

Biology of the Tribal Groups of Rajasthan, India: 7. Occurrence of Nutritional Deficiencies

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ABSTRACT The study was carried on the tribal groups of Rajasthan. Cross-sectional study was done on 2928 samples consisting of 1503 males and 1425 females belonging to both adolescent (8+ to 18+) and adult age groups (19 & above). Clinical assessment (using clinical signs of a disease) has been used for describing the prevalence of nutritional diseases for the tribal groups under study. All the populations show high prevalence of mottled enamel and spongy and bleeding gums. Females in all the tribal groups were found to have high prevalence of lack of lustre in hair, which may indicate higher protein deficiency in them than males. Percent prevalence of Bitot's spot, which occurs due to vitamin A deficiency, is also seen to be high. Thus the data for deficiency diseases from the six tribal groups of the present study indicate widespread prevalence of deficiencies of protein, vitamin A, vitamin B. It has been recognized that vitamin B deficiency is the most commonly occurring nutrient deficiency among the tribal groups of Rajasthan.

INTRODUCTION

The morbidity statistics are immensely important in assessing the health status or rather the absence of health and well being in a population, and can eventually be used for health and development planning. The global burden of malnutrition and infectious disease is immense, especially amongst children. Childhood infections impair growth and development. Malnutrition takes several forms that often appear in combination, such as protein-energy malnutrition and deficiencies in micronutrients. Growth of the individual is also impaired owing to the combination of poor nutrition, malabsorption and the host response to infection, which can involve anorexia and altered metabolism of nutrients (Calder and Jackson, 2000). For individual adolescents, growth may be limited by such factors as prolonged undernutrition, infection and chronic disease.

Nutritional status of children can be evaluated under three broad headings, namely, clinical, biochemical and anthropometric. The diets and infections ultimately determine nutrient availability at the cellular level, one outcome of which is growth. A variety of clinical features have been described in PEM (Protein-Energy Malnutrition) and other micronutrient deficiency state. As a consequence of dietary deficiency, several nutritional deficiencies with clinical manifestations and disabilities are encountered in our country, namely, Protein-calorie malnutrition, vitamin A deficiency, iron deficiency and vitamin B

deficiency. These diseases if untreated or not prevented may lead to many disabilities. PEM results in poor growth and development of children and grave consequences are the outcome of these. Vitamin A deficiency may lead to nutritional blindness. This may lead to impaired work capacity, diminished host defense and future ill health.

Aspects of health particularly influence the community nutritional level by the frequency and severity of nutritionally "conditioning or contributing infections" (Mata et al., 1977; Neumann, 1981; Solomons and Keusch, 1981; Chandra, 1983; Chen, 1983; Chen and Scrimshaw, 1983; Briend et al., 1989; Lutter et al., 1989; Briend, 1990; Martorell et al., 1990; Becker et al., 1991; Walker et al., 1992). Studies of the effects of diarrhoea and other diseases on physical growth have been reviewed by Martorell and Yarbrough (1983) and childhood ailments in particular, diarrhoeal diseases, are often shown to be significantly associated with poor physical growth (Martorell et al., 1975). These ailments have been further shown to be related with reduced dietary intakes in children (Mata, 1978; Hoyle et al., 1980; Molla et al., 1983; Martorell et al., 1984).

Malnutrition results in defective development and pathological states resulting primarily from diet deficiencies. Sometimes the diet is so inadequate that diet deficiency outweighs other factors as a cause of malnutrition. Even though dietary inadequacy due to poverty, unavailability and ignorance is a well established cause of malnutrition (Vijayadurgamba et al., 1979; Devdas et al.,

1983), role of infections in the causation of malnutrition are also important. The present study thus attempts to investigate malnutrition disease incidence and tries to determine the prevalence of nutritional deficiencies on examination of clinical signs among the tribal groups of Rajasthan.

MATERIALS AND METHODS

Cross-sectional investigation was carried out on 2928 samples consisting of 1503 males and 1425 females (Table 1) belonging to both adolescent (8+ to 18+) and adult age groups (19 & above). The study was carried out on the Scheduled Tribes, namely Mina, Bhil, Sahariya, Garasia, Damor and Kathodi residing in the districts Sawai Madhopur, Udaipur, Baran, Sirohi, Dungarpur, respectively of Rajasthan (for details about area and people see Bhasin and Jain, 2007). Samples are collected from the place of residence and schools. For the purpose of analysis, the subjects were classified into preadolescent (8+ to 11 years), adolescent (12+ to 15+ years), young adults (16+ to 18+ years) age groups and adults (19 & above).

