Anthropometric Assessment of Nutritional Status in Relation to Socio-Economic Determinants among Bhatra Women of Bastar, Chhattisgarh, India

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Abstract: *Anthropometric measurements are useful for nutritional and growth studies and also it any be used as parameter for health status. The nutritional transition in developing countries may lead to imbalances in growth and nutritional status. The present study seeks to determine the pattern of nutritional status among Bhatra women of Chhattisgarh. Anthropometric data from 258 women were collected and BMI is calculated in relation to their socio-economic, determinants. The mean height and weight of Bhatra women belonging to age 18-40+ years are observed to be 151.08±0.34 cm and 40.95±0.32 kg respectively. The mean height among women of literate group, service class, non-consanguineous marriage group and joint families is found to be higher. However the same trend is found for their body weight. The mean body mass index is found to be 17.93±0.13kg/M². The mean body index of Bhatra women of 40+ years age group literate group and service class is observed under normal status. The mean menarcheal age is 12.83±0.66 year and the mean BMI of women who experienced first menstruation at the age of 11 years is found to be in normal range. The mean age of marriage is 17.08±0.13 years and the Bhatra women get married at the age of 22+ years are found to be normal. The mean age of first child birth is found to be 18.93±0.15 years and the Bhatra women, who born their first child at the age of 25+ years are observed nutritionally normal. The proportion of underweight women is found to be 73.64% while majoring of women of illiterate group, house wife, joint families and consanguineous marriage are observed under weight. The body mass index indicates that only 37.60% studied women are normal followed by nutritionally mild women and severs women. The Bhatra women of littered group service class nuclear families and non-consanguineous marriage are observed comparatively nutritionally normal. However the majonty of Bhatra women who experienced first mensruartion at 11 years, married at 22+ years and born their first child at 25+ year are found to nutritionally normal.*

Keywords: *Anthropometry, BMI, Bhatra Women, Chhattisgarh*

1. INTRODUCTION

The health of Indian women is intrinsically linked to their status in society. Researches on women's status found that the contributions of Indian women make to families often are over looked and instead they are viewed as economic burdens. They typically have little autonomy, living, under the control of first their father then their husband and finally their sons (Chatterjee, 1990, Desai, 1994, The Word Bank 1996). Women in poor health are more likely to give birth to low weight infants. According to WHO, maternal mortality is currently estimated to be 529000 deaths per year a global ratio of 400 maternal death per 100000 live births between 11 to 17 percent maternal death happen during child birth itself and between 50 to 71 percent in the postpartum period. The low status of women in the society coupled with their low literacy levels prevents the women from taking antenatal care even if services are available. A number of socio-economic factors are known to be associated with their nutritional status.

Anthropometry is the science of measurement and the art of application that establishes the physical geometry mass properties and strength capabilities of the human body (pradu, LU JLD, 2007). The body mass index is the established anthropometric indicator used for assessment of adult nutritional status (Lohman et.al. 1988, FerroLuzzie et. al, 1992, Lee and Nieman 2003) According to NFHS-4, 26.7% (C. G.-29.67, Bastar 40.6%) of tribal women had body mass index below 18.5 indicating chronic energy deficiency. A BMI < 18.5 kg/m² is widely used as practical measure of chronic energy

or hunger deficiency (CED) a steady underweight in which an individual is in energy balance irrespective of a loss in body weight or body energy stores (Khorgsdies, 2005). A study under weight is likely to be associated with morbidity or other physiological and functional impairment (James et al 1988; shetty and James, 1999). WHO classification, 1995 of the public health problem of low BMI, based on adult populations Worldwide. This classification categories prevalence according to percentage of a population with BMI<18.5

- Low (59%): warning sign monitoring request
- Medium (10-19%): poor situation
- High (20-39%): serious situation
- Very high (≥40%): critical situation

Body mass index is also considered as an important nutritional index for detecting the case of underweight over weight and obesity (WHO 1995)

Poor health has repercussions not only for women but also for their families. Women in poor health are more likely to give birth to low infant. Bhatra is one of the major tribal groups of Bastar and their economy is based on agriculture and collection of minor forest produces. The aim of the present study is to understand their nutritional measurements and also to evaluate the nutrition's status in relation to their socio demographic determinants.

2. MATERIAL AND METHODS

The Bhatra is major tribal population comprising 21.41% of total tribal population of Bastar (census, 2001). The Bhatra are mainly concentrated in north-eastern part of Jagdalpur tahsil. The word Bhatra is said to mean servant. At present Bhatras are engaged in cultivation and gain their livelihood by agriculture. They are also engaged in various other occupations; daily wages labourers in different Institutions. Racially the Bhatra tribe may classify as proto Australoid.

The socio conomic status of women directly associated with their health. Millions of women are malnourished and suffer from chronic anemia naleria and intestinal disease. Women health affects personal and family productivity and also help to ensure healthier generations in future. Therefore in the present study an attempt has been made to study the state of chronic energy level in relation to their socio economic determinant among Bhatra women of Bastar.

An extensive field work carried out among the Bhatra tribe of Bastar. The data for present study were collected from various tribal villages of Bastar district namely Deora, Ulnar, Kachnar, Podaguda etc. The subjects for this study comprised 258 women aged 18 to 40+ years from different socio-economic group. Standardised measurement of height and weight were obtained for using standard techniques. Height was measured to the nearest 1mm with an anthrop meter and body weight was measured to the nearest 0.05 kg with standard weighting machine. Body mass index (BMI) was calculated for each subject to evaluate the nutritional status of Bhatra women. Statistical analysis of data was done to examine their nutritional status. The relationship between the age at menarche and weight, height and BMI and also the relationship between the age at marriage and age of first child birth and different anthropometric variables are also examined to understand its influence on their nutritional status.

3. RESULTS AND DISCUSSION

The distribution of mean height and weight according to age of Bhatra women are presented in Table 1. Table shows that height and weight increases with the change of age except in women of 25-29 and 40+ years of age. However in case of weight at the age of 19-24 years, the mean height of Bhatra women is found to be 153.85±0.95 cm at the age of 35-39 year and mean weight is observed to 44.72±3.77 keigher in 40+ years as compared to other age groups of women. Where as the mean height and mean weight among Bhatra women are observed to be 151.08±0.34 cm and 40.95±0.32 kg respectively. The distribution of mean height and weight are shown in fig 1 and 2 respectively.

