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Adult tribal malnutrition in India: an anthropometric and socio-demographic review

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ABSTRACT: The nutritional status and socio-demographic profile of tribal people is an important issue in India due to their marginalization from main stream population with respect to varied facilities. However, data on their nutritional status and socio-demographic profile are limited. This review aims to give an overview of the prevalence of chronic energy deficiency (CED) using Body mass index (BMI) and various demographic profile of Indian tribes based on studies published hitherto. In total 76 studies were reviewed for mean BMI based on the World Health Organization (WHO) classification of the public health problem of low BMI, based on adult populations worldwide. The overall sex specific prevalence of CED showed that both the tribal females (52.0%) and males (49.3%) were passing through the critical situation with respect to nutritional status with females being more underprivileged.

In conclusion, although there is a gradual increase in knowledge about the nutritional and socio-demographic status of tribes since last decades; there is still paucity of data and information on more than approximately 600 tribes regarding their bio-social profile. However previous studies clearly indicate the need to enhance the health and nutrition status of the tribes by providing job opportunity and food security. Since the prevalence of CED was higher (critical to serious situation) in tribal populations, concerted efforts should also be made to improve the health status and nutrition uptake among them.

KEY WORDS: Tribes, Indian, nutritional status, malnutrition

Introduction

India, being a country in developmental transition, faces the dual burden of pre-transition diseases like undernutrition and infectious diseases as well as post-transition, lifestyle-related degenerative diseases such as obesity, diabetes,

hypertension, cardiovascular diseases and cancers (ICMR 2010). In developing countries where most people are affected by poverty and dietary constraints, meeting the nutrient requirements becomes a challenge. A majority of the population hence do not attain anthropometric

measurements corresponding to reference standards, which forms the basis for recommending dietary allowances of nutrients. Normal anthropometric standards for population groups differ from country to country (ICMR 2010). Prolonged malnutrition is a major public health problem throughout the developing world, particularly in Southern Asia and Sub-Saharan Africa (WHO 2002; 2004; FAO 2004). The high prevalence of bacterial and parasitic diseases in developing countries contributes greatly to malnutrition there (Brabin and Coulter 2003; FAO 2004; De Onis et al. 1993; Dickson et al. 2000; Stoltzfus et al. 2004). Malnutrition also increases susceptibility to infectious disease and is thus a major component of illness and death from disease (Brabin and Coulter 2003; Pinstrup et al. 1993; Murray and Lopez 1997; Rice et al. 2000; Black 2003). Malnutrition is thus the most important risk factor for the burden of disease in developing countries (Murray and Lopez 1997; Nemer et al. 2001). Thus it is a direct cause of about 300,000 deaths per year (FAO 2004; Nemer et al. 2001; Müller et al. 2003; Black et al. 2003).

India is composed of 29 States and 7 Union Territories. A State is governed by its own elected governments. The Union territories are governed by administrators, appointed by the President of India (Central Government). Indian tribes belong to three races namely the Proto-Australoids, the Mongoloids and the Negritos (Guha 1935). Indian tribal language is classified into four major families of language namely Austro-Asiatic, Tibeto-Chinese, Dravidian and Indo-European. In Indian academic and administrative discourse there are different names to denote tribes. It includes *Van-yajati* (caste of forest), *Vanavasi* (inhab-

itants of forest), *Pahari* (hill dwellers), *Adimjati* (primitive people), *Girijan* (hill dwellers), *Anusuchit Jan Jati* (scheduled tribe) (Rajora 1987). Indian tribe contributes a population of 104.3 million (Census 2011) out of the total population of 1.21 billion. India has the largest tribal population in the world that constitutes 8.6 per cent of the total population of the country. There are 705 Scheduled Tribes (ST) and 75 (approx) Particularly Vulnerable Tribal Groups (PVTG) with diverse cultural and socio-economic developmental stages (Census 2011). Majority of the tribes live in scattered and small habitats located in remote and distant areas from main stream population near forests and hillocks of the country. The tribes in India are undisputedly considered to be the weakest sections of the population in view of common socio-economic and socio-demographic factors such as poverty, illiteracy, lack of developmental facilities and lack of adequate primary health facilities (Basu 1994; Thakur et al. 1991). Green Revolution in Asia boosted food production and with the enhancement of supplies, hunger and undernutrition continued to decline since 1981 (Gupta 2004). Despite surplus food grains a majority of the tribes in India suffer from undernutrition and hunger since tribal communities are isolated from general population and are socially and economically vulnerable (Laxmaiah et al. 2007). Tribal populations of our country are at different transitional stages of social, cultural and economic development. The socio-cultural pattern varies from region to region and from tribe to tribe. The economy of the tribes is explicit in character. Based on the food pattern the Indian tribes can be of varied type viz. Food gatherers and hunters (Example – Birhor Bihar, Hill Juangs, the

Onge, the Jarwa and the Andamanese of Andaman islands etc.); Shifting (Jhum) Cultivators: (Example – Khasis, Nagas, Korwa, Muria and Maria etc.); Settled Agriculturists: (Example – Santal, Munda, Ho, Oraon, Gond, Bhil, Mina etc.); Artisans: (Example – Birhor etc.); The Pastoralists and Cattle Herders: (Example – Todas, Gujar, Gaddi etc); The Folk Artists: (Example – Pradhans etc.); Wage Labourers: (Example – Large number of tribes from eastern India engaged in mining and industrial development, tea plantations, coal mines, brick industry etc). The prime underlying principle of this review paper summarizes the nutritional status and socio-demographic profile of the tribes of India based on existing literature.

