

Intertribal Variation With Respect To BMI: A Study On Tribal Women Of Bastar, Chhattisgarh, India

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ABSTRACT

Body mass index (BMI) is the most established indicator to assess nutritional status. The aim of the present study is to determine variation between Bhatra and Dhurwa women of Bastar, Chhattisgarh with respect to BMI and also to evaluate variation in magnitude of BMI in relation to socio-anthropometric determinants. Anthropometric data from 290 Bhatra women and 207 Dhurwa women of reproductive age group were collected cross-sectionally and BMI is calculated in relation to the socio-economic status of tribal women. BMI is determined by measuring the weight and height of selected respondents by using standard techniques. Result reveals that Bhatra women are slightly heavier and taller than Dhurwa women. The mean BMI is found to be higher in Bhatra women ($19.98 \pm 0.15 \text{ Kg/M}^2$) than Dhurwa women ($19.70 \pm 0.18 \text{ Kg/M}^2$). The mean values of mean BMI in relation to different socio-anthropometric determinants indicate state of normal nutrition in women of both tribal groups of Bastar except women of body weight ranged 30-41Kg., sitting height vertex ranged 59-66cm and height vertex ranged 160-178cm. The present study reveals that the prevalence of chronic energy deficiency (CED) is higher in Dhurwa women (31.88%) than Bhatra women (27.58%). However BMI suggested that the prevalence of obesity in Bhatra women (3.45%) is higher than Dhurwa women (2.90%). The factors like age, menarcheal age, educational status, occupational status and different anthropometric determinants showed an impact over BMI magnitude among both tribal women of Bastar. However statistical analysis indicates non-significant intergroup differences among them except women of illiterate group, sitting height vertex ranged 59-66 cm and height vertex ranged 160-178 cm. Sources of mean BMI of various tribal women of India indicates that tribal women of Bastar are nutritionally better and show state of normal nutrition in comparison to them.

Keywords: BMI, Bhatra women, Dhurwa women, Chhattisgarh.

INTRODUCTION

Anthropometric measurements play an important role to assess state of nutrition. World Health Organization (WHO, 1995) has recommended that anthropometry could be used to assess the nutritional and health status of adults. Quetlet or body mass index is accepted as one of the best indicators of nutritional status for adult populations (James et.al.1988; Ferro-Luzzi et.al. 1992;

Shetty and James, 1994). According to Lee and Nieman, 2003, BMI is the most established indicator and it can be used to assess nutritional status. BMI is generally considered a good indicator of not only the nutritional status but also the socio-economic condition of population, specially adult population of developing countries (Ferro-Luzzi et.al., 1992; Nube et. Al., 1998; Khongsdier 2002; Mosha, 2003). A steady underweight ($BMI \leq 18.5$) is likely to be associated with morbidity or other physiological and functional impairments (James et.al., 1988; WHO, 1995). Chronic energy deficiency (CED) is caused by inadequate intake of energy accompanied by high level of physical activities and infections (Shetty et. al., 1994). It is associated with reduced work capacity (Durnin, 1994), performance and productivity (Kennedy and Gracia, 1994) and behavioural changes (Kusin et. al., 1994).

India has variety of tribal population reflecting its great ethnic diversity. They constitute about 8.2 percent of total population though they are scattered all over the hilly and dense forest region of the country. Women in the reproductive age group are the most vulnerable to malnutrition, owing to several cultural, social and biological reasons. According to Calder and Jackson, undernutrition is one of the major causes of morbidity and mortality in developing World. Inadequate food intake leads to protein energy malnutrition and chronic energy deficiency. Nutritional anaemia is one of the major problems of tribal women. According to UN, 1994 at least half of the non-pregnant and two third of the pregnant women were anaemic in developing countries. About 56 percent is the prevalence of anaemia globally as estimated by World Health Organisation. Anaemia is a major cause of high incidence of premature birth, perinatal mortality, low birth weight and maternal mortality.

The health and nutritional problems are most common in tribal women. According to NFHS, 26.7 percent of tribal women had body mass index below 18.5 kg. / m indicating chronic energy deficiency. Bhatra and Dhurwa are patriarchal tribal groups inhabiting in Bastar region and their economy is based on agriculture and collection of minor forest produces. The aim of the present study is to examine the state of nutrition in relation to different socio-anthropometric factors among tribal women of Bastar and also evaluate the degree of intergroup variation with respect to BMI among them.

MATERIALS AND METHODS

Bastar is known for tribal populations in Chhattisgarh. Bhatra is major tribal populations comprising about 21.41 percent of total tribal population of Bastar and Dhurwa may be considered as minor tribal group comprising about 0.18 percent of total tribal population of Bastar. Their economy is based on agriculture and collection of minor forest produces. Racially both tribal groups may be classified as proto-australoid.

The socio-economic status of women directly associated with their health. Bhatra and Dhurwa both tribal groups of Bastar follow the rules of patrilocal, patrilineal and endogamy. Socio-economic status of tribal women of Bastar is somewhat as found in other patriarchal societies. Majority of tribal women are still illiterate and engaged as agricultural labour.

The cross-sectional study was conducted among Bhatra and Dhurwa tribal women of reproductive age group 15-49 years in Bastar district of Chhattisgarh during 2017. Data for present study were collected from various villages of Bastar. A cross-sectional anthropometric survey of 290 Bhatra

women and 207 Dhurwa women aged 15-49 years were undertaken. Anthropometric measurements such as height, weight and sitting height vertex were measured cross-sectionally. Standard anthropometric procedure as described by Cameron, 1978 was followed. Height was measured to the nearest 1mm with anthropometer and body weight was measured to the nearest 0.5 kg with standard weighing machine. Body mass index was calculated for each subject to evaluate the nutritional status of women of tribal women. Body mass index of women is also compared with age, menarcheal age, educational and occupational status. t-value is calculated to examine the degree of intergroup variation among them. BMI is computed using the following standard equation: BMI = weight in kg /Height in meter square. Nutritional status is evaluated by using internationally accepted BMI guidelines (WHO, 1995). The following distribution are used to evaluate state of nutrition:

- BMI < 18.5 = Under weight
- 18.5 – 24.9 = Normal
- > 24.9 = Over weight

RESULTS

Table 1 reveals the mean body weight, height and sitting height vertex among tribal women of Bastar. The mean body weight is found to be higher in Bhatra women (45.69±0.33kg) as compared to Dhurwa women (45.00±0.44kg). Bhatra women (151.36±0.38 cm) are observed slightly taller than Dhurwa women (151.13±0.37 cm), which is higher than standard height as set by Medical Council of Medical Research. The magnitude of mean sitting height vertex is also higher in Bhatra women (73.27±0.22 cm) is compared to Dhurwa women (73.17±0.24 cm). t-values for intertribal variation with respect to anthropometric determinants indicate statistically non-significant differences among them.