Table1: *Distribution of height and weight according to age of Bhatra women*

Mothers age	No.	Height (cm)		Weight (kg)	
		X±S.E	σ±S.E	X±S.E	σ±S.E
≤18	10	150.02±2.14	6.77±1.51	41.20±1.75	5.53±1.24

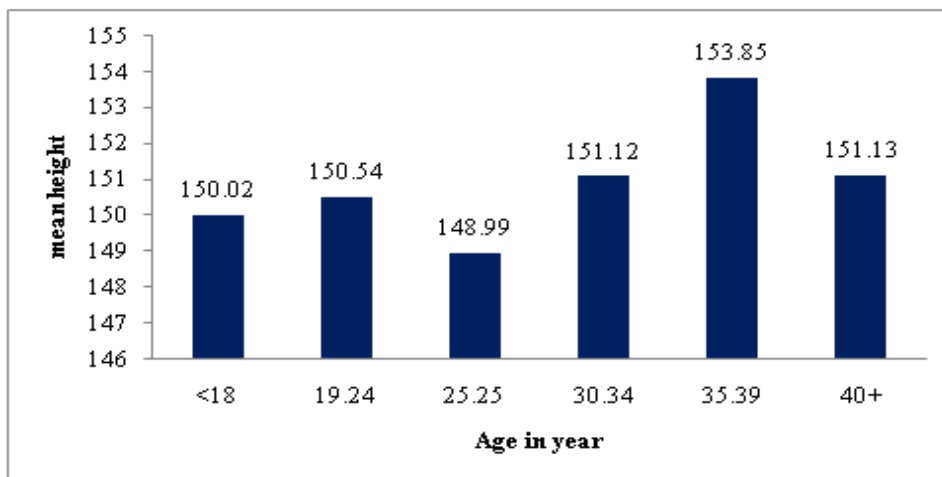| 19-24 | 88 | 150.54±0.60 | 5.61±0.42 | 39.59±0.48 | 4.56±0.34 |
25-29	79	148.99±0.51	4.56±0.36	40.51±0.52	4.66±0.37
30-34	48	151.12±0.92	6.35±0.65	41.65±0.68	4.74±0.48
35-39	25	153.85±0.95	4.76±0.67	42.88±1.18	5.91±0.84
> 40	08	151.13±1.64	4.63±1.16	44.72±3.77	10.67±2.66
Total	258	151.08±0.34	5.44±0.24	40.95±0.32	5.13±0.22

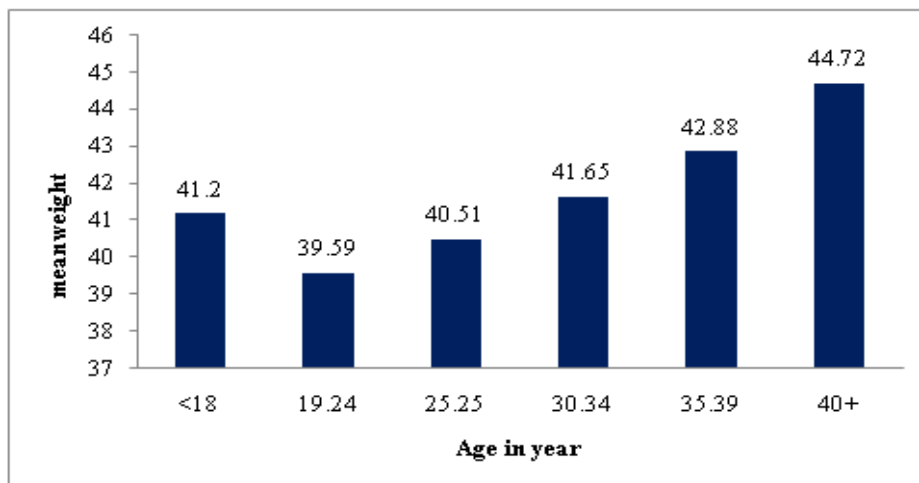**Fig1:** *The mean height among Bhatra women of Bastar*

Fig2: *The mean weight among Bhatra women of Bastar*

Table 2 indicates the distribution of mean height and weight among the Bhatra women of Bastar. Table shows that the mean height and weight are observed to be higher in illiterate women than literate women; However service class women were found to be taller (155.29±2.17cm) and heiver (47.43±3.12 kg) than women of other occupational groups. The proportion of Bhatra women related to non-consanguineous marriage (58.14%) is higher than the women related to consanguineous marriage (41.86%). However the mean height and weight are observed to be higher in the women of non-consanguineous marriage. Nuclear family is observed to be more frequent than joint family among Bhatra tribe where as the mean height is found to be higher in women of joint families (151.17±0.60 cm) than nuclear families and reverse trend is observed for mean weight. It is evident from the table that the socio economic status of women affects their height and weight.

Table2: *Distribution of height and weight according to background characteristics of women*

Background characteristics	No.	%	Height (C.M.)		Weight (K.G.)	
			$\bar{X}$±S.E	σ±S.E	$\bar{X}$±S.E	σ±S.E
Educational status						
Illiterate	73	28.29	151.38±0.67	5.72±0.47	42.38±0.68	5.84±0.48
literate	185	71.71	150.97±0.39	5.34±0.28	40.39±0.35	4.72±0.25

Occupational status						
house wife	160	62.02	151.07±0.42	5.33±0.30	40.66±0.39	4.97±0.28
labor	90	34.88	150.78±0.58	5.50±0.41	40.94±0.50	4.77±0.36
service	08	3.10	155.29±2.17	6.15±1.54	47.43±3.12	8.82±2.20
Marriage pattern						
Non-consanguineous	150	58.14	151.29±0.44	5.34±0.31	41.27±0.42	5.14±0.30
Consanguineous	108	41.86	150.74±0.52	5.60±0.38	40.42±0.49	5.09±0.35
Family type						
Nuclease family	166	64.34	151.02±0.41	5.29±0.29	41.22±0.42	5.44±0.30
Joint family	92	35.66	151.17±0.60	5.76±0.42	40.41±0.47	4.48±0.33
Total	258	100.00	151.08±0.34	5.44±0.24	40.95±0.32	5.13±0.22

The distribution of mean BMI according to age of women among Bhatra tribe of Bastar. The values of mean BMI increase with change of age with some exception. The magnitude of mean BMI indicates its highest value among the women of 40+ year age group (19.42 ± 1.14 kg/m^2) and lowest among the women of 19-24 year age group. The mean BMI indicate that the women belonging to age group 40+ year are nutritionally normal where as mild malnutrition is prevalent among the women of other age groups 18-39 years. However the mean BMI is found to be 17.93 ± 0.13 kg/m^2 showing their mild state of malnutrition. The distribution of mean BMI is presented in fig 3

Table3: *The distribution of mean BMI according to age of women among Bhatra tribe of Bastar*

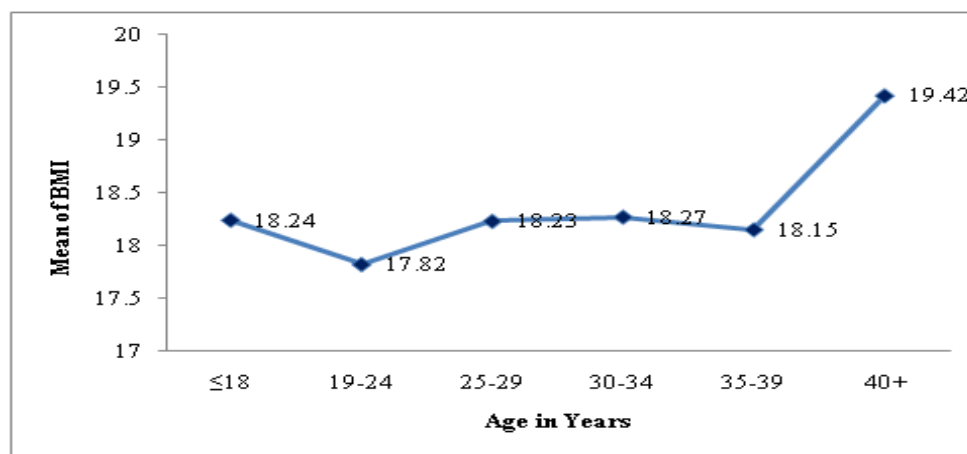| Age-group	No.	BMI	
		$\bar{X}\pm$S.E	$\sigma\pm$S.E
≤18	10	18.24±0.46	1.45±0.32
19-24	88	17.82±0.19	1.82±0.14
25-29	79	18.23±0.23	2.04±0.16
30-34	48	18.27±0.25	1.76±0.18
35-39	25	18.15±0.41	2.07±0.29
> 40	08	19.42±1.14	3.74±0.81
Total	258	17.93±0.13	2.07±0.09

Fig3: *The distribution of mean BMI among Bhatra women of Bastar*

The distribution of mean BMI according to socio-economic status among women of Bhatra tribe is shown in table 4. The mean BMI indicate its highest magnitude among literate women (18.54 ± 0.25kg/m^2), Service class women (19.61 ± 0.99 25kg/m^2), women of nuclear families (18.05 ± 0.16 25kg/m^2) and the women of non-consanguineous marriage pattern (18.02 ± 0.1625kg/m^2) and shows normal state of nutrition in literate and service class women, where as the mild state of malnutrition prevalent among the women of other socio-economic status of Bhatra tribe.

