Nutrition and Genetic Variation among Central Indian Tribes

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Abstract

The present study deals with the assessment of nutrition through BMI, and evolutionary variation using the coefficient of racial likeness (CRL) among 9 tribes of Central India. Anthropometric data collected by the Anthropological Survey of India on 2066 adult males aged 18-64 years from 9 tribal populations belonging to 37 districts of Central India were used for present analysis. Half of the total tribal population of Central India was found chronic energy deficient; they have BMI below 18.5 kg m^{-2}. Among Sonr tribe, this proportion is found highest as 71 per cent of them were found in this category, although the mean BMI varies from 17.64 to 20.83 kg m^{-2} among the total tribal population. The tribal differ more in shape than size as the shape and size distance were found 1.20 and 0.33 respectively. Out of 9 tribal groups four viz. Sonr, Bhil, Korku and Gond are more vulnerable from the point of view of low nutritional status. They require immediate intervention as 50 to 70 percent of their population fall under chronic energy deficient grades. These tribal groups differ more in shape than size. They all fall within the same cluster indicates their parental affinities.

Introduction

Anthropometric measurements play a very important role in the assessment of nutrition in human population. Quetlet or body mass index (BMI) is widely accepted as one of the best indicators of nutritional status for the adults (James et al., 1988; Ferro-Luzzi et al. 1992, Shetty and James 1994). It is also suggested that the BMI may effects more nutritionally than genetically related changes (Rolland-Cachera, 1993), despite wide variation between human populations in weight and height (Eveleth and Tanner, 1990; Majumder et al., 1990). Thus the use of BMI as an anthropometric indicator of nutritional status may be more appropriate in a country with diverse ethnic groups like India (Khongsdier, 2001; Gautam et.al., 2006). The assessment is done by observing the deviations of the anthropometric measures from the normal standard. The basic causes of undernutrition in developing countries are poverty, poor hygienic conditions and little access to preventive and health care (Mitra, 1985; WHO, 1990). In developing countries like India, anthropometry, despite its inherent limitations, remains the most practical tool for assessing the nutritional status the community (Ghosh et al., 2001).

Central India is one of the fastest population growing regions of the country. This part of India is also known for its poor demographic and health situation. Reasons behind this may be traced to high levels of mortality that had persisted over time along with low levels of social, economic and infrastructure development in the rural areas. Literature on BMI of adult Indians is limited. Noteworthy among them are the studies of BMI among the Central Indian (Gautam et.al., 2006; Adak et.al., 2006), North-East Indian (Khongsdier, 2001) and South Indian populations (Ferro-Luzzi et al, 1992). However, little is known about the BMI of the tribal of Central India. An attempt has been made in the present study to examine the level of nutrition of adult males in 9 tribes of Central India.

Material and Methods

In the present study a sub sample form a total of 2066 adult males aged 18-64 years of 9 tribal populations belonging to 37 districts of Central India were drawn for investigation, which is a part of larger study and data were collected by the Anthropological Survey of India (Basu et al., 1994). For further details Gautam et.al. (2006) and Adak et.al.(2006) can be referred. The data were collected by the trained physical anthropologists of Anthropological Survey of India, following standard techniques (Martin and Saller 1956). Therefore, it can be well assumed that accuracy of the data is properly taken care of. For convenience, measurements were taken only on adult males who looked apparently normal. Efforts were also made to exclude closely related individuals like brothers and fathers and sons and those with any kind of physical deformities. Therefore the samples were free from any selection bias. Tribe and district wise distribution of sample is presented in appendix 2.

Cormic index (SH/H) and body mass index (W/H^2) were calculated for each individual. Calculation of central tendency (arithmetic mean), dispersion (standard deviation) and relative dispersion (coefficient of variation) for each population and group of populations was comined using MS-Excel and SPSS software packages. Subsequent calculations were also done using the SPSS software. For screening the Chronic Energy Deficiency (CED) groups the value 18.5 is taken as a cut-off point following James et al. (1988), Ferro-Luzzi et al. (1992), Khongsdier (2001), Gautam et.al. (2006) and Adak et.al.(2006). The formula of shape, size and CRL are defined elsewhere (Adak et.al., 2006).

