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Role of Diet and Non-Diet Factors on Nutritional Status

Padam Singh
Institute for Research in Medical Statistics,
Indian Council of Medical Research, New Delhi

SUMMARY

The findings of the study undertaken to examine the role of dietary and non-dietary factors on nutritional status of children and adults in Rajasthan and Bihar are presented. The magnitude of malnutrition depends on dietary intake as well housing and sanitary conditions. The proportion of severely malnourished children showed decline with increase in energy intake. Severe grade malnourished children are more in Bihar as compared to in Rajasthan.

Keywords: Gomez classification, BMI classification, Chronic Energy Deficiency (CED), Socio-economic condition.

1. Introduction

Institute for Research in Medical Statistics, New Delhi has undertaken a study sponsored by Department of Women and Child Development (DWCD) on District Nutrition Profile in the States of Rajasthan and Bihar. In this study, information has been collected on household characteristic, diet, anthropometry etc. The overall sample size is about 35,000 households spread over all the Districts in the two States. The reports of the study submitted to DWCD included results on socio-economic conditions of households, dietary intake and nutritional status of children and adults. A comparison of results contained in the reports for the two States revealed the following:

(i) The availability of pucca house, electricity, piped drinking water, flush toilets, separate room as kitchen, were much lower in Bihar as compared to Rajasthan (Table I).

(ii) There were large variations in the dietary pattern in these two States (Table II).

(iii) The average energy intake was higher in Bihar as compared to Rajasthan (Table III.)

(iv) The severely malnourished children were much higher in Bihar as compared to Rajasthan. Chronic Energy Deficiency (CED) adults were

also higher in Bihar as compared to Rajasthan. All these is inspite of higher energy intake in Bihar as compared to Rajasthan (Tables IV and V).

Table I Household Characteristics (Per cent)

Characteristics	Rajasthan	Bihar
Pucca House	49.0	14.6
Separate room as kitchen	55.3	28.5
Electricity	68.9	14.0
Piped Water	36.8	4.0
Flush Toilet	18.9	5.1

Table II Consumption of Food Stuff (gm/cu/day)

Items	Rajasthan	Bihar
Cereal	483.57	541.70
Pulse	29.12	37.68
Leafy Veg.	24.19	18.26
Roots & Tuber	79.15	154.90
Other Veg.	45.25	106.73
Fruits	21.80	17.75
Condi. & Spices	16.00	12.42
Meat, Fish & Egg	5.88	8.14
Milk Prod.	197.69	43.96
Fats/Oils	22.31	12.52
Sugar	25.25	7.39

Table III Nutrient Intake (per cu/day)

Items	Rajasthan	Bihar
Protein (g)	77	70
Fat (g)	46	24
Energy (kcal)	2386	2464
Calcium (mg)	734	433
Phos. (mg)	2130	1757
Iron (mg)	31	22
Thiamine (mg)	3	2
Ribo (mg)	1	1
Niacin (mg)	21	20
Vit-C (mg)	46	60
Vit-A (carot) (ug)	1599	1051

Table IV Nutritional Status of Children 1-5 Years Gomez Classification (per cent)

Malnutrition Grade	Male	Female	Combined
RAJASTHAN			
Severe	10.0	9.9	10.0
Moderate	32.3	32.7	32.5
Mild	40.2	38.2	39.2
Normal	17.5	19.2	81.3
BIHAR			
Severe	27.2	25.0	26.2
Moderate	29.4	30.4	29.9
Mild	27.1	25.3	26.2
Normal	16.3	19.3	17.7

Table V Nutritional Status of Adults (18 Years and above) BMI Classification (per cent)

State/Sex	Male	Female	Combined
RAJASTHAN			
CED	44.4	43.1	43.7
Normal	52.2	53.9	53.2
Over Weight	3.4	3.0	3.1
BIHAR			
CED	39.8	58.3	50.3
Normal	56.3	40.5	48.2
Over Weight	1.9	1.2	1.5

Table VI Calorie Intake of Children According to Nutritional Status (per cu)

	Rajasthan	Bihar
Severe	1636	1750
Moderate	1776	2052
Mild	1914	2054
Normal	1996	1975
Total	1860	1973

Table VII Calorie Intake of Adults as per Nutritional Status (per cu)

	Rajasthan	Bihar
CED	2483	2690
Normal	2619	2740
Over Weight	2578	2865
Total	2561	2717

This indicates that magnitude of malnutrition is not only affected by the diet but could also be influenced by the other factors.

