

Prevalence of Undernutrition Based on Thinness among Birhors of Korba District, Chhattisgarh, India

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KEYWORDS

Anthropometry, Body Mass Index, Thinness, and Nutritional Status

ABSTRACT

The rising/ escalating problem of malnutrition, commonly envisioned as double burden due to increasing rate of both under-nutrition and obesity in third world including country like India in which high prevalence of undernutrition, which is assess by thinness more precisely. Thus, the present study aims to assess the prevalence of under nutrition among Birhor tribe of three villages of Korba district, Chhattisgarh, India. The data was collected from each available individual of the households of the villages on the day of investigation. The social and demographic profile was personally collected by interviewing them and the anthropometric measurement (height, weight, BMI and MUAC) was taken using standard procedures. All the statistical analysis was analysed in the Statistical Package for Social Science (SPSS) version 16.0. The t-test and Chi-square/Fisher Exact test were used to see the difference in anthropometric measurement and undernutrition of males and females. The study revealed that sex combined prevalence of thinness was found higher among children (86.6%), elderly (70%) and adult (58.2%) population than normal. The over-all age and sex combined prevalence of undernutrition is 64.2 % (of which 21.1% were came under grade III thinness, 10.1% were fall within grade II thinness and 33% were in grade I thinness) and 35.8% were normal. No statistically significant sexual difference ($\chi^2=0.86$, $df=3$, $P>0.05$) was found among them. The high prevalence of undernutrition shows their critical nutritional situation.

Introduction

The rising problem of the double burden of malnutrition identified with the increasing rate of both under-nutrition and obesity is a commonly heard subject in third world countries like India. There are various steps taken by government and non-government organisations in order to reduce the prevalence rate of this double burden of malnutrition. But still it is prevalent. The pre-school children, adolescents, pregnant and lactating mothers and elderly population are regarded as most vulnerable segment in terms of inadequate nutrition profile in Indian society. This is because the lack of proper nutrition during pre-school age have a huge impact on the overall growth and functional capacity of children's and it also plays a determinant role in the physical, mental and intellectual building (Mandal & Bose, 2014; Mahapatra & Bose, 2020), poor school enrolment and performance, greater absenteeism and dropout (Mandal, 2017) in later life. The importance of nutritional studies in adolescence age groups is due to their fastest physical, psycho-social growth and sexual maturation, independency and transitional stage in human development (Das & Bose, 2011; Maiti *et al.*, 2011; Ali *et al.*, 2016; Shakya *et al.*, 2016). Low literacy rate, inequalities, nourishing of children's, inadequate intake (Hailesslassie *et al.*, 2013), multiple physiological changes, presence of co-morbidities, family patterns, and social negligence and other factors (Kikafunda & Lukwago, 2005; Ramage-Morin & Garriguet, 2013; Kalaiselvi *et al.*, 2016) make pregnant/lactating women and elders respectively more prone to become

undernourished which reduce their quality of life. In fact a less intake of nutrition during pregnancy and the lactating period causes poor birth outcomes and a poor lactating performance of a woman, ultimately increases child mortality.

The thinness is defined as the low Body Mass Index (BMI) for age. The BMI is universally accepted criteria to classify individual thinness and fatness (Biswas *et al.*, 2009). Cole *et al.*, (2007) stated that by using similar sex and age specific cut-off value the undernutrition is determined more precisely than wasting (low weight for height). Thus both BMI and international reference cut-offs of Cole *et al.* (2007) is used to assess the under-nutrition of adult (above 18 year) by Chronic Energy Deficiency (CED) or thinness, adolescent and children (2-18 year) by thinness and has been graded into mild (I), moderate (II) and severe (III) under-nutrition respectively (Bisai *et al.*, 2010; Mandal & Bose, 2014).

There are many studies available to assess the thinness among children and adolescent separately world-wide including India. But there is scarcity in studies that assess the prevalence of thinness of a community as whole. However nutrition is important in each and every stage of life as it was beautifully stated by Mandal (2017) "*According to World Health Organization, the ultimate intention of the Nutritional Assessment is to improve human health. A healthy child will become a healthy adult. A healthy adult would be the backbone of the society as well as the country*". So the present study aims to assess the prevalence of under-nutrition based on thinness of Birhor tribe of three villages of Korba district, Chhattisgarh, India.