Physical examination (using clinical signs of a disease) has been used for describing the prevalence of nutritional diseases for the tribal groups under study. Clinical assessment of an individual or of a community (using clinical signs of a disease) can give valuable information about the physiological adequacy of their diets. The nutritional deficiencies were studied using the signs of deficiency disease (WHO, 1963). Various parts of the body were examined for the given signs. The nutritional deficiency signs were

broadly classified as vitamin A deficiency signs, vitamin B deficiency signs and protein calorie malnutrition. Bitot spot, xerosis and angular palpebritis were included in the vitamin A deficiency groups and under vitamin B deficiency such signs were classified – angular stomatitis, glossitis, cheilosis. Kwashiorkor, marasmus, moon face and oedema were grouped as protein calorie malnutrition.

RESULTS AND DISCUSSION

The primary cause of malnutrition as manifested in the above deficiencies is inadequate and faulty diets a disused earlier. Diet survey data indicates widespread prevalence of deficiencies of energy, pulses, carbohydrates, animal and vegetable proteins, iron and fats and are much below the nutritional standards. Apart from poverty and socioeconomic factors, environmental factors also play an important role in aggravating the dietary deficiency and precipitating nutritional deficiency diseases (Aykroyd and Krishnan, 1937). These widespread factors are the widespread chronic infection among the poor living conditions of poor environmental sanitation and personal hygiene. Thus a marginal intake of nutrients which by itself may not lead to clinical deficiency may do so when infectious diseases are superimposed.

Extensive diet surveys carried out in the country both in rural and urban areas indicate that our diets are predominantly based on cereals (Gopalan et al., 1996) as can be observed in the present study also. However, the energy levels and calorie intakes are not very satisfactory. As a consequence of this dietary deficiency, several

Table 1: Distribution of sample size in various age groups in six tribes of Rajasthan

Age (Yrs)	Mina		Bhil		Sahariya		Garasia		Damor		Kathodi	
	M	F	M	F	M	F	M	F	M	F	M	F
8+	21	26	24	20	21	24	13	13	12	12	12	12
9+	21	20	22	20	23	22	12	12	12	12	13	12
10+	21	20	21	23	22	25	14	13	12	11	12	12
11+	24	20	22	23	21	21	14	11	12	12	12	12
12+	25	20	23	23	21	21	14	12	12	12	13	11
13+	25	21	20	21	21	21	12	12	12	12	12	12
14+	21	20	22	21	24	22	12	11	12	12	11	11
15+	21	20	21	20	21	21	13	11	12	12	13	12
16+	21	19	22	20	20	23	13	11	12	11	12	12
17+	24	21	21	20	22	20	12	13	13	13	12	12
18+	22	21	22	20	22	17	12	12	12	12	11	11
> 19	89	76	66	66	50	39	81	76	41	37	43	43
Total	335	304	306	297	192	170	319	313	175	169	176	172

nutritional deficiencies with clinical manifestations are encountered in the tribal groups of Rajasthan.

Tables 2 to 7 show the percent prevalence of nutritional deficiency diseases in six tribal groups of Rajasthan. All the populations show high prevalence of mottled enamel and spongy and bleeding gums. Highest incidence of mottled enamel is seen in Kathodi males (74.9%) followed by Damor males (65.9%) and Garasia females (66.7%) and Damor females (63.9%) at 19 and above age group which indicates fluorosis in these populations. Males show higher percentage prevalence of mottled enamel, spongy and bleeding gums than females in all the populations except for Garasia, who show this trend at 16 to 18 age group.

Percent prevalence of Bitot's spot, which occurs due to vitamin A deficiency, is also seen to be high among them with Kathodi males (41.9% at 19 and above age group) and females (28.6% at 16 to 18 age group) showing the maximum values. Angular stomatitis, caused due to deficiency of vitamin B₂, also shows a high incidence. Minas show the highest prevalence of angular

stomatitis for both males and females than the other tribal groups for both males (48.9% at 12 to 15 age group) and females (57.4% at 16 to 18 age group).

Females in all the tribal groups were found to have lack of lustre in hair, which may indicate higher protein deficiency in them than males. Both Mina and Bhil females exhibit greater lack of lustre in hair than others with Mina females showing the highest prevalence of 57.4% at 16 to 18 age group followed by Bhil females (57.0%).

