

Skinfold Measurements of The High and Low Altitude Gujjar Populations of North-Western India

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ABSTRACT The skinfold measurements not only provide a fair estimate of stored energy in adipose and other body tissues, but also exhibit health and nutritional status and physiological adaptation of a population. The present study deals with six skinfold measurements, viz. biceps, triceps, subscapular, above iliac crest, widest portion of forearm and of calf muscle of the low and high altitude Hindu and Muslim Gujjars, respectively in the North-Western part of India. The high altitude Muslim Gujjars significantly differ from the lowland Hindu Gujjars in five skinfold measurements. These findings are consistent with the high and lowland populations studied by the other investigators elsewhere. The results of the present study have been discussed in relation to some associated variables.

The Gujjars are one of the predominant communities of India. Both the Hindu and Muslim Gujjars are biologically as well as geographically isolated populations in the North-Western part of India (Balgir, 1983, 1989, 1993; Balgir and Sharma 1986, 1988). They differ in their habitats, economy and socio-cultural and religious practices (Balgir, 1991a, 1992a, 1995 and 1996). They are the victim of forcible proselytism of their religion by the invading Muslims since 7th to 17th century A.D. (Balgir, 1983, 1991b). They had a flourishing kingdom in the South-Western Rajputana (Rajasthan) and Gujarat (Balgir, 1983). They belonged to a common Hindu stock about 1000 years ago (Balgir and Sharma, 1988). They were the people with brisk activities during the course of Indian history.

With the passage of time, their migrations

took place to different parts of India. Now, the Hindu Gujjars are in the Sub-Himalayan region (foothills of Shivaliks) and adjoining plains and practise sedentary agriculture and semi-postoralism (Balgir, 1992c). They have been declared as one of the economically backward communities of Punjab ever since 1979. The converted Muslim Gujjars are found exclusively in the Himalayan regions, leading a pastoral, semi-nomadic and semi-agricultural life (Balgir, 1995 and 1996). They had migrated to the Himalayan regions about 3-4 centuries ago. They have been declared as one of the Scheduled Tribes of Himachal Pradesh since 1956. The Muslim Gujjars practise polygyny and consanguinity (Balgir, 1991a, 1992a); whereas, the Hindu Gujjars, although observe clan exogamy, the practices of fraternal polyandry and brother-sister exchange marriages are still prevalent in them (Balgir, 1991a, 1992a).

The present study is focussed on the comparative evaluation of the Hindu and Muslim Gujjar populations belonging to the low and high altitudes, respectively in relation to some skinfold measurements, physiological adaptations, and health and nutritional status in the North-Western part of India.

MATERIAL AND METHODS

For the present study, the skinfold measurements were taken on the Hindu and Muslim Gujjars of the low and high altitudes, respectively. The Muslim Gujjars were the inhabitants of Paddar, Proatha, Sra, Qureel and Rajindu villages in Chamba district of Himachal Pradesh. These villages are situated about 25-40 kms. North East of Chamba

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Town on the Sahoo riverlet which ultimately joins the major river, Ravi near the township of Chamba. The Sahoo area falls under Chamba Tehsil, which is surrounded by mountain ranges and Alpine forests. The altitude of this area varies between 1900 to 2700 metres above sea level and comes under the Sahoo Range of Pir Punjal (snowy range) of the Great Himalayas. During summer, the Muslim Gujjars even go beyond 3000 metres above sea level on the higher peaks of Himalayas along with their cattle in search of grassy pastures, where they spend 3 to 4 months a year. The summer is mild and pleasant. The winter is severe.

The Hindu Gujjars for the present study were selected from the Majrian village and its four hamlets, namely, Majri, Guhra, Kasauli and Karaundewala in Ropar district of Punjab. The village of Majrian is situated about 15-20 kms North of the Union Territory of Chandigarh along the riverine tract of Jayanti Devi choe. This area was recently proposed to be the city of New Chandigarh. The altitude of the Sub-Himalayan region varies between 600 to 650 metres above sea level. The climate of the Sub-Himalayan region falls in the range of tropical dry climate. The Hindu Gujjars have fixed abodes in the Sub-Himalayan (foothills of the Shivaliks) terrains.

