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Research Paper

Prevalence of malnutrition in *Bhal* region of Gujarat

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■ **ABSTRACT :** There is increasing evidence that development of underweight and obesity has deleterious social and health consequences. Study was conducted to determine the prevalence of underweight and obesity in rural areas of *Bhal* region of Gujarat state. Total of 1213 subjects of four different age groups were selected from different 80 villages of rural area. The height, weight were measured for all age groups. Mid upper arm circumference, hair colour and skin texture were observed for pre-school children as well as the blood pressure was measured for adults above 40 years. All parameters were correlated with the body mass index. The results found were alarming. Majority of girls had malnourishment symptoms compared to boys. More of tobacco addiction was found in adult male and 40 to 49 years adults were suffered with high blood pressure problem. Illiteracy was higher in female which is indirectly responsible for the health of the community.

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■ **KEY WORDS:** Underweight, Mid upper arm circumference, Body mass index, Malnourishment, Blood pressure, Illiteracy

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Agricultural progress in the last decade has made India self-sufficient in major food grains. Yet undernutrition continues to be major nutritional problem especially in rural populations. High prevalence of low birth weight, high morbidity and mortality in children and poor maternal nutrition of the other continue to be major nutritional concerns in India. For India, published data show that increased mortality is associated with low BMI (NIN Annual Report, 1991) and increased incidence of low birth weight with increasing reduction of the BMI of pregnant women (Naidu and Rao, 1994). While we are in the midst of combating these long-standing problems of undernutrition in children and women, a new situation has arisen. The World health bank has predicted that coronary heart disease will become the leading cause of premature death in India by 2015 and that the maximum number of diabetic patients in the world will be in India (Bulatao and Stephens, 1992).

Globally there are more than 850 million people undernourished. (Brahmam, NIN) India being second after Bangladesh with respect to the prevalence of underweight children in the world. India has 49 per cent of underweight children which contributes to 39 per cent of the world's underweight children. School children contribute to 21.8 per cent population, of these who are aged between 6-14 years, carry almost 63-73 per cent prevalence of under nutrition. The prevalence varies state to state, depending on socio-economic status and their residential location. The most affected group is rural

population (World Bank, 2006).

Malnutrition in children also encompasses micronutrient deficiencies. Iodine and Iron deficiency are most detrimental. A review of such studies examining the relationship between mental development and severe malnutrition concluded that, school-age children who suffered from early childhood malnutrition generally have poorer IQ levels, cognitive function, school achievement and greater behavioural problems than matched controls, and to lesser extent siblings. The detrimental effect was observed to affect their adolescence and later age (Grantham McGregor, 1995). One third of the world's population suffer from anaemia whereas 2.2 billion are iodine deficient. According to NFHS III the prevalence of anaemia is 70- 80 per cent in children (NFHS, 2005). Anemia in adolescent girls affects their physical work capacity and reprductive physiology (Seshadri, 1997).

Gujarat has high level of child malnutrition which is 47 per cent as compared to the national average 21 per cent (World Bank Report, 2005). Growth faltering in malnourished children also hampers intelligence and physical capacity. These in turn lead to slowing down socio-economic growth, reduces productivity and increased poverty and therefore economic cost of malnutrition becomes very high (Mason, 2003).

In Gujarat it is seen that malnutrition is not only affecting children but adults are also suffering from many macro and micro nutrient deficiencies (NFHS III, 2005). The present study aimed in the light of the above issues and discuss strategies for achieving better health of our people.

■ RESEARCH METHODS

The prevalence of underweight and malnutrition is increasing rapidly, especially in underdeveloped countries. In describing the nutritional status of a population the body mass index (BMI) represents the most complete indicator and, at the same time, is the easiest to use. The study was conducted with the aims to find out the health status of all age group people by measurement of their height, weight, Body mass Index and Blood pressure, to collect the family, medical and dietary history using personnel interview technique and to correlate the collected information with the health status of individual.