Thus the data for deficiency diseases from the six tribal groups of the present study indicate widespread prevalence of deficiencies of protein, vitamin A, vitamin B. Chronic undernutrition from early childhood continuing through adolescence into adult life is common among these tribes. It has been recognized that vitamin B deficiency is the most commonly occurring nutrient deficiency among the tribal groups of Rajasthan. Glossitis and angular stomatitis have been recognized as lesions suggestive of vitamin B complex deficiency. It is widely accepted and established from earlier papers that large majority of children and adults of tribal groups suffer from undernutrition and specific deficiency syndromes.

Table 2: Distribution of symptoms of nutritional deficiencies among Minas of Rajasthan

<i>Clinical Signs</i>	<i>8+ to 11+</i>		<i>12+ to 15+</i>		<i>16+ to 18+</i>		<i>19 & above</i>	
	<i>M</i> (<i>N</i> =87)	<i>F</i> (<i>N</i> =86)	<i>M</i> (<i>N</i> =92)	<i>F</i> (<i>N</i> =81)	<i>M</i> (<i>N</i> =67)	<i>F</i> (<i>N</i> =61)	<i>M</i> (<i>N</i> =89)	<i>F</i> (<i>N</i> =76)
HAIR								
Lack of lustre	-	27.9	1.1	21.0	3.0	13.1	2.2	21.1
Thinness & sparseness	1.1	-	-	-	4.5	-	3.4	-
Dispigmentation	-	9.3	-	9.9	-	4.9	-	3.9
FACE								
Diffuse Dispigmentation	4.6	-	-	-	-	-	-	-
EYES								
Xerosis Conjunctiva	5.7	8.1	6.5	4.9	7.5	11.5	18.0	18.4
Bitot's Spot	20.7	17.4	30.4	28.4	31.3	27.9	29.2	17.1
Angular palpebritis	-	-	-	-	-	-	-	-
LIPS								
Angular Stomatitis	32.2	44.2	48.9	49.4	43.3	57.4	46.1	35.5
TONGUE								
Scarlet & raw	2.3	3.5	7.6	3.7	11.9	6.6	5.6	2.6
Atrophic papillae	-	-	4.3	1.2	3.0	3.3	5.6	2.6
TEETH								
Mottled enamel	54.0	37.2	60.9	55.6	58.2	57.4	61.8	53.9
GUMS								
Spongy	33.3	34.9	44.6	39.5	49.3	45.9	49.5	38.2
Bleeding	20.7	15.1	26.1	25.9	29.9	31.1	37.1	30.3
SKIN								
Petechiae	5.7	1.2	2.2	-	1.5	3.3	3.4	-
Pellagrous Dermatitis	-	-	-	-	-	-	-	-
NAILS								
Koilonychia	-	1.2	-	1.2	-	1.6	-	3.9
RIBS								
Beading of ribs	-	-	-	-	-	-	-	-
LEGS								
Knock-knees	1.1	-	-	-	-	-	-	-

Table 3: Distribution of symptoms of nutritional deficiencies among Bhils of Rajasthan

<i>Clinical Signs</i>	<i>8+ to 11+</i>		<i>12+ to 15+</i>		<i>16+ to 18+</i>		<i>19 & above</i>	
	<i>M</i> (<i>N</i> =89)	<i>F</i> (<i>N</i> =86)	<i>M</i> (<i>N</i> =86)	<i>F</i> (<i>N</i> =85)	<i>M</i> (<i>N</i> =65)	<i>F</i> (<i>N</i> =60)	<i>M</i> (<i>N</i> =66)	<i>F</i> (<i>N</i> =66)
<i>HAIR</i>								
Lack of lustre	40.4	57.0	41.9	52.9	27.7	53.3	43.9	34.8
Thinness & sparseness	1.1	2.3	-	-	-	-	-	-
Dispigmentation	5.6	17.4	3.5	21.2	1.5	6.7	4.5	1.5
<i>FACE</i>								
Diffuse Dispigmentation	-	-	-	-	-	-	-	-
<i>EYES</i>								
Xerosis Conjunctiva	3.4	-	-	-	1.5	3.3	1.5	4.5
Bitot's Spot	3.4	4.7	11.6	2.4	12.3	11.7	16.7	22.7
Angular palpebritis	-	-	-	-	-	-	-	-
<i>LIPS</i>								
Angular Stomatitis	10.1	5.8	10.5	5.9	15.4	11.7	16.7	22.7
<i>TONGUES</i>								
carlet & raw	1.1	-	-	-	-	1.7	-	-
Atrophic papillae	1.1	1.2	1.2	1.2	-	1.7	-	-
<i>TEETH</i>								
Mottled enamel	43.3	23.3	34.9	25.9	47.7	35.0	43.9	65.3
<i>GUMS</i>								
Spongy	25.8	20.9	26.7	25.9	20.0	23.3	37.9	47.0
Bleeding	52.8	29.1	45.3	30.6	60.0	57.6	57.6	56.1
<i>SKIN</i>								
Petechiae	-	-	-	-	-	-	-	-
Pellagrous Dermatitis	-	2.3	-	-	-	-	-	3.0
<i>NAILS</i>								
Koilnchia	1.1	-	-	-	-	3.3	4.5	-
<i>RIBS</i>								
Beading of ribs	-	-	-	-	-	-	-	-
<i>LEGS</i>								
Knock-knees	3.4	-	-	-	-	-	-	-

