

## Nutritional Anthropometry and Health Status: A Study Among Dhanka Tribals of Rajasthan

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**ABSTRACT** The study was undertaken to evaluate health status with the help of anthropometric measurements. It is based on cross-sectional sample of 360 adult Dhanka males and 340 adult Dhanka females of Rajasthan. Body measurements, which have direct bearing on health and nutritional status, like stature, body weight, upper-arm circumference, calf circumference, biceps skin fold thickness and triceps skin fold thickness were taken into consideration. All measurements showed an increasing trend up to the middle age followed by a decline. Circumferential measurements and skin fold thicknesses were found to be better predictor of body fat. A wide variation in skin fold thickness could be attributed to the varied health status, physical activity level and energy expenditure.

### INTRODUCTION

The physical well being and maintenance of normal health of an individual is related closely to his status of nutrition. Life cannot be sustained without adequate nourishment. Man needs adequate food for normal growth and development. Nutrition, which is vital, is a multi-step process with intake of food, metabolism of food and its utilization. Proper nutrition keeps man healthy and fit whereas inadequate or improper nutrition reduces fitness and causes susceptibility to diseases. Anthropometric measurements are important tools to assess the nutritional and health status of people depend on their respective energy intakes. The National Institute of Nutrition (NIN) carried out nutritional surveys on 30 tribal groups spread over nine states and UTI of India during the last 20 years. The present study aims to assess changes in body structure with age among adult Dhanka males and females.

### MATERIALS AND METHODS

The present study is based on the cross-sectional sample of 360 adult Dhanka males and 340 adult Dhanka females. Dhanka is a tribe in Rajasthan. The study was conducted in Alwar district of Rajasthan. The most populous villages of Dhankas tribals are: Jonaicha Khurd, Jonaicha Kalan, Siryani, Sansedi, Kutirna, Kakar, Dehmi, Gugar Kota, Shahjahanpur, Chaubara, Phaulad Pur, Jat Behror, Jalahwas, Manithi, Mauldawas, Sanauli, Bardod, Peepli, Neemrana, Majri, Majri Kalan, Shivpuri, Silarpur and Naghaudi.

Majority of these tribal people are agricultural labourers, eat bajra and wheat as their staple food. Dhankas are non-vegetarian provided they can afford the same. They do not own any land. Both the male and female population of this tribe work as agricultural labourers on lands owned by higher caste people like Brahmins, Rajputs, Yadavs, etc. Some of the people of this tribe work as Beldars (labourer in truck loading/construction sites), as rickshaw pullers, in mining and animal husbandry, etc. Dhanka tribe has a total of 52 clans. Dhanka observe tribe endogamy and clan exogamy. They do not marry their daughters in the clan from which their grandmother or mother comes. They also do not marry their sons in the village whom they have already given their daughters to.

The literacy rate of Dhanka people is very low. People of this tribe are illiterate (96.2%) and work as agricultural labourers (86%) or as construction labourers (14%). None of the Dhanka tribals were landholders. They had Kachha houses (89%) and very few had electric connection (8%). No one had domesticated animals except very few who had goats. Dried mustard stalks were used as fuel for cooking. All these indicators points towards a lower socio-economic status.

Dhanka tribals were mostly non-vegetarian. The non-vegetarian foods include goat, hen, meat and other birds (like teetar and batara). However, these food items were consumed by them very occasionally and were considered to be delicacies, which they could not afford on regular basis. The women folks were the worst sufferers

as they not only worked harder than their man folks but as the food distributors, they themselves took the smallest share. Their husbands and children always came first.

All the subjects were apparently healthy and normal, ranging in age from 20 years to 65 years and above. They were classified into 10 age groups 20-24 years, 25-29 years, 30-34 years, 35-39 years, 40-44 years, 45-49 years, 50-54 years, 55-59 years, 60-64 years and above 65 years (Table 1). After attaining adult status, the body measurements remain quite stable over a bigger age range and any change in them is slow, unlike during growing years. It is a widely used practice to group the adult subjects in to five years or ten years interval. In the present study an interval of five years has been followed to study the impact of age. The general information with respect to their socio-economic status, health, nutrition, education, occupation and physical activity level has been recorded for each individual before taking anthropometric measurements.