Sample selection:

Taking into consideration the time restraints and convenience, most of the villages from Bhal region *Dholka* taluka of Ahmedabad district were selected. Twelve hundred and thirteen subjects (1213) of Ahmedabad district different age groups were interviewed who were from different 80 villages of Bhal region. For the pre-school and school children selection the schools were purposively selected and then the subjects were randomly selected. For the adolescents the purposive selection was done from the school as well as from the rural areas. Adults were selected those who were the participants of on and off campus training. The Height and weight were measured using standard techniques. Nutritional assessment was done on the basis of Body Mass Index (BMI). For the pre-school children of 2 to 5 years total of 106 (53 boys and 53 girls) were selected from six different Anganwadies and their Mid upper Arm Circumference (MUAC), Head circumference, hair colour and skin texture were observed. For school children 262 (136 boys and 126 girls) of 6 to 12 years and adolescents 222 (117 boys and 105 girls) of 13 to 17 years the subjects were selected from five different schools and their. hair colour and skin texture were visually observed. The adult group of 18 years and above subjects 623 (382 male and 241 female) were interviewed for the general questions like education, number of family members, suffering from any disease, any addiction (Tobaco/Mava/Masala etc.). All these parameters were correlates with their BMI status. The blood pressure was also measured using the digital blood pressure measurement unit for the adult group.

Following standard techniques were used for measurements :

Height:

Height in centimeters was marked on a wall with the help of a measuring tape. All subjects were measured against the wall without foot wear and with heels together and their heads positioned so that the line of vision was perpendicular to the body. A metal scale was brought down to the topmost pint on the head. The height was recorded to the nearest 1 cm.

Weight:

The weight was measured using a weighing machine (Bathroom Scale) with an accuracy of ±100 g. The subjects were asked to remove their footwear before

measuring their weight. The scales were recalibrated after each measurement. Accuracy of the weighing scale was verified from time to time against known weights

Body mass index (BMI):

BMI of the study subject was calculated by using the formula weight (kg)/ height^2 (m^2). For grading proposed criteria of BMI of Asians and CDC (2010) was adopted. Children (6 to 17 years) and adults (18 and above years) with BMI below 18.5 were considered underweight whereas BMI at or above 25 were considered overweight.

Blood pressure:

Blood pressure of adults above 40 years (123 female and 248 male) were measured using the Fully Automatic Blood Pressure Monitoring instrument (Lloyd pharmacy, UK). For systolic and diastolic pressure grading proposed criteria of blood pressure cut off points was adopted.

Hair colour and skin texture:

The visual observation was done for the hair colour (Rusty red, light and dark bands of colour) and skin texture (dry skin, wrinkled skin).

■ RESEARCH FINDINGS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under following heads :

Group I (Pre-school children, 2-5 years):

Malnutrition substantially raises the risk of infant and child deaths and increase the vulnerability to a variety of diseases in later life. Children who are undernourished and underweighted are likely to be less clever than if they are well fed (WHO report). Even though the problem of fetal growth may be taken care off, rural conditions are such that poor growth is a characteristic phenomenon among pre-school children and it may be interesting to examine postnatal effect of chronic undernutrition on adult size and health.

In this study the pre-school children (53 girls and 53 boys) of six different anganwadies were examined for height, weight, hair color and skin texture. Table 1 data indicated that around 83 per cent girls and 84 per cent boys were underweight and 62 per cent girls and 67 per cent boys had not attained the normal height. This indicates that the early years of life are critical for rural children may miss the 'second opportunity' for catch-up growth during adolescence due to stunting in early life.

Mid upper arm circumference (MUAC) of girls was 5.6 per cent lower than the normal and 1.9 per cent in the pre-school boys which indicates that moderate malnutrition symptoms. Same way the head circumference shows that 33.9 per cent girls and 11.3 per cent boys were suffered from moderate to severe malnutrition. The symptoms found in girl child were higher than the boys.