Results and Discussion

Means, standard deviations and coefficient of variation of heights, sitting heights, body weight, cormic indices and body mass indices of 9 tribes belonging to 37 districts of Central India are furnished in Table 1. It is evident that the Oraon are tallest with an average height 163.19±5.35 cm and heaviest with an average weight 52.17±6.26 Kg, whereas the Korwa are the shortest, with as average height 155.12± 6.53 cm and Sonr are lightest, with an average weight 46.43 Kg. In respect of stature the ranking is more or less in the following order: Oraon>Sahariya>Korku> Gond>Sonr>Kol>Majhi>Korwa. On the other hand the body weight is in the following order: Oraon>Korwa>Gond >Manjhi>Kol>Sahariya>Korku>Bhil>Sonr.

The average body mass index (BMI) among these tribes ranges from 17.64±1.44 for the Sonr to 20.83±1.99 for the Korwa. Among the nine tribes the Korwa are the shortst and they have the highest mean BMI (20.83 kg m^{-2}). They occupy second place in body height. BMI usually depends on height. Highest mean of BMI among the Korwa corroborate this view. But in human population we may not always get the same picture. In fact, the Oraon, with a mean BMI of 19.55 kg m^{-2} have the second position in BMI. But in contrary they are tallest among the 9 group. When all these tribal group taken into consideration, the mean BMI is found to be 18.56 kg m^{-2}, which is lower than that reported for the well-to-do individuals (Bharati, 1989; Visweswara Rao et.al. 1990, 1995; Khongsdier 1997; Reddy 1998), but it is not as low as that among the south Indian population (Ferro-Luzzi et.al. 1992) and tribes of Maharashtra (Adak et.al, 2006).

Table 1. Mean, standard deviations and coefficient of variation of Anthropometric measurements and indices

		Stature (cm)			Sitting Height (cm)			Weight (in Kg)			Cormic Index			BMI		
Tribes	N	Mean	SD	CV	Mean	SD	CV	Mean	SD	CV	Mean	SD	CV	Mean	SD	CV
Bhil	401	161.42	5.48	3.40	80.05	3.33	4.16	47.57	5.78	12.16	0.496	0.018	3.59	18.248	1.989	10.90
Gond	904	162.35	5.61	3.46	80.21	3.32	4.13	49.00	5.48	11.19	0.494	0.017	3.42	18.576	1.698	9.14
Kol	200	161.16	5.75	3.57	80.14	3.47	4.34	48.76	5.01	10.27	0.497	0.016	3.25	18.756	1.501	8.00
Korku	101	162.45	5.34	3.29	80.83	2.46	3.04	47.98	5.23	10.90	0.498	0.015	3.03	18.173	1.706	9.38
Majhi	50	158.43	5.72	3.61	79.21	2.93	3.69	48.76	5.04	10.35	0.500	0.013	2.62	19.405	1.496	7.71
Oraon	99	163.19	5.34	3.27	80.33	2.74	3.41	52.17	6.26	12.01	0.493	0.014	2.74	19.554	1.808	9.25
Sonr	56	162.06	7.12	4.39	80.93	3.80	4.70	46.43	5.67	12.22	0.500	0.017	3.31	17.643	1.508	8.55
Primitive Tribe																
Korwa	51	155.12	6.53	4.21	78.43	3.21	4.09	50.24	6.17	12.29	0.506	0.015	3.01	20.831	1.739	8.35
Sahariya	204	162.78	5.97	3.67	81.79	3.47	4.24	48.12	5.46	11.34	0.502	0.017	3.29	18.124	1.441	7.95
Total	2066	161.86	5.83	3.60	80.32	3.34	4.16	48.67	5.63	11.56	0.496	0.017	3.40	18.563	1.787	9.63
Minimum		155.12	5.34	3.27	78.43	2.46	3.04	46.43	5.01	10.27	0.49	0.01	2.62	17.64	1.44	7.71
Maximum		163.19	7.12	4.39	81.79	3.80	4.70	52.17	6.26	12.29	0.51	0.02	3.59	20.83	1.99	10.90
Average		161.00	5.87	3.65	80.21	3.19	3.98	48.78	5.57	11.41	0.50	0.02	3.14	18.81	1.65	8.80
F-Ratio		14.252			8.997			9.432			9.139			23.127		

It is apparent that most of the adult males in these populations are lean. Ganguly (1977) on the basis of Pignet's constitutional index also stated that the Indian body build is noticeably slender. To find out the difference of mean of BMI between pairs of Tribes ANOVA test is computed, the result of which is furnished in Table 2.