Therefore, with a view to examine the role of dietary and non-dietary factors on nutritional status of children and adults, an in depth analysis of the data collected in the study on "District Nutrition Profile for Rajasthan and Bihar" has been undertaken. This analysis would be useful in finding the characteristics of those requiring special attention and identifying the target group for the nutrition programmes.

2. *Methodology*

Utilising the data for the States of Rajasthan and Bihar, separate analysis has been done studying the influence of diet and non-diet factors on nutritional status for

(i) Children under 5 year and

(ii) Adults

(a) For the analysis, in each of the two States the children under 5 years of age have been categorised under following heads using Gomez Classification

Nutritional Status of Children

Severe	:	< 60% of NCHS Standard
Moderate	:	60-75% of NCHS Standard
Mild	:	75-90% of NCHS Standard
Normal	:	> 90% of NCHS Standard

(b) Similarly, in each of the two States, the adults have been categorised under following heads using BMI Classification

Nutritional Status of Adults

C.E.D.	:	BMI Value less than 18.5
Normal	:	BMI Value between 18.5 to 25.0
Over Weight	:	BMI Value more than 25.0

For (a) and (b) the households have been categorised under following heads with reference to energy intake

< 50% of RDA

50-75% of RDA

> 75% of RDA

For each of the above categories further sub-grouping has been made on the basis of socio-economic conditions of the households as under:

Caste	:	S.C., S.T. and Others
Type of House	:	Pucca, Semi Pucca and Kucha
Source of Lighting	:	Electricity, Kerosene and others
Drinking Water	:	Piped, Well and Others
Toilet Facility	:	Flush Toilet, Pit and Field/Bush

3. Results and Discussion

3.1 Nutritional Status of Children

The proportion of children under different grades of malnutrition have been analysed for each of the sub-grouping according to energy intake and household characteristics (Caste/Type of House/Source of Lighting/Source of Drinking Water/Toilet Facility).

The results of the analysis have been presented as under

Nutritional Status of Children according to:

Caste and Energy Intake (Table 1)
Type of House and Energy Intake (Table 2)
Source of Lighting and Energy Intake (Table 3)
Source of Drinking Water and Energy Intake (Table 4)
Toilet Facility and Energy Intake (Table 5)

Although magnitude of severe grade of malnourished children is higher for Bihar as compared to Rajasthan for both the States, the proportion of severely malnourished children showed decline with increase in energy intake.

The severe type of nutritional deficiency among children was higher among SC as compared to others. Consequently, the proportion of normal children was much lower among Scheduled Caste as compared to others specially among those with energy intake less than 50% of RDA.

Among those consuming more than 75 percent of RDA, nutritional deficiency was more among kucha house dwellers.

Severe grade of malnutrition was lower among those using electricity for lighting as compared to those using kerosene and others.

Nutritional status of Children was better among those using pipe water supply.

Nutritional status was better among those using flush toilet or pits as compared to bush/field.

Table 1. Nutritional Status Among Children According to Level of Energy Intake and Caste

Energy Intake	Caste	Nutritional Status of Children				
		Severe	Moderate	Mild	Normal	Total
		Per cent of NCHS Standard				
		< 60	60-75	75-90	> 90	
			RAJASTHAN			
< 50% of RDA						
	SC	16.7	36.5	33.3	13. 5	100
	ST	11.1	35.6	42.2	11.1	100
	Others	10.7	23.4	43.7	22.2	100
50-75% of RDA						
	SC	7.2	32.5	48.2	12.0	100
	ST	5.9	27.6	54.7	11.8	100
	Others	5.3	26.1	49.3	19.2	100
> 75% of RDA						
	SC	9.4	25.2	50.4	15.1	100
	ST	8.0	36.0	42.0	14.0	100
	Others	5.3	25.4	47.0	22.2	100
			BIHAR			
< 50% of RDA						
	SC	23.3	22.7	34.1	19.9	100
	ST	21.4	30.6	28.6	19.4	100
	Others	18.2	26.1	30.8	24.8	100
50-75% of RDA						
	SC	28.0	28.7	24.8	18.5	100
	ST	19.0	32.8	37.9	10.3	100
	Others	19.4	27.0	35.7	17.9	100
> 75% of RDA						
	SC	18.2	28.5	32.5	20.8	100
	ST	17.1	28.6	34.3	20.0	100
	Others	15.4	27.0	34.3	23.2	100