The most crucial measurements for health studies are stature and body weight. The stature sums up all the linear measurements of the body

whereas body weight helps in estimating the total mass of body of an individual. Besides these two measurements, circumferential measurements and skin fold thickness measurements at various sites over the body were also taken. The skin fold thickness acts as a significant index of energy reserve. The circumference and skin fold thickness measurements also helps in determining whether differences in body weight are due to adipose tissues or muscle mass. The differences in the values of skin fold thickness in people of same age would reflect the status of energy reserve.

#### *List of Anthropometric Measurements:*

Stature, body weight, upper arm circumference, calf circumference, biceps and triceps skin fold thickness. The measurements were taken according to the techniques described by Weiner and Lourie (1981). Stature was measured with Martin's anthropometer. Body weight of the subjects, wearing minimum clothes was measured with weighing machine. For the circumference measurements a flexible steel tape was used. The thickness of skin fold at various sites was measured using Holtain's skin fold caliper that exerted a constant pressure of 10 gm/mm<sup>2</sup> over the contact surface.

## RESULTS

The data were statistically analyzed to find the mean and standard deviation of various anthropometric variables in different age groups. The basic data of the subjects has been presented in Table 2. A declining trend in stature has been observed in Dhanka males as the age advance. The highest mean value was observed in the youngest group while the least was seen in last age group i.e. 65 and above years. Among Dhanka

**Table 1: Age and sex-wise distribution of Dhanka Tribals of Rajasthan**

Group No.	Age groups (in years)	Number of Dhanka males	Number of Dhanka females
1.	20-24	35	34
2.	25-29	32	32
3.	30-34	33	33
4.	35-39	34	32
5.	40-44	35	32
6.	45-49	37	33
7.	50-54	38	35
8.	55-59	35	35
9.	60-64	39	36
10.	65 and above	42	38

**Table 2: Mean and S.D. of stature and body weight among Dhanka males and females in different age groups**

Group No.	Age Group	Stature (cm)		Body weight (kg)	
		Dhanka Males Mean $\pm$ S.D.	Dhanka Females Mean $\pm$ S.D.	Dhanka Males Mean $\pm$ S.D.	Dhanka Females Mean $\pm$ S.D.
1.	20 - 24	170.4 $\pm$ 6.2	152.3 $\pm$ 4.4	55.6 $\pm$ 5.2	46.5 $\pm$ 5.5
2.	25 - 29	169.5 $\pm$ 8.4	152.6 $\pm$ 5.8	56.2 $\pm$ 4.3	49.8 $\pm$ 4.6
3.	30 - 34	169.3 $\pm$ 5.8	154.6 $\pm$ 5.8	57.2 $\pm$ 4.3	45.3 $\pm$ 5.5.
4.	35 - 39	168.5 $\pm$ 6.7	154.4 $\pm$ 6.2	58.7 $\pm$ 4.1	52.4 $\pm$ 8.3
5.	40 - 44	169.2 $\pm$ 6.6	154.3 $\pm$ 4.8	57.7 $\pm$ 4.1	52.2 $\pm$ 7.5
6.	45 - 49	168.7 $\pm$ 6.4	154.7 $\pm$ 6.3	56.9 $\pm$ 4.5	52.8 $\pm$ 7.7
7.	50 - 54	167.7 $\pm$ 7.0	152.3 $\pm$ 4.8	55.1 $\pm$ 4.0	50.5 $\pm$ 6.4
8.	55 - 59	167.8 $\pm$ 8.1	152.8 $\pm$ 5.1	57.4 $\pm$ 6.0	52.1 $\pm$ 6.0
9.	60 - 64	167.2 $\pm$ 7.2	151.1 $\pm$ 5.0	53.3 $\pm$ 4.1	49.7 $\pm$ 5.2
10.	65 and above	166.2 $\pm$ 7.9	151.0 $\pm$ 4.4	51.8 $\pm$ 5.3	49.3 $\pm$ 5.9

females, stature showed an increase till 6<sup>th</sup> age group and a decline thereafter.