Table 4: Distribution of symptoms of nutritional deficiencies among Sahariyas of Rajasthan

<i>Clinical Signs</i>	<i>8+ to 11+</i>		<i>12+ to 15+</i>		<i>16+ to 18+</i>		<i>19 & above</i>	
	<i>M</i> (<i>N</i> =87)	<i>F</i> (<i>N</i> =92)	<i>M</i> (<i>N</i> =87)	<i>F</i> (<i>N</i> =85)	<i>M</i> (<i>N</i> =64)	<i>F</i> (<i>N</i> =50)	<i>M</i> (<i>N</i> =81)	<i>F</i> (<i>N</i> =76)
<i>HAIR</i>								
Lack of lustre	52.8	53.2	36.8	51.8	34.4	58.0	38.3	40.0
Thinness & sparseness	2.3	-	2.3	-	-	-	3.7	-
Dispigmentation	8.0	21.7	1.1	10.6	-	14.0	1.2	21.1
<i>FACE</i>								
Diffuse Dispigmentation	-	-	-	-	-	-	-	-
<i>EYES</i>								
Xerosis Conjunctiva	-	1.1	3.4	2.3	3.1	-	7.4	15.8
Bitot's Spot	17.2	13.0	13.8	11.8	25.0	18.0	29.6	18.4
Angular palpebritis	-	-	1.1	-	-	-	-	-
<i>LIPS</i>								
Angular Stomatitis	42.5	52.1	43.6	52.9	45.3	76.7	41.9	42.1
<i>TONGUE</i>								
Scarlet & raw	-	-	2.3	2.3	-	4.0	-	-
Atrophic papillae	-	-	-	-	-	-	-	-
<i>TEETH</i>								
Mottled enamel	40.2	39.1	55.1	38.8	51.5	62.0	54.3	63.2
<i>GUMS</i>								
Spongy	23.0	30.4	23.0	29.0	32.8	40.0	24.7	31.6
Bleeding	36.8	35.8	43.7	38.8	43.7	56.0	51.8	47.4
<i>SKIN</i>								
Petechiae	-	-	-	-	-	-	-	-
Pellagrous Dermatitis	-	-	-	-	-	-	-	-
<i>NAILS</i>								
Koilnchia	1.1	2.2	-	2.3	-	4.0	-	2.6
<i>RIBS</i>								
Beading of ribs	-	-	-	-	-	-	-	-
<i>LEGS</i>								
Knock-knees	2.3	2.3	-	-	-	-	-	-

Table 5: Distribution of symptoms of nutritional deficiencies among Garasias of Rajasthan