Material and Method

Study Area and population

This cross sectional study was conducted among the Birhor tribe of three villages namely Chuiya, Daldali and Deoduwari of Korba block, Chhattisgarh. These villages come under the three different gram panchayats named Chuiya, Ajagarbahar, and Deopahari respectively. The Birhor tribe is one among the five Particularly Vulnerable Tribal Groups (PVTG's) of Chhattisgarh. Who are mainly distributed in the interior forest pocket of Korba, Bilaspur, Jashpur and Raigarh district, of which district Korba share their maximum population (Rajyapal Prativedan, 2918-19). At Korba block their population is nearly 448. The data were collected from each available household and every available individual of the house was incorporated into the study and measured. Anthropometric characteristics of total 109 individuals (aged two years and above) were recorded who were present on the day of investigation. Daldali and Deopahari are isolated villages where Birhor people live and are totally surrounded by the forest; without any road connection in village Deopahari. Locally, they all speak Chhattisgarhi.

Data Collection

The socio-demographic profile was personally collected by means of interviews and the anthropometric measurement (height, weight, BMI and MUAC) was measured using standard procedures. The height and weight of an individual was taken in plane surface by keeping their head in Frankfort horizontal plane with the help of anthropometric rod and portable weighing machine. The height and weight of the respondents were measured to the nearest 0.1 cm and 100 grams respectively. The exact date of birth and age was noted from an authentic source like birth certificates (or from Aaganwadi centre in case of below five children), Mark sheets, Aadhar cards, etc. Sometimes the age of elders were also traced from their marriage and first child birth. The data were collected after taking permission from village authority (Sarpanch) then prior consent was taken from parents in case of children or the head of the family. The motive of the study was explained to the participants before taking measurements.

Analysis

The Body Mass Index was calculated using formula; $BMI = \text{Weight (kg)} / \text{Height (m}^2\text{)}$. Then the prevalence of thinness among children (below and equal 18 years) was evaluated by using international reference cut-offs introduced by Cole et al., (2007); while the prevalence of thinness among adult and elder (above 18 year) was assessed by the principal WHO cut-off points (WHO, 1995) and categories as per their classification into Grade I (Mild thinness), Grade II (Moderate thinness) and Grade III (Severe thinness). All the statistical analysis was carried out in the Statistical Package for Social Science (SPSS) version 16.0. Independent sample t-test and Chi-square/Fisher Exact test are used to see the sexual difference in anthropometric characteristics and thinness respectively.

Results

Socio-Demographic profile of the studied Birhor population

Among the studied Birhor population maximum 46.8 % were married, 40.4 % unmarried followed by widow/widower (12.8 %). Their education status was also poor as most of respondents were non literate (60.6 %) and the researcher found that middle school was the highest level of education. Their primary occupation was basket making, rope making, then they used to sell it nearby (not daily) and generate approx. Rs. 250 per day; sometimes they cultivate rice and pulses for their own purpose. They also perform hunting and gathering and are mostly depend on forest for their livelihood. Again, most nuclear families living benefited from electricity and ration cards. Rice was their staple food; which they gathered from a government's distribution agency.

Anthropometric Characteristics and Undernutrition among Birhor Population

Table 1 shows the anthropometric characteristics of the studied Birhor population of the three villages of Korba District (C.G.). The mean age, height, weight, BMI and MUAC of children's were 6.40 years, 114.60 cm, 19.27 kg, 13.74 kg/m² and 14.96 for male while it was 4.90 years, 104.30 cm., 14.39 kg, 12.83 kg/m² and 13.86 for female respectively. It was 16.25 years, 156.38 cm, 46.43 kg, 18.90 kg/m², 23.37 and 16.17 years, 149.67 cm, 40 kg, 17.94 kg/m², 21.83 for adolescent male and female respectively. Similarly the mean age, height, weight, BMI and MUAC of adult male were as follows 35.65 years, 160.44 cm, 48.33 kg, 18.75 kg/m² and 23.91 whereas the same were 38.38 years, 149.19 cm, 41.61 kg, 18.71 kg/m² and 22.34 among adult female. Again the mean age, height, weight, BMI and MUAC of elder male were 77 years, 163.75cm, 46.10 kg, 17.07 kg/m² and 21.50 while it was 66 years, 151.81cm, 39.11 kg, 16.95 kg/m² and 21.37 among elder female. Mostly, there was no significant difference found between male and female for anthropometric characteristics except for height among adolescent ($t=2.48$; $p<0.05$), adult ($t=6.70$; $p<0.05$) and elderly ($t=4.02$; $p<0.05$) population, for weight among adult ($t=3.65$; $p<0.05$) and for age among elderly ($t=3.12$; $p<0.05$) respondents.