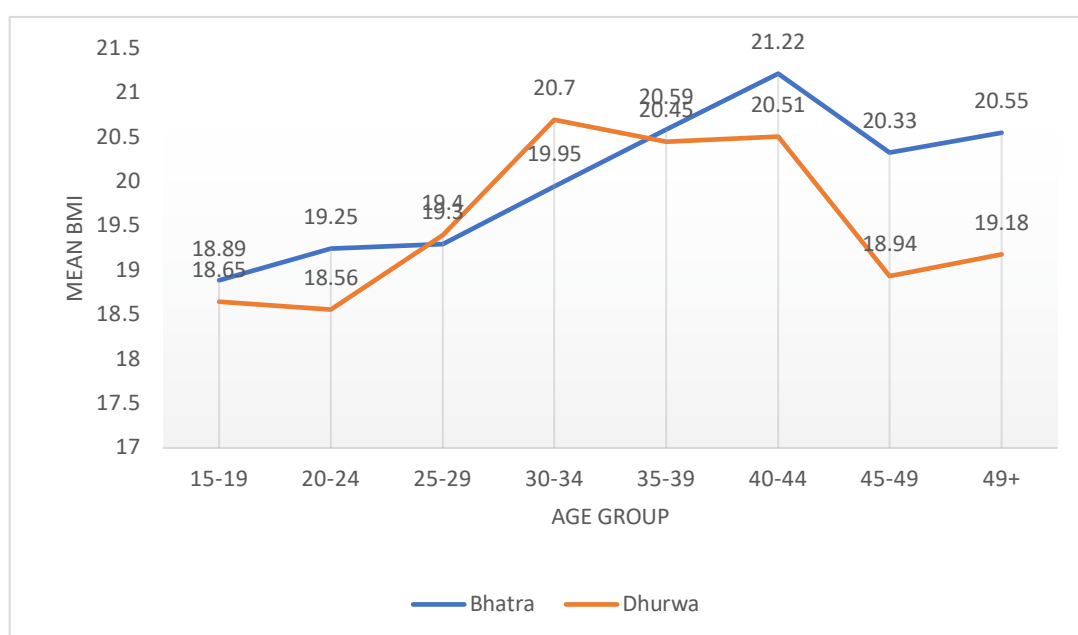
Table 1. Mean body weight, height and sitting height vertex among tribal women of Bastar.

Anthropometric measurements	Bhatra women			Dhurwa women			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
Weight(kg)	290	45.69±.33	5.66±.24	207	45.00±.44	6.30±.31	1.25
Height vertex(cm)	290	151.36±.38	6.45±.27	207	151.13±.37	5.38±.26	0.43
Sitting height vertex (cm)	290	73.27±.22	3.83±.16	207	73.10±.24	3.48±.17	0.52

The mean values of BMI according to age of women is presented in Table 2. The value of mean BMI varies from 18.89±0.36 to 21.22±0.54 kg./m² in Bhatra women and from 18.56±0.33 to 20.70±0.60 kg/m² in Dhurwa women. The mean value of BMI is found to be lowest among both tribal women aged 15-19 years (Bhatra: 18.89±0.36 kg/m²; Dhurwa: 18.65±0.66 kg/m²). However BMI is observed to be highest among Bhatra women aged 40-44 years (21.22±0.54 kg/m²) and Dhurwa women aged 30-40 years (20.70±0.60 kg/m²). The mean values of BMI increases with increase in age of women from 15 to 44 years. The mean BMI reveals that women of all age groups are nutritionally normal. However overall mean BMI is found to be slightly higher in Bhatra women (19.98 kg/m²) than Dhurwa women (19.70 kg/m²). t-value for intergroup variation indicate non-significant differences among them. Mean BMI according to age is also shown in fig.1.

Table 2. Mean BMI according to age among tribal women of Bastar.

Age Group	Bhatra women (kg/m ²)			Dhurwa women (kg/m ²)			Intergroup variation t-value
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
15-19	19	18.89±.36	1.58±.26	04	18.65±.66	1.31±.46	0.32
20-24	54	19.25±.23	1.68±.16	39	18.56±.33	2.09±.24	1.72
25-29	54	19.30±.34	2.50±.24	45	19.40±.35	2.36±.25	0.20
30-34	46	19.95±.36	2.44±.25	32	20.70±.60	3.40±.42	1.07
35-39	61	20.59±.30	2.36±.21	41	20.45±.35	2.12±.23	0.30
40-44	32	21.22±.54	3.08±.38	19	20.51±.61	2.68±.44	0.87
45-49	19	20.33±.57	2.51±.41	13	18.94±.58	2.08±.41	1.71
49+	13	20.55±.65	2.34±.46	14	19.18±.61	2.08±.39	1.54
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

**Fig.1. Mean BMI according to age among tribal women of Bastar.**

Mean BMI according to family structure among tribal women of Bastar is presented in Table 3. Nuclear family is more frequent among both tribal groups and the proportion of nuclear family is slightly higher in Bhatra tribe (74.48%) than Dhurwa tribe (72.46%), while joint family is found to be more frequent among Dhurwa tribe. The mean BMI indicates its higher values in nuclear family than joint family in both tribal groups of Bastar, which shows that women of nuclear families are nutritionally moresound than women of joint families. The mean BMI of Bhatra women (20.02±.18kg/m²) is found to be higher than Dhurwa women (19.73±.22 kg/m²) when compared to nuclear families and the same trend is observed for Bhatra women in joint families. On the basis of mean BMI, it can be said that Bhatra women are comparatively more nutritionally sound than Dhurwa women. T-values for intergroup variation indicate non-significant differences either in nuclear families or joint families. Mean BMI according to family structure is also shown in fig.2.

Table.3. Mean BMI according to family structure among tribal women of Bastar.