Prolonged protein deficiency in the diet results in Kwashiorkor. This disease involves multiple symptoms including the reduction of pigment production and incorporation into hair fibre. Normally dark brown hair becomes a rusty red. Light coloured hair become blonde. The flag sign sometimes seen in kwashiorkor involves alternating light and dark bands of colour along individual hair fibres. The flag sign is associated with intermittent protein malnutrition. Presumably normal hair colour is produced when protein intake is adequate. Severe vitamin B_{12} deficiency has been reported by some as a potential promoter of gray hair. Overall, it is extremely unusual to see hair colour changes as a result of dietary deficiencies. The results indicate that around 62 per cent girls and 37 per cent boys have brown rusty hair colour and they were also of underweight and stunted height. So this may be an indication of protein malnutrition. The girl child

Table 1 : Different Anthropometric measurements of pre-school children (2-5 years) (n=106)

Sr. No.	Anthropometric parameters	Group I (Pre-school children)					
		Girl (n=53)		Boy (n=53)		Total	
		F	%	F	%	F	%
1.	Under weight	44	83.1	45	84.9	89	83.9
2.	Stunted (Lower height)	33	62.3	36	67.9	69	65.1
3.	Mid upper arm circumference (MUAC) (< 12.5cm)	3	5.6	1	1.9	4	3.8
4.	Head circumference (<45.5 cm)	18	33.9	6	11.3	24	22.6
5.	Brown hair	33	62.3	20	37.7	53	50.0
6.	Dry skin	36	67.9	24	45.3	60	56.6

has higher number of protein malnourishment compared to boys.

Vitamin deficiency and dry skin can, quite literally, go hand in hand. The appropriate dosage of different vitamins and nutrients are essential for proper health and inadequate supplies of certain vitamins can result in dry skin. In our results we had observed that 67 per cent girls and 45 per cent boys were having the dry skin problem may because of vitamin deficiencies.

Group II (School children, 6-12 years):

School children (6 to 12 years) from different five schools were examining for anthropometric measurements. The body mass index was calculated using height and weight measurements and the data were categorized for under weight, normal and overweight. Table 2 results indicate that out of 262 school children 97 per cent school children were in the underweight category. Almost all girls were of underweight category. So this is the indication of severe malnutrition problem. Brown rusty hair problem was observed in 57 per cent school children and the 61 per cent children were having the dry skin which was the indications of protein malnutrition and vitamin deficiencies. When the body mass index was compared with the hair and skin observations the data indicate that around 97 per cent and 98 per cent school children were in the underweight category, respectively which may be the result of protein and vitamin deficiencies.

Group III (Adolescence, 13 to 17 years):

Adolescence is known to be a "second opportunity" for growth as it facilitates catch-up growth for children experiencing nutrition deficits in their early life. However, as discussed above, stunting appeared to be a persistent phenomenon beyond the early life among rural children and it had significant impact at 10+ years of age. Thus the majority of children enter adolescence with poor nutritional status (Joshi *et al.*, 1998, Rao *et al.*, 1998a and b, 2000 and Kanade *et al.*, 1999). We had therefore, examined the adolescence of 13 to 17 years (105 girls and 117 boys) from three different schools.

Table 3 indicates the body mass index of adolescence. 79 per cent adolescence was in the underweight category. Here the boy numbers were higher than the girls. In adolescent girls, short stature that persists into adulthood is associated ith increased risk of adverse reproductive outcomes (Thance *et al.*, 1997 and Kirchengast and Winkler, 1996). According to the limited number of studies from India, the prevalence of anemia in adolescent girls is also fairly high (Kanani and Ghanekar, 1997 and Vir, 2000).