Table 2: One way analysis of variance test for BMI among 9 tribes of Central India

One-way analysis of variance

Source	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	544.376	8	68.047	23.127	0.000
Within Groups	6052.416	2057	2.942		
Total	6596.791	2065			

Multiple range test (least significant difference)

	Bhil	Gond	Kol	Korku	Korwa	Majhi	Oraon	Sahariya	Sonr
Bhil		+	+	+	+	+	+	+	+
Gond			+	+	+	+	+	+	+
Kol				+	+	+	+	+	+
Korku					—	+	+	+	+
Korwa						+	+	+	+
Majhi							+	+	+
Oraon								+	+
Sahariya									+
Sonr									

Here, + (plus) & - (minus) represents the level of significance of difference in mean between Tribes, the + (plus) sign represents $p<0.05$, whereas the - (minus) sign represents $p>0.05$.

It is apparent from the table that there are significant difference of mean between most of the pairs of the caste groups excepting the pairs of Korwa and Korku. The mean cormic index (CI) or proportion of sitting height to stature was found to vary between 0.493±0.013 among Oraon to 0.506±0.018 among Korwa.

To understand the physical variation among these tribes the Penrose distance analysis (Penrose, 1954) is computed on the basis of 8 anthropometric measurements, namely stature, sitting height, weight, head length, head breadth, nasal height, nasal breadth and head circumference. The values of shape and size between any two groups are shown in the Tables 3 and 4 respectively. This has been furnished for an overview on the size and shape factors used to find out the divergence among the population groups. The computed mean value is 1.20 for shape and 0.33 for size distance. It shows that the mean value of shape distance is larger than that of size distance. So, the 9 tribes show a tendency to differ more in shape distance than in size distance. However, here, the shape distance plays a more important role than the size distance because of the morphological dissimilarity and differences.

Table 3: Shape distance (C_Z^2) among tribal groups

Caste groups		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Bhil									
(2)	Gond	0.84								
(3)	Kol	0.56	0.20							
(4)	Korku	0.53	0.99	0.48						
(5)	Korwa	2.08	1.48	1.18	2.32					
(6)	Majhi	1.45	0.86	0.66	2.00	0.78				
(7)	Oraon	0.51	1.48	1.02	1.15	1.87	1.65			
(8)	Sahariya	0.74	1.05	1.22	1.72	2.43	1.56	1.48		
(9)	Sonr	0.75	0.28	0.49	0.93	2.43	1.46	1.79	0.62	

Note : Average Shape Distance 1.20

$$C_Z^2 = \frac{1}{K}\sum_{i=1}^{K} d_i^2 - \left(\sum_{i=1}^{K} d_i / K\right)^2$$

Table 4: Size distance ( ) among tribal groups

Caste groups		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Bhil									
(2)	Gond	0.73								
(3)	Kol	0.36	0.06							
(4)	Korku	0.23	0.14	0.01						
(5)	Korwa	0.10	1.36	0.84	0.63					
(6)	Majhi	0.26	0.12	0.01	0.00	0.67				
(7)	Oraon	0.64	0.00	0.04	0.10	1.23	0.08			
(8)	Sahariya	0.82	0.00	0.09	0.18	1.49	0.16	0.01		
(9)	Sonr	0.12	0.26	0.07	0.02	0.42	0.03	0.21	0.32	

Note : Average Shape Distance 0.33

$$C_Q^2 = \left(\sum_{i=1}^{K} d_i / K\right)^2$$

The values of CRL are furnished in Table 5 and the same are plotted in a dendrogramme (Fig. 1), which revealed that all these tribes are placed in a single cluster. However, the Kol and Gond are found to be very closer in distance, while the tribes like Sahariya, Oraon and Korku are placed for apart.