Family structure	Bhatra women(kg/m ²)			Dhurwa women(kg/m ²)			t- value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
Nuclear family	216	20.02±.18	2.59±.12	150	19.73±.22	2.67±.15	1.04
Joint family	74	19.85±.30	2.04±.17	57	19.62±.29	2.17±.20	0.56
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

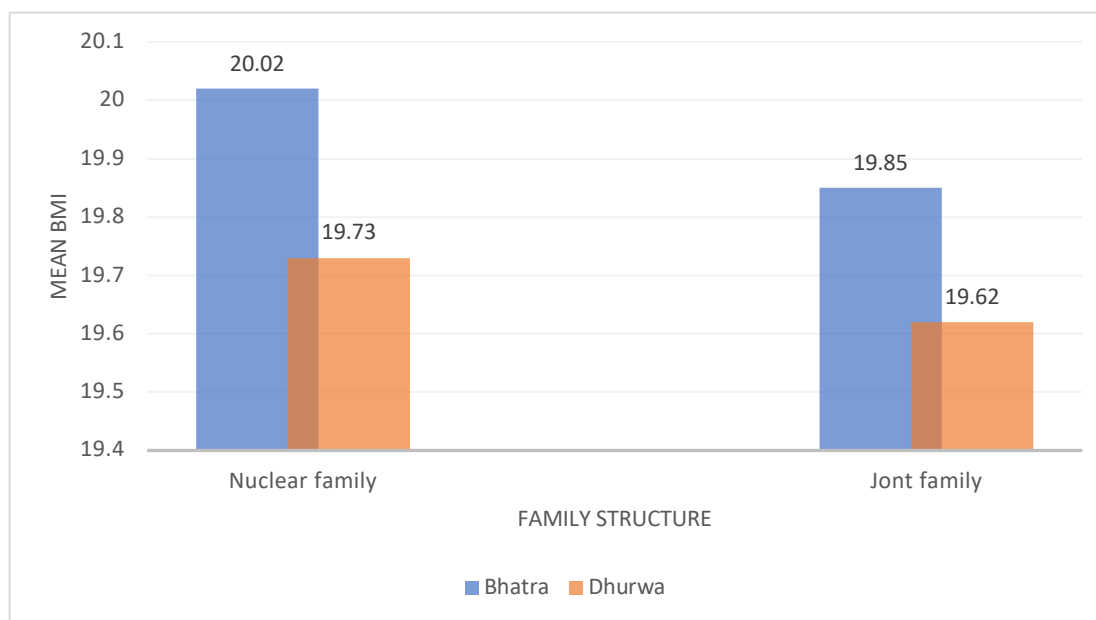


Fig.2. Mean BMI according to family structure among tribal women of Bastar.

Table 4 exhibits the mean values of BMI according to age of menarche among tribal women of Bastar. The mean age of menarche is found to be higher in Dhurwa women (11.90 years) than Bhatra women (11.74 years). The mean value of mean BMI ranges from 19.70±0.19 to 24.39±1.30 kg/m² in Bhatra women and from 18.95±0.39 to 21.38±0.96 kg/m² in Dhurwa women. The mean BMI indicates its lowest value among those Bhatra women (19.70±0.19 kg/m²), who experienced their first mensuration at the age of 12 years and among Dhurwa women (18.95±0.39 kg/m²) experienced at the age of 11 years. However the mean BMI is found to be highest among those Bhatra women (24.39±1.30 kg/m²), who experienced their first mensuration at the age of 16 years and among Dhurwa women (21.38±0.96 kg/m²) experienced first mensuration at 10 years. The mean BMI indicates its higher values in Bhatra women experienced their first mensuration at the age of 11, 13 and 14 years as compared to Dhurwa women. t-values indicate highly significant intergroup variation among those tribal women who experienced their first mensuration at the age of 11 years (p>0.01). Mean BMI according to age of first mensuration is shown in fig 3.

Table 4. Mean BMI according to age of menarche among tribal women of Bastar.

Age of menarche	Bhatra women (kg/m ²)			Dhurwa women (kg/m ²)			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
09	-	-	-	-03	20.57±.31	0.54±.21	-
10	43	20.18±.39	2.54±.27	16	21.38±.96	3.83±.68	1.17
11	53	20.24±.32	2.33±.23	48	18.95±.39	2.69±.27	2.58 ***
12	154	19.70±.19	2.39±.14	87	19.59±.25	2.30±.17	0.35
13	26	20.09±.48	2.45±.34	41	19.90±.34	2.15±.24	0.33
14	06	21.55±1.4	3.49±1.01	08	21.19±.15	1.27±.11	0.25
15	06	20.05±.74	1.85±.53	04	20.30±.69	1.37±.48	0.25
16	02	24.39±1.3	1.84±.92	-	-	-	-
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

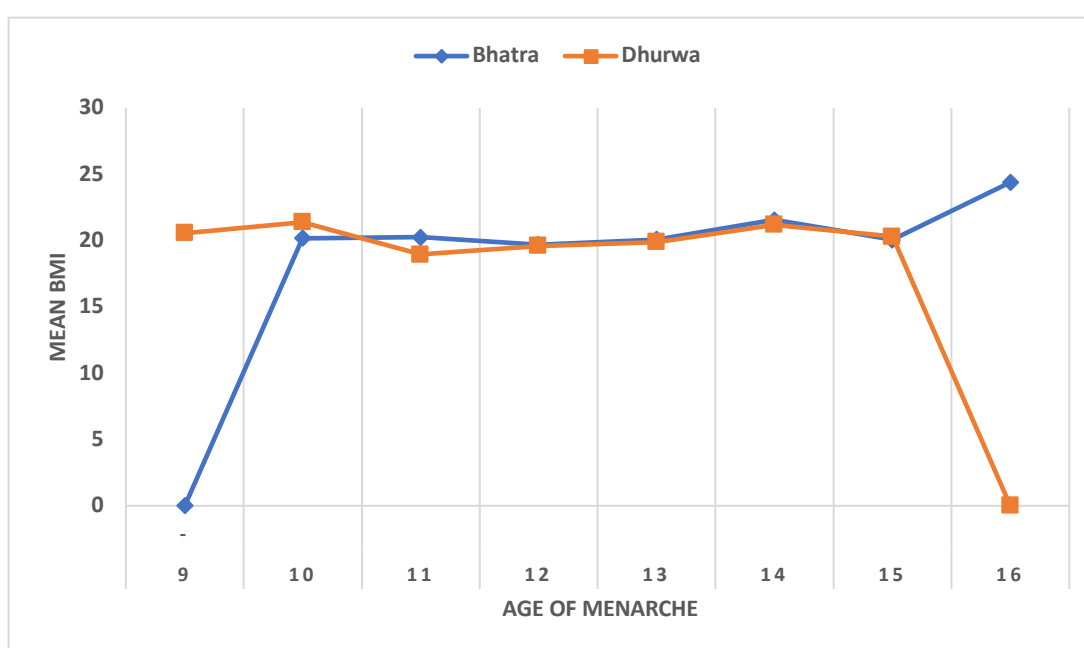
**Fig.3: Mean BMI according to age of menarche among tribal women of Bastar.**

Table 5 reveals the mean values of BMI according to educational status of tribal women of Bastar. The Dhurwa women (70.05%) are found to be more illiterate than Bhatra women (63.79%). The Bhatra women are observed to be more nutritionally sound than Dhurwa women, who are either illiterate or educated up to middle standard. The mean values of BMI according to educational status varies from 19.54±0.41 to 22.73±0.08 kg/m² in Bhatra women and from 19.54±0.19 to 25.63±2.94 kg/m² in Dhurwa women. t-values exhibits statistically significant intergroup variation among illiterate tribal women ($p > 0.05$). Mean BMI according to educational status is presented in fig. 4.

