ICCIDD, for school based survey, 30 cluster sampling approach has to be adopted keeping in view the operational feasibility. Recently DGHS (2005) has given new guidelines for sampling according to which sample size is calculated on the basis of prevalence of Zinc deficiency as 11 % (collectively cluster of under nutrition and micronutrient deficiencies caused about 6 million deaths in 2000) i.e.11% of the global total has been considered as the basis for sample size, level of confidence - 95 %, relative precision - 20 %. Using formula $(Za)^2 Q / (L^2) P$, sample size worked out to be 810 children (rounded off) from Jodhpur district or 810/30=27 or 30 children (rounded off) per cluster. Keeping in view the operational feasibility, 15 clusters/schools have been adopted to cover 450 school children i.e. 30 children per cluster for the identification of the problem in this area. At first step, listing of all the government and private schools with children 6-11 years of age from both rural and urban areas were listed from district education office of Jodhpur. Secondly cumulative enrollment was determined. Finally schools were selected using PPS sampling technique as recommended by WHO. In the selected schools, children were selected randomly using Tippets random number table. Equal proportion of boys and girls and proportionate distribution of children from 6-11 years were covered from the selected schools.

All children have been interviewed/ examined for Socio-demographic profile, nutritional deficiency signs, morbidity for last 15 days and anthropometry (Height, Weight and FFT) using standard WHO techniques.

Blood samples have been collected for estimation of Zn deficiency along with anemia and urine samples for estimation of UIE in laboratory. Blood samples have been collected from school children, for that, collection tubes and the cryotubes (in which serum was stored) were labeled. Each child was given a code number that was also the same on the collection tube, cryotube and prescribed form. The blood collected in the tube was allowed to clot at room temperature in dark for 15 minutes. After, 15 minutes, tubes with clotted material were kept in the rotor of a battery operated centrifuge machine and spinned @ 1,500 to 2,000 rpm for 5 minutes. After centrifuging the clotted material, serum that was separated from the clot was removed very carefully with the help of a micropipette and immediately transferred to cryotubes. Precaution was taken at the time of separating the serum from the clot, so that the tip of micropipette should not come in contact with the clot. For each sample, a new micropipette tip was used to avoid contamination. A casual urine sample was also collected. Zn deficiency was assessed by AOAC method using flame mode of Atomic Absorption Spectrophotometer. Anemia was assessed by Hemoglobin levels (Cyanmethaemoglobin technique), and was classified as per WHO classification. Iodine deficiency disorders was assessed by clinical examination of thyroid gland using the standard method as recommended by the joint WHO/ UNICEF/ICCIDD consultation. A casual urine sample was also collected for estimation of Urinary Iodine Excretion (UIE) levels to asses the Iodine nutriture status. UIE was determined by Ammonium Persulphate Digestion on Microplate method (APDM) using standard laboratory technique. UIE level less than 10 mcg/dl have been considered as indicator of iodine deficient nutriture.

Initially District Education Officer of Jodhpur was contacted regarding this project and letter of cooperation addressed to all the principles of primary and middle schools of Jodhpur district for providing the necessary help at their school level was obtained. List of all the high schools was collected from the same office and 15 clusters/schools have been selected by random sampling for study purpose. Rapport has been established with some of the selected school and started field work. Till now, data has been collected from 210 school children of 6 to 11 years belonging to seven schools of Jodhpur district. Standardization of the techniques has been done for estimation of Zn by Atomic Absorption Spectrophotometer by flame mode.

Preliminary analysis of 210 school children has been done. Table 1 showed age and sex wise distribution of population (121 males and 89 females). It was observed that 31.4 percent children belong to low income group and 98.8 percent of population was Hindus.

School children suffering from Acute Respiratory infection, GIT (Diarrhoea, stomach ache) and Fever were 3.8, 7.1 and 1.9 percent respectively. Regarding nutritional deficiency signs, it is observed that discoloration of hair, a sign of protein calorie malnutrition was observed to be high i.e. 20.5 percent. Angular stomatitis, Cheliosis and glossitis were 1.9, 0.9 and 0.5 percent. Vitamin A deficiency i.e. Bitot spot were 1.9 percent.

The extent of different types of malnutrition viz. stunting (Height for age), under nutrition (Weight for age), wasting (Weight for Height) were computed by adopting standard deviation classification using WHO standards. All the children with any of the above anthropometric measurement less than Median-2SD of WHO values were considered as undernourished.

Stunting (Height for age) was 18.6 percent in school age children with the prevalence of severe stunting 3.8%. Underweight (Weight for age) in school age children was observed 27.1 % and wasting 8.6%. Both stunting and wasting were observed higher in females than males though statistically insignificant (Fig 1-3).