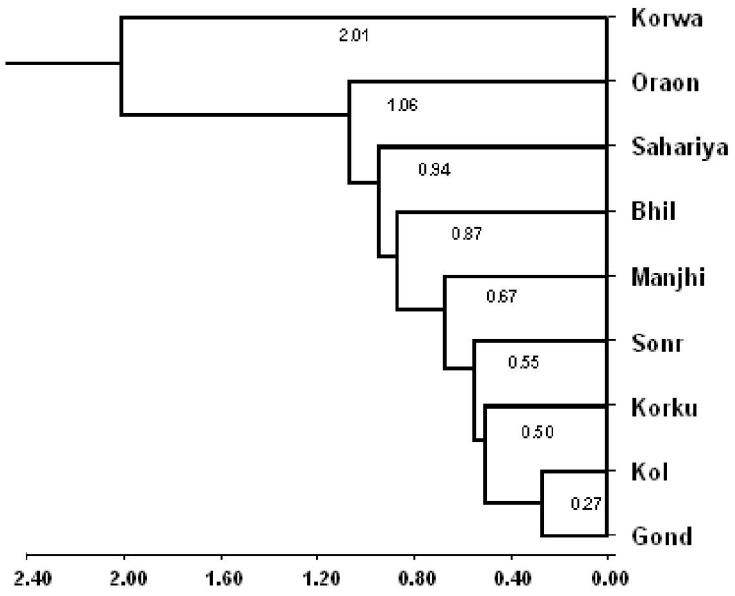
Table 5: Coefficient of racial likeness (C_H^2) among tribal groups

Caste groups		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
(1)	Bhil									
(2)	Gond	1.56								
(3)	Kol	0.92	0.27							
(4)	Korku	0.77	1.13	0.50						
(5)	Korwa	2.18	2.84	2.01	2.94					
(6)	Majhi	1.71	0.98	0.67	2.00	1.45				
(7)	Oraon	1.15	1.48	1.06	1.25	3.10	1.73			
(8)	Sahariya	1.56	1.05	1.32	1.90	3.92	1.72	1.49		
(9)	Sonr	0.87	0.55	0.56	0.95	2.85	1.49	2.00	0.94	

Note : Average Shape Distance 1.52

$$CRL = C_H^2 = \frac{1}{K} \sum_{i=1}^{K} d_i^2$$

Fig. 1: Dendrogram based on coefficient of racial likeness of nine tribal groups of Central India



Further, the coefficient of variation (Table 1) shows that these tribes have less variation of anthropometric parameters within individual tribal groups as compared to between groups, F-Ratio is higher especially for BMI followed by stature. It means that there is wide variation at the level of nutrition of these tribal groups. Some tribes are comparatively better nourished, whereas others have very poor level nutrition, which is also proved by the analysis of proportion of different tribe for chronic energy deficiency (CED). It is apparent from Table 6 and Fig. 2 that prevalence of CED is highest in the Sonr tribe, among whom 12.5 per cent fall under the severe grade of CED, 10.7 percent in the moderate grade and 50 per cent in mild grade. In this way 71 per cent population of this tribe is chronically energy deficient. Next is Bhil in whom 60 per cent population is chronically energy deficient followed by Korku and Gond among them more than 50 per cent population are chronically energy deficient. In this way 50 to 70 per cent respondents are found chronically energy deficient with BMI value below 18.5 kg m^{-2}.

Table 6: Percentage distribution of Population as per presumptive diagnosis for Chronic Energy Deficiency (CED)

Population	Range of CED on the basis of BMI (W/H^2 m)						Total
	CED Grade III (Severe) <16.0	CED Grade II (Moderate) 16.0-16.99	CED Grade I (Mild) 17.0-18.49	Low Weight Normal (18.5-19.99)	Normal (20.0-24.9)	Obese Grade I (25.0-29.99)	
Bhil	10.47	14.46	36.16	22.44	15.71	0.75	100
Gond	6.31	9.73	34.96	29.98	18.92	0.11	100
Kol	3.50	8.00	34.50	34.50	19.50	0.00	100
Korku	8.91	15.84	32.67	22.77	19.80	0.00	100
Korwa	0.00	1.96	5.88	23.53	66.67	1.96	100
Majhi	2.00	4.00	18.00	42.00	34.00	0.00	100
Oraon	2.02	4.04	22.22	31.31	40.40	0.00	100
Sahariya	7.84	15.69	37.25	30.88	8.33	0.00	100
Sonr	12.50	10.71	50.00	21.43	5.36	0.00	100
Total	6.82	10.79	33.93	28.65	19.55	0.24	100