Table 5. The values of mean BMI according to educational status among tribal women of Bastar.

Educational status	Bhatra women(kg/m ²)			Dhurwa women (kg/m ²)			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
Illiterate	185	20.10±.19	2.56±.13	145	19.54±.19	2.23±.13	2.15*
Primary	42	19.54±.41	2.64±.29	20	19.67±.47	2.10±.33	0.21
Middle	28	19.85±.40	2.09±.28	22	18.95±.54	2.51±.38	1.34
Higher Sec.	32	19.76±.34	1.94±.24	17	21.42±.82	3.39±.58	1.89
Graduate	03	22.73±.08	0.13±.05	03	25.63±2.9	5.10±2.01	0.97
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

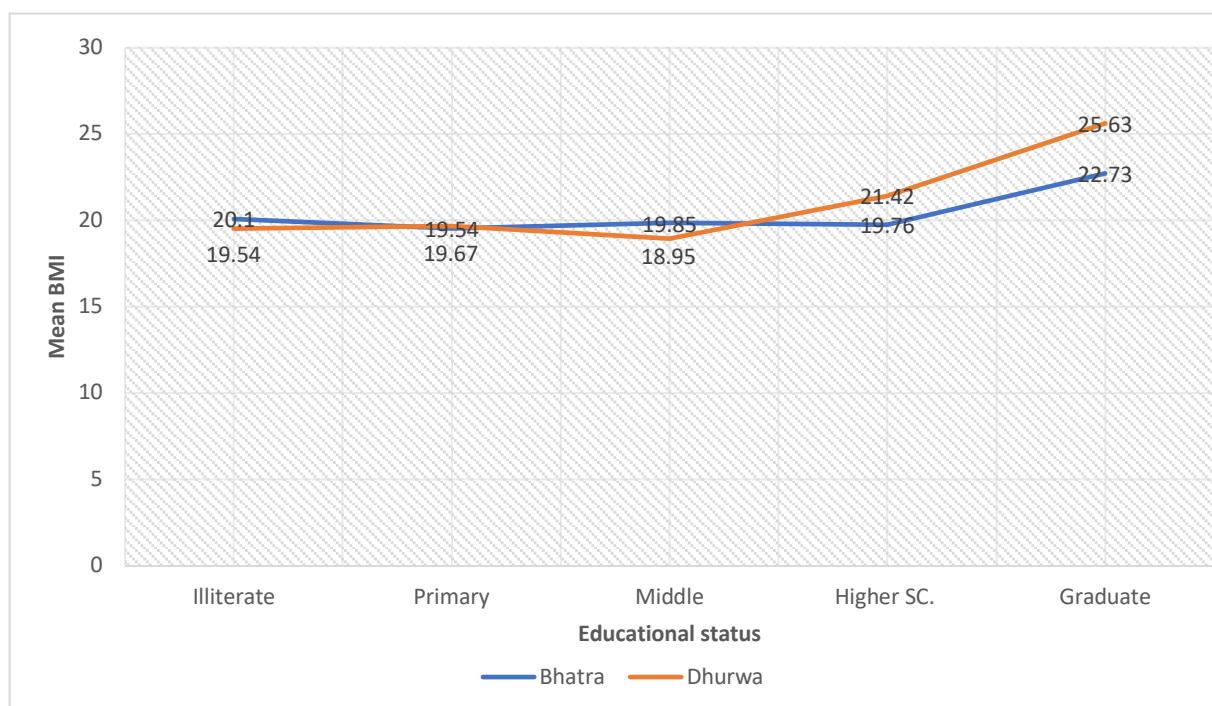


Fig. 4. Mean BMI according to educational status among tribal women of Bastar.

The values of mean BMI according to occupational status among tribal women of Bastar is presented in Table 6. The proportion of labour women is found to be higher in Bhatra tribe (53.10%) than Dhurwa women (47.34%). The mean values of mean BMI indicate state of normal nutrition among women of all occupational groups in both tribes and it varies from 19.72±0.19 to 22.48±1.34 kg/m² in Bhatra women and from 19.48±0.22 to 22.57±1.21 kg/m² in Dhurwa women. However Bhatra women are found to be nutritionally better as compared to Dhurwa women in all occupational groups except service class. No significant intergroup variation has been observed among them. Mean BMI is also shown in fig 5.

Table 6. The values of mean BMI according to occupational status among tribal women of Bastar.

Occupational status	Bhatra women (kg/m ²)			Dhurwa women (kg/m ²)			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
Labour	154	19.72±19	2.38±.14	98	19.48±.22	2.22±.16	1.85
House wife	118	20.05±.23	2.50±.16	98	19.66±.26	2.57±.18	1.15
Business	06	21.53±.84	2.06±.59	02	19.63±.88	1.25±.63	1.57
Service	07	21.01±.62	1.64±.44	09	22.57±1.2	3.62±.85	1.16
Politicians	05	22.48±1.3	3.01±.95	-	-	-	-
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

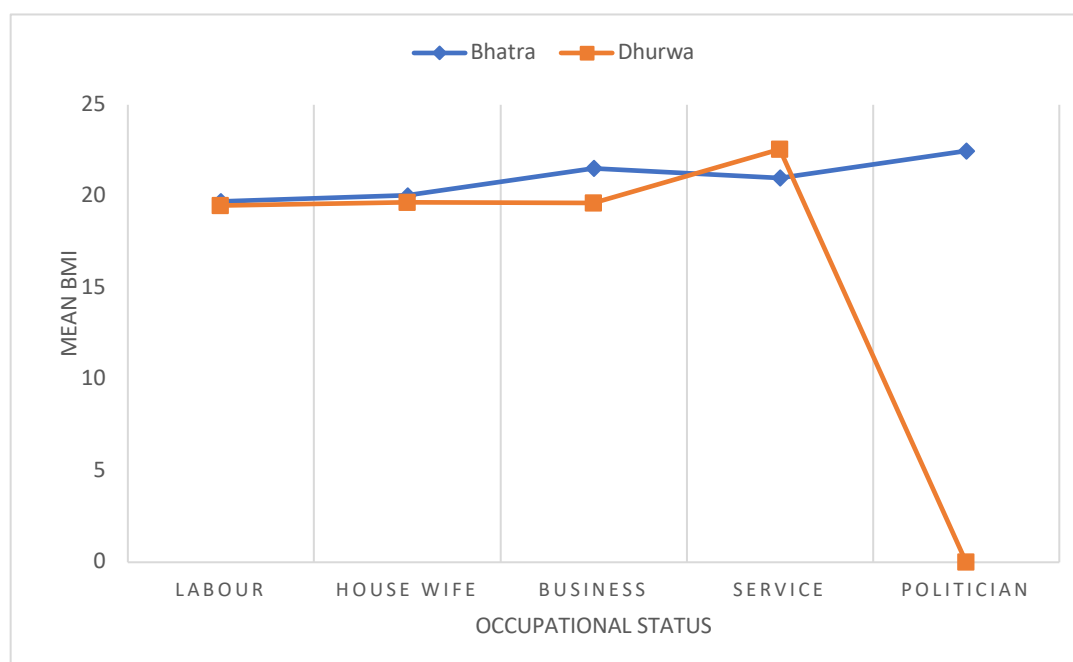
**Fig. 5. Mean BMI according to occupational status among tribal women of Bastar.**

