

# **Comparative Analysis of Nutritional Status Among Tribal and Non-Tribal Women in India: A Comprehensive Review**

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## **Abstract**

The nutritional status of women in India, particularly among tribal and non-tribal communities, presents a multifaceted and complex issue influenced by socio-economic, cultural, and environmental factors. This comprehensive review aims to synthesize the existing body of research on the nutritional status of tribal and non-tribal women in India, providing a comparative analysis that underscores the disparities, challenges, and progress in this domain. By examining various studies conducted over time, this review seeks to highlight the critical issues, inequities, and transformations experienced by women in tribal communities.

Tribal women in India often live in remote, underdeveloped regions where access to healthcare, education, and employment opportunities is limited. These factors significantly impact their nutritional status, leading to higher rates of malnutrition, anemia, and other health-related issues compared to their non-tribal counterparts. The review indicates that tribal women are more vulnerable to food insecurity, inadequate dietary diversity, and poor maternal and child health outcomes. This vulnerability is compounded by traditional practices, low socio-economic status, and limited access to health and nutritional services.

Studies highlighted in this review illustrate the extent of malnutrition among tribal women, characterized by high prevalence rates of underweight, stunting, and wasting. The dietary patterns of tribal women are often limited by the availability of local food resources and traditional dietary practices, which may not meet the nutritional requirements. Additionally, the impact of seasonal food scarcity and dependency on forest produce further exacerbates their nutritional deficiencies.

This review also explores the role of government policies and interventions aimed at improving the nutritional status of women in India. Programs such as the Integrated Child Development Services (ICDS) and the National Health Mission (NHM) have been instrumental in addressing malnutrition and promoting health and well-being among women. However, the implementation and effectiveness of these programs vary significantly between tribal and non-tribal regions, often due to logistical challenges and socio-cultural barriers.

The comparative analysis underscores the need for targeted nutritional interventions that consider the unique socio-economic and cultural contexts of tribal and non-tribal women. It advocates for a multi-sectoral approach that integrates health, education, and socio-economic development to address the root causes of nutritional disparities. Additionally, empowering women through education, skill development, and community participation is essential for sustainable improvements in nutritional status. Addressing these disparities requires concerted efforts from policymakers, healthcare providers, and the communities themselves to ensure that all women, regardless of their tribal status, have the opportunity to achieve optimal nutritional health.

**Keyword:** Nutritional status, Tribal women, Non-tribal women, India, Malnutrition, Socio-economic factors, Government policies, Nutritional interventions.

## **Introduction**

Health is a state of complete physical, mental, and social well-being. It is a positive concept that makes the body to adapt threats and infirmities. Health and nutrition may be considered as the two faces of a coin. The body needs good nutrition to function properly. Nutrition plays a vital role in the physiological and biochemical process that provides energy and proper functioning of all the body parts. Lack of nutrition in the food components may develop several chronic degenerative heart diseases, cancer, infections, mental dysfunctions, etc. The entire world is concerned with improvement in health and nutrition, health and nutrition-related interventions, and developing a healthy environment (Mason et al., 2006).

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The consequences of malnutrition could be very serious. It is disheartening that around 45% of child deaths in 2011 were associated with malnutrition including fetal growth restriction, suboptimal breastfeeding, stunting, wasting, and deficiencies of vitamin A and zinc (Branca et al., 2015). 161 million children under the age of 5 were reported to have chronic undernutrition in 2013, leading to hampered cognitive and physical development, poor health, and increased risk of degenerative diseases (WHO, 2014). Deficiency of vitamin A and zinc caused 157000 and 116000 child deaths in 2011 (Black et al., 2013). Some of the recent estimates confirm that about 200 million children in the world failed to attain their full development potential due to malnutrition (Branca et al., 2015).

Social and economic determinants of health have acknowledged inequalities in health outcomes between low, middle, and high-income countries. There are differences in dietary intake, pattern, and quality among the peoples of various countries. Nutritional disparities are prevalent, people from high and middle-income countries appear more prone to over-nutrition (overweight and obesity) while low-income countries are prone to malnutrition (Perez-Escamilla et al., 2018). Estimates show that globally 155 million preschool-aged children are stunted 53 million are wasted due to malnutrition/undernutrition while 41 million are overweight due to overnutrition (UNICEF/WHO/World Bank, 2016). People in the world are suffering from the double burden of malnutrition as well as overnutrition.