Adolescence of 41 per cent were suffered from protein malnutrition as they had brown rusty hair as well

Table 2 : Anthropometric measurements of school children (6-12 years) (n=262)

Sr. No.	Anthropometric measurements	Group II (School children)					
		Girl (n=126)		Boy (n=136)		Total	
		F	%	F	%	F	%
	BMI						
1.	< 18.5 (Under weight)	125	99.2	131	96.4	256	97.7
2.	18.5 to 24.9 (Normal)	1	0.8	4	2.9	5	1.9
3.	≥ 25 (Over weight)	0	0.0	1	0.7	1	0.4
	Brown hair	90	71.4	61	44.8	151	57.6
	Dry skin	82	65.1	78	57.4	160	61.1

Table 3 : Anthropometric measurements of adolescence (13-17 years) (n=222)

Sr. No.	Anthropometric measurements	Group III (Adolescence)					
		Girl (n=105)		Boy (n=117)		Total	
		F	%	F	%	F	%
	BMI						
1.	< 18.5 (Under weight)	79	75.2	98	83.8	177	79.7
2.	18.5 to 24.9 (Normal)	25	23.8	18	15.4	43	19.4
3.	≥ 25 (Over weight)	1	0.95	1	0.8	2	0.9
	Brown hair	55	52.4	37	31.6	92	41.4
	Dry skin	50	47.6	23	19.7	73	32.8

as 32 per cent adolescence were having the vitamin deficiency because they have dry skin. Brown rusty hair and dry skin were observed more in the adolescence girls compared to adolescence boys. The adolescence that has brown rusty hair (82.6) was having the underweight problem same way 84 per cent adolescence have dry skin may because of vitamin deficiencies. Adolescence boys were higher in underweight category compared to adolescence girls. Adolescence demands high level of activity and growth, dietary requirements both quantitatively as well as qualitatively are of great importance. A failure to consume an adequate diet during adolescence can potentially retard growth (Johnson *et al.*, 1994).

Group IV (Adults, 18 years and above):

The retrospective nature of observations based on which the fetal origins theory is proposed, overlooks the confounding effects of lifestyle and environmental factors in determining the risks for adult diseases. Continuous exposure to poor environmental conditions, morbidity and undernutrition in rural India, need investigation of postnatal influences in determining the risks associated with adult diseases. In this study 623 adults were involved out of them 242 were female and 382 were male subject. Their body mass index was calculated using the height and weight data and the other information like Blood pressure measurements of 40+ adults, education, age, any addiction (mava/masala/ tobacco etc.) were also collected. All the data regarding the other information were correlates with the BMI status of adults for getting the idea about the health status of adults. Table 4 indicates the body mass index data of adult category. 23 per cent adults were in underweight category whereas 21 per cent were in overweight category. The female subjects were higher in both the underweight and overweight category compared to male subjects.

When the underweight and overweight subjects were age wise categorized we had observed that more of female in the age group of 18 to 39 years were of underweight subjects and more overweight female and male subjects were in 40 to 59 years age group.

The 371 adults who are ≥ 40 years (123 female and 248 male) were examine for the blood pressure. Results shows that 27 per cent adults had high systolic blood pressure and 31 per cent had high diastolic blood pressure. 70 per cent and 67 per cent adults were having the normal systolic and diastolic blood pressure respectively. In comparison of high blood pressure with the different age groups the data revealed that 46 per cent to 49 per cent adults of 40 to 49 years were suffered of high systolic and diastolic blood pressure. Less number of 60 + adults was having the high blood pressure.

Adults with high blood pressure were compare with the body mass index and it indicated that more percentage

Table 4 : Body mass index of adult group (≥18 years) **(n=623)**

Sr. No.	BMI	Group IV (Adult ≥18 years)					
		Female (n=241)		Male (n=382)		Total	
		F	%	F	%	F	%
1.	< 18.5 (Under weight)	72	29.8	72	18.8	144	23.2
2.	18.5 to 24.9 (Normal)	104	43.3	238	62.3	342	54.9
3.	≥ 25 (Over weight)	65	26.9	72	18.9	137	21.9