Table 1: *Anthropometric Characteristics of Studied population of Birhor Tribe*

| Age Group | Sex (N) | Age (year) | Height (cm) | Weight (kg) | BMI (kg/m ²) | MUAC |
|--------------------|-------------|------------|-------------|-------------|--------------------------|-------|
| Childhood (2-12) | Male (15) | 6.40 | 114.60 | 19.27 | 13.74 | 14.96 |
| | Female (15) | 4.90 | 104.30 | 14.39 | 12.83 | 13.86 |
| t value | | 1.48 | 1.36 | 1.66 | 1.57 | 1.38 |
| P vale | | 0.14' | 0.18' | 0.10' | 0.12' | 0.17' |
| Adolescent (13-18) | Male (8) | 16.25 | 156.38 | 46.43 | 18.90 | 23.37 |
| | Female (6) | 16.17 | 149.67 | 40 | 17.94 | 21.83 |
| t value | | 0.08 | 2.48 | 1.73 | 0.86 | 1.24 |

| | | | | | | |
|---------------|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| P value | | 0.93 [*] | 0.02 [#] | 0.10 [*] | 0.40 [*] | 0.23 [*] |
| Adult (19-60) | Male (26) | 35.65 | 160.44 | 48.33 | 18.75 | 23.91 |
| | Female (29) | 38.38 | 149.19 | 41.61 | 18.71 | 22.34 |
| t value | | -0.79 | 6.70 | 3.65 | 0.05 | 2.48 |
| P value | | 0.43 [*] | 0.00 [#] | 0.00 [#] | 0.95 [*] | 0.16 [*] |
| Elder (>60) | Male (2) | 77 | 163.75 | 46.10 | 17.07 | 21.50 |
| | Female (8) | 66 | 151.81 | 39.11 | 16.95 | 21.37 |
| t value | | 3.12 | 4.02 | 1.30 | 0.06 | 0.05 |
| P value | | 0.01 [#] | 0.00 [#] | 0.23 [*] | 0.95 [*] | 0.95 [*] |

([#] Significant, ^{*} Not Significant; $P < or > 0.05$)

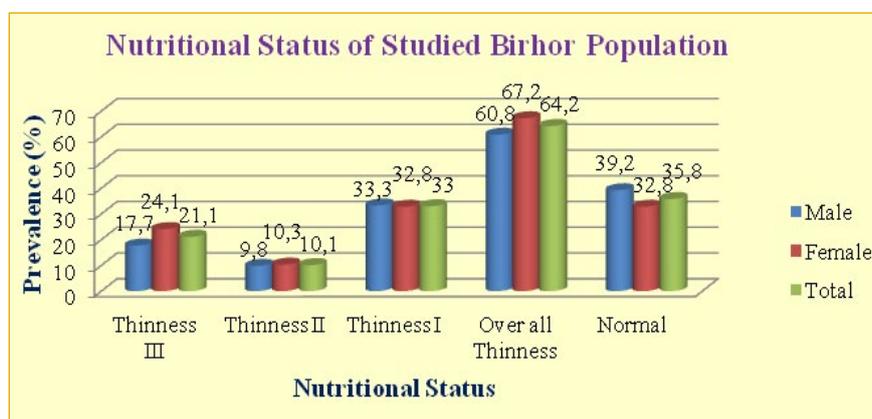
The distribution of the studied population in different grade of thinness (undernutrition) and normal nutritional status is shown in table 2. Among the studied population 27.5% were children, 12.8% were adolescent, 50.4% were adults and remaining 9.1% were elders. The sex combined result inferred that total 86.6% children were found thin; of which 40% were grade III thin followed by grade I Thinness (26.7%) and grade II thinness (19.9%). Among the adolescent most were normal (64.3%). Again the prevalence of thinness was found greater among the adult (58.2%) and old age (70%) individuals than normal. The value of chi-square/Fisher Exact test confirms that there was no significant difference exists between male and female ($P > 0.05$) in any of the age group. Proportionally, thinness was observed more among Birhor children.

Table 2: Distribution of studied population in different grades of thinness (Cole et al., 2007; WHO, 1995)