Table 2. Nutritional Status Among Children According to Level of Energy Intake and Type of House

Energy Intake	Type of House	Nutritional Status of Children				
		Severe	Moderate	Mild	Normal	Total
		Per cent of NCHS Standard				
		< 60	60-75	75-90	> 90	
			RAJASTHAN			
< 50% of RDA						
	Pucca	12.5	23.9	43.8	19.9	100
	Semi-Pucca	13.9	24.1	43.0	19.0	100
	Kucha	15.9	29.7	36.7	17.7	100
50-75% of RDA						
	Pucca	8.2	24.0	48.6	19.2	100
	Semi-Pucca	9.3	23.3	53.5	14.0	100
	Kucha	9.9	31.3	44.3	14.5	100
> 75% of RDA						
	Pucca	6.0	20.9	48.7	24.4	100
	Semi-Pucca	6.0	27.4	49.6	17.1	100
	Kucha	10.8	33.0	41.5	14.8	100
			BIHAR			
< 50% of RDA						
	Pucca	32.9	16.5	30.4	20.3	100
	Semi-Pucca	31.2	18.8	31.8	18.2	100
	Kucha	31.7	16.2	31.5	20.6	100
50-75% of RDA						
	Pucca	22.3	29.8	29.8	18.1	100
	Semi-Pucca	21.6	27.3	34.1	17.0	100
	Kucha	26.0	27.7	29.1	17.2	100
> 75% of RDA						
	Pucca	12.4	25.4	35.1	27.0	100
	Semi-Pucca	14.9	31.1	35.4	18.6	100
	Kucha	17.5	27.3	33.2	22.1	100

Table 3. Nutritional Status Among Children According to Level of Energy Intake and Source of Light

Energy Intake	Source of Lighting	Nutritional Status of Children				
		Severe	Moderate	Mild	Normal	Total
		Per cent of NCHS Standard				
		< 60	60-75	75-90	> 90	
			RAJASTHAN			
< 50% of RDA						
	Electricity	12.6	27.7	39.6	20.1	100
	Kerosene	12.1	29.3	41.4	17.2	100
	Others	20.0	10.0	70.0	0.0	100
50-75% of RDA						
	Electricity	8.5	25.1	48.3	18.0	100
	Kerosene	9.4	30.2	46.2	14.2	100
	Others	25.0	50.0	25.0	0.0	100
>7 5% of RDA						
	Electricity	4.9	25.5	47.4	22.2	100
	Kerosene	12.2	28.6	45.0	14.3	100
	Others	16.7	30.0	46.6	6.7	100
			BIHAR			
< 50% of RDA						
	Electricity	27.0	20.2	33.7	19.1	100
	Kerosene	25.4	20.1	31.5	22.9	100
	Others	25.0	40.0	20.0	15.0	100
50-75% of RDA						
	Electricity	17.6	31.8	37.6	12.9	100
	Kerosene	26.1	27.4	29.0	17.5	100
	Others	26.7	36.6	21.7	15.0	100
>7 5% of RDA						
	Electricity	11.2	26.2	34.8	27.8	100
	Kerosene	17.2	27.8	33.7	21.3	100
	Others	29.2	29.2	29.2	12.5	100

Table 4. Nutritional Status Among Children According to Level of Energy Intake and Source of Drinking Water