Table 5 : Blood pressure prevalence in adult (≥40 years) **(n=371)**

Sr. No.	Blood pressure	Group IV (Adult ≥18 years)					
		Female (n=123)		Male (n=248)		Total	
		F	%	F	%	F	%
Systolic blood pressure							
1.	≤ 90 (Lower side)	1	0.8	6	2.5	7	1.9
2.	91-129 (Normal blood pressure)	92	74.8	169	68.1	261	70.4
3.	≥ 130 (Higher side)	30	24.4	73	29.4	103	27.7
Diastolic blood pressure							
1.	≤ 60 (Lower side)	1	0.8	4	1.6	5	1.4
2.	61-84 (Normal blood pressure)	90	73.2	159	64.1	249	67.1
3.	≥ 84 (Higher side)	32	26.0	85	34.3	117	31.5

Table 6 : Correlation of profile and BMI of different age groups

Sr. No.	Profile	Correlation co-efficient	
		Female	Male
Pre-school children			
1.	Age	0.072 (NS)	-0.389 (**)
2.	MUAC	0.176 (NS)	0.280 (*)
3.	Head circumference	0.091 (NS)	0.006 (NS)
4.	Hair	-0.153 (NS)	0.153 (NS)
5.	Skin	-0.138 (NS)	0.248 (NS)
School children			
1.	Age	0.114 (NS)	0.230 (**)
2.	Hair	0.006 (NS)	-0.104 (NS)
3.	Skin	-0.013 (NS)	0.076 (NS)
Adolescent			
1.	Age	0.476 (**)	0.170 (NS)
2.	Hair	0.075 (NS)	0.125 (NS)
3.	Skin	0.068 (NS)	0.185 (*)
Adult			
1.	Age	0.234 (**)	0.164 (**)
2.	Family	-0.196 (**)	-0.007 (NS)
3.	Education	-0.017 (NS)	0.015 (NS)

* Significant difference ($p< 0.05$) and ** Highly significant difference ($p<0.01$), NS=Non-significant

of females were in the overweight category whereas the males were in the normal weight category.

The information regarding the addiction of tobacco was also collected from adult male group. Results shows that out of 382 adult male 212 *i.e*. 55 per cent were having the addiction of tobacco. When the data were categorized age wise the more of addicted male were found in 40 to 59 years age category and the second rank was of 18 to 39 years adult male. In comparision of high blood pressure with tobacco addiction in $\geq$ 40 years adult males, the results indicated that 31 per cent and 36 per cent adults were having the high systolic and diastolic blood pressure, respectively. In comparison of body mass index and tobacco addiction of $\geq$ 18 years adult male the data indicated that there is not any effect of tobacco addiction on the BMI of adults. The information regarding the education of adults was also collected and 44 per cent females were illiterate and very less subjects were getting the graduation and post graduation degree.

The table depicted that as the age increase in pre-school boys the BMI is highly significantly decrease ($P<0.01$) while school boys as the age is increase the BMI is significantly increase ($P<0.05$). In adolescent girls as the age increase the BMI is also significantly increase ($P<0.01$). The same trend was found for adult male and female.

Conclusion :

The study concludes that a majority of girls had malnourishment symptoms compared to boys. More of tobacco addiction was found in adult male and 40 to 49 years adults were suffered with high blood pressure problem. Illiteracy was higher in female which is indirectly responsible for the health of the community. Adolescents are expected to enjoy good health, but this does not seem to be the case in the rural areas of developing countries like India, where poverty, malnutrition and repeated infection are rampant. In the light of the above discussion, it is necessary to discuss some strategies required for improving the nutritional status of our people.

Maternal nutrition intervention programmes need to examine the role of micronutrient rich foods. Interventions to improve preconceptional maternal nutritional status for rural young girls may be more beneficial than those during pregnancy.

– Most problems related to maternal and child health will need awareness in rural mothers.