Table 7 reveals the values of mean BMI according to body weight among tribal women of Bastar. The proportion of women above 41 kg is found to be higher in Bhatra tribe (79.66%) than Dhurwa tribe (73.43%). The values of mean BMI increase with increase in body weight of women, however, tribal women of weight ranged 30-41 kg are observed to be under weight and state of normal nutrition is prevalent among tribal women of weight ranged 41 kg or above. The mean BMI indicates its higher value in Bhatra women than Dhurwa women when compared to their body weight and it varies from 17.19±0.53 to 25.40±0.46 kg/m² in Bhatra women and from 16.75±3.41 to 25.95±0.81 kg/m² in Dhurwa women. No significant intergroup variation has been observed among them. Mean BMI according to their body weight is shown in fig 6.

Table 7. Mean BMI according to body weight among tribal women of Bastar.

Weight (kg)	Bhatra women (kg/m ²)			Dhurwa women (kg/m ²)			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
30-36	05	17.19±.53	1.19±.38	04	16.75±3.4	6.83±2.4	0.13
36-41	54	17.49±.13	0.97±.09	51	17.41±.16	1.15±.11	0.40
41-46	95	19.17±.16	1.58±.11	57	19.18±.18	1.35±.13	0.04
46-51	85	20.83±.17	1.59±.12	69	20.53±.16	1.37±.12	1.30
51-56	38	22.11±.35	2.16±.25	14	21.71±.43	1.62±.31	0.73
56+	13	25.40±.46	1.66±.33	12	25.95±.81	2.81±.57	0.59
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

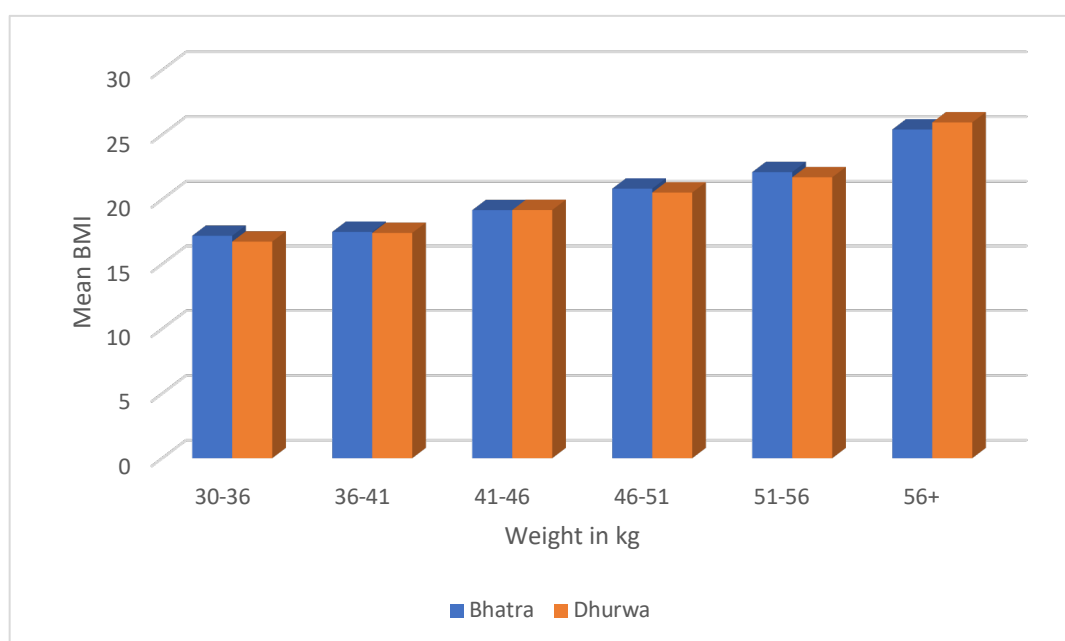


Fig. 6. Mean BMI according to body weight among tribal women of Bastar.

The values of mean BMI according to sitting height vertex among tribal women of Bastar is shown in Table 8. Mean BMI is found to be higher among women of sitting height ranged 67-76 cm in Bhatra tribe as compared to Dhurwa tribe and it varies from 18.26±0.57 to 20.19±0.28 kg/m² in Bhatra women and from 19.44±0.22 to 20.41±0.44 kg/m² in Dhurwa women. However mean sitting height is found to be slightly higher in Bhatra women (73.27±0.22 cm) than Dhurwa women (73.10±0.24 cm). The tribal women of sitting height ranged 59-83 cm are observed in normal state of nutrition in both tribal groups of Bastar except women of Bhatra tribe sitting height ranged 59-66 cm. Statistically significant intergroup variation is observed among women of sitting height ranged 59-66 cm. mean BMI is also shown in fig 7.

Table 8. Mean BMI according to sitting height vertex among tribal women of Bastar.

Sitting height vertex	Bhatra women (kg/m ²)			Dhurwa women (kg/m ²)			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
59-66	12	18.26±.57	1.97±.40	08	20.41±.44	1.24±.31	2.99***
66-71	69	20.11±.28	2.36±.20	41	19.52±.33	2.11±.23	1.37
71-76	133	19.94±.22	2.53±.16	114	19.44±.22	2.36±.16	1.61
76-83	76	20.19±.28	2.44±.20	44	20.39±.49	3.24±.34	0.36
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