Material and Methods

For the description of the demography and the nutritional status of the adult tribal (Indian) people, a recent census (2011) report of India and previously published work of various scholars were used. The socio-demographic profiles of reviewed tribes were collected from (Census (1951–2011)). To describe the mean BMI (Kg/m^2) and nutritional status of tribes of India, papers and abstracts were searched in Google scholar and Google. The following keywords were used for searching through the literature: India, tribe, adult, undernutrition, nutritional status, and anthropometry. In Google scholar and Google there were very limited studies about the nutritional status of adult Indian tribes in India. Additional papers published in offline (Hard cover journals) in India were also used. All published articles and abstracts used in this review report were cross-sectional studies. A total of 76 studies were con-

sidered covering the years from 2005 to 2014.

Since 1973, surveys carried out annually by the National Nutrition Monitoring Bureau (NNMB) have been a major source of data on diet and nutritional status of the Indian population. Initially, NNMB units were established in nine States – Kerala, Tamil Nadu, Andhra Pradesh, Karnataka, Gujarat, West Bengal, Maharashtra, Uttar Pradesh and Madhya Pradesh. In 1976, another unit was established in Orissa. Three National Family Health Surveys (NFHS-1) conducted in 1992–93, NFHS-2 conducted in 1998–99 and NFHS-3 conducted in 2004–05 provide national and state-level information on fertility, family planning, infant and child mortality, reproductive health, child health, nutrition of women and children, and the quality of health and family welfare services.

Indian mainland comprises numerous socio-culturally distinct caste groups, ethnic and tribal communities. Tribal people inhabit various ecological and geo-climatic conditions ranging from plains, forest, hills and less accessible areas. The data available from 2001–2014 on nutritional status were collected from various published papers. The census reports of 2011 and internet sites were also referred to get the required information on population characteristics. To the best of our knowledge there has been limited information on the anthropometric and nutritional status of various tribal populations of India (Arlappa 2005; Bose and Chakrabarty 2005; Bose et al. 2006a). In India the most underprivileged groups are the tribal communities both in terms of socio-economic condition as well nutritional status (Basu et al. 2004). This has been reflected by several studies which have

reported high undernutrition among tribal across India (Adak et al. 2006). In this paper, the nutritional status of adult tribes within different states of India is discussed. The purpose is to review all available nutritional studies published using body mass index (BMI), and also to give a general overview of the prevalence of CED (undernutrition) among tribes in India, and other socio-demographic profile of Indian tribes. Nutritional status based on BMI (WHO 1995) using the standard equation $BMI = \text{weight (kg)} / \text{height}^2 \text{ (m}^2\text{)}$ has been considered in our paper. The following cut-off points were utilized: CED: $BMI < 18.5$; normal: $BMI = 18.5\text{--}24.9$; overweight: $BMI \geq 25.0$. We also followed the WHO (1995) classification of the public health problem of low BMI, based on adult populations worldwide. This classification categorizes prevalence according to percentage of a population with $BMI < 18.5$: low (5–9%): warning sign, monitoring required; medium (10–19%): poor situation; high (20–39%): serious situation; very high ($\geq 40\%$): critical situation.

Results and Discussion

Figure 1 shows the distribution of the Indian tribes by States and Union Territories in 2011. The total Scheduled Tribal (ST) population in Census 2011 is 104.3 million that constitutes 8.6% of the total population. Female scheduled tribes numbered 51.9 million (Rural – 46.7 million and Urban – 5.2 million). The percentage during the 2001 Census was 8.2%. There has thus been an increase of 0.4% during the last decade. The highest proportion of Scheduled Tribes have been recorded in Lakshadweep (94.8%) and the lowest in Uttar Pradesh (0.6%). The Scheduled Tribes population in absolute

numbers have increased by 20.0 million. This constitutes a decade growth rate of 23.7%. The highest number of Scheduled Tribes has been recorded in Madhya Pradesh (15.3 million) and the lowest in Daman & Diu (15,363). In terms of gender composition STs, there are 52.4 million ST males (Rural = 47.1 million and urban = 5.3 million) and 51.9 million females.

Percentage of Tribes in India: The trend in ST population since Census 1951 is illustrated in the figure 2. From 5.29% (1951) in 1951, the ST population has increased to 8.6% in 2011. A total of 3.31% increase in tribal population was observed from 1951 to 2011. A maximum increase was observed during 1951 to 1961 (1.56%).

Decadal growth of overall & tribes in India: Data on decadal growth of overall and tribal population is presented in figure 3 during Indian census operations since 1951. From 1951 to 1971 there was steady inclined growth followed by gradual decline in population thereafter for both overall and tribal (except 2011) population. It is also observed that since 2001 there has been increase in (0.2%) of tribal population. The highest decadal growth was observed in 1971 (41.8%).

Sex ratio (Females per thousand males) of tribal and overall population in India since 1951: Sex ratio (Females per thousand males) of tribal and overall population in India since 1951 is presented in figure 4. It is clear from the figure that in the highest range (Difference between tribal and overall sex ratio) was observed in 1971 census, the sex ratio of the tribal population was 985 females per thousand males against 930 for the overall population. Similarly, the lowest range (Difference between tribal and overall sex ratio) was observed in 1951