Table4: *The distribution of mean BMI according to socio-economic status among women of Bhatra tribe of Bastar*

Background characteristics	No.	BMI		t-value
		$\bar{X}\pm$S.E	$\sigma\pm$S.E	
Educational status				

Illiterate	188	17.71±0.14	1.87±0.01	2.88
literate	70	18.54±0.25	2.12±0.18	
Occupational status				
house wife	160	17.88±0.15	1.92±0.11	0.194
labour	90	17.93±0.21	1.98±0.15	1.66
service	08	19.61±0.99	2.82±0.71	
Marriage pattern				
Non-consanguineous	150	18.02±0.16	1.96±0.11	1.13
Consanguineous	108	17.78±0.19	2.02±0.13	
Family type				
Nuclease family	166	18.05±0.16	2.10±0.11	1.25
Joint family	92	17.74±0.19	1.83±0.14	
Total	258	17.93±0.13	2.07±0.09	

Significant at 5% level of probality

The distribution of mean BMI according to the menarche age among women of Bhatra tribe of Bastar is shown in table5. Table indicates that most of the women experience their first menstruation at the age of 13 year, while the mean age at menarche is found to be 12.83±0.04 years. The mean BMI indicates its higher magnitude among women, Who experienced first menstruation at 11 years (19.85±1.37) and lowest at 10 years (16.17±0.47 kg/m^2). The normal state of nutrition observed prevalent among the women, who experienced first menstruation at 11 years of age while mean BMI of women of other menarcheal age group are observed to be mild state of nutrition. The distribution of mean BMI according to their menarche age is shown in fig4.

Table5: *The distribution of mean BMI according to menarcheal age among women of Bhatra tribe of Bastar.*

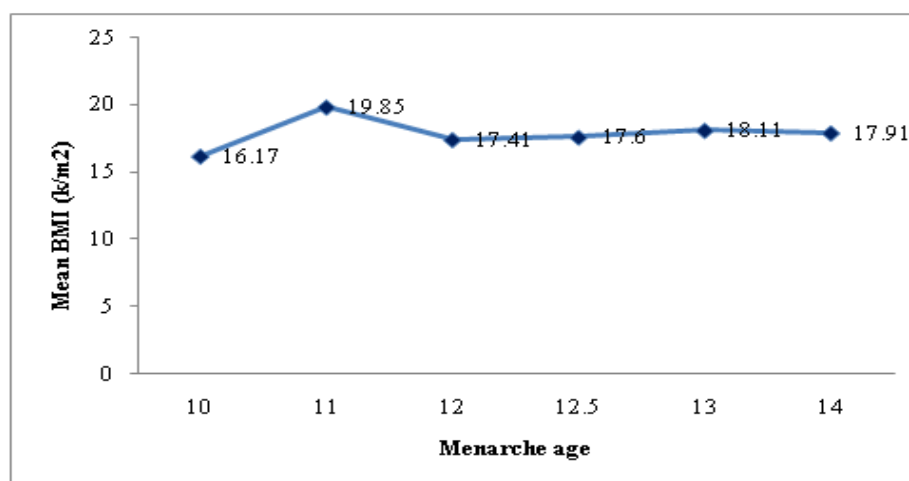| Age in year	No. of Women	%	$\bar{X}$±S.E	σ±S.E
10	03	1.16	16.17±0.47	0.82±0.34
11	04	1.55	19.85±1.37	2.74±0.97
12	07	2.71	17.41±0.22	1.52±0.16
12.5	56	21.70	17.60±0.22	1.68±0.19
13	161	62.40	18.11±0.16	2.08±0.29
14	27	10.48	17.91±0.38	1.96±0.27
Total	258	100.00	17.93±0.13	2.07±0.09

Fig4: *The distribution of mean BMI according to age of menarche among Bhatra women of Bastar*

Table 6, indicates the distribution of mean BMI according to their age of marriage among women of Bhatra tribe of Bastar. Table shows that most of women get married at age of 16-18 years (67.83%); however the mean age of marriage is found to be 17.08±0.13 year. The mean BMI varies from 17.46±0.42 kg/m^2 to 20.74±0.96 kg/m^2 and indicates its highest magnitude among the women who get married at 22 years and lowest at 19-21 years. The normal state of nutrition is observed prevalent among the Bhatra women who get married either 22 years or later. However women of other marriage group show their mild state of nutrition. The distribution of mean BMI according to age of their marriage is present in fig 5.

Table6: *The distribution of mean BMI according to age of marriage among women of Bhatra tribe of Bastar*

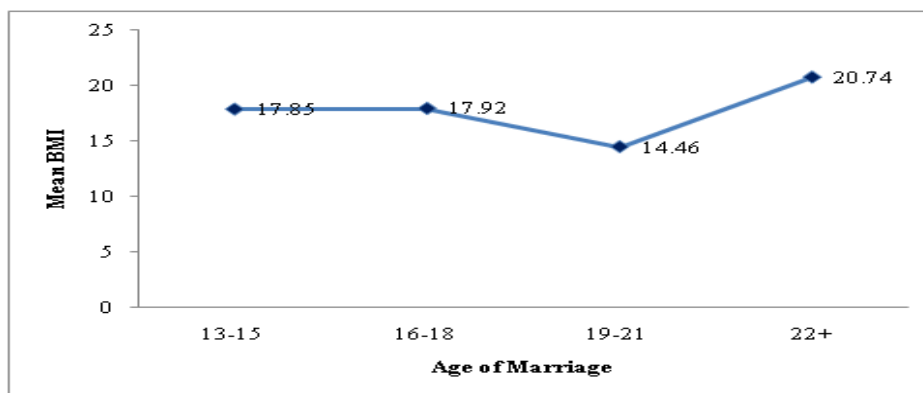| Age in year	No. of Women	%	$\overline{X}\pm$S.E	$\sigma\pm$S.E
13-15	54	20.93	17.85±0.24	1.75±0.17
16-18	175	67.83	17.92±0.15	1.98±0.11
19-21	23	8.91	17.46±0.42	1.99±0.29
22<	06	2.33	20.74±0.96	2.36±0.68
Total	258	100.00	17.93±0.13	2.07±0.09

Fig5: *The distribution of mean BMI according to age of marriage among women of Bhatra tribe of Bastar*

The distribution of mean BMI according to age of first child birth among women of Bhatra tribe is shown in table 7. Table shows that the majority of women (43.87%) gave birth to their first child at 16-18 years followed by 19-21 year age women (40.71%) and 22-24 year aged women (8.30%). However the mean age of first child birth among Bhatra women is observed to be 18.93±0.15years. The mean BMI increases with increase of age of first child birth and indicates it highest values among those women who gave their first child at 25+ years (20.41±0.7 kg/m^2) and lowest at 15 years (17.26±0.20 kg/m^2). The normal state of nutrition is observed to be prevalence among those women, who gave birth to their first child either at 25 years or later. However the mean BMI of Bhatra women who give birth their first child between 15 to 24 years are found to be mild state of nutrition. The results of Table 7 show that the age of first child birth of women affects their state of nutrition. The distribution of mean BMI is shown in Fig 6.