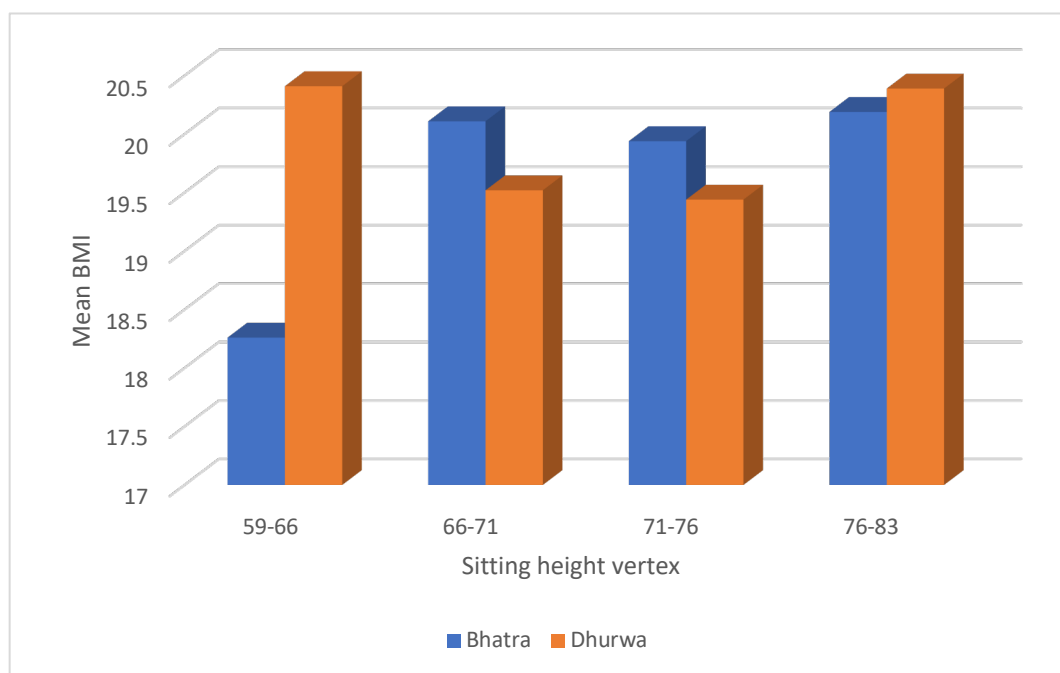
**Fig 7. Mean BMI according to sitting height vertex among tribal women of Bastar.**

Table 9 exhibits the values of mean BMI according to height among tribal women of Bastar. The mean height of Bhatra women (151.36±0.38 cm) is slightly higher than Dhurwa women (151.13±0.37 cm). The proportion of women of height ranged 150-178 cm is found to be higher in Bhatra tribe (54.14%) than Dhurwa tribe (52.17%). Mean BMI decreases with increase in height and it varies from 17.17±0.45 to 20.94±0.87 kg/m² in Bhatra women and from 18.65±0.44 to 20.54±0.67 kg/m² in Dhurwa women. All the women under study are observed in normal state of nutrition except women of Bhatra tribe height ranged 160-178 cm. The value of mean BMI indicates its higher magnitude in Bhatra tribe as compared to Dhurwa tribe except Bhatra women of height ranged 160-178 cm. Statistically significant intergroup variation is observed among 160-178 cm tall tribal women. mean BMI according to height vertex is presented in fig 8.

Table 9. Mean BMI according to height vertex among tribal women of Bastar.

Height vertex	BHatra women (kg/m ²)			Dhurwa women (kg/m ²)			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
136-141	09	20.94±.87	2.60±.61	04	20.54±.67	1.34±.47	0.37
141-146	39	20.72±.43	2.67±.30	28	19.83±.40	2.14±.29	1.53
146-150	85	19.94±.27	2.46±.19	67	19.66±.29	2.25±.19	0.72
150-155	107	20.30±.21	2.15±.15	66	19.88±.39	3.15±.27	0.95
155-160	28	19.73±.38	2.01±.27	26	19.70±.43	2.20±.31	0.05
160-178	22	17.17±.45	2.13±.32	16	18.65±.44	1.77±.31	2.39**
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

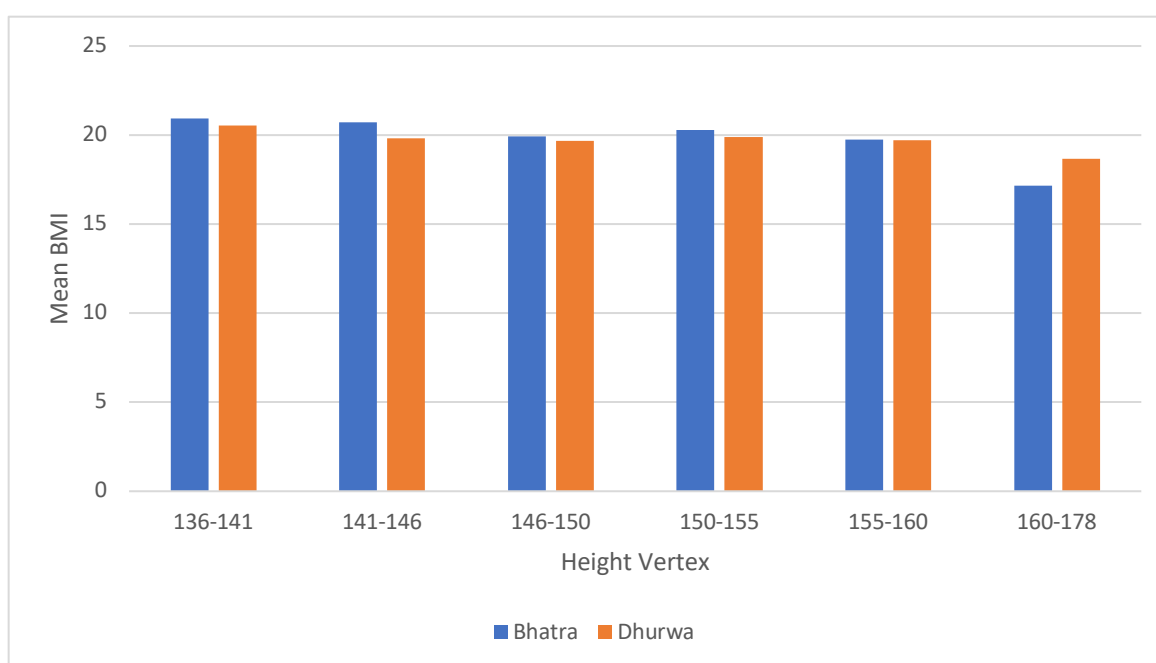


Fig. 8. Mean BMI according to height vertex among tribal women of Bastar.

The values of mean BMI according to cormic index among tribal women of Bastar is presented in Table 10. The proportion of brachy cormic women is found to be higher in Dhurwa tribe (91.30%) than Bhatra tribe (86.21%). Mean BMI increases with increase in value of cormic index and it varies from 19.88±0.15 to 21.89±0.53 kg/m² in Bhatra women and from 19.53±0.16 to 23.79 ± 6.66 kg/m² in Dhurwa women. Mean BMI of all classes of cormic index shows normal state of nutrition among women of both tribal groups of Bastar. Intergroup variation with respect to cormic index indicates non-significant differences among them. Mean BMI according to cormic index is shown in fig 9.