In India, malnutrition, particularly undernutrition, is a significant public health challenge (Prasad et al., 2018). Despite being one of the largest economies, India's human development is lower than China, Brazil, and Russia (Saikia and Kulkarni, 2017). The country ranks 97 out of 118 developing nations in the Global Hunger Index (International Food Policy Research Institute, 2016). The annual number of deaths of children below 5 was 1.3 million in 2015 (Saikia and Kulkarni, 2017). About 42% of Indian children, under 5 years of age were underweight in 2011, accounting for India having the highest number of undernourished children globally (HUNGaMA {Hunger and Malnutrition} Report, 2011). India's performance appears poor on food and nutritional security.

The present study aims to review thoroughly the currently done research on the Nutritional status of tribal and non-tribal women. Compiling the insights of various studies over time, this work highlights issues, unfairness, and changes, women in a tribal community face.

## **Methodology**

The approach of this paper is a method of exploring, assessing, and synthesizing current data on the nutritional status of tribal and non-tribal women. To begin with, a comprehensive literature review was conducted to search for papers related to the research topic through academic databases, journals, official publications, and other relevant sources. Searches were designed to select studies based on, publication date, geographical area, sample size, and the method of production. Data extraction was then used to collect relevant information from the selected studies, such as key findings, sample characteristics, educational level, income, access to health care, and nutritional factors including cultural traits.

## **Review of literature**

In a study conducted by Sarmah et al., 2018 among 480 never-married postgraduate tribal female students aged 21-25 years; it was found that mild anemia was prevalent in 60.9%, moderate in 28.5%, and severe anemia in 10.6%. The prevalence of iron deficiency and iron deficiency anemia was 23.4% and 38.5% respectively. Das and Bose, 2011 undertook a study to determine the rate of stunting, underweight, and wasting using anthropometric indices in the children of the Santal tribe of West Bengal. The finding reported 26.3 % (stunted), 38.2 % (underweight), 12.7 % (wasted) and 43.4 % had composite Index of Anthropometric failure. The underweight index was higher (0.881) followed by the stunting index (0.606) and then the wasting index (0.294) out of the overall undernutrition. In another study, Philip et al. 2016 surveyed 438 tribal preschool children Wayanad district of Kerala. More than half of the children (58.7%) were found to have deficits in at least one of the three anthropometric indicators. The prevalence of underweight, stunting, and wasting was 39%, 38%, and 20.5% respectively. The prevalence of anemia was 95.7%.

## **Nutritional status of tribal and non-tribal women**

Kasar et al., (1990) studies the consumption behavior of Tribals of Ambegoan Tahsil in the Pune district. The study revealed that food was the major item of family expenditure which alone shared 67.74

percent of the total family expenditure. Sugar and jaggery, milk, etc the consumption of cereals alone provided 80.60 and 70.72 of the total calories and proteins respectively. There was no nutritional gap from the viewpoint of the minimum calories and proteins recommended for average work. This was mainly due to the inadequacies in the consumption of pulses and protective food such as vegetables, fruits milk, fats and oils, eggs, fish, meat etc. The consumption expenditure of Tribals was significantly influenced by the annual gross family incomes and the family size in adult units.

NIN (1990) studied the nutritional status of primitive tribes in the Andaman- Nicobar Islands. Glosstis was observed in one adult woman. The daily intake of foods like cereals, oils, and coconut did not very much. But the consumption of fresh foods like pork, tortoise, crab, and fish showed wide variation daily. Protein intake varied between 45- 90 gms and that of calcium between 150- 670 mg per CU per day. Intakes of all nutrients except protein and thiamine were lower than the RDA. Among the Andamans, the adult women were concise with a mean height of 2140 cm and heavier by about 7 kgs than rural women. Some showed signs of vitamin A deficiency and pallor suggestive of anemia.

Pande et al., (1990) studied the nutrient intake of a selected Tribal population in the Kinwat area of Maharastra. Forty-five families were selected from Gond (12), Andh (12), and Kolum (10) communities. The differences in intake of calories and protein among the four tribes' average did not reveal any statistically significant variation. It was observed that the intake of protein by adult males and adult females (90.01 and 68.5 gm respectively) was more than the recommended daily female (90.01 and 68.5 gm respectively) allowances (55 and 45 gms respectively). The energy intake was (3000 and 2184 Kcal respectively) less than the recommended allowances.

NIN (1990-91) reported the nutritional status of certain Tribal groups of the northeastern hill states. Their consumption level, in general, tended to be more than what has been recommended in the "Balanced diets" by ICMR. The daily average intake levels (per CU) of nutrients such as protein, calcium, iron, riboflavin, and thiamine were more than RDA in all the Tribal groups.