| Age Group | Sex (N) | Undernutrition [N (%)] | | | | Normal | df | χ^2 |
|--------------------|-------------|------------------------|-------------|------------|-------------------|-----------|----|--------------------|
| | | Thinness III | Thinness II | Thinness I | Over all Thinness | | | |
| Childhood (2-12) | Male (15) | 6 (20) | 2 (6.6) | 5 (16.7) | 13 (43.3) | 2 (6.7) | 3 | 0.761 [*] |
| | Female (15) | 6 (20) | 4 (13.3) | 3 (10) | 13 (43.3) | 2 (6.7) | | |
| Adolescent (13-18) | Male (8) | 0 (0) | 0 (0) | 2 (14.3) | 2 (14.3) | 6 (42.9) | 2 | 0.417 [*] |
| | Female (6) | 0 (0) | 1 (7.1) | 2 (14.3) | 3 (21.4) | 3 (21.4) | | |
| Adult (19-60) | Male (26) | 2 (3.6) | 3 (5.5) | 10 (18.2) | 15 (27.3) | 11 (20) | 3 | 0.630 [*] |
| | Female (29) | 4 (7.3) | 1 (1.8) | 12 (21.8) | 17 (30.9) | 12 (21.8) | | |
| Old Age (>60) | Male (2) | 1 (10) | 0 (0) | 0 (0) | 1 (10) | 1 (10) | 2 | 0.659 [*] |
| | Female (8) | 4 (40) | 0 (0) | 2 (20) | 6 (60) | 2 (20) | | |

(* Not Significant; $P > 0.05$)

Figure 1: Age and Sex combined Nutritional Status among studied Birhor Tribe.



The figure 1 presented the overall (age and sex combined) prevalence of nutritional status of the Birhor population. Among them, over all 64.2% were found undernourished (of which 21.1% came under grade III thinness, 10.1% fall within grade II thinness and 33% were in grade I thinness) and 35.8% were normal.

The nutritional situation (BMI <18.5) of the Birhor population was found very critical when age and sex combined analysis was done.

Discussion

The quality and quantity intake of nutritious food is required for the well-being from every stages of life especially among the deprived segments of society. Although various nutritional programs have been launched in the past 20 years, to date the underfed are still prevalent in the nation (Mandal, 2017), which poses serious challenge through-out the world (Biswas et al., 2009; Singh & Mondal, 2013; Giri et al., 2017; Mandal, 2017) and causes the increasing risk of morbidity and mortality (Mahapatra & Bose, 2020). It is a well-established fact that India is a land of various ethnic and indigenous groups with genetic diversity; which plays a key role in the nutritional assessment along with the anthropometric measurement of individuals (Singh & Mondal, 2013). The significant evidences on the prevalence of thinness are already reported among the children and adolescent but studies on the thinness matrix among society as a whole are seriously lacking.

Thus the present study aims to assess the prevalence of under-nutrition based on thinness grade among Birhor tribe of three villages of Korba district as whole. The sex combined thinness was found higher among children (86.6%), elderly (70%) and adult (58.2%) population than normal, while most (64.3%) adolescent were normal. The over-all age and sex combined prevalence of undernutrition is 64.2 % (of which 21.1% were came under grade III thinness, 10.1% were fall within grade II thinness and 33% were in grade I thinness) and 35.8% were normal. The prevalence of thinness was slightly higher among the females than males but there was no statistical difference found ($\chi^2=0.86$, $df=3$, $P>0.05$). The less energy intake (taking only two times meal in a day), low literacy rate, lack of knowledge and awareness, and child health care practices of mothers might be reason behind this high prevalence of thinness among the studied Birhor population.

Overall the prevalence of thinness (64.2%) in the present study is found towards at the higher end when it was compared against the highest 82.4 % (Mandal, 2017) and the lowest 19% (Shukla et al., 2002) and arranged in ascending and descending order with other previously reported studies conducted among different age and sex group throughout the nation. It was also analysed from previous studies that many studies are basically community specific and consider any particular age groups as sample; that actually fails to present the full picture of a community as whole. So, the present study tried to understand the problem of undernutrition among such an isolated particular vulnerable tribal community as whole.

Table 3: Comparison of present study with other reported studies

| Sl. No. | Author | Years | Location | Population | Age group | Prevalence (%) | | |
|---------|-----------------------|-------|--|----------------------------|-----------|----------------|-------|-------------------------------|
| | | | | | | Boys | Girls | All |
| 1 | Shukla <i>et al.</i> | 2002 | Urban area, Mumbai | 99 598 adults | >35 years | - | - | 19 |
| 2 | Bose & Chakraborty | 2005 | Anandapur, Keonjhar District, Orissa | 409 Bathudis adult | >18 years | - | - | 57.9 |
| 3 | Arlappa <i>et al.</i> | 2006 | 9 provincial State, India | 3,932 elder | >60 years | 61.8 | 65.4 | 63.6 |
| 4 | Banik <i>et al.</i> | 2007 | Naxalbari, West Bengal | 305 adult Dhimals | >18 years | 27.0 | 46.4 | 36.4 |
| 5 | Bose <i>et al.</i> | 2008 | PaschimMedinipur District, West Bengal | 157 Lodha 161 Bhumij adult | >18 years | | | Lodha (45.2) Bhumij (48.4) |