Energy Intake	Source of Drinking Water	Nutritional Status of Children				
		Severe	Moderate	Mild	Normal	Total
		Per cent of NCHS Standard				
		< 60	60-75	75-90	> 90	
			RAJASTHAN			
< 50% of RDA						
	Piped Water	10.9	23.4	45.3	20.3	100
	Handpump	12.1	30.9	36.4	20.6	100
	Well	14.9	28.4	43.2	13.5	100
	Others	11.4	28.6	42.9	17.1	100
50-75% of RDA						
	Piped Water	10.5	23.7	43.2	20.3	100
	Handpump	10.8	24.6	50.8	13.8	100
	Well	10.2	34.7	38.8	16.3	100
	Others	16.7	16.7	62.5	4.2	100
>75% of RDA						
	Piped Water	5.1	28.2	44.4	22.2	100
	Handpump	6.8	27.7	48.6	16.9	100
	Well	5.6	29.8	47.6	16.9	100
	Others	4.6	24.6	49.2	21.5	100
			BIHAR			
< 50% of RDA						
	Piped Water	32.0	12.0	28.0	28.0	100
	Handpump	22.9	18.2	34.4	24.5	100
	Well	29.8	23.6	27.1	19.6	100
	Others	25.0	50.0	25.0	0.0	100
50-75% of RDA						
	Piped Water	22.7	22.7	31.8	22.7	100
	Handpump	24.3	25.9	30.4	19.3	100
	Well	25.5	32.7	28.8	13.0	100
	Others	40.0	20.0	25.0	15.0	100
>75% of RDA						
	Piped Water	7.8	29.4	27.5	35.3	100
	Handpump	15.8	26.8	35.2	22.2	100
	Well	18.7	29.4	31.2	20.8	100
	Others	22.5	20.0	42.5	15.0	100

Table 5. Nutritional Status Among Children According to Level of Energy Intake and Toilet Facility

Energy Intake	Toilet Facility	Nutritional Status of Children				
		Severe	Moderate	Mild	Normal	Total
		Per cent of NCHS Standard				
		< 60	60-75	75-90	> 90	
			RAJASTHAN			
< 50% of RDA						
	Flush Toilet	6.3	15.9	57.1	20.6	100
	Pit	10.0	16.7	50.0	23.3	100
	Bush/Field	13.8	30.6	37.6	18.0	100
50-75% of RDA						
	Flush Toilet	5.3	18.4	50.0	26.3	100
	Pit	9.3	28.4	48.2	14.0	100
	Bush/Field	12.0	24.0	36.0	28.0	100
> 75% of RDA						
	Flush Toilet	1.9	16.7	48.1	33.3	100
	Pit	6.3	12.5	46.9	34.4	100
	Bush/Field	8.4	28.6	46.3	16.8	100
			BIHAR			
< 50% of RDA						
	Flush Toilet	30.0	25.0	25.0	20.0	100
	Pit	26.5	19.4	31.6	22.6	100
	Bush/Field	26.7	20.2	30.5	22.6	100
50-75% of RDA						
	Flush Toilet	18.2	18.2	45.5	18.2	100
	Pit	19.8	19.4	43.1	17.6	100
	Bush/Field	26.4	28.0	28.4	17.3	100
> 75% of RDA						
	Flush Toilet	6.5	21.7	30.4	41.3	100
	Pit	8.0	29.5	33.0	29.5	100
	Bush/Field	17.5	27.6	34.1	20.8	100

3.2 Nutritional Status of Adults

The results for the adults have been presented as under

Nutritional Status of Adults according to:

Caste and Energy Intake (Table 6)
Type of House and Energy Intake (Table 7)
Source of Lighting and Energy Intake (Table 8)
Source of Drinking Water and Energy Intake (Table 9)
Toilet Facility and Energy Intake (Table 10)

Similar to children, in both the States, proportion of adults with CED showed decline with the increase in energy intake. It has been observed that the proportion of adults with CED was higher among SC as compared to others. The proportion of adults with CED was higher among kucha house dwellers. Further the proportion of adults CED was lower among those using electricity for lighting. Also, the CED adults were less among those with pipe water source. Again the proportion of CED adults was higher among bush/field users as toilet facility.