Mohanty et al., (1991) attempted to study the food habits childhood mortality, growth, and nutritional status of the rural Kisans of Sambalpur, Orissa. It was observed that their average diet was much inferior to the standard balanced diet required for normal growth and well-being. Nutritional status as studied by weight/height index shows the presence of malnutrition among 46% of adults. The observed childhood mortality was 18.75% and the rate of pregnancy wastage among the Kisan mothers was 8.1%.

Hanumantha Rao et al., (1992) conducted a study on "Nutritional status of Maria Gonds- A primitive tribe of Maharastra". The study revealed that Maria Gonds was better off as compared to their rural counterparts in Maharastra as revealed by their better food and nutrient intake and anthropometry. They were also found to be better off than the Gonds of Bastar who mainly depended on agriculture. Thus, the Tribal population inhabiting isolated regions with little exploitation by outside people and with sufficient employment potential was found to be nutritionally better.

Sar et al., (1992) studied the consumption pattern of Tribals in Thane district. The study was based on a diet survey in 120 rural households in Thane district, out of which, 42 Tribal households were selected randomly and surveyed, they reported that the intake of almost all the foodstuff, except pulses, vegetable roots, and tubers, was inadequate among the Tribals. At an overall level, the calorie intake was inadequate while protein intake was just adequate among the Tribal of the thane district per day per capita cost of the Tribals was Rs.6.81 which was less than the cost of a balanced diet (Rs.7.04). The diet of Tribals concerning 69 and 52/4 percent of households had a deficit in calories and proteins, respectively. Among the various influences on the calorie and protein intake of the Tribals.

Tandon et al., (1992) studied the impact of ICDS on immunization coverage of children and mothers in nineteen rural, eight Tribal, and nine urban ICDS projects DPT, BCG, and polio vaccine were recorded for 65.00%, 63%, and 64% of children respectively in ICDS population. By comparing the coverage in the non-non-ICDS group was only 22% for BCG, 28% for DPT, and 27% for polio Myelitis. Complete immunization with tetanus toxoid was recorded for 68% of the mothers in the ICDS group and for 40.00% in the non-ICDS group.

The prevalence of anemia among pregnant women in Tamil Nadu was analyzed by Koen et al., 1992. This community-based survey was conducted by R.U.H.S.A department, Christian Medical College, Vellore.

It has been found that 76 percent of women had a hemoglobin level of less than 11g. Severe anemia was observed in 11 percent of women. Stool specimens were collected from 130 subjects and observed microscopically. Another observation was that 62 percent of the sample had hookworm infections. In brief, the previous studies in India particularly done in South Indian states clearly showed that women were severely affected by many ill-health problems during pregnancy and delivery the most important.

Kulkarni (1993) conducted a study to assess the malnutrition in Junnar and Dhule Tribal of Maharashtra state. The study revealed that although these tribals of basic potential to grow normally, the overall malnutrition due to several factors has affected the growth, indicated especially through body weight and mid-upper arm-circumference. An intermittent intervention program of environmental ecological balance and various health nutritional practices to some extent might help improve their nutritional status. This could be done by alternated intervention and assessment activities.

Sharma et al., (1995) attempted to assess the nutritional status of the Hill Korwa Tribal population of Madhya Pradesh. The study was based on 239 unrelated individuals (136 adult males and 103 adult females) from predominated inhabited villages namely Ghatgaon and Sewari (Rajpur blocks), Jori and Raghupur and Khala (Ambikapur blocks) of the Suguja district, M.P. The Pelidisi index indicated that all males and females have low nutritional status, whereas the Pignet index (Body Build Index) showed that 0.82%, 1.64%, 18.03%, 27.87%, 13.11% and 9.84% of males belonging to very sturdy, good, weak, and poor nutritional status groups, respectively

Thanuja et al., (1995) carried out a study to measure the extent of malnutrition among the Tribal women of Singbhum district of Bihar state. Completed data were available for 222 Tribal women. Tribal women in this study did not have the habit of wearing slippers when they went out. This may increase the chances of getting hookworm infestation thereby causing anemia thus majority of women were at risk of delivering low birth weight babies and having pregnancy complications. Some of the reasons for undernutrition among Tribal women could be poor diet intake, ignorance, early marriage, and high morbidity due to unhygienic practices and surroundings. Undernutrition of mothers may be carried over to their children. Hence, there was a need to provide special attention to this group in improving their nutritional status by intervening in appropriate health and nutritional programs like nutrition education, iron supplementation, and deworming both during adolescence and adulthood.