| | | | | | | | | |
|----|--------------------------|------|---|--|-------------------|-------|-------|---------------------------|
| 6 | Biswas <i>et al.</i> | 2009 | Chapra, Nadia District, West Bengal | 2016 Rural Bangalee | 3-5 years | 49.68 | 51.57 | 50.69 |
| 7 | Bisai <i>et al.</i> | 2010 | Medinipur, west Bengal | 119 children | 2-13 years | - | - | 67.2 |
| 8 | Mukhopadhyay | 2010 | Birbhum District | 400 Adult Santal | >18 Years | - | - | 34.5 |
| 9 | Das & Bose | 2010 | Purulia District West Bengal | 513 Adult Santal | >18 Years | 30.6 | 63.4 | - |
| 10 | Das & Banik | 2011 | Darjeeling District, West Bengal | 268 Nepali speaking children | 2-6 years | 43.0 | 47.4 | 45.2 |
| 11 | Das & Bose | 2011 | Purulia, West Bengal | 421 Santal tribal Children and adolescent | 7-18 years | 38.2 | 44.6 | 41.3 |
| 12 | Garg & Mondal | 2011 | Garhkhal, HP | 100 Adolescent girls | 13-18 Years | - | 79.5 | - |
| 13 | Maiti <i>et al.</i> | 2011 | PaschimMedinipur, West Bengal | 3693 Adolescent girls | 10-14 years | - | - | 58.30 |
| 14 | Jamir <i>et al.</i> | 2013 | Rural Ballabgarh, Haryana | 948 elders | >60 years | - | - | 53.7 |
| 15 | Singh & Mondal | 2013 | Dibrugarh, Assam, | 1343 SonowalKachari children | 6-18 years | 28.08 | 23.92 | 25.99 |
| 16 | Mandal & Bose | 2014 | Bali gram panchayat, Arambag, West Bengal | 108 SantalChildren's | 6-10 years | 75.9 | 76.0 | 75.95 |
| 17 | Singh & Mondal | 2014 | Dibrugarh, Assam | 1545 | 6-20 years | 26.36 | 21.03 | 23.69 |
| 18 | Bharathi <i>et al.</i> | 2015 | Adilabad district, Telangana | 284 pre-school Kolam children | 2-5 years | 72.91 | 72.14 | 72.52 |
| 19 | Mukherjee <i>et al.</i> | 2015 | Udham Singh Nagar District, Uttarakhand | 176 Tharu Adult | >18 years | 26.2 | 18.9 | 22.2 |
| 20 | Ali <i>et al.</i> | 2016 | Srinagar, Baramulla, Pulwama, Kashmir | 428 Adolescent girls | 12-18 years | - | 35.70 | - |
| 21 | Kalaiselvi <i>et al.</i> | 2016 | Puducherry, South India | 271 elders | >60 years | - | - | 24.8 |
| 22 | Das <i>et al.</i> | 2017 | West Bengal | 2,310 Bangalee Children | 2-12 years having | 62.2 | 62.6 | 62.4 |
| 23 | Giri <i>et al.</i> | 2017 | South 24 Parganas District, West Bengal | 656 preschool children | 3-5.5 years | 81.90 | 80.61 | 81.25 |
| 24 | Mandal | 2017 | Bali-Gram Panchayat, West Bengal | 618 rural Bengalee primary school children | 5-11 years | 83.2 | 81.5 | 82.4 |
| 25 | Das <i>et al.</i> | 2020 | Purulia district, West Bengal | Sabar adult men | 18-60 Years | - | - | BMI (47.2) MUAC (54.4) |
| 26 | Mahapatra & Bose | 2020 | MedinipurJhargram, West Bengal | 643 tribal children | 2-5 years | 69.5 | 69.2 | 69.4 |
| 27 | Present study | 2021 | Korba District, Chhattisgarh | 109 | >2 years | 60.8 | 67.2 | 64.2 |

Conclusion

The present study concludes that the nutritional status of studied Birhor tribe is found very critical.

The study revealed a high prevalence of undernutrition 64.2% (of which 21.1% came under grade III thinness, 10.1% were falling within grade II thinness, and 33% were in grade I thinness) among them. The thinness was greater among the females than their male counterparts but there was no statistical difference ($\chi^2=0.86$, $df=3$, $P>0.05$) found between them. The thinness was seen more among children proportionally than other age groups. It focuses on the nutritional and health status of isolated Birhor tribal (PVTG) groups living in the interior pocket of forests with minimum resources and inadequate facilities viz. health, road, transport and communication, education etc. The study suggests assessment of the Birhor's health status at regular intervals and implement new or revise strategies for the same, especially these particularly vulnerable tribal groups.

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