Table7: *The distribution of mean BMI according to age of first child birth among women of Bhatra tribe of Bastar.*

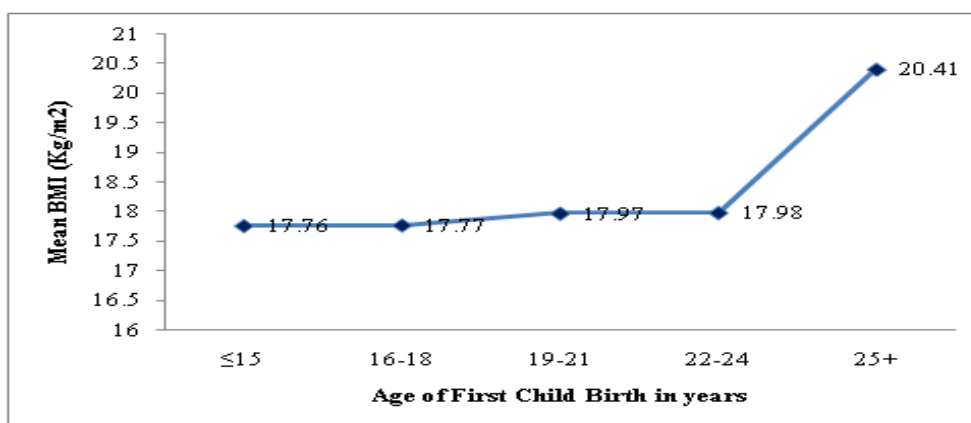| Age of first child birth in year	No. of Women	%	$\overline{X}\pm$S.E	$\sigma\pm$S.E
≤15	09	3.56	17.26±0.20	0.59±0.14
16-18	111	43.87	17.77±0.17	1.74±0.12
19-21	103	40.71	17.97±0.22	2.21±0.15
22-24	21	8.30	17.98±0.39	1.77±0.27
25<	09	3.56	20.41±0.71	2.14±0.50
Total	258		17.93±0.13	2.07±0.09

Fig6: *The distribution of mean BMI according to age of first child birth among women of Bhatra tribe of Bastar.*

WHO considers BMI as an important nutritional index for detecting cases of underweight over weight and obesity? Table 8 indicates the distribution of women as per WHO specification among the Bhatra tribe of Bastar. The proportion of underweight women is observed to be highest among 19-24 years age group (82.95%) and lowest among ≤18 years age group. The proportion of underweight women decreases with increase in their age group. Howerever the Ideal weight is more prevalent among women of ≤18 year age group. In over all the proportion of underweight (73.64%) is found to be much more than Ideal weight (26.36%) among the Bhatra women of Chhattisgarh. It is also shown in Fig 7.

Table8: *The distribution of Bhatra women according to weight variation evaluated by BMI*

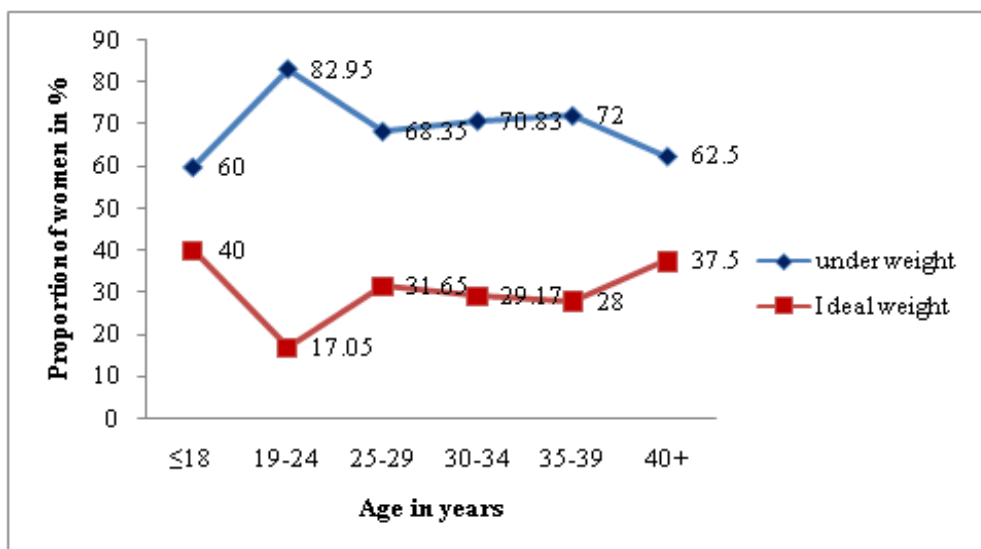| Age in year	No. of women	<19 under weight		19.10-25.80 Ideal weight	
		No.	%	No.	%
≤18	10	06	60.00	04	40.00
19-24	88	73	82.95	15	17.05
25-29	79	54	68.35	25	31.65
30-34	48	34	70.83	14	29.17
35-39	25	18	72.00	07	28.00
40+	8	05	62.50	03	37.50
Total	258	190	73.64	68	26.36

Fig7: *Distribution of Bhatra women according to their underweight and Ideal weight among Bhatra tribe of Bastar*

The distribution of Bhatra women according to their socio-cultural status is shown in Table 9. The underweight status is found to be more prevalent among women of illiterate group (78.92%), House wife (76.25%), joint families (75.08%)and women belonging to consanguineous marriage (77.78%), where as Ideal weight is found to be more prevalent among women of literate group (27.11%) and women belonging to non-consanguineous marriage (29.33%). In this study it is evident that socio-cultural status of women affects their weight status.

Table9: *The distribution of weight variation among women to according to their socio-cultural status among Bhatra tribe of Bastar*

BMI Range

Background characteristics	No. of women	<19 under weight		19.10-25.80 Ideal weight	
		No.	%	No.	%
Educational status					
Illiterate	185	146	78.92	39	21.08
literate	73	44	60.37	29	39.73
Occupational status					
house wife	160	122	76.25	38	23.75
labour	90	63	70.00	27	30.00

service	08	05	62.50	03	37.50
Marriage pattern					
Non-consanguineous	150	106	70.67	44	29.33
Consanguineous	108	84	77.78	24	22.22
Family type					
Nuclease family	166	121	72.89	45	27.11
Joint family	92	69	75.00	23	25.00

The distribution of weight status women according to age of menarche among Bhatra tribe of Bastar is shown in Table 10. The state of underweight is found to be more prevalent among those women who experienced their first menstruation between 12 to 12.5 years (90.48%). However the state of Ideal weight is found to be more prevalent among women who experienced first menstruation at the age of 14 years (33.33%). It is also shown in Fig 8.