Guru et al., (1997) conducted a study on maternal nutrition, antenatal care, and infant mortality in the Rayagada district of Orissa state. The nutritional status of the Paraja Mothers was more or less the same as that during their last pregnancy and lactation periods. The Paraja population lived in acute poverty and their nutritional standards were likely to be low. It was observed that slightly above one-fifth (22.75%) of the Paraja mothers possessed good weight for height status. Moderate weight for height status constituted 45.10 percent and almost one-third (32.16%) belonged to the category of poor weight and height status. 46.27% of Paraja mothers were severely anemic. Only 16.85% were normal. Rice during summer and winter and maize during the rainy seasons constituted staple food among the Parajas. Even regular consumption of pulses, meat, or fish was not possible. Regarding the distribution of food, there was no gender discrimination among the Parajas. The majority (63.13%) of the mothers in the sample did not receive any antenatal care during pregnancy of the index child. Only a small proportion of mothers (13.72%) received complete antenatal care. A very low proportion (18.04%) of deliveries took place in a hospital in the population under study. An overwhelming proportion (8.96%) of deliveries were carried out at home and were attended by Indigenous untrained dais or elderly female members of the family.

“A note of dietary habits and malnutrition among Tribal of Bastar, Madhya Pradesh” was attempted by Choubey (1998). The study revealed that due to the lack of various nutrients in the diet of Tribals of the region, they were likely to be more susceptible to diseases or to have weak resistance power. Faulty dietary habits, selection of foodstuff, poverty ignorance, and tradition were some of the other factors which were likely to affect their nutritional status. Personal bad habits like smoking, chewing tobacco, and drinking country liquor, rice beer in large quantities were additional factors that made them susceptible to various health hazards.

Khongsdier et al., (1998) described the food and nutrient intakes among the Dimasana of North Cochar hills in Assam. The findings indicated that the overall dietary intake among the Dimasana was more or



less according to the recommended allowances given by the Indian Council of Medical Research, though the consumption of nutrients like iron, carotene, and vitamin B12 was far below the recommended requirement. The problems concerning the practical method for measuring under-nutrition in a population were pointed out taking into consideration the use of recommended allowance for any given nutrient as a cut-off point and the hypothesis of homeostatic variation in dietary requirements.

Lim Hwei Mian (1998) conducted a study “Nutritional status and Reproductive Health of Orang Asli women in two villages in Kuantan, Pahang”. The study was conducted to determine the nutritional status and Reproductive Health of 34 Orang Asli women, aged 16-45 years, from two Orang Asli villages in Kuantan, Pahang Darul Makmur. The results of the study indicated that on the whole, the women's nutritional status was generally not satisfactory. Their mean iron intakes, for example, were very low, about one-quarter to one-third of the required level. All their other mean nutrient intake levels were below the required level. Only their mean intake of vitamin C exceeded the required level due to their frequent intake of raw vegetables. Their main source of carbohydrates was rice, while their main source of protein was fish, and their main source of minerals and vitamins were Chinese mustard and cabbage. From BMI measurements, it was found that less than half of the women (42.9%) had normal weight, 35.7% suffered from chronic energy deficiency (CED), 7.1% (one) were overweight, and 14.3% (two) were obese. The accessibility and availability of food were a problem for the women, limiting their choice of varieties of food sources. For their Reproductive Health needs, the pregnant women relied on the government hospitals and clinics for their antenatal check-ups and birth deliveries. Of all the women, nine suffered from menstrual pain, and five from vaginal discharge. Food taboos and cultural practices were practiced by the pregnant women during their confinement. It was concluded that the nutritional status of the women needed to be improved since most of them had insufficient nutrient intake.

Priti et al., (1998) studied the nutritional status by anthropometry of Tribal women of Jhadua district of Madhya Pradesh. Households with women in the reproductive age group i.e., 18 to 45 years were studied. They were categorized as pregnant and lactating status. The findings revealed that the Bill Tribal women were living in a state of great deprivation due to poor socio-economic status. Anthropometric measurements showed that the weight deficit was maximum compared to height, and BHI values indicated a higher prevalence of moderate forms of malnutrition. Almost three-fourths of Bhil women in all psychological groups belonging to lower socio-economic status were in moderate grades of malnutrition. This was likely to have an adverse long-term impact on their health as well as on the welfare of the entire family.