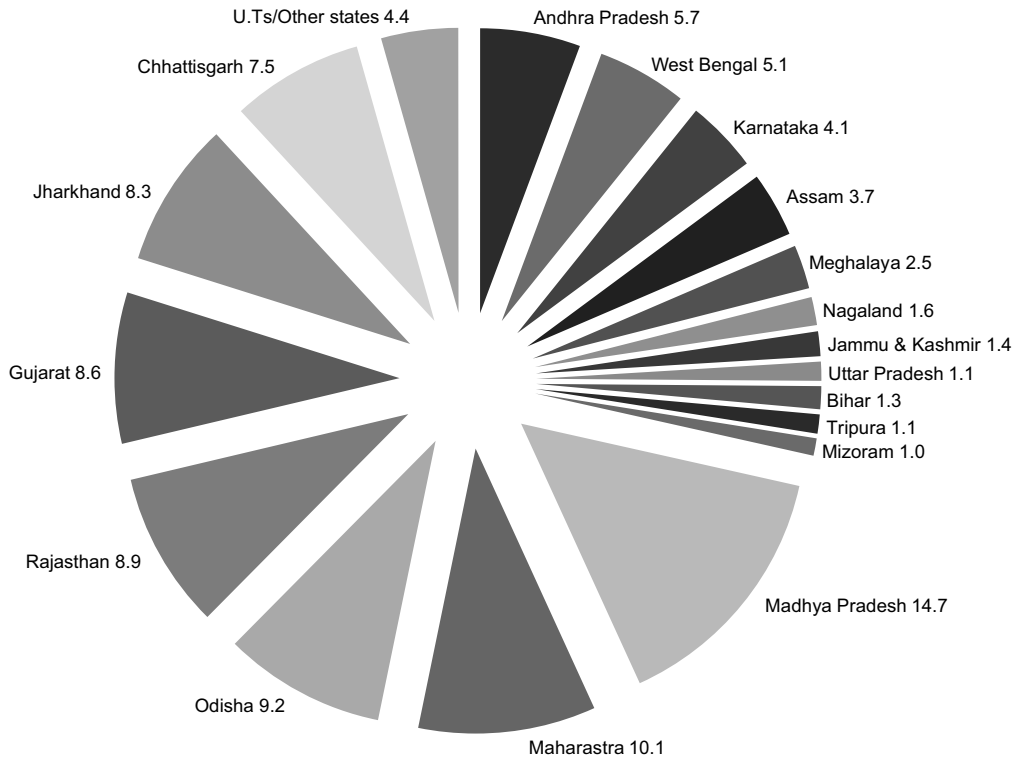


Fig. 1. State wise Scheduled Tribe (ST) Population out of Total ST Population of India (Census- 2011) * States/UTs having population below 1% have been united, such as: Arunachal Pradesh; Manipur; Tamil Nadu; Kerala; Himachal Pradesh; Uttarakhand; Sikkim; Dadar & Nagar Haveli; Goa; Lakshadweep; Daman & Diu; Andaman & Nicobar Islands