Table10: *The distribution of weight status of women according of menarche among Bhatra tribe of Bastar*

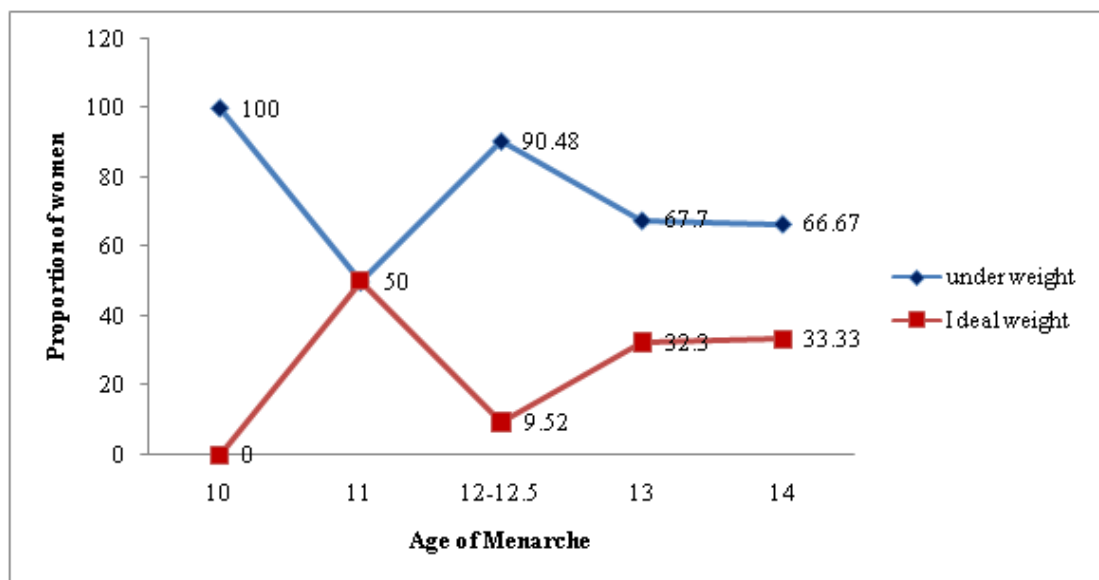| Age of menarche	No. of women	<19 under weight		19.10-25.80 Ideal weight	
		No.	%	No.	%
10	03	03	100.00	-	-
11	04	02	50.00	02	50.00
12-12.50	63	57	90.48	06	9.52
13	161	109	67.70	52	32.30
14	27	18	66.67	09	33.33

Fig8: *Distribution of weight status of women according to their menarche age among Bhatra tribe of Bastar*

Table 11 indicates the distribution of weight status of women according to age of marriage among Bhatra tribe of Bastar. The state of underweight is found to be more prevalent among those women who get married between 13-15 years (77.78%). However Ideal weight is observed to be more prevalent among those women who married at 22 years or later (50.00%). The state of underweight decreases with increase age of marriage, while a reverse trend can be seen for ideal weight. None of the women are found with overweight. The state of weight variation is also presented in Fig 9.

Table11: *The distribution of weight status of women according to age of marriage among Bhatra tribe of Bastar*

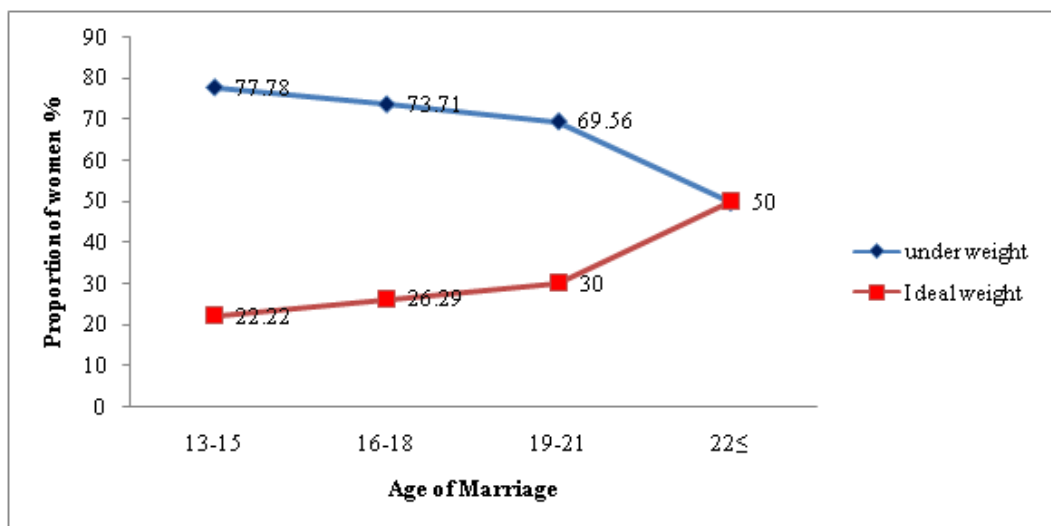| Age of marriage	No. of women	<19 under weight		19.10-25.80 Ideal weight	
		No.	%	No.	%
13-15	54	42	77.78	12	22.22
16-18	175	129	73.71	46	26.29
19-21	23	16	69.56	07	30.44
22<	06	03	50.00	03	50.00

Fig9: *Distribution of state of weight according to age of marriage among Bhatra women of Bastar*

The distribution of weight status of women according to age of first child birth among Bhatra tribe of Bastar is presented in Table 12. The proportion of underweight varies from 33.33 to 100.00% and the state of Ideal weight varies from 0 to 66.67% among women of Bhatra tribes. It is evident from the table that the state of underweight decreases with increase of age of first child birth, where as the state of Ideal weight increases with increases in age of child birth. The state of underweight is observed to be more prevalent among those women, who gave birth to their first child at 15 years, while the state of ideal weight is found to be more prevalent among women born their first child at 25 years or later. The state of weight status of Bhatra women is also presented in Fig 10.

Table12: *The distribution of weight status of women according to age of first child among Bhatra tribe of Bastar*

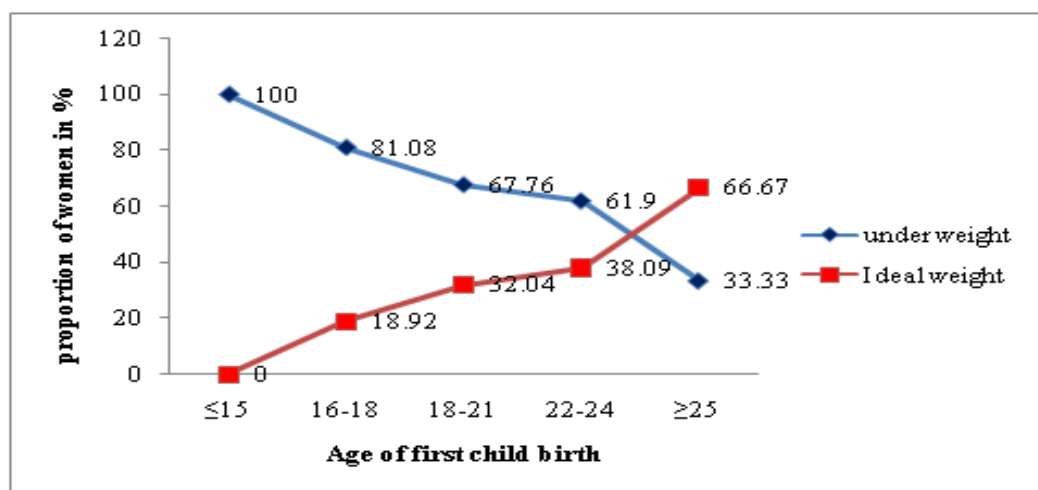| Age of first child birth	No. of women	<19 under weight		19.10-25.80 Ideal weight	
		No.	%	No.	%
≤15	09	09	100.00	-	-
16-18	111	90	81.08	21	18.92
18-21	103	70	67.96	33	32.04
22-24	21	13	61.90	08	38.09
25<	09	03	33.33	06	66.67