– Efforts are necessary for exploring non-nutritional avenues such as imparting knowledge about nutritional needs during pregnancy, lactation and infancy,

and creating nutritional and health awareness among young rural girls to ensure a better quality of life for the next generation.

– Mission for stop the tobacco addiction are required.

■ REFERENCES

Brahmam, G.N.V., NIN Procedure for the estimation of haemoglobin from finger prick blood sample by cyanmethaemoglobin method using filter paper technique.

Bulatao, R.A. and Stephens, P.W. (1992). Global estimates and projections of mortality by cause 1970-2015, Working Paper Series No. 1007 (Population and Human Resources Department, The World Bank).

Grantham-McGregor, S. (1995). A review of the studies of the effect of severe malnutrition on mental development. *J. Nutri.*, **125**(8) : 2233-2238.

Johnson, F., Wardle, J. and Griffith, J. (2002). The adolescent food habits checklist: reliability and validity of a measure of healthy eating behavior in adolescents. *European J. Clinical Nutri.*, **56** : 644-649.

Joshi, S.B., Kanade, A.N. and Rao, S. (1998). Growth pattern of rural Indian boys aged 8-18 years: A longitudinal study, *Indian J. Nutri. & Dietetics*, **35** : 149-156.

Kanade, A.N., Joshi, S.B. and Rao, S. (1999). Undernutrition and adolescent growth among rural Indian boys. *Indian Pediatrics*, **36** : 145-156.

Kanani, S. and Ghanekar, J. (1997). Anaemia and adolescent girls: A review of research evidence and intervention stretegies, Department of Food and Nutrition, M.S. University of Baroda and UNICEF, India.

Kirchengast, S. and Winkler, E.M. (1996). Nutritional status as indicator for reproductive success in Kung San and Kavango females from Nambia, *Anthropological Anz.*, **54** (3) : 267-276.

Mason, J.B. (2003). Atleast one third of poor countries diseases burden is due to malnutrition: diseases control priorities project: working paper no.1.

Naidu, A.N. and Rao, N.P. (1994). Maternal body mass index; a measure of the nutritional status in Indian populations, *European J. Clinical Nutri.*, **48** (3) : 131-140.

National Family Health Statistics-2005-2006.

National Institute of Nutrition (1991). Body mass index and mortality rates: a 10 year retrospective study, *Annual Report* (1989-90), Hyderabad (A.P.) INDIA.

NFHS III (2005). The major deficiencies are anemia, goiter, calcium deficiency and these are referred to in the Adult macro and micro malnutrition.

Rao, S., Joshi, S.B. and Kanade, A.N. (1998a). Height, weight and menarcheal age of rural Indian girls. *Indian Pediatrics*, **35** : 619-626

Rao, S., Kanade, A.N. and Joshi, S.B. (1998b). Height, weight and menarcheal age of rural Indian girls. *Indian J. Nutr. & Dietetics*, **35** : 117-128.

Rao, S., Joshi, S.B. and Kanade, A.N. (2000). Growth in some physical dimensions in relations to adolescent growth spurt among rural Indian boys. *Annual Human Biol.*, **27** : 127-138

Seshadri, S. (1997). Nutritional anaemia in South Asia, In: Gillespie SK, ed. Malnutrition in South Asia: A regional profile. UNICEF Regional office for South Asia, 75-124.

Thance, M., Wilks, R.J., McFarlane, A.N., Bennett, F.I. and Forrester, T.E. (1997). Relationship between maternal nutritional status and infant's weight and body proportions at birth. *European J. Clinical Nutri.*, **51**(3) : 134-138.

Vir, S.C. (2000). Iron deficiency anaemia control - a public health programme priority. *Proc. Nutr. Soc. India*, **47** : 45-73.

WHO report, Life in the 21st century – A vision for all, Geneva

World Bank Report (2005). Malnourishment among children in India, a regional analysis – Indian Rank.

World Bank (2006). Directions in development. Repositioning nutrition as central to development- a strategy for long scale action.