Body weight did not show much difference among males till the 8<sup>th</sup> age group followed by a decline in the later age groups. Among females body weight increased initially then remained stable up to age group 55-59 years and decreased in the 9<sup>th</sup> and the 10<sup>th</sup> age groups.

The upper arm circumference increased up to 3<sup>rd</sup> age group, thereafter it showed decline in Dhanka male population. The highest value of upper arm circumference was found in age group 30-34 years whereas the lowest value was observed in 60-64 years old subjects (Table 3). Among females, the maximum and minimum mean values for the upper arm circumference were found in 4<sup>th</sup> and 10<sup>th</sup> age group respectively. The upper arm circumference increased initially and remained stable till 7<sup>th</sup> age group and declined there after.

Mean calf circumference in Dhanka males showed highest value in 35-39 years age group while age group 65 and above years depicted the lowest value. A similar trend has been seen in case of females.

There was an increase in the biceps skin fold

thickness till 40-44 years of age in male population after that decline was found till last age group (Table 4). The highest thickness value was seen in 5<sup>th</sup> age group while minimum biceps skin fold thickness was observed in 65 and above years of age. Similar trend was observed in Dhanka females where the minimum thickness was observed in last age group and maximum value were seen in 5<sup>th</sup> and 6<sup>th</sup> age group. Triceps skin fold thickness values were also observed least in last age group both in Dhanka males and females while the maximum value was seen in 5<sup>th</sup> age group.

### DISCUSSION

The interpretation of food intake suggested that people of Dhanka tribes eat “chapattis” made out of wheat, bajra flour together with raw onion, green chilies or chutney (green/red chilies crushed with common salt) supplemented by occasional intake of pulses, sour milk etc. The findings revealed that the tribal women were living in a state of great deprivation due to poor socio-economic status. Various anthropometric measurements like stature, body weight, upper arm circumference, calf

**Table 3: Mean and S.D. of upper arm and calf circumference among Dhanka males and females in different age groups**

Group	Age group	Upper Arm Circumference (cm)		Calf Circumference (cm)	
		Dhanka Males Mean± S.D.	Dhanka Females Mean ± S.D.	Dhanka Males Mean ± S.D.	Dhanka Females Mean ± S.D.
1.	20-24	22.4 ± 1.3	20.7 ± 1.5	30.9 ± 1.5	26.2 ± 1.6
2.	25-29	22.8 ± 1.3	21.4 ± 1.6	30.5 ± 1.5	26.9 ± 1.7
3.	30-34	25.6 ± 2.3	22.5 ± 1.8	32.3 ± 1.2	27.4 ± 1.8
4.	35-39	24.9 ± 1.4	22.9 ± 1.8	32.4 ± 1.1	27.8 ± 1.8
5.	40-44	23.4 ± 1.5	22.5 ± 1.9	32.1 ± 1.4	27.5 ± 2.8
6.	45-49	22.8 ± 1.3	22.2 ± 1.6	30.6 ± 1.6	26.8 ± 1.7
7.	50-54	23.0 ± 1.2	22.3 ± 1.8	30.5 ± 1.9	27.0 ± 1.7
8.	55-59	21.8 ± 1.6	21.1 ± 1.4	30.4 ± 1.3	26.8 ± 1.6
9.	60-64	20.8 ± 1.5	21.0 ± 1.5	30.4 ± 2.2	25.8 ± 1.6

**Table 4: Mean and S. D. of biceps and triceps skin fold thickness among Dhanka males and females in different age groups**