Fig10: *Distribution of state of weight according to age of first child birth among Bhatra women of Bastar*

The Body mass index (BMI) is the most established anthropometric indicator used for assessment of adult nutritional status. CED is a major public health problem especially among rural underprivileged adults in developing countries. A BMI <18.5 kg/m^2 is widely used as practical measure of chronic energy deficiency i. e. a steady underweight in which an individual is in energy balance irrespective

of loss in body weight or body energy stores (Khongsdier, 2005). Nutritional status was evaluated using internationally accepted BMI guideline (WHO,1995). The following cut-off points were used;

CED: BMI <18.5

Normal: BMI = 18.5-24.9

Overweight: BMI ≥ 25.0

The nutritional status of Bhatra women according to their age is shown in Table 13. Prevalence of severe deficiency varies from 10.00 to 18.18%, moderate deficiency varies from 8 to 37.50% and wild deficiency varies from 12.50 to 30.00%. However normal statusvaries from 27.27 to 52.00% among Bhatra women of Bastar. The highest proportion of women with normal nutritional status is observed in 35-39 years age group and lowest is 19-24 years age group. However severe malnutrition is found to be more prevalent among women of 19-24 years age group. The prevalence of CED based on BMI of less than 18.50 is found to be 62.40% women which is much more than normal nutritional status of Bhatra women (37.60%). The distribution of Bhatra women with their different nutritional status based on BMI is presented in Fig 11.

Table13: *Percentile prevalence of nutritional status according to age among Bhatra women of Bastar*

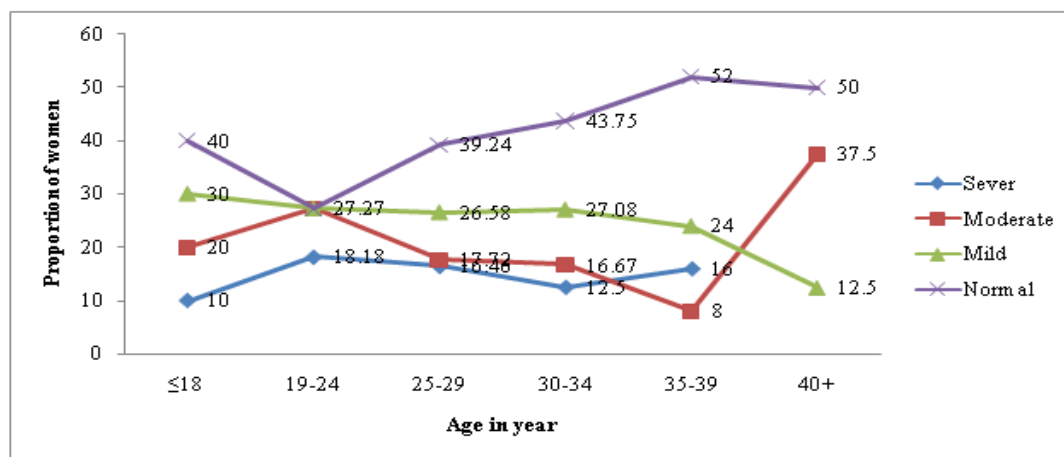| Age of first child birth	No. of women	<16 (Severe)		16.00-16.99 Moderate		17.00-18.49 Mild		> 18.50 Normal	
		No.	%	No.	%	No.	%	No.	%
≤18	10	01	10.00	02	20.00	03	30.00	04	40.00
19-24	88	16	18.18	24	21.27	24	27.27	24	27.27
25-29	79	13	16.46	14	17.72	21	26.58	31	39.24
30-34	48	06	12.50	08	16.67	13	27.08	21	43.75
35-39	25	04	16.00	02	8.00	06	24.00	13	52.00
40+	08	-	-	03	37.50	01	12.50	04	50.00
Total	258	40	15.50	53	20.54	68	26.36	97	37.60

Fig11: *The distribution of Bhatra women with their nutritional status based on BMI.*

Percentage prevalence of nutritional status according to socio-economic status of Bhatra women of Bastar is shown in Table 14. Prevalence of normal nutritional status is observed to be more prevalent among Bhatra women of literate group (49.32%), service class (62.50%) nuclear family (39.76%) and non-consanguineous marriage pattern (42.00%). However CED is found to be more frequent among Bhatra women of illiterate group (67.03%), consanguineous marriage pattern (68.52%).

Table14: *Percentile prevalence of nutritional status according to socio-economic status of Bhatra women of Bastar*

Background characteristics	No. of women	<16 (Severe)		16.00-16.99 Moderate		17.00-18.49 Mild		> 18.50 Normal	
		No.	%	No.	%	No.	%	No.	%
Educational status Illiterate	185	30	16.22	44	23.78	50	27.03	61	32.97

literate	73	10	13.70	09	12.33	18	24.66	36	49.32
Occupational status								
house wife	160	25	15.63	33	20.63	40	25.00	62	38.75
labor	90	15	16.67	20	22.22	25	27.78	30	33.33
service	08	-	-	-	-	03	37.50	05	62.50
Marriage pattern								
Non-consanguineous	150	23	15.33	24	16.00	40	26.67	63	42.00
Consanguineous	108	17	15.74	29	26.85	28	25.92	34	31.48
Family type								
Nuclease family	166	23	13.86	33	20.63	44	26.51	66	39.76
Joint family	92	17	18.48	20	21.74	24	26.09	31	33.70

Table 15 exhibits the percentage prevalence of nutritional status according to menarcheal age of Bhatra women of Bastar. The proportion of women with CED is found to more prevalent among those Bhatra women who experience first menstruation at the age of 10 years (100.00%) followed by at the age of 12-12.50 years (79.37%). However the normal status of women observed more frequent among Bhatra women experienced first menstruation at age of 11 years (75.00%). The percentage prevalence of nutritional status according to menarcheal age is shown in Fig 12

Table15: *Prevalence of state of nutrition according to menarcheal age among Bhatra women of Bastar*

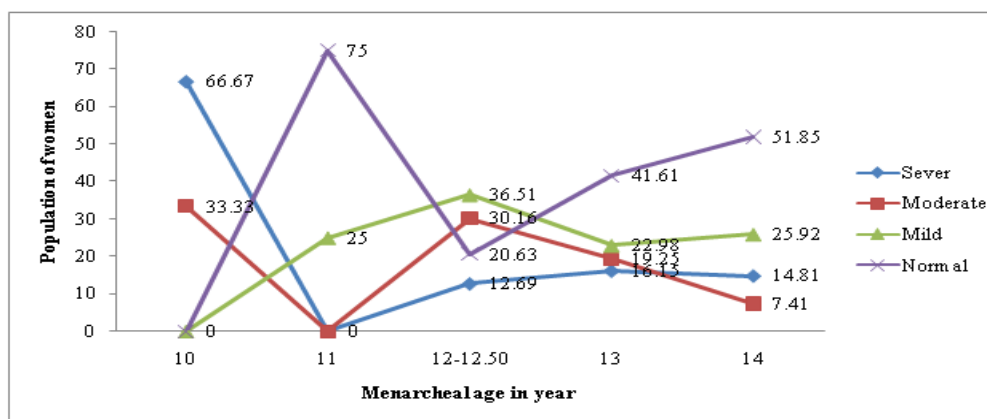| Age of menarche	No. of women	<16 (Severe)		16.00-16.99 Moderate		17.00-18.49 Mild		> 18.50 Normal	
		No.	%	No.	%	No.	%	No.	%
10	03	02	66.67	01	33.33	-	-	-	-
11	04	-	-	-	-	01	25.00	03	75.00
12-12.50	63	08	12.69	19	30.16	23	36.51	13	20.63
13	161	26	16.15	31	19.25	37	22.98	67	41.61
14	27	04	14.81	02	7.41	07	25.92	14	51.85
Total	258	40	15.50	53	20.54	68	26.36	97	37.60