Table 1. Age and sex wise distribution of school children covered

Age group	Males	%	Females	%	Total	%
6+	22	18.2	16	18.0	38	18.1
7+	17	14.0	26	29.2	43	20.5
8+	29	24.0	15	16.9	44	21.0
9+	14	11.6	11	12.3	25	11.9
10+	21	17.3	14	15.7	35	16.6
11+	18	14.9	7	7.9	25	11.9
Total	**121**	**100**	**89**	**100**	**210**	**100**

Fig 1. SD classification for Height for Age in School children

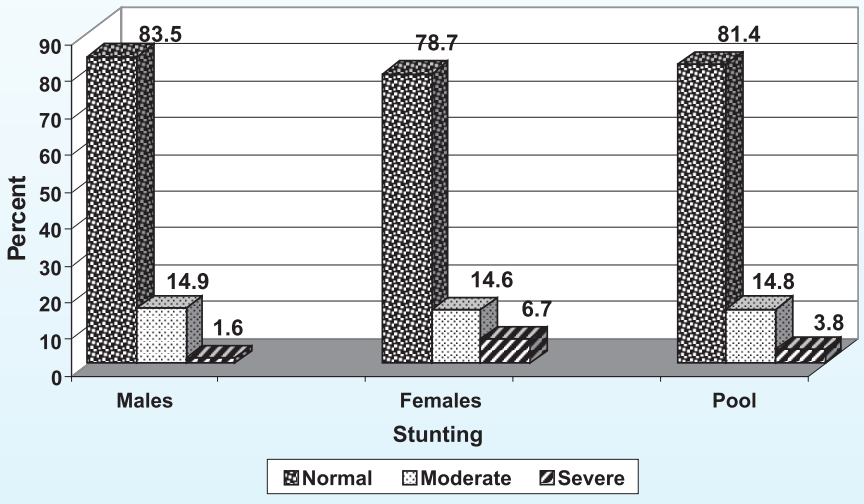


Fig 2. SD classification for Weight for Age in school children

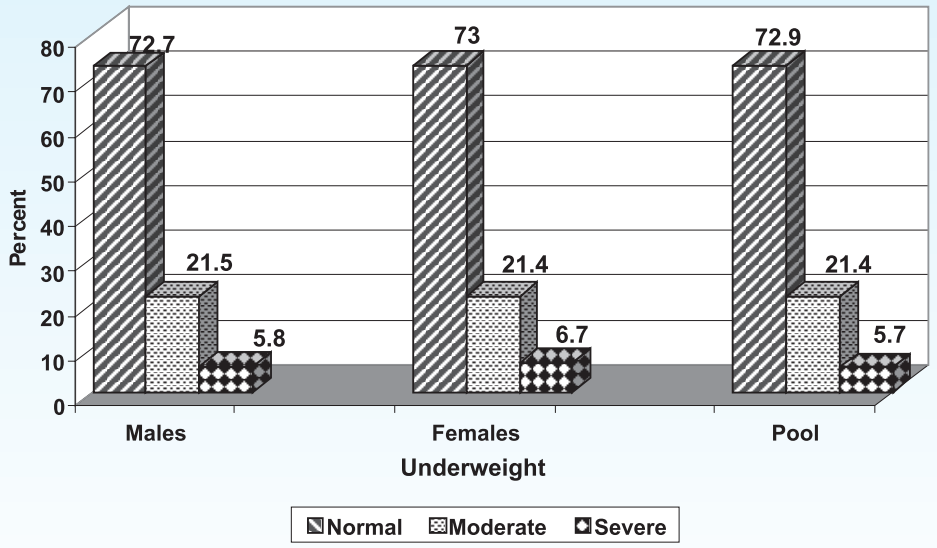
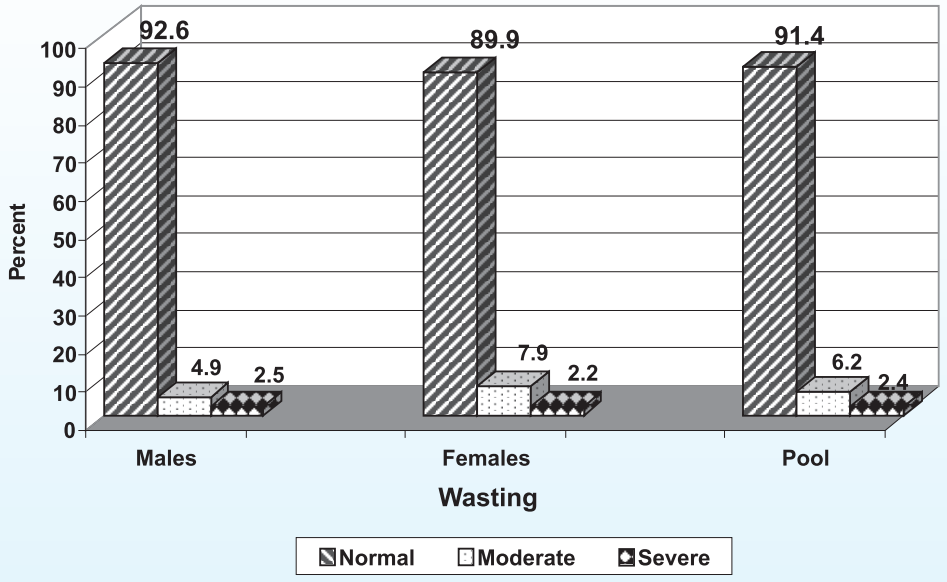