The skinfold measurements provide a mean of estimating the amount of fat in the body. These may be taken at different sites: triceps, *i.e.* on the back of the right upper arm over the triceps muscles. Biceps, inside back of upper arm. Subscapular site, *i.e.* below the inferior angle of scapula. Widest portion of the left forearm on the radial and ulnar sides, when the forearm is flexed at right angle to the upper arm. Above the iliac crest at the level of umbilicus. Widest portion of the calf with leg hanging downward freely. These measurements are obtained with the help of Harpenden-Caliper by lifting about one cm. longitudinal fold of the skin with thumb and index finger. The caliper should

exert uniform pressure.

The skinfold measurements for the present study were taken on 200 adult aged 20 to 50 years male individuals each belonging to Hindu and Muslim Gujjar populations using the Harpenden Caliper. They were normal healthy subjects free from any deformity or pathological condition. The skinfold measurements were taken as per the standard procedure described for anthropometry (Singh and Bhasin, 1968). The student's *t*-test was applied to assess the significance of difference, if any.

RESULTS

The mean values for six skinfold measurements of the Hindu and Muslim Gujjars are given in table 1. Mean skin-fold thickness values are higher for the Muslim Gujjars than for the Hindu Gujjars. The difference between the Hindu and Muslim Gujjars for mean triceps, sub-scapular, skinfold above iliac crest and calf muscle thickness is highly significant ($p < 0.001$). Similar results were obtained even for the transformed mean values between the Hindu and Muslim Gujjars. There was no difference for biceps, but the skinfold at widest portion of the forearm shows significant variation between the two populations ($p < 0.01$) (Table 1).

DISCUSSION

The skinfold thickness is a determinant of stored energy in adipose and other body tissues. It is important in the study of body composition and caloric aspects of nutritional status. It is well established that the variability of a population in every kind of human tissue is much better determined by genetic rather than environmental factors (Knussmann, 1977). In the present study, the high altitude semi-nomadic pastoral Muslim Gujjars significantly differ from the lowland sedentary agriculturist Hindu Gujjars in var-

Table 1 : Comparison of the skinfold measurements of adult Hindu and Muslim Gujjars

Skinfold measurements	Hindu Gujjars (N=200)		Muslim Gujjars (N=200)		t-value	p
	Mean (cm)	S.D.	Mean (cm)	S.D.		
Triceps	1.68±0.03	0.43	1.92±0.04	0.55	4.860	<0.001
Biceps	1.13±0.02	0.35	1.16±0.03	0.36	0.962	N.S.
Sub-Scapular	1.37±0.03	0.38	1.96±0.04	0.58	12.006	<0.001
Widest Portion of Forearm	0.84±0.02	0.27	0.96±0.03	0.47	3.227	<0.01
Above Iliac Crest	1.89±0.03	0.39	2.22±0.04	0.54	7.008	<0.001
Calf	1.66±0.03	0.36	1.94±0.04	0.50	6.366	<0.001

N.S. = Not significant

ious skinfold measurements (Table 1). These findings are compatible with the high and low-land populations as noted by Clegg et al. (1970 and 1972) and Gupta and Basu (1981).

The Muslim Gujjars of the Himalayan regions have higher skinfold thickness than the Hindu Gujjars of the Sub-Himalayan regions (Table 1). This indicates that the Muslim Gujjars are physiologically well adapted to the high-land Himalayan eco-system. They have migrated from the plains to these high altitude regions about 3 to 4 centuries ago. Their (Muslim Gujjars) survival and maintenance of good health under severe cold and harsh climatic conditions in the Himalayas shows that they are better accustomed to the local environment than the Hindu Gujjars of the Sub-Himalayan region. Further, their health and nutritional status is also better than the Hindu Gujjars counterparts.

The higher skinfold values among the Muslim Gujjars may partly be attributed to their consanguineous marriages (inbreeding coefficient 0.0387). These consequently increase the homozygosity of these polygenic characters, which may be reflected by the higher values for these skinfold measurements among the Muslim Gujjars than among the Hindu Gujjars.

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