Group No.	Age Group	Biceps skin fold thickness (mm)		Triceps skin fold thickness (mm).	
		Dhanka Males Mean ± S.D.	Dhanka Females Mean ± S.D.	Dhanka Males Mean ± S.D.	Dhanka Females Mean± S.D.
1.	20-24	5.7 ± 1.2	5.2 ± 1.9	6.9 ± 1.2	6.7 ± 1.4
2.	25-29	5.4 ± 0.5	5.3 ± 1.4	7.4 ± 1.0	6.4 ± 1.3
3.	30-34	5.8 ± 0.5	5.2 ± 1.2	7.4 ± 1.3	6.1 ± 1.2
4.	35-39	5.8 ± 1.0	5.9 ± 1.2	6.8 ± 1.4	6.9 ± 1.3
5.	40-44	6.7 ± 1.3	6.1 ± 1.2	7.8 ± 1.6	7.9 ± 1.2
6.	45-49	6.1 ± 1.8	6.1 ± 1.2	7.5 ± 1.6	7.6 ± 1.2
7.	50-54	5.4 ± 1.8	5.7 ± 1.0	7.4 ± 1.8	6.6 ± 1.0
8.	55-59	5.4 ± 1.8	5.7 ± 1.3	6.8 ± 1.7	6.5 ± 2.0
9.	60-64	5.3 ± 1.4	5.2 ± 1.0	6.7 ± 1.6	6.2 ± 1.0
10.	65 and above	4.9 ± 1.5	4.7 ± 1.3	5.8 ± 1.4	5.5 ± 1.3

circumference, biceps skin fold thickness and triceps skin fold thickness showed tendency to increase up to middle age followed by decline. The decrease in later age groups is more marked. This age related phenomena displayed by various body measurements reflect the impact of ageing process. It seems to be a universal phenome-non despite the differences in socioeconomic status (Nikolic et al., 2005; Bhardwaj et al., 2006)

The reason for decline in stature could be due to thinning of intervertebral discs as well as flabbiness of muscles, which changes the posture. The decline in stature among adult is well documented and it appears to be a common phenomenon (Khosla and Lowe, 1968; Brahmam, 1994). The decrease in height with age seems to be a universal and inevitable age related change. A loss of collagen between spinal vertebrae causes the spine to bow and the height to shrink leading to a decrease as much as 3 inches (Aiken, 1995)

The decline in body weight may be attributed to the decrease in muscle mass in response to reduced amount of protein intake as well as decline in number and size of muscle fibers due to degenerated diseases associated with the advancing age. It may partly be due to bones becoming lighter because of gradual mineral mass loss (Verma et al., 1987).

Upper arm circumference and calf circumference showed more or less similar pattern of decreasing trend with advancing age. This decline with age is indicative of the reduced lean body mass. The loss of lean tissues with age has been substantiated in the longitudinal study by Tzankoff and Norris (1976) who have shown decline in the basal metabolism with age indicating loss of muscle mass.

The decline in skin fold thickness at biceps and triceps may be attributed to decrease in subcutaneous fat as a result of reduced energy intake, as fat content is dependent on nutrition intake and energy expenditure of the individual concerned (Borkan and Norris, 1977). The most unusual finding in the present study is the comparison of mean values of skin fold thickness at biceps and triceps among Dhanka males and females. The females showed almost similar mean values of these skin fold thickness as compared to their counterpart males. Despite repeated measurements the values remained same. It is a well known fact that females are fatter than males of the same age group due to the additional reproductive functions related essential fat. But

an undisputable fact remains that fat stores in the body reflect nothing but the energy imbalance between food intake and energy expenditure. May be due to extra physical activity combined with less food intake has called upon all the fat reserves in Dhanka females resulting in their present physique Dhanka females were found to have significantly lesser fat mass as compared to Brahmin females of the same area who were economically well off (Bhardwaj et al., 2006).

On analyzing the result it can be said that Dhankas are living in a state of great deprivation due to poor socio-economic status and the situation is worst among females with having to undertake the burden of household and working outside for supplementing the family income besides bearing and rearing children.

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