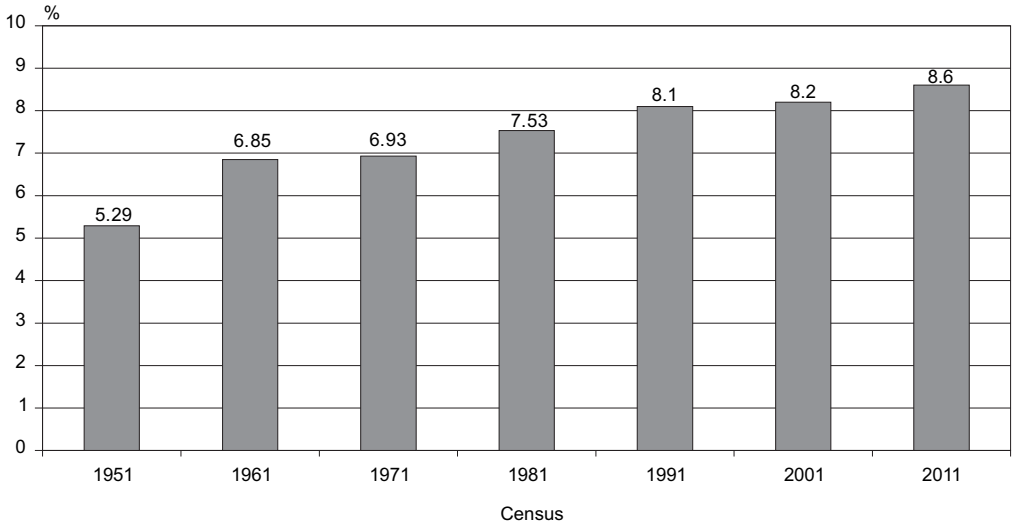


Fig. 2. Percentage of Tribals in India Since 1951

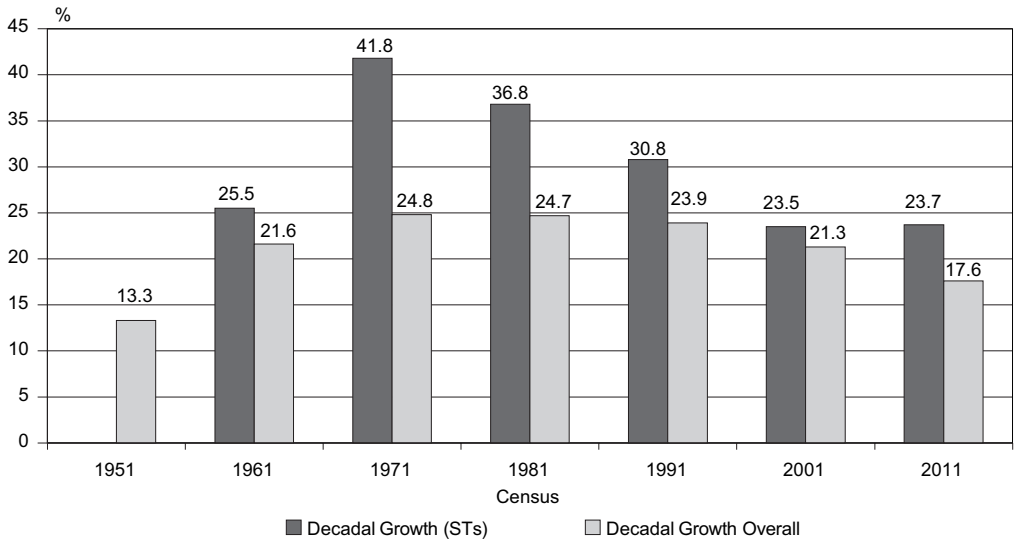


Fig. 3. Decadal Growth of Tribal Population and Overall Population in India

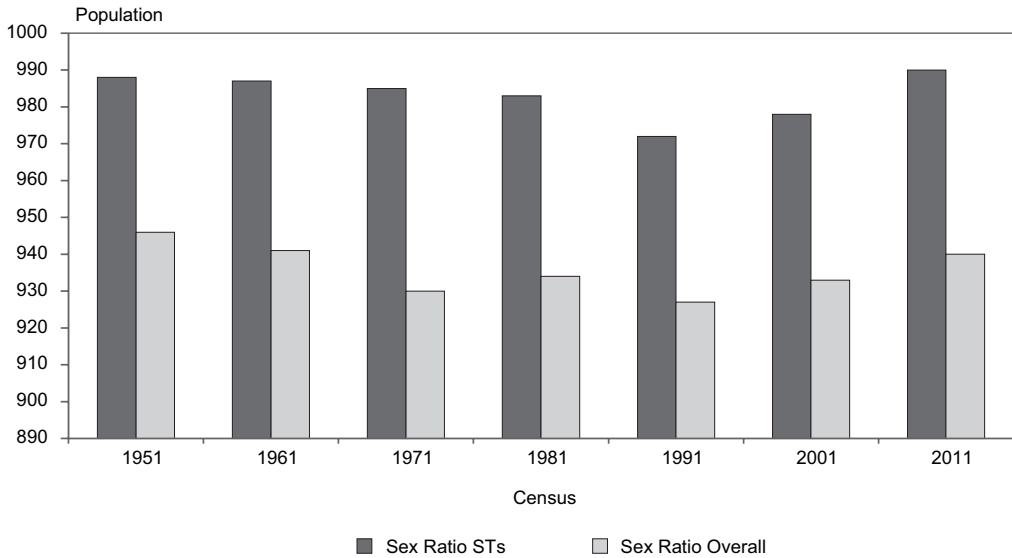


Fig. 4. Sex ratio of schedule tribes and overall population of India

census, the sex ratio of the tribal population was 988 females per thousand males against 946 for the overall population. It is also clear that since 1951 the sex ratio among the tribes decline and then gradually it is increasing to reach its highest 990 in 2011 census.

Mean BMI of the studied tribes (males and females) of India are shown in Table 1. From this, it is clear that Car Nicobarrese (21.9 kg/m²) of Andaman Nicobar Islanders (Kapoor et al. 2012) have the highest mean BMI and Garasia (15.9 kg/m²) males of Rajasthan (Bhasin and

Table 1. Mean Body Mass Index (BMI) of reviewed tribal populations of India

State	Community	Male BMI (kg/m ²)	Female BMI (kg/m ²)	Reference
1. Andaman & Nicobar Island				
1	Jarwa	18.9	19.8	Sahani, 2004
2	Onge	19.7	21.2	Rao et al., 2006
3	CarNicobarese	21.9	NA	Kapoor et al., 2012
2. Assam				
4	Boro-Kachari	19.8	NA	Khongsdier, 2001
5	Lalung	19.2	NA	
6	Mech	20.5	NA	
7	Miri	19.6	NA	
8	Dibongiya	20.0	NA	Gogoi & Sengupta, 2002
3. Chhattisgarh				
9	Bhaina	NA	20.6	Singh et al., 2014
4. Gujarat				
10	Tadvi	18.1	NA	Kapoor et al., 2012
5. Jharkhand				
11	Oraon	18.5	NA	Datta Banik, 2008
12	Oraon	18.0	NA	Chakraborty & Bose, 2008
6. Kerala				
13	Mannan	20.2	19.1	John & Ramadas, 2008
7. Madhya Pradesh				
14	Saharia	19.1	NA	Kapoor et al., 2012
15	Baiga	17.5	18.3	Chakma et al., 2009
16	Bhumia	17.9	18.1	Jaiswal, 2013
17	Korku	18.2	NA	Das, 2010
18	Kol	18.8	NA	Adak et al., 2006
8. Maharashtra				
19	Tribes (Chikhaldara)	19.4	18.6	Ingole et al., 2014
20	Andh	17.1	NA	Adak et al., 2006
21	Bhil	18.0	NA	
22	Gond	18.3	NA	
23	Kathodi	17.0	NA	
24	Korku	18.0	NA	
25	Mahadeokoli	18.2	NA	
26	Warli	16.8	NA	
27	Sonr	17.6	NA	
28	Majhi	19.4	NA	Gautam & Adak, 2006
29	Korwa	20.8	NA	
9. Manipur				
30	Tangkhuil Naga	NA	21.2	Mungreiphy et al., 2012
31	Adult tribals (TB Patient)	NA	18.8	Tungdim & Kapoor, 2010
32	Adult tribals (Control group)	NA	21.6	Tungdim & Kapoor, 2010

Table 1. cont.

State Community	Male BMI (kg/m ²)	Female BMI (kg/m ²)	Reference
10. Meghalaya			
33 Pnars Khasi	19.9	NA	Khongsdier, 2001
34 War Khasi	20.1	NA	Khongsdier, 2002
11. Odisha			
35 Bathudi	18.4	17.9	Bose & Chakrabarty, 2005
36 Oraon	18.8	19.7	Mittal and Srivastava 2006
37 Santal	19.6	NA	Bose et al., 2006
38 Paraja	NA	17.3	
39 Bhuiya	19.4	NA	
40 Gond	18.1	NA	Chakrabarty et al., 2008
41 Khond	19.2	NA	
42 Munda	19.1	NA	
43 Oraon (Migrants)	18.8	18.2	Beck & Mishra, 2010
44 Oraon (Natives)	18.8	19.3	Beck & Mishra, 2010
45 Paroja	17.3	NA	
46 Santal	18.3	NA	Chakraborty et al., 2008
47 Savara	18.5	NA	
48 Savar	18.9	19.3	Bisai & Bose, 2012
49 Desia Khond	17.6	NA	Kapoor et al., 2012
50 Juang	19.4	18.3	Goswami, 2013
51 Bhumij	18.9	18.5	Goswami, 2012
52 Mankidia	19.3	18.6	Goswami, 2011
12. Rajasthan			
53 Mina	18.1	19.1	
54 Bhil	16.6	16.5	
55 Garasia	15.9	16.2	Bhasin & Jain, 2007
56 Sahariya	17.6	17.8	
57 Damor	16.1	17.3	
58 Kathodi	16.2	15.9	
13. Uttarakhand			
59 Bhotia	19.5	NA	Kapoor et al., 2012
14. West Bengal			
60 Munda	18.7	17.7	Ghosh & Bharati, 2006
61 Oraon	18.8	19.7	Mittal & Sivastava, 2006
62 Kora Mudi	18.7	18.3	Bose et al., 2006b
63 Santal	20.0	19.3	Bose et al., 2006c
64 Dhimal	19.5	19.1	Datta Banik et al., 2007
65 Lodha	19.5	19.3	Mondal, 2007
66 Santal	18.5	18.7	Ghosh & Mallik, 2007
67 Bhumij	18.7	18.4	Ghosh, 2007
68 Kora Mudi	18.6	18.3	Bisai et al., 2008