Fig12: *The state of nutrition of Bhatra women according to their menarcheal age.*

The percentage prevalence of nutritional status according to age of marriage among Bhatra women is presented in Table 16. The proportion of women with CED is found to be highest among those women who married at the age of 13 to 15 yearss (72.22%) and lowest among married at the age of 12 years or later (16.67%). However the normal status of nutrition is observed more frequent among Bhatra women married at 22 years or later. The sever state of nutrition is found to be more frequent among Bhatra women married at 19 to 21 years where as moderate and mild state are more prevalent among women married at 13-15 years (22.22%;37.04%). The state of normal nutrition is found to be most prevalent (37.60%) followed by mild state (26.36%), moderate state (20.54%) and sever state (15.50%). The state of nutrition according to age of marriage among Bhatra women is shown in Fig 13.

Table16: *Prevalence of state of nutrition according to age of marriage among Bhatra women of Bastar*

Age of marriage	No. of women	<16 (Severe)		16.00-16.99 Moderate		17.00-18.49 Mild		> 18.50 Normal	
		No.	%	No.	%	No.	%	No.	%
13-15	54	07	12.96	12	22.22	20	37.04	15	27.78

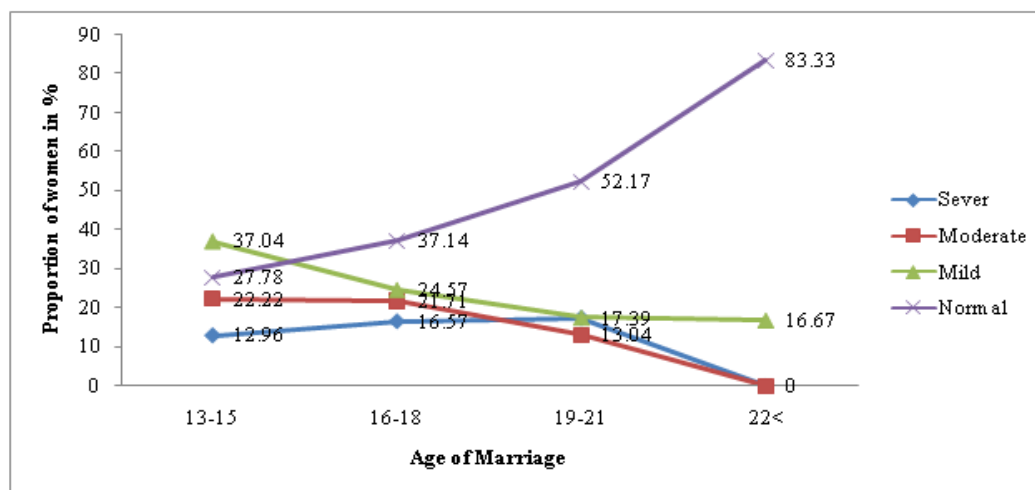| 16-18	175	29	16.57	38	21.71	43	24.57	65	37.14
19-21	23	04	17.39	03	13.04	04	17.39	12	52.17
22<	06	-	-	-	-	01	16.67	05	83.33
Total	258	40	15.50	53	20.54	68	26.36	97	37.60

Fig13: *The state of nutrition according to age of marriage among Bhatra women of Bastar.*

The state of nutrition according to age of first child birth among Bhatra women is shown is Table 17. The state of CED is found to more prevalent among women who born their first child at 15 years (100.00%) followed by at age 16-18 years (72.97%), at age 18 to 21 years (56.31%) and 22 to 24 years (42.86%). The proportion of women with CED de-creases with increase age of first child birth. However the proportion of normal state of nutrition increase with increases in age of first child birth. The state of normal nutrition is found to be more prevalent among those women, who born their first child at the age of 25 years or later (77.78%). The present investigation in-dicates that there is positive correlation between state of nutrition and age of first child birth. It is evident from table that 253 Bhatra females born their first child in different age group and 62.85 percent of them are categorized under CED while 37.15 percent women are found to be normal.

Table17: *Prevalence of state of nutrition according to age of first child birth among Bhatra women of Bastar*

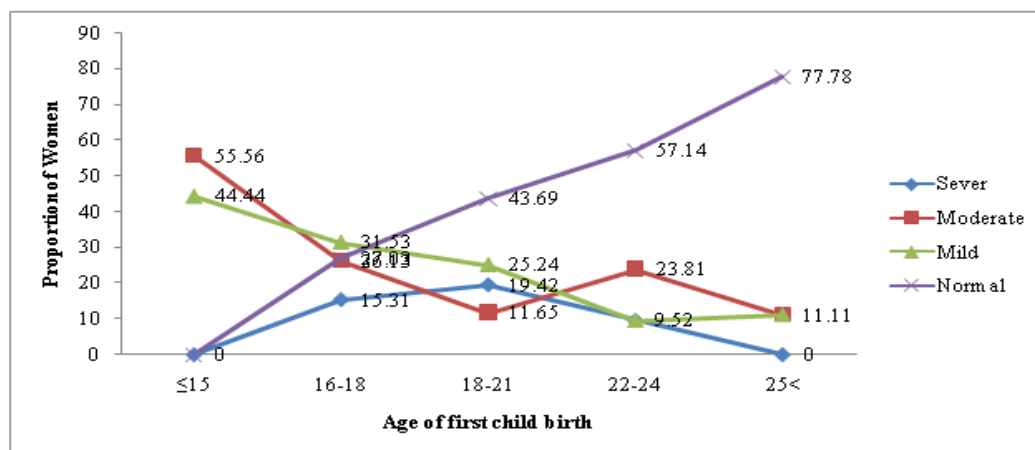| Age of marriage of first child birth	No. of women	<16 (Severe)		16.00-16.99 Moderate		17.00-18.49 Mild		> 18.50 Normal	
		No.	%	No.	%	No.	%	No.	%
≤15	09	-	-	05	55.56	04	44.44	-	-
16-18	111	17	15.31	29	26.13	35	31.53	30	27.03
18-21	103	20	19.42	12	11.65	26	25.24	45	43.69
22-24	21	02	9.52	05	23.81	02	9.52	12	57.14
25<	09	-	-	01	11.11	01	11.11	07	77.78
Total	253	39	15.41	52	20.35	68	26.88	94	37.15

Fig14: *Prevalence of state of nutrition according to age of first child birth among Bhatra women of Bastar.*

Mean BMI among some tribal women of India is presented in Table 18. It is evident from table that the mean BMI of Bhatra women (17.93kg/m^2) is higher than Mundawomen (Ghosh & Bharti; 2006) and lower than other reported tribal women. However prevalence of CED is found to be 62.40 percent higher than santal women (Ghosh & malik; 2007), Oraon women (Mittal & srivastava; 2006), Lodha women (Adhikary; 2007), Kora Mundia women (Bose at al; 2006) Bhumij women, (Biswas; 2007) and lower than Baiga women (Chakma etal; 2008) and Munda women, (Ghosh &Bharti; 2006). The mean BMI and prevalence of CED are presented in Fig 15 and 16 .