<i>Clinical Signs</i>	<i>8+ to 11+</i>		<i>12+ to 15+</i>		<i>16+ to 18+</i>		<i>19 & above</i>	
	<i>M</i> (<i>N</i> =46)	<i>F</i> (<i>N</i> =49)	<i>M</i> (<i>N</i> =52)	<i>F</i> (<i>N</i> =46)	<i>M</i> (<i>N</i> =37)	<i>F</i> (<i>N</i> =36)	<i>M</i> (<i>N</i> =50)	<i>F</i> (<i>N</i> =39)
<i>HAIR</i>								
Lack of lustre	9.4	30.6	3.8	28.3	8.1	19.4	10.0	35.9
Thinness & sparseness	-	-	-	-	-	-	-	-
Dispigmentation	-	-	-	-	-	-	-	12.8
<i>FACE</i>								
Diffuse Dispigmentation	-	-	-	-	-	-	-	-
<i>EYES</i>								
Xerosis Conjunctiva	-	2.0	-	-	2.7	2.8	-	-
Bitot's Spot	13.2	12.2	7.7	17.4	16.2	11.1	28.0	15.4
Angular palpebritis	-	-	-	-	-	-	-	-
<i>LIPS</i>								
Angular Stomatitis	9.4	26.5	13.5	21.7	24.3	19.4	18.0	10.3
<i>TONGUE</i>								
Scarlet & raw	-	2.0	1.9	-	2.7	19.4	-	-
Atrophic papillae	9.4	2.0	7.7	6.5	-	5.6	6.0	2.6
<i>TEETH</i>								
Mottled enamel	52.8	40.8	55.8	63.0	59.5	58.3	64.0	66.7
<i>GUMS</i>								
Spongy	22.6	32.7	25.0	32.6	40.5	33.3	40.0	35.9
Bleeding	20.8	26.5	19.2	30.4	40.5	50.0	28.0	23.1
<i>SKIN</i>								
Petechiae	-	2.0	3.8	-	10.8	-	-	2.6
Pellagrous Dermatitis	-	-	-	-	-	-	-	-
<i>NAILS</i>								
Koilonychial	1.9	-	-	-	-	-	-	-
<i>RIBS</i>								
Beading of ribs	-	-	-	-	-	-	-	-
<i>LEGS</i>								
Knock-knees	3.8	6.1	-	-	-	-	-	-

Table 6: Distribution of symptoms of nutritional deficiencies among Damors of Rajasthan

<i>Clinical Signs</i>	<i>8+ to 11+</i>		<i>12+ to 15+</i>		<i>16+ to 18+</i>		<i>19 & above</i>	
	<i>M</i> (<i>N</i> =49)	<i>F</i> (<i>N</i> =48)	<i>M</i> (<i>N</i> =48)	<i>F</i> (<i>N</i> =48)	<i>M</i> (<i>N</i> =37)	<i>F</i> (<i>N</i> =36)	<i>M</i> (<i>N</i> =41)	<i>F</i> (<i>N</i> =36)
<i>HAIR</i>								
Lack of lustre	6.1	39.6	-	27.1	18.9	33.3	9.8	38.9
Thinness & sparseness	-	-	-	-	-	-	-	-
Dispigmentation	2.0	20.8	-	16.7	-	22.2	-	13.9
<i>FACE</i>								
Diffuse Dispigmentation	-	-	-	-	-	-	-	-
<i>EYES</i>								
Xerosis Conjunctiva	-	-	-	-	-	-	-	-
Bitot's Spot	6.1	4.2	20.8	18.8	35.1	11.1	24.4	25.0
Angular palpebritis	2.0	-	-	-	-	-	-	-
<i>LIPS</i>								
Angular Stomatitis	-	12.5	-	14.6	5.4	16.7	14.6	2.8
<i>TONGUE</i>								
Scarlet & raw	-	-	2.1	2.1	-	-	-	-
Atrophic papillae	-	-	4.2	2.1	2.7	-	4.9	5.4
<i>TEETH</i>								
Mottled enamel	83.7	60.4	77.1	60.4	78.4	63.9	65.9	61.1
<i>GUMS</i>								
Spongy	22.4	27.1	22.9	31.3	37.8	38.9	31.7	61.1
Bleeding	18.4	12.5	27.1	29.2	35.1	25.0	39.0	36.1
<i>SKIN</i>								
Petechiae	-	-	8.3	-	5.4	-	4.9	5.6
Pellagrous Dermatitis	-	-	-	-	-	-	-	-
<i>NAILS</i>								
Koilonychial	-	-	-	-	-	-	-	-
<i>RIBS</i>								
Beading of ribs	-	-	-	-	-	-	-	-
<i>LEGS</i>								
Knock-knees	-	-	-	-	-	-	-	-

Table 7: Distribution of symptoms of nutritional deficiencies among Kathodis of Rajasthan