Bivariate correlation values among three anthropometric measurements and two indices are furnished in Table 7. There is significant correlation (at the 0.01 level) between stature and sitting height, and stature and weight; whereas inverse correlation was noticed between stature and cormic index, and stature and BMI among studied groups. Significant correlation is also found between BMI and sitting height, BMI and weight, and BMI and CI.

Fig. 2: 100% Bar-diagramme showing proportional distribution of each tribal population in different grades of chronic energy deficiency (CED)

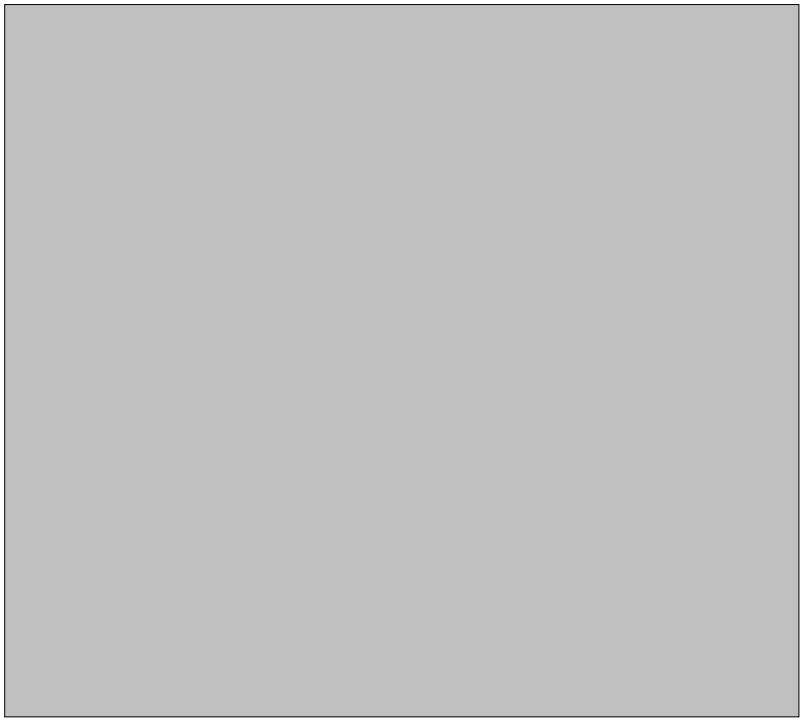


Table 7: Bivariate Correlations between stature, sitting height, weight, cormic index and body mass index

	Stature (cm)	Sitting Height (cm)	Weight (Kg)	Cormic Index	BMI
Stature (cm)	1.000	0.633(**)	0.560(**)	-0.284(**)	-0.077(**)
Sitting Height (cm)		1.000	0.477(**)	0.551(**)	0.098(**)
Weight (in Kg)			1.000	-0.002	0.781(**)
Cormic Index				1.000	0.210(**)
BMI					1.000

The regression coefficient of BMI on CI was calculated and the results are furnished in Table 8. The regression coefficient was found to be significant ($p>0.05$). There is positive correlation between BMI and CI. Side by side, BMI is dependent on CI and increases with rise in CI.