Table18: *Mean Body mass Index (BMI) of women among some tribal population of India*

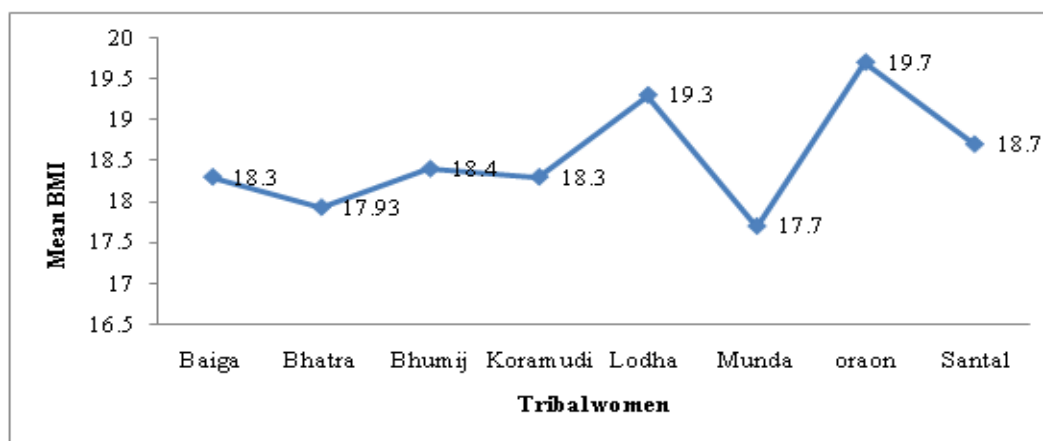| Tribes	Mean BMI	CED (%)	Source
Baiga	18.3	66.50	Chakma, et al. Al 2009
Bhumij	18.4	58.9	Biswas, 2007
Koramudi	18.3	56.4	Bose et al. 2006
Lodha	19.3	40.70	Adhikary, 2007
Munda	17.7	67.90	Ghosh & Bharati, 2006
oraon	19.7	31.70	Mittal & Srivastav, 2006
Santal	18.7	52.50	Ghosh & Malik, 2007
Bhatra	17.93	62.40	Present study

Fig15: *Mean BMI among tribal women of India.*

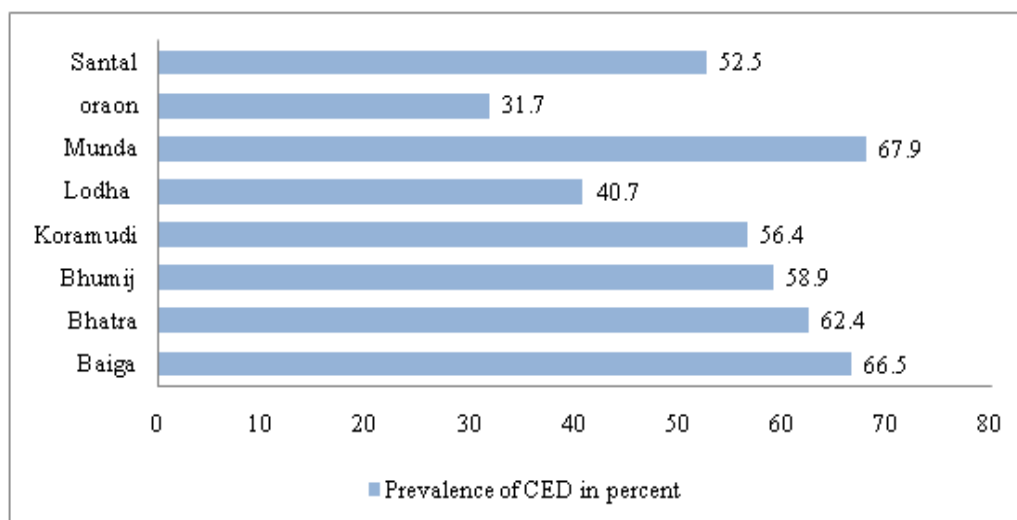**Fig16:** *Percentage prevalence of CED among tribal women of India.*

4. DISCUSSION

The Anthropometric measurement play important role to assess state of nutrition among various population. The present study reveals that the average height of Bhatra women is 151.08±0.34 cm and average weight is 40.95±0.32 kg. Which is below the standard weight of 55 kg. and slightly more than standard height of 151 cm. as set for Indian women suggested by Indian council of medical Research.

The mean BMI is found to be 17.93 ± 0.13kg/m^2 and indicate their underweight status. However the Bhatra women belong to age group 40 years are found to be under ideal weight with 17.93 ± 0.13kg/m^2 BMI. The mean BMI is measured in relation to socio-economic status of Bhatra women which reveals that only service class women can be categorised under ideal weight.

The mean BMI is also composed in relation to their menarcheal age and the women experienced first menstruation at the age of 11 years are observed in ideal weight category. However the Bhatra women married at 22 years or later are found in ideal weight and married below 22 years can be categorized in under weight and women married below 22 years are found to be in underweight category. Born and showing low risk towards lifestyles disorder

The Bhatra women born their first child between 15 to 25 years of their age and showing mean BMI from 17.26 ± 0.20 to 20.41 ± 0.71 kg/m^2. The mean BMI of Bhatra women born their first child at 25 years are observed in normal category.

BMI measured among Bhatra women is used to determine their weight status. The prevalence of underweight varies from 60.00 to 82.95% and majority of women are found to be in underweight status. Whereas 26.39 percent are found to be in normal category. Socio-economic status of women affects their weight status and majority of Bhatra women belonging to illiterate, labour. House wife, joint family and consanguineous marriage pattern are found to be in underweight category showing high risk toward lifestyle disorder. However below 40% women are observed to be normal.

Majority of Bhatra women who experienced their first mensnration at 10 to 14 years of age are observed to be in underweight category. However increase in age of menarche increases the proportion of women with ideal weight and same trend has been observed when their ideal weight is compared with their age of marriage (age of marriage 22-24 year age of first child birth 25 years; 66.67%)

Nutritional status of Bhatra women based on BMI indicates that older women are normal as compared to younger women. Socio-economic status of Bhatra women shows that majority of women belonging to literate group service group; nuclear family and non-consanguineous marriage pattern are observed to be normal. However women of reaming groups indicate more prevalence of CED. Very high prevalence of CED has been observed among Bhatra women when they compared with their age of menarche age of marriage and age of first child birth.

The socio-economic conditions and nutritional status are influenced by the ecosystem (Rao et. al 1993; 1994). The mean BMI at Bhatra women indicate its status between Munda women and Baiga women and lower than other reported tribal women. However the prevalence of CED among Bhatra women is lower than Baiga and Munda women and higher than other tribal women (31.70 to 58.90%).

5. CONCLUSION

The Anthropometric parameters of Bhatra women are below than ICMR standards. Majority of women are showing high risk of CED and more prevalence of underweight. The results observed in present study indicate that anthropometric parameter of Bhatra women influenced by their socio-economic status, age of menarche, age of marriage and age of first child birth. However women of literate group, service class, nuclear family are observed nutritionally sound among Bhatra tribe of Bastar.

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