Table 1. cont.

State Community	Male BMI (kg/m ²)	Female BMI (kg/m ²)	Reference
69 Lodha	19.5	NA	Bose et al., 2008
70 Bhumij	18.7	NA	
71 Santal	20.5	19.5	Mukhopadhyay, 2010
72 Santal	19.5	18.1	Das & Bose, 2010
73 Munda	19.35	NA	Bose et al., 2011
74 Oraon	19.46	2 NA	Bose et al., 2011
75 Hill Kheria	19.2	17.9	Das & Bose, 2014
76 Birhor	20.5	20.	Das et al., 2013

NA= Not available

Jain 2007) have the lowest mean BMI. Similarly, adult tribal (Control group) females (21.6 kg/m²) (Tungdim and Kapoor 2010) of Manipur have the highest and Kathodi (15.9 kg/m²) females of Rajasthan (Bhasin and Jain 2007) have the lowest mean BMI out of all the studied tribal populations.

The state and community based sex specific prevalence of CED are presented in (Figures 6: 1–5), it is clear from

figure 6 (1) that out of the 17 studied tribes of West Bengal the CED of female and males were highest among Mundas 67.9% (Ghosh and Bharati 2006) and Santals 55.0% (Ghosh and Mallik 2007), respectively.

Figure 6(2) shows that out of the 16 studied tribes of Odisha the CED of female and males were highest among Paroja 80.0% (Chakrabarty et al. 2008) and Santals 92.0% (Kapoor et al. 2012),