<i>Clinical Signs</i>	<i>8+ to 11+</i>		<i>12+ to 15+</i>		<i>16+ to 18+</i>		<i>19 & above</i>	
	<i>M</i> (<i>N</i> =49)	<i>F</i> (<i>N</i> =48)	<i>M</i> (<i>N</i> =49)	<i>F</i> (<i>N</i> =36)	<i>M</i> (<i>N</i> =33)	<i>F</i> (<i>N</i> =35)	<i>M</i> (<i>N</i> =43)	<i>F</i> (<i>N</i> =45)
HAIR								
Lack of lustre	4.1	29.2	6.1	78.8	5.7	37.1	23.3	27.9
Thinness & sparseness	-	-	-	-	-	-	-	-
Dispigmentation	-	4.2	-	11.1	-	17.1	2.3	7.0
FACE								
Diffuse Dispigmentation	-	6.3	-	-	-	-	-	-
EYES								
Xerosis Conjunctiva	-	-	-	-	-	-	-	-
Bitot's Spot	18.4	2.1	24.5	13.9	28.6	28.6	41.9	25.6
Angular palpebritis	-	-	-	-	-	-	-	-
LIPS								
Angular Stomatitis	12.2	8.3	18.4	16.7	34.3	11.4	23.3	16.3
TONGUE								
Scarlet & raw	-	2.1	-	-	-	-	2.3	7.0
Atrophic papillae	6.1	2.1	12.2	2.8	20.0	11.4	11.6	9.3
TEETH								
Mottled enamel	59.2	54.2	53.1	50.8	62.9	48.6	74.4	62.8
GUMS								
Spongy	53.1	25.0	51.0	36.1	57.1	45.7	53.5	44.2
Bleeding	36.7	33.3	40.8	44.4	45.7	17.1	53.5	53.5
SKIN								
Petechiae	-	-	-	-	2.9	-	9.3	-
Pellagrous Dermatitis	-	-	-	-	2.9	-	-	-
NAILS								
Koilonychia	-	-	-	-	-	-	-	4.7
RIBS								
Beading of ribs	-	-	-	-	-	-	-	-
LEGS								
Knock-knees	4.1	2.1	-	-	-	-	-	-

The nutritional scenario of these tribal groups is not satisfactory as reported earlier and the intake of foods like pulses, green and leafy vegetables, fruits, milk and fats and oils are grossly inadequate to meet the needs of the individuals, resulting in growth impairment and poor nutritional status. In addition to the inadequacy of good quality nutrition, the tribal groups of Rajasthan have certainly been deprived of good health facilities, healthy life styles, even safe drinking water resulting in a number of health hazards.

The educational level affects nutritional status in various ways, such as by the number, quality, and relevance of technical training establishments, as well as the existence or non-existence, of schools and their involvement with nutrition education (Jelliffe and Jelliffe, 1982). Gopalan (1980) considered education as one of the major factors explaining why PEM (as suggested by child mortality rates) was much more prevalent in one Indian State as compared with another. This is further accentuated by the lack of awareness prevailing among majority of people, especially in lower income group, regarding the type of foodstuffs required to meet the

dietary requirements as observed in the present study.

The consumption of protective foods by the population is very low and lack of awareness prevails with regards to good and healthy diet, which further tends to deteriorate the situation as also reported elsewhere by Aykroyd and Krishnan, 1937. Although dietary deficiencies of nutrients are primary cause of these deficiencies in the tribal groups, they are aggravated by infective morbidity among the poor due to bad environmental and personal hygiene.

Gopalan (1972) has reported that 80% of pre-school children suffer from malnutrition dwarfism. There is a general agreement that socio-economic factors influence growth by affecting dietary intakes and/or the incidence and severity of infections (Darshan Singh et al., 1988; Prameela et al., 1995). A relationship between malnutrition, infection and poverty has been well documented. Gomez (1956) has shown greater incidence of malnutrition in low socio-economic group of the population. Socio-economic status is shown to affect the ability of the household to produce and/or buy food, to constrain infant feeding and health practices, and to determine environmental

sanitation. Young children are very susceptible to infections and have relatively high nutritional requirements. These two aspects interact to make young children vulnerable to growth failure and malnutrition in societies with a high infectious load and limited food availability. In the tribal groups of Rajasthan it can be seen that poverty along with illiteracy are the major factors which results in poor nutrition and this has a grave impact on the health and well being of the individuals and the community.

Anthropometric measurements showed that all the tribal groups were below the standard measurements. Inadequate intake of food resulted in inadequate intake of nutrients and subsequently the deficiency signs were more prevalent in nutritionally affected individuals. Similar findings were also been reported by Devdas et al. (1983) in his study in Coimbatore on children.

The present study indicates serious deficiencies in children and adults of all the tribes studied resulting in major nutritional deficiencies of vitamin A, vitamin B and protein. The long-term solution for the problem of malnutrition is to improve the consumption of protective foods by the affected populations through economic upliftment and increased production of such foods. Based on these informations, effective, direct nutrition and health intervention efforts need to be channeled through the hospitals, voluntary agencies and organizations for the promotion and maintenance of positive health.

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