Table 10. Mean BMI according to cormic index among tribal women of Bastar.

Cormic index	Bhatra women (kg/m ²)			Dhurwa women (kg/m ²)			t-value for intergroup variation
	N	Mean±SE	SD±SE	N	Mean±SE	SD±SE	
X-51	250	19.88±.15	2.43±.11	189	19.53±.16	2.21±.11	1.67
51-52.9	37	20.47±.45	2.73±.32	16	21.12±.87	3.48±.62	0.67
52.9-x	03	21.89±.53	0.91±.37	02	23.79±6.7	9.43±4.7	0.28
Total	290	19.98±.15	2.48±.10	207	19.70±.18	2.54±.12	1.22

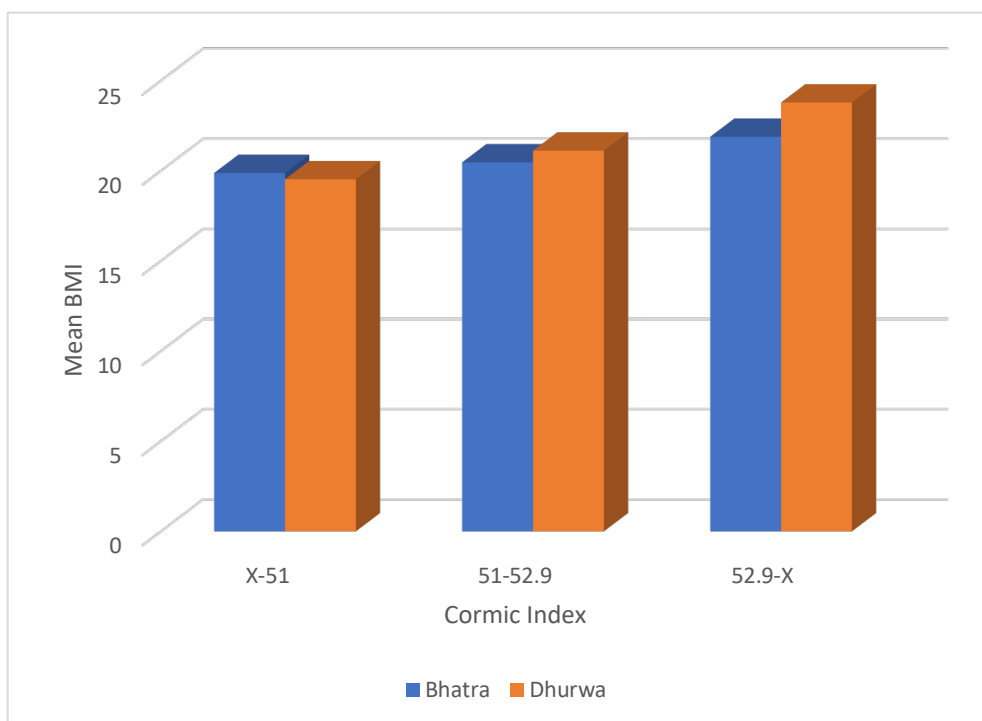
**Fig 9. Mean BMI according to cormic index among tribal women of Bastar.**

Table 11 reveals the distribution of women according to BMI among tribal women of Bastar. Under weight is more prevalent among Dhurwa women (31.88%) than Bhatra women (27.58%), while over weight is comparatively more prevalent among Bhatra women. The state of normal nutrition is found to be more prevalent among Bhatra women (68.97%) than Dhurwa women (65.22%). X²-value for intergroup variation is observed non-significant among them. The proportion of women according to their state of nutrition is also shown in fig 10.

Table. 11. Distribution of women according to BMI among tribal groups of Bastar.

Tribal group	N	< 18.5		18.5-24.9		>24.9	
		No.	%	No.	%	N	%
Bhatra women	290	80	27.78	200	68.97	10	3.45
Dhurwa women	207	66	31.83	135	65.22	06	2.90

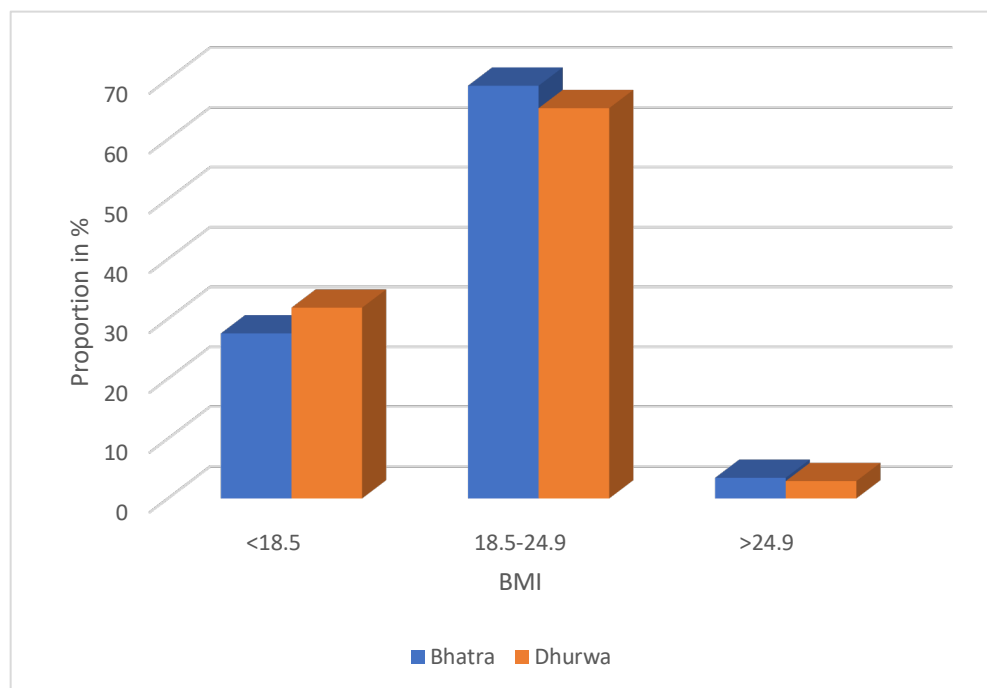


Fig.10. Distribution of women according to BMI among tribal groups of Bastar.

Mean BMI among some tribal women of India is presented in Table 12. Mean BMI of women of Bastar tribe is found to be lower than Bhaina of Chhattisgarh (Singh et. al.,2014), Birhor of West Bengal (Das et. al.,2013) and Onge of Andman Nicobar (Rao et. al;2006), however higher than remaining tribal women of India.