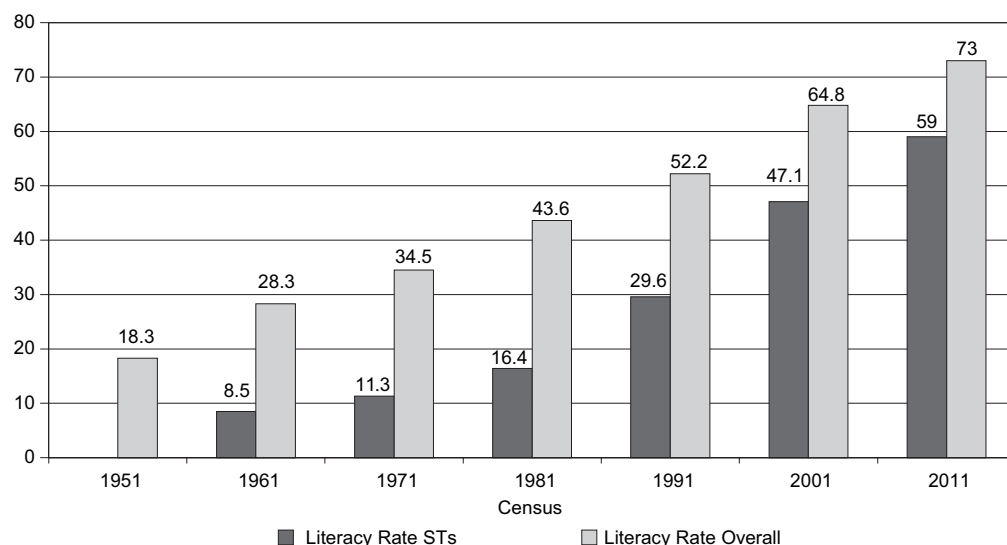


Fig. 5. Literacy Rate of schedule tribes and overall population of India

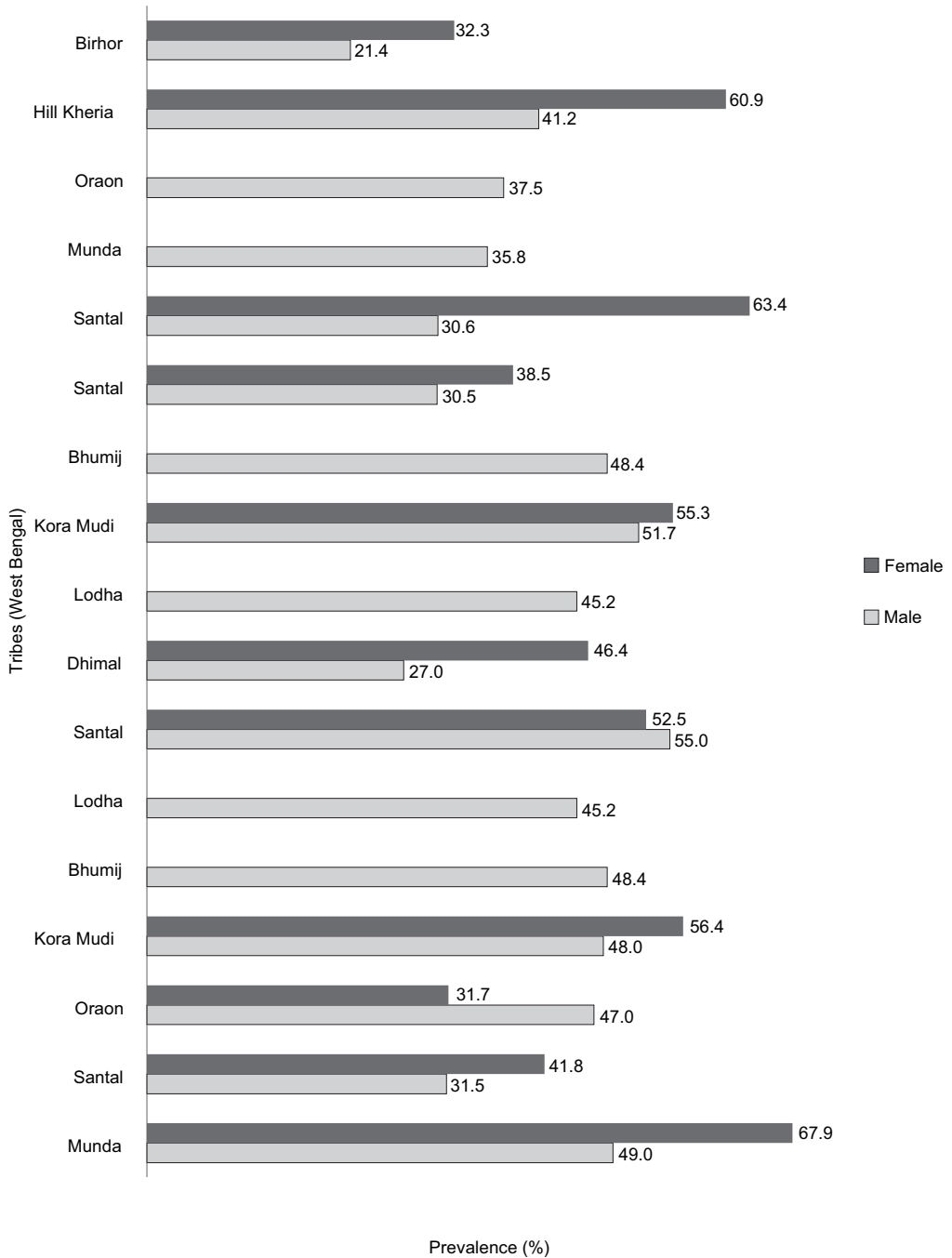


Fig. 6(1). Percentage (%) of undernutrition among the studied tribal population of West Bengal, India

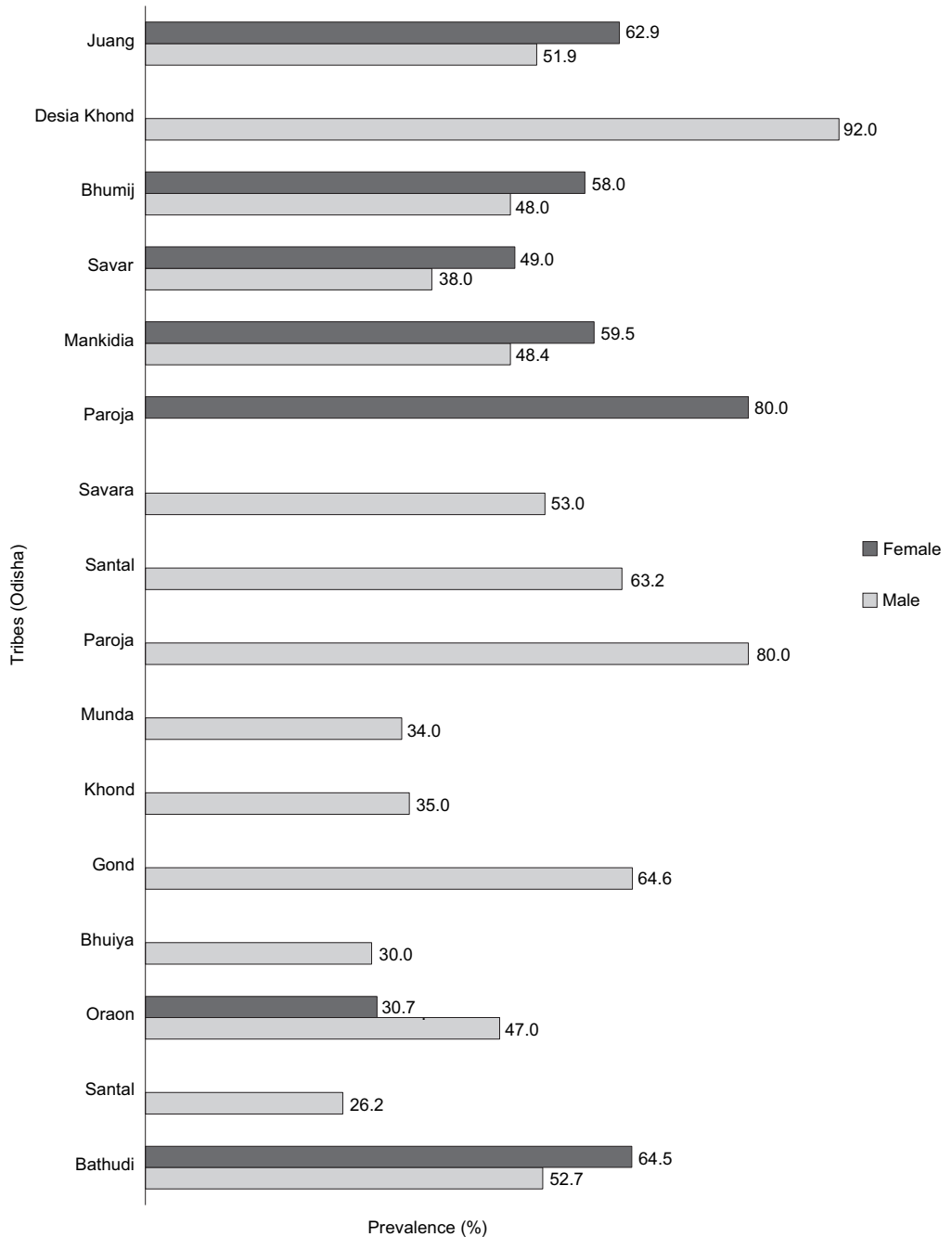


Fig. 6(2). Percentage (%) of undernutrition among the studied tribal population of Odisha, India