3.3 These results indicate that the magnitude of malnutrition among children depends both on dietary intake as well as housing and sanitary conditions. Irrespective of the level of nutrient intake the extent of malnutrition remains higher among Scheduled Castes vis-a-vis, others. The magnitude of malnutrition among children (those with severe and moderate level) was much higher among those with poor housing and sanitary conditions even with the same level of dietary intake. However, the level of malnutrition was much lower for those living in better sanitary conditions in spite of lower dietary intake. This indicates that to reduce the problem of malnutrition among children, there should be dual focus on providing supplementary nutrition as well as improving their general standard of living in terms of safe drinking water and better sanitation and housing condition. For identifying the target group for nutritional programmes, the indicators could be poor housing and sanitary conditions i.e. the preference should be for those living in Kucha Houses, not having access to safe drinking water, using kerosene as source of lighting and using bush/fields for toilet facility as this group is more vulnerable and any deficiency in diet will adversely affect the nutritional status specially of children.

The findings for adults are similar to those for children in terms of influence of diet and non-diet factors on their nutritional status. Further, both the genders are equally affected by inadequacy of diet, housing and sanitary conditions.

Table 6. Nutritional Status Among Adults (%) According to Level of Energy Intake and Caste

Energy Intake	Caste	Nutritional Status of Adults			
		CED	Normal	Over Weight	Total
		Body Mass Index			
		< 18.5	18.5–25.0	> 25.0	
		RAJASTHAN			
< 50% of RDA					
	SC	55.4	44.0	0.6	100
	ST	79.5	20.6	0.0	100
	Others	42.4	56.8	0.9	100
50-75% of RDA					
	SC	57.4	42.2	0.4	100
	ST	64.2	35.8	0.0	100
	Others	38.9	60.2	0.9	100
> 75% of RDA					
	SC	45.6	50.8	3.6	100
	ST	45.4	49.2	5.4	100
	Others	34.9	54.9	10.3	100
		BIHAR			
< 50% of RDA					
	SC	65.1	34.2	0.7	100
	ST	54.2	45.8	0.0	100
	Others	57.1	41.6	1.3	100
50-75% of RDA					
	SC	55.6	43.6	0.9	100
	ST	47.1	50.2	2.7	100
	Others	49.2	48.6	2.2	100
> 75% of RDA					
	SC	52.7	45.8	1.4	100
	ST	52.0	46.9	1.1	100
	Others	47.3	50.8	1.9	100

Table 7. Nutritional Status Among Adults (%) According to Level of Energy Intake and Type of House

Energy Intake	Type of House	Nutritional Status of Adults			
		CED	Normal	Over Weight	Total
		Body Mass Index			
		< 18.5	18.5–25.0	> 25.0	
		RAJASTHAN			
< 50% of RDA					
	Pucca	42.6	56.6	0.8	100
	Semi-Pucca	48.3	51.3	0.5	100
	Kucha	59.0	40.3	0.6	100
50-75% of RDA					
	Pucca	38.4	60.6	0.9	100
	Semi-Pucca	50.4	49.2	0.4	100
	Kucha	54.5	45.1	0.4	100
> 75% of RDA					
	Pucca	32.5	56.0	11.5	100
	Semi-Pucca	40.2	53.4	6.3	100
	Kucha	45.9	49.5	4.6	100
		BIHAR			
< 50% of RDA					
	Pucca	54.1	44.7	1.2	100
	Semi-Pucca	53.1	44.9	2.0	100
	Kucha	61.3	38.1	0.5	100
50-75% of RDA					
	Pucca	42.2	55.1	2.7	100
	Semi-Pucca	49.8	49.0	1.2	100
	Kucha	52.2	47.6	0.2	100
> 75% of RDA					
	Pucca	40.0	57.3	2.7	100
	Semi-Pucca	45.2	52.8	2.0	100
	Kucha	52.7	46.0	1.4	100

Table 8. Nutritional Status Among Adults (%) According to Level of Energy Intake and Source of Lighting