Zoe Matthews et al., (2001) conducted a study on “Antenatal Care, Careseeking and Morbidity in Rural Karnataka, India: Results of a Prospective Study” to identify the socioeconomic determinants of antenatal care-seeking among rural women in a South Indian setting. The extent and nature of the antenatal morbidities suffered by these women were also described. The results give their responses to sequential questionnaires administered during pregnancy and beyond. All those who became pregnant in 11 South Indian villages within 25 months from August 1996 to September 1998 were followed as part of the study. Responses were collected during pregnancy itself, thereby reducing the recall error inherent in many cross-sectional studies. This article presented survey results for 282 women interviewed two or more times during pregnancy, with the second interview taking place during the latter part of the third trimester. Occasional supporting qualitative information was also given based on in-depth interviews with pregnant women and their families, as well as with healthcare providers and other key informants. The study took place in the state of Karnataka, which has a rural profile typical of South India. Early marriage and consanguineous marriages, especially between first cousins, were very common in this part of the country. Recent rapid fertility declines at all ages have brought the total fertility rate to 3.09 children per woman for rural residents, but short birth intervals still predominated - almost half were less than two years in duration. Literacy levels in the state were just a little higher than the national average of 52 percent, with levels for men exceeding those for women by over 30 percent (IIPS, 1993). This was a progressive rural setting for a developing country in South Asia; the fertility transition was well advanced in this part of India but maternal health was still very poor. Within India, which showed a considerable diversity of maternal health care provision, Karnataka falls between the extremes of good and poor health infrastructure. It was therefore a state with the potential for substantial improvement in maternal health.

The Report (2002) Macro Determinants of Nutritional Status of Women and Children in Ethiopia based on data from the 2000 Demographic and Health Survey with reference to 13,447 women aged 15-49

years and 9,768 children under five of interviewed mothers with complete and plausible anthropometric data. This study showed a significant association between the nutritional status of women and each of the explanatory variables under study. The proportion of women suffering from chronic energy deficiency (CED) malnutrition was significantly higher in rural areas than in urban areas. The highest prevalence of chronic energy deficiency in women was observed in Somali (48%), followed by Affar (42%), Gambella (39%), and Benishangul-Gumuz (38%); it was lowest in Addis Ababa (18%) and Harari (25%), the two most urban areas of the country. Women's educational level was also found to be negatively associated with malnutrition in women. The prevalence of CED was higher among very poor women than among poor women, who in turn have higher rates of CED than women of medium/higher economic status. The prevalence of malnutrition in women was also higher among the unemployed than women who were employed (cash or not). Women who have no say or joint say in how their cash earnings are to be used were more likely to suffer from malnutrition compared with women who have a full say. Demographic variables such as age, parity, and marital status of the women were also found to be significantly associated with women's nutritional status. The highest proportion of malnourished women was observed in the youngest age group of 15-19 years (38%), followed by the oldest age group of 35-49 (33%). The lowest rate was found in the age group 20-24 years (23%). The highest rate of malnutrition was also observed among nulliparous (34%) women, followed by higher parity (6+) women (30%); the level decreased as the parity group decreased. A significant association between malnutrition in women and their marital status was also observed; the prevalence of malnutrition was highest among never-married women (36%), followed by widowed (32%) and divorced women (29%).

Parul Christian (2003) in his study on "Micronutrients and Reproductive Health Issues: An International Perspective" stated that Micronutrients may have a role in enhancing the Reproductive Health of women living in the developing world. Two illustrative micronutrients zinc and vitamin A, have received some attention in this regard. Numerous animal experiments and observational studies suggested the potential role of zinc deficiency in labor and delivery-related complications such as premature rupture of membrane, placental abruption, preterm labor, and inefficient uterine contraction. These associations have not been confirmed in supplementation studies. Zinc does not appear to be a limiting factor in intrauterine growth in the developing world, contrary to some evidence of its suggested benefit among women residing in industrialized countries. One study in Nepal found that maternal vitamin  $\alpha$  or  $\beta$ -carotene supplementation reduced pregnancy-related mortality but not infant mortality. These findings were corroborated by observations of the significantly higher risk of mortality among night-blind women compared to non-night-blind women long after the termination of pregnancy and the resolution of night blindness. Maternal multiple micronutrient supplementation needs more careful evaluation before its use in large-scale programs. Two recent trials indicated that prenatal multiple micronutrient supplements provided no added advantage over iron and folate in reducing outcomes such as low birth weight and probably no survival benefit. Data were also suggestive that adding zinc may negate the beneficial effect of iron and folic acid on birth weight. Research was needed to further understand nutrient-nutrient interactions.