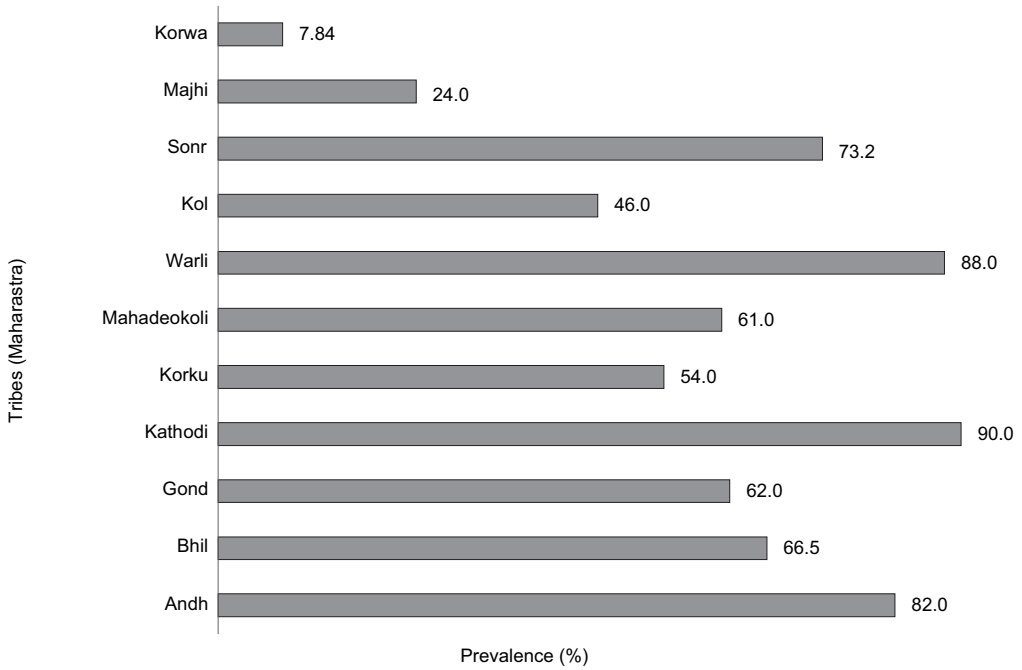


Fig. 6(3). Percentage (%) of undernutrition among the studied tribal male population of Maharashtra, India

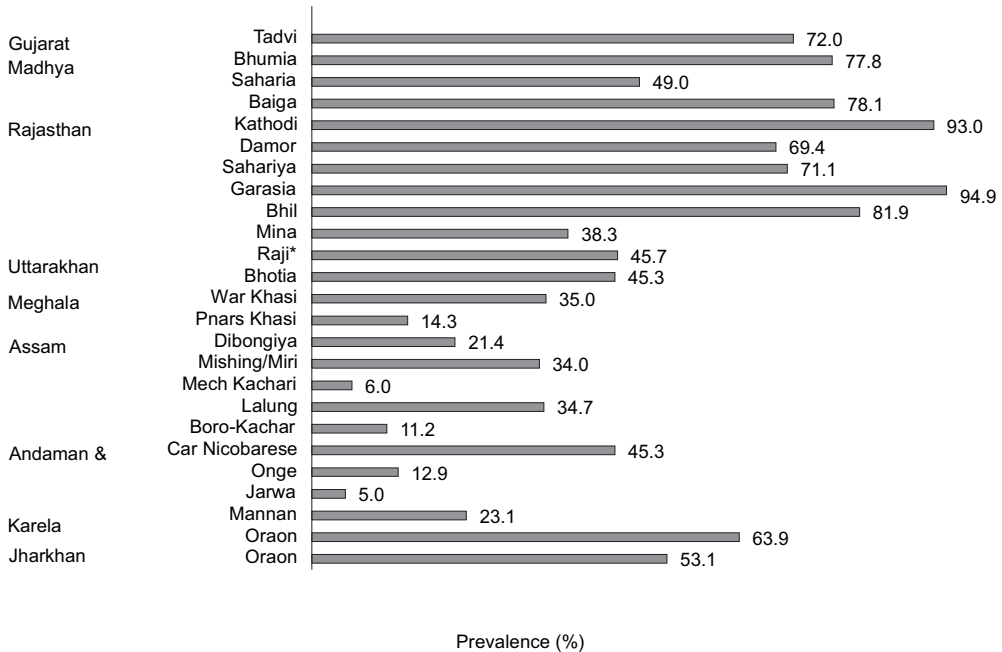


Fig. 6(4). Percentage (%) of undernutrition among the studied tribal male population of Gujarat, Madhya Pradesh, Rajasthan, Uttarakhand, Meghalaya, Assam, Andaman & Nicobar, Kerala, and Jharkhand, India