It is clear from the above-discussed findings that tribals of Central India are thin and lean with medium to short stature. Majority of them fall in the category of energy deficient grades. Out of total 51.54 percent population having less than 18.5 kg m^{-2} BMI. In spite of falling under energy deficient category, majority of them are active like healthy personnel. This finding raises two important questions. First, and most important is that tribals had poor subsistence of livelihood. Large proportion of their foodstuffs are

coarse grains, and forest produces like roots, shoots, leaves, berries, seeds, tender bamboo stick, mushrooms, flowers, fruits, nuts etc. lacking essential nutrients. Availability of these foodstuffs is also affected by seasonal variability, rainfall, monsoon and other environmental up and downs. In such an adverse condition tribals are used to face starvation or partial starvation; and since generations they are surviving in such a condition and may genetically evolved to survive with deficiency of essential energy required for normal activity by a normal person. In other words, they genetically adapted to starvation. Simultaneously, they had very tough life style full of labour and struggle, which decreases the chances of fat deposition and ultimately leads towards low body mass index (BMI). Besides poor subsistence of livelihood, alcoholism is also common among tribals, which may be one of the causes associated with low BMI. Ferro-Luzzi et al. (1992) proposed that BMI alone is sufficient to define CED in adults, irrespective of energy turnover as they suggested earlier (James et al. 1988). Furthermore, their findings on the distribution of BMI according to various grades of CED in a south Indian population seem to be corroborated by the present result, i.e. a large proportion of individuals with CED belong to grade I CED. They have suggested that the majority of the rural population in India is likely to be undernourished if grade I CED is associated with increased risk of morbidity and mortality.

Table 8: Regression Coefficient and F Statistics of BMI on CI

Population	Coefficients of Regression					F Statistics	
	R	r^2	β	SE	t-value	F Change	p-value
Bhil	0.294	0.087	32.797	5.336	6.147	37.782	0.000
Gond	0.234	0.055	23.51	3.256	7.221	52.139	0.000
Kol	0.158	0.025	14.702	6.521	2.255	5.083	0.025
Korku	0.260	0.068	29.353	10.961	2.678	7.171	0.009
Korwa	0.196	0.038	22.352	15.985	1.398	1.955	0.168
Majhi	0.068	0.005	7.745	16.461	0.470	0.221	0.640
Oraon	0.244	0.060	32.66	13.164	2.481	6.155	0.015
Sahariya	0.031	0.001	2.727	6.136	0.444	0.198	0.657
Sonr	0.154	0.024	14.017	12.239	1.145	1.312	0.257

The second question is that BMI classification used world wide for presumptive diagnosis of different grades of CED, Normal and Obese is applicable uniformly or not to each of the human group of this planet; or for different groups there is need to develop specific scale to categorize the population in different grades of CED, Normal and Obese.

It has been suggested that BMI is correlated with sitting height, i.e. BMI is lower in those population groups who have higher sitting height (Norgan, 1994). Though, present findings do not support above hypothesis and bivariate correlation too show significant correlation of low degree between BMI and CI. According to Khongsdier (2001) it is believed that BMI is largely independent of ethnic or genetic variation, its correlation with CI may have certain implications as the latter may be subject to both genetical and environmental influences. So the differences in BMI between ethnic groups in the present study may not only be due to nutrition but also due to low degree impact of other environmental and genetic factors.

Conclusion

Out of 9 tribal groups four viz. Sonr, Bhil, Korku and Gond are more vulnerable from the point of view of low nutritional status. They require immediate intervention as 50 to 70 percent of their population fall under chronic energy deficient grades. Furthermore, study on the assessment of nutrition taking different measures on Indian population will help to develop scales to assess chronic energy deficiency and the clarification of population in different grades of chronic energy deficiency. Tribes differ more in shape than size, the dendrogram reveals that all these tribes are places in a single cluster, indicates their parental affinities. However, the Kol and Gond are found to be very close in distance, while the tribes like Sahariya, Oraon and Korwa are placed far apart.

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Appendix I

Tribes

Bhil: Bhils are tribal of central India. As per census of India (1991) they are largest in number (9,769,763) among the Indian tribes. They speak Bhil languages, a group of Indic languages. They are distributed in the states of Gujarat, Madhya Pradesh, Maharashtra and Rajasthan in the western and central India, as well as in Tripura in far-eastern India, on the border with Bangladsh. They are also setteled in Tharparkar district of Sindh (Pakistan). They are good archer and hunter. They are widely recogonized in ancient Indian literature. The Eklavay was a well known mythological character of the great epic Mahabharata, his talent of self learning the archery is still rembered and recognized. The Shabari of Ramayana (epic) is known for her love and affection.