Fig 3. SD classification for Weight for Height in school children



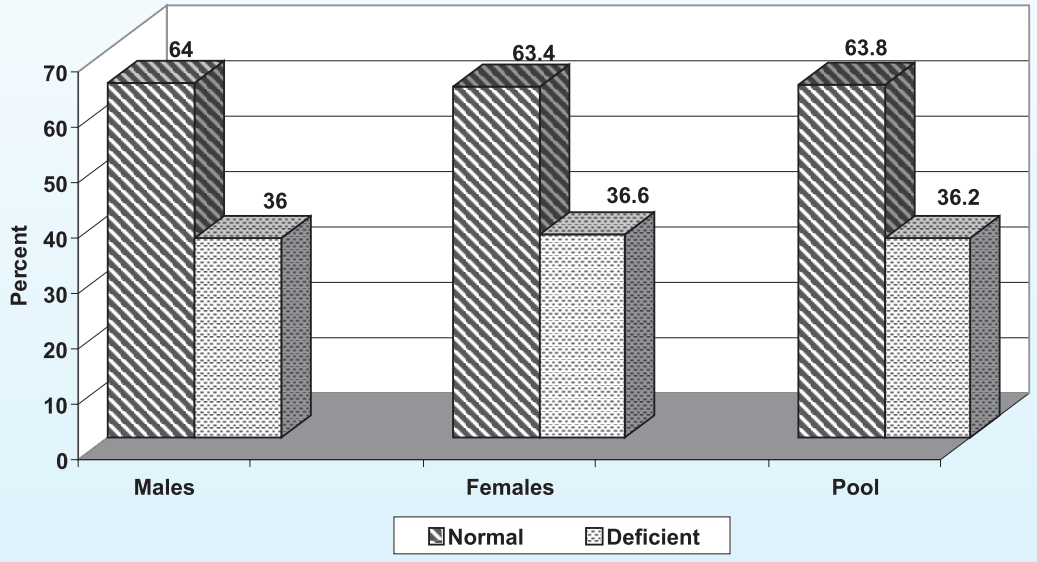
Analysis of the serum zinc has been done for 196 school children. It was observed that 63.8% school children were normal and 36.2% children were deficient in serum zinc i.e. serum Zn level was less than 0.65 mg/l (Table 2). It was observed that serum zinc deficiency was more in early age group i.e. 50 percent in 6 to 7 years age group than 11 years age group. It was observed that serum zinc deficiency was 36 percent in boys whereas 36.6 percent in girls (Fig 4).

Table 2. Age wise distribution of school children according to Serum Zinc

Age Years	Normal Serum Zn level ≥ 0.65 mg/l *(less than 10 years)*		Deficient Serum Zn level < 0.65 mg/l *(less than 10 years)*	
	N	%	N	%
6+ (N=37)	22	59.5	15	50.0
7+ (N=39)	22	56.4	17	50.0
8+ (N=41)	25	61.0	16	39.0
9+ (N=23)	13	56.5	10	43.5
10+ (N=32)	22	68.8	10	31.3
11+ (N=24)	21	87.5	3	12.5
Total (N=196)	**125**	**63.8**	**71**	**36.2**

Cut offs for 10 years and above: Ref. IZiNCG, 2004
Male- Normal: Serum Zn level ≥ 0.70 mg/l; Deficient: Serum Zn level < 0.70 mg/
Female- Normal: Serum Zn level ≥ 0.66 mg/l; Deficient: Serum Zn level < 0.66 mg/l

Fig 4. Distribution of school children according to serum zinc level



Analysis of 153 school age children according to Hb estimation revealed that only 26.8 percent children were non anaemic (Hb ≥ 11.5 g/dl) where as 52.9 percent children belong to mild category (10-11.5 g/dl) and 20.3 percent to moderate category (7-10 g/dl) of anaemia.

Epidemiological criteria, as prescribed by WHO, for assessing iodine nutrition is based on median urinary iodine concentrations/ levels. Analysis of 108 urine samples has been done so far. Median urinary iodine value was 124.65 mcg/l. It was observed that proportion of school children less than 100 mg/L were 34.2 percent, whereas, proportion of school children less than 50 mg/L were 14.8 percent. Iodine content of 73 salt samples has been estimated using standard iodometric titration method. 53.4 percent children consumed salt adequately iodized i.e. 15 ppm or more. Overall high proportion of children (46.6%) consumed salt having inadequate iodine content i.e. less then 15 ppm. 4.1 percent children consumed salt having negligible iodine content (Less than 7 ppm). Project is ongoing. Data will be collected from 8 schools of Jodhpur district covering 240 school age children.

RESEARCH OUTCOME

This will be helpful in assessing extent of Zinc deficiency in Rajasthan. It will facilitate health functionaries in reduction of Zinc deficiency disorders in Rajasthan.