Energy Intake	Source of Lighting	Nutritional Status of Adults			
		CED	Normal	Over Weight	Total
		Body Mass Index			
		< 18.5	18.5–25.0	> 25.0	
		RAJASTHAN			
< 50% of RDA					
	Electricity	47.0	52.2	0.8	100
	Kerosene	53.1	46.6	0.4	100
	Others	75.0	25.0	0.0	100
50-75% of RDA					
	Electricity	41.8	57.4	0.8	100
	Kerosene	52.5	47.0	0.4	100
	Others	52.5	47.8	0.7	100
>75% of RDA					
	Electricity	35.5	54.0	10.5	100
	Kerosene	52.5	43.2	4.2	100
	Others	38.9	61.1	0.0	100
		BIHAR			
< 50% of RDA					
	Electricity	49.0	49.0	2.0	100
	Kerosene	61.7	37.6	0.7	100
	Others	61.7	38.3	0.0	100
50-75% of RDA					
	Electricity	43.0	53.1	3.9	100
	Kerosene	51.9	46.5	1.7	100
	Others	68.8	31.3	0.0	100
>75% of RDA					
	Electricity	42.9	54.1	3.0	100
	Kerosene	51.2	47.4	1.4	100
	Others	41.4	56.4	2.2	100

Table 9. Nutritional Status Among Adults (%) According to Level of Energy Intake and Source of Drinking Water

Energy Intake	Source of Drinking Water	Nutritional Status of Adults			
		CED	Normal	Over Weight	Total
			Body Mass Index		
		< 18.5	18.5–25.0	> 25.0	
		RAJASTHAN			
< 50% of RDA					
	Piped Water	43.4	55.8	0.8	100
	Handpump	53.7	45.7	0.7	100
	Well	46.8	52.6	0.6	100
	Others	57.6	45.6	0.4	100
50-75% of RDA					
	Piped Water	41.9	57.0	1.0	100
	Handpump	46.8	52.8	0.4	100
	Well	51.2	48.3	0.5	100
	Others	44.6	55.0	0.4	100
>75% of RDA					
	Piped Water	33.7	54.0	12.4	100
	Handpump	37.3	55.6	7.1	100
	Well	43.0	51.3	5.7	100
	Others	46.9	48.3	4.9	100
		BIHAR			
< 50% of RDA					
	Piped Water	54.3	45.7	0.0	100
	Handpump	60.3	39.1	0.6	100
	Well	58.0	40.4	1.6	100
	Others	60.0	40.0	0.0	100
50-75% of RDA					
	Piped Water	36.2	62.1	1.7	100
	Handpump	50.6	47.4	1.9	100
	Well	52.2	45.9	1.9	100
	Others	55.0	44.5	0.5	100
>75% of RDA					
	Piped Water	36.4	60.8	2.8	100
	Handpump	47.8	50.6	1.6	100
	Well	53.9	44.4	1.7	100
	Others	51.9	44.5	0.5	100

Table 10. Nutritional Status Among Adults (%) According to Level of Energy Intake and Toilet Facility

Energy Intake	Toilet Facility	Nutritional Status of Children			
		CED	Normal	Over Weight	Total
		Body Mass Index			
		< 18.5	18.5–25.0	> 25.0	
		RAJASTHAN			
< 50% of RDA	Flush Toilet	34.8	63.9	1.2	100
	Pit	50.0	39.7	0.3	100
	Bush/Field	54.4	45.2	0.4	100
50-75% of RDA	Flush Toilet	28.5	71.3	1.2	100
	Pit	39.7	59.2	1.2	100
	Bush/Field	51.2	48.3	0.5	100
> 75% of RDA	Flush Toilet	27.7	55.2	17.1	100
	Pit	34.5	53.0	12.5	100
	Bush/Field	40.8	53.2	6.0	100
		BIHAR			
< 50% of RDA	Flush Toilet	45.6	51.3	3.1	100
	Pit	46.3	51.2	2.4	100
	Bush/Field	59.3	40.0	0.6	100
50-75% of RDA	Flush Toilet	37.5	59.3	3.3	100
	Pit	40.7	56.0	3.3	100
	Bush/Field	51.7	46.6	1.7	100
> 75% of RDA	Flush Toilet	37.4	59.1	3.5	100
	Pit	38.3	57.6	4.1	100
	Bush/Field	50.9	47.8	1.4	100

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