Gond: The Gond are largest tribe of India, they are widely distributed in central and southern region of the country. They live in the forests and hills of India. They are one of the most significant groups of original Indian tribes. In the 1500's, several Gond dynasties were firmly incorporated by the Gond rajas, or kings. They ruled like Hindu princes until Muslim armies overthrew them in 1592. In the 1700's, the Gond lost all power to the Maratha kings who forced their culture to retreat to the hills. Sixty percent of the Gond are Hindus, worshipping hundreds of gods and goddesses. The remaining forty percent include animists and converted Christian. They are semi-nomadic framers. Some of them also hold wage-earning jobs. They do not make their own clothing or jewels but buy them from neighboring groups. As per census of India (1991) they are enumerated 9,319,795, though their number in central India (Madhya Pradesh and Chhattisgarh) is 6,727,838.

Korku: Korku are concentrated in the states of Madhya Pradesh and Maharashtra. Most are settled agriculturalists, and many have substantial farms; others shifted as recently as the late 19th century from shifting cultivation (jhum) to forestry and field labour. The Korku live in villages of thatched houses. They speak a language of the Munda family.

Their ceremonies resemble those of the low castes Hindus in that they employ their own priests and mediums instead of Brahmans. They regard themselves as ranking above the Gond and Bhil peoples.

Korwa: The main concentration of Hill-Korwa tribe is in Jashpur, Sarguja & Raigarh districts. They are branch of Kolarian tribe and belonging mundari language. According to Anthropological description of family they belongs to Austro-Asiatic family. The tribe has two-sub tribe known Pahari Korwa and Dihari Korwa. They are medium to short height have a dark brown or black skin.

Hill Korwa are divided into Five totamistic Edogamous clains viz. Hansadwar, samar,Edigwar, Ginnur & Renla. The main source of livelihood of Hill-Korwa tribe is hunting and collection of minor forest products like Sal ,mahua, gum, tendu leaves, amla, harra, bahera etc. In rainy season they gather some forest roots, leaves and vegetables. Now a days, they do cultivation but their primitive techniques. Fishing and hunting are practiced as occupation. Though they have no land work for cultivation as labour. During some season they get food grains to eat while during the odd season they satisfy their

hunger on leaves, fruits, tubers (namely Gainth, Pitharu, Nakwa, katharu, kulthi, konge, charhat, bilar etc.) between October and March they get better food which includes makai maize arua/Madua a soil of paddy saturu, kutki, arhar (pigion pea) and other pulses etc.

Oraon: The Oraon tribe inhabit in various states across central and eastern India as well as Balgladesh. Traditionally they depended on the forest for their ritual and economic livelihood, but in recent times they have become mainly settled agriculturists. Small numbers of Oraon have emigrated to the northeastern part of India, where they are mainly employed as labourers on tea gardens. The tribe is divided into numerous clans associated with animal, plant, and mineral totems. Every village has a headman and a hereditary priest; a number of neighbouring villages constitute a confederation, the affairs of which are conducted by a representative council. The traditional religion of the Oraon comprises the cult of a supreme god, Dharmes, the worship of ancestors, and the propitiation of numerous tutelary deities and spirits. Hinduism has influenced the ritual and certain beliefs. Many Oraon, including the majority of the educated, have become Christians.

Kol: The Kol tribe is found in the states of Madhya Pradesh, Maharashtra and Orissa. However, they are principally found in Madhya Pradesh. The Kol are divided into several endogamous lineage groups or 'Kur'. Monogamy is the most common form of marriage among them though few polygyny can also be noticed. Their religion is of animistic character but now-a-days many of them profess Hinduism. A large section of the Kol depends on agriculture labour for their subsistence economy.

Manjhi: The Manjhi means boatman. This tribe is divided into sub-divisions such as Kisan (Kanwar) Manjhi, Kol (Mundari) Manjhi, Dhanwar Manjhi, Binjhwar Manjhi and Gondh Manjhi etc. Marriage alliances are usually negotiated. Monogamy is the norm, but polygyny is permitted. Traditional occupation of the Manjhi was fishing; some worked as boatman. Today their primary occupation is agriculture and agricultural labour. They now profess Hinduism instead of their traditional religion. In many districts they are considered as backward caste (or Other Backward Caste or OBC).