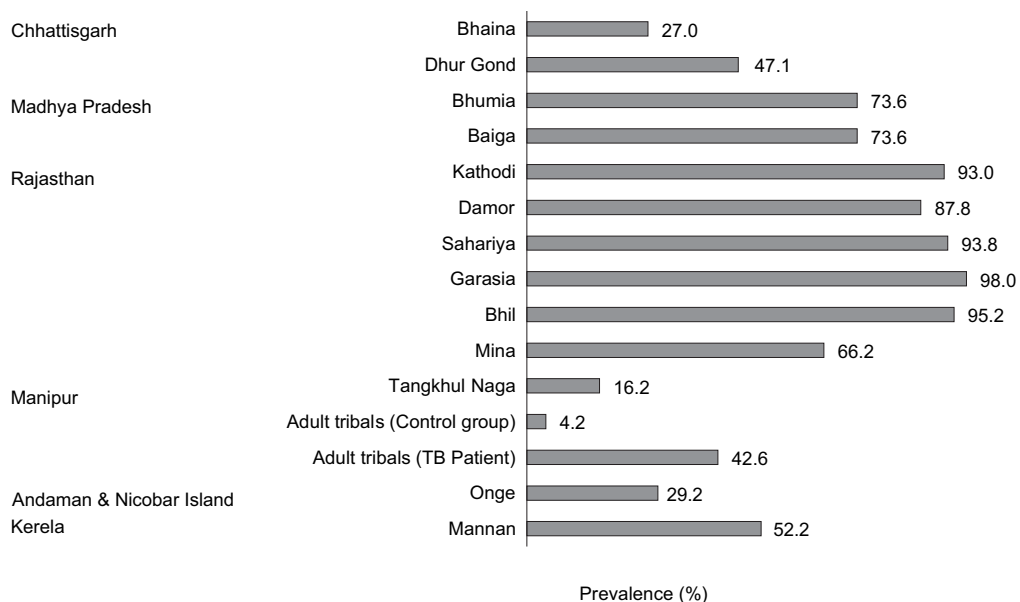


Fig. 6(5). Percentage (%) of undernutrition among the studied tribal female population of Chhattisgarh, Madhya Pradesh, Rajasthan, Manipur, Andaman & Nicobar Island and Kerela, India

respectively. Figure 6(3) shows that out of the 11 studied tribes of Maharashtra the CED of males were highest among Kathodi 90.0% (Adak et al. 2006).

Figure 6(4) shows the percentage (%) of undernutrition among the studied tribal male population of Gujarat, Madhya Pradesh, Rajasthan, Uttarakhand, Meghalaya, Assam, Andaman & Nicobar, Kerela and Jharkhand, India. Out of the two studied tribes of Jharkhand, CED among Oraon males was highest at 63.9% (Chakraborty and Bose 2008). Males of Mannan tribe of Kerela had the highest rate of CED of 23.1% (John & Ramadas, 2008). Out of the three studied tribes of Andaman and Nicobar Islands, the rate of CED was highest among Car Nicobarese 45.3% (Kapoor et al. 2012). Among the five studied tribes of Assam, CED of males was high-

est among Lalung 34.7% (Khongsdier 2001). Out of the two studied tribes of Meghalaya, CED of males was highest among War Khasis 35.0% (Khongsdier 2002). Among the two studied tribes of Uttarakhand, the overall rate CED of Raji tribe was highest 45.7% (Abrar et al. 2014). Out of the six studied tribes of Rajasthan, the prevalence of CED of Garasia males 94.9% was highest (Bhasin and Jain 2007). Among the three studied tribes of Madhya Pradesh, the highest CED prevalence among males was observed among Baigas: 78.1% (Chakma et al. 2009). Figure 6(4) also demonstrates the very high prevalence of CED among Tadvi males (72.0%) of Gujarat (Kapoor et al. 2012). Figure 6(5) shows the percentage (%) of undernutrition (CED) among the studied tribal female population of Chhattisgarh, Madhya Pradesh,

Rajasthan, Manipur, Andaman and Nicobar Islands and Kerela.. It is clear from the figure that females of Mannan tribe of Kerela had the highest prevalence of 52.2% (John & Ramadas, 2008). In Andaman and Nicobar Islands, the rate of CED of Onges was 29.2% (Rao et al. 2006). Among the three studied tribes of Manipur, CED of females was highest among adult tribals (none specified) (TB Patient) 42.6% (Tungdim and Kapoor 2010). Out of the six studied tribes of Rajasthan, the rate of CED of Garasia females 98.0% was highest (Bhasin and Jain 2007). Out of the two studied tribes of Madhya Pradesh, CED among females was equally very high (73.6%) among Baigas (Chakma et al. 2009) and Bhumia (Jaiswal 2013). Out of the two studied tribal females of Chhattisgarh, CED was highest among Dhur Gonds: 47.1% (Chandraker et al. 2009). The overall sex specific prevalence of CED demonstrated that both tribal females (52.0%) as well as males (49.3%) were passing through the critical situation with respect to nutritional status with females being worse off.

Tribes are comparatively more vulnerable to food and nutrition uncertainty than their rural counterparts. Studies carried out among the tribal groups in different States of the country revealed that their socio-economic conditions and nutritional status are largely influenced by the eco-system (Rao et al. 1993; 1994). There is immense discrepancy in sex and state specific prevalence of CED among tribes in India. It may be due to different reasons, such as availability of samples during data collection, sample size etc. Such breach between the general population with respect to varied socio-demographic and health profile of the tribes of our country as well as oth-

er countries should be taken seriously to bridge the lacunae from individual, societal, national and international level.

Policy implication

Total health expenditure in India steadily increases from past years and it also improves the health of the population as whole. But still there are population too far from the basic health and nutritional benefits who continue facing the problem of undernutrition in our country. Despite of all the actions taken by the authority to reduce the undernutrition, one section of population is still facing severe to critical situation of undernutrition. This suggests necessitating mechanism and implementation of need based policies.

Conclusion

In conclusion, although there is a gradual increase in knowledge about the nutritional and socio-demographic status of tribes since last decades; there is still paucity of data and information on more than approximately 600 tribes regarding their bio-social profile. However previous studies clearly indicate the need to enhance the health and nutrition status of the tribes by providing job opportunity and food security. Since the prevalence of CED was higher (critical to serious situation) in tribal populations, concerted efforts should also be made to improve the health status and nutrition uptake among them.

Acknowledgement

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Authors' Contributions

SD and KB conceptualized and designed the paper, performed the review work; SD prepared the manuscript and KB edited the manuscript. Both authors were involved in drafting the manuscript and approved the final manuscript.

Conflict of interest

The Authors declare that there is no Conflict of interest.

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