Tribal women	State	Mean BMI	Source
Bhaina	Chhattisgarh	20.06	Singh et.al;2014
Baiga	Madhya Pradesh	18.3	Chakma et. al;2009
Bhumia	Madhya Pradesh	18.1	Jaishwal,2013
Oraon	Orissa	19.7	Mittal and Shrivastava,2006
Savar	Orissa	19.3	Bisai and Bose,2012
Juang	Orissa	18.3	Goswami,2013
Bhumij	Orissa	18.5	Goswami,2012
Mina	Rajsthan	19.1	Bhasin & Jain,2007
Bhil	Rajsthan	16.5	Bhasin & Jain,2007
Garasia	Rajsthan	16.2	Bhasin & Jain,2007
Saharia	Rajsthan	17.8	Bhasin & Jain,2007
Damor	Rajsthan	17.3	Bhasin & Jain,2007
Santal	West Bengal	19.3	Bose et.al;2006b
Lodha	West Bengal	19.3	Mondal,2007
Hill Kheria	West Bengal	17.9	Das & Bose,2014
Birhor	West Bengal	20.0	Das et.al,2013
Jarwa	Andman & Nicobar	19.8	Sahani,2004
Onge	Andman & Nicobar	21.2	Rao et.al;2006
Bhatra	Chhattisgarh	19.98	Present study
Dhurwa	Chhattisgarh	19.70	Present study

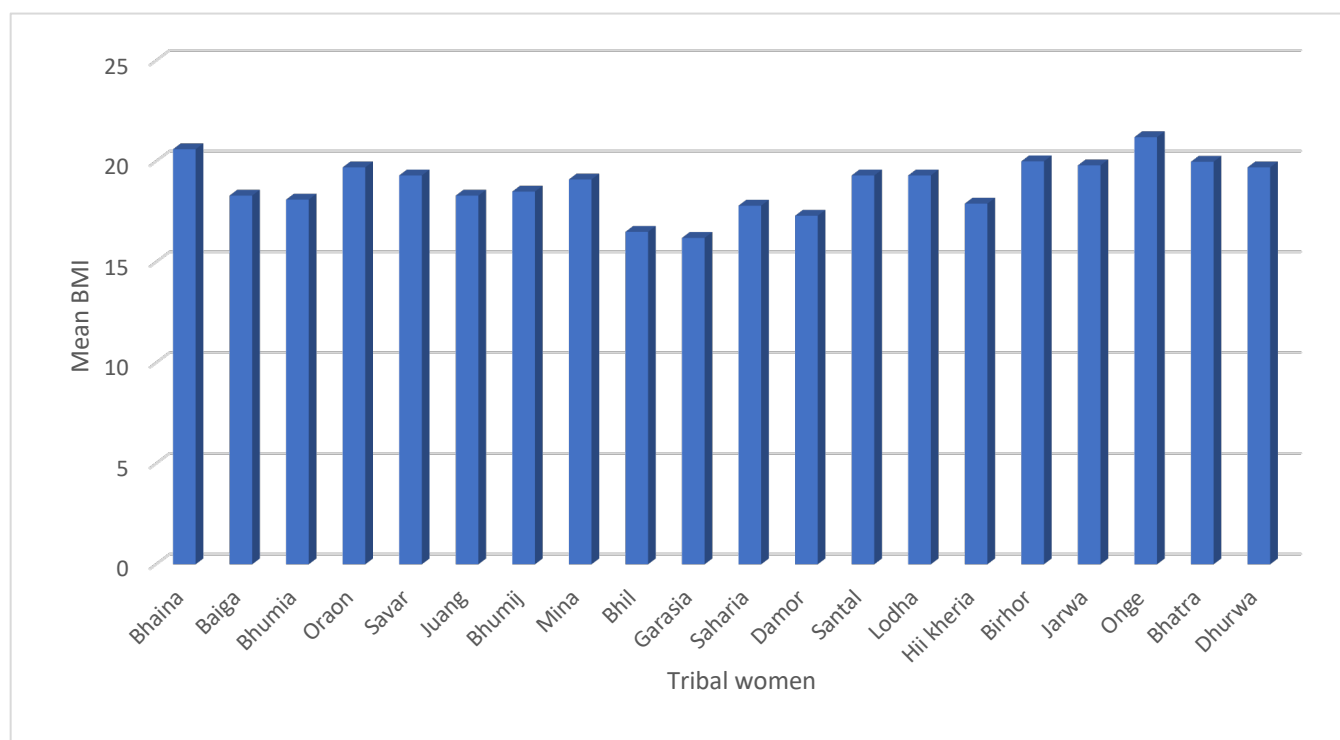


Fig. 11. Mean BMI among tribal women.

DISCUSSION

Anthropometric measurements and BMI are used to assess the state of nutrition. The present study reveals that the mean body weight is higher in Dhurwa women ($45.69 \pm 0.33\text{kg}$) than Dhurwa women ($45.00 \pm 0.44\text{kg}$), which is below the standard weight of 55kg. The Bhatra women ($151.36 \pm 0.38\text{cm}$) are found to be taller than Dhurwa women ($151.13 \pm 0.37\text{cm}$), while their mean

height is slightly more than the standard height of 151cm as set for Indian women suggested by Indian Council of Medical Research.

The mean BMI is observed slightly higher in Bhatra women($19.98 \pm 0.15 \text{ kg/m}^2$) than Dhurwa women ($19.70 \pm 0.18 \text{ kg/m}^2$) and the proportion of underweight women is found to be higher in Dhurwa women (31.88%) than Bhatra women (27.58%), which suggested that socio-economic status of women Influence their health and state of nutrition.

The mean age of menarche is found to be higher in Dhurwa women (11.90 years) than Bhatra women (11.74 years). The mean value of BMI is observed to be higher among those tribal women, who experienced their first mensuration after 13 years of age suggesting that the state of nutrition is influenced by age of menarche.

Present study reveals that older women are nutritionally more sound than younger women and tribal women of nuclear family, service class, weight over 46kg , sitting height vertex over 76cm , height below 146cm and cormic index over 51.00 have been observed with comparatively high magnitude of BMI indicating their better position in nutritional status as compared to women of other classes. On the basis of mean BMI, it can be said that the state of nutrition of present sample is below than Bhaina tribe of Chhattisgarh (Singh et. al;2014), Birhor tribe of West Bengal (Das et.al;2013) and Onge tribe of Andaman and Nicobar (Rao et.al;2006).

CONCLUSION

The anthropometric features of under study tribal groups are below ICMR standards. Majority of Dhurwa women at high risk of CED and underweight as compared to Bhatra women and the state of nutrition is influenced by their socio-economic and bio-anthropometric determinants.

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