Sahariya: The Sahariya is one of the primitive tribe of Madhya Pradesh. They are distributed in the districts of Bhopal, Vidisha, Shivpuri, Guna, Datia and Gwalior in the state. The Sahariya Society is endogamous and divided into a number of exogamous clans. Commonest form of marriage among them is monogamy. Agriculture is their main occupation. Collection of firewood and from jungle and selling is their subsidiary occupation. They are followers of Hinduism.

Sonr: The Sonr are concentrated in the rural areas of Tikamgarh, Panna, Satna and Chhatarpur districts of Madhya Pradesh. The Sonr have fire exogamous clans. They are Bela, Bararjoia, Rajoria, Sunaria and Lathbandhia. They practice Junior sororate but avoid levirate. The parents through negotiations fix marriage alliances. The traditional occupation of the Sonr is the collection of firewood from the nearby forest. They sell this at the market. Now a days they have taken up cultivation and agricultural wage labour in a big way. The Sonr are Hindus by faith. They pay homage to their family deities such as Deviji and Gour.

Appendix 2: Tribe and District wise distribution of sample.

S.No.	Districts	Population									Total
		Bhil	Gond	Kol	Korku	Korwa	Majhi	Oraon	Sahariya	Sonr	
1	Balaghat	0	50	0	0	0	0	0	0	0	50
2	Betul	0	50	0	0	0	0	0	0	0	50
3	Bilaspur	0	50	0	0	0	0	0	0	0	50
4	Chhatarpur	0	50	0	0	0	0	0	0	0	50
5	Chhindwara	0	50	0	0	0	0	0	0	0	50
6	Damoh	0	50	0	0	0	0	0	0	0	50
7	Dewas	0	0	0	50	0	0	0	0	0	50
8	Dhar	50	0	0	0	0	0	0	0	0	50
9	Durg	0	50	0	0	0	0	0	0	0	50
10	Guna	0	0	0	0	0	0	0	51	0	51
11	Gwalior	0	0	0	0	0	0	0	50	0	50
12	Hoshangabad	0	50	0	0	0	0	0	0	0	50
13	Indore	50	0	0	0	0	0	0	0	0	50
14	Jabalpur	0	50	0	0	0	0	0	0	0	50
15	Jhabua	50	0	0	0	0	0	0	0	0	50
16	Khandwa	0	0	0	50	0	0	0	0	0	50
17	Mandla	0	49	0	0	0	0	0	0	0	49
18	Mandsaur	49	0	0	0	0	0	0	0	0	49
19	Narsinghpur	0	50	0	0	0	0	0	0	0	50
20	Panna	0	52	0	0	0	0	0	0	0	52
21	Raigarh	0	0	0	0	0	0	49	0	0	49
22	Raipur	0	50	0	0	0	0	0	0	0	50
23	Raisen	0	50	0	0	0	0	0	0	0	50
24	Rajgarh	52	0	0	0	0	0	0	0	0	52
25	Ratlam	50	0	0	0	0	0	0	0	0	50
26	Rewa	0	0	50	0	0	0	0	0	0	50
27	Sahdol	0	0	50	0	0	0	0	0	0	50
28	Satna	0	0	50	0	0	0	0	0	0	50
29	Saugar	0	50	0	0	0	0	0	0	0	50
30	Seoni	0	50	0	0	0	0	0	0	0	50
31	Shajapur	50	0	0	0	0	0	0	0	0	50
32	Shibpuri	0	0	0	0	0	0	0	53	0	53
33	Sidhi	0	51	50	1	0	0	0	0	0	102
34	Surguja	0	52	0	0	51	50	50	0	0	203
35	Tikamgarh	0	0	0	0	0	0	0	0	56	56
36	Ujjain	50	0	0	0	0	0	0	0	0	50
37	Vidisha	0	0	0	0	0	0	0	50	0	50
Total		401	904	200	101	51	50	99	204	56	2066