Kiran Vani (2007) in the study on knowledge and adoption of selected health and nutritional practices by rural women in Belgaum district, Karnataka with a total of one hundred and fifty (150) respondents found that while studying nutritional practices of children, the majority reported that colostrum should be given to newborn baby (53%), breastfeeding for infants was must (100%), introducing solid foods like khichri/ rice/ dal/ soaked chapattis has to be given to the seven-month-old child (63%), daily consumption of a combination of rice, dal, and vegetables was beneficial for growing children (55%), introducing small quantities of soups, juices, kheer, etc. to baby's diet at the 3-month stage was good for child health (42%), introducing milk, milk products, egg, and its products were good for growing child (87%). And the knowledge about the nutritional practices of adults revealed that green leafy vegetables must be included in the diet (58%), sprouted pulses were more nutritious (46%), including cereal-pulse combination(dal chapatti, dal-rice) in a regular diet was nutritious for the body (63%), consumption of milk and curd strengthen bones (56%), using the jaggery often in the diet reduces iron deficiency (38%), fruits provide vitamins and mineral(78%), drinking of 2 liters of water would makes the person hygiene(42%), mixing Soya bean with jowar and wheat during grinding makes food more nutritious (60%). The remaining percent of each statement showed that the respondents did not know nutritional practices.

Miguel Angel et al., (2009) conducted A cross-sectional study “Differences in the reproductive pattern and low birth weight by maternal country of origin in Spain, 1996–2006”. Designated study objectives: maternal age on the date of birth, birth multiplicity, birth weight, and the mother's country of origin. The maternal country of origin variable comprised 21 categories. LBW was associated with a combination of older maternal age and multiple pregnancies in the case of women who had been born in Europe (EU15). However, this association was not found in women who originated from outside the EU15, mostly from countries that have shown significant emigration to Spain during the last decade. LBW was present among all age groups, in both singleton and multiple births, and in particular, Romanian mothers showed the highest OR 2.34 (95% CI 1.20–4.80). This study confirms differences in the reproductive pattern and LBW depending on maternal country of origin. These results allow a better understanding of the reproductive pattern and the implications of mothers' country of origin in LBW. Thus, helping health decision-makers to plan future health interventions aimed at reducing the LBW prevalence in Spain.

In the study on the diet and nutritional status of women in India, Rao, et al. (2010) found that the prevalence of goiter was relatively higher (4.9%) among tribal women compared to their rural counterparts (0.8%). Tribal women were particularly vulnerable to undernutrition compared to women in rural areas. The prevalence of chronic energy deficiency was higher (56%) among tribal NPNL women compared to rural women (36%). The prevalence of bitot spots, a sign of Vitamin A deficiency was 0.6% among tribal and 0.3% among rural women. The prevalence of angular stomatitis, a sign of B complex vitamin deficiency was 1.1% and 0.8% in tribal and rural women respectively. About 14% of tribal and 12% of rural women had dental caries.

Sreelakshmi, et.al. (2012) presented their view in a study of 346 tribal women where 271 were found anemic. The BMI of almost half of these women i.e. 179(51.9%) fell in the undernourished category. On the whole, the nutritional status of this group of tribal women was not satisfactory. The socio-economic status of the tribal population was poor compared to that of the general population of Kerala.

Prabha Chauhan et al., (2012) in their study on Maternal Mortality as per Gravidity among Tribal women at a tertiary level of care in Bastar, Chhattisgarh, India. Materials and Methods: This was a hospital-based retrospective, reproductive-age mortality study (RAMOS) of Tribal women of Bastar region, Chattisgarh, who were admitted and managed in Obstetrics and Gynecology Department Govt. Medical College, Jagdalpur, Bastar, Chattisgarh, between July 2007 and October 2011. There was a total of 120 cases. Result: Results of the present study showed that among 120 deceased Tribal women, highest maternal mortality 65 cases (54.166%) was noted in Primigravida (Nullipara G1P0), second highest maternal mortality 44 cases (38.333%) was noted in 2nd to 4th Gravida (Multipara), 10 cases (8.333%) were in 6th and 7th Grand Multigravida (Grand Multipara), and 01 case (0.833%) was in 8th Great Grand Multigravida. Direct causes of maternal mortality were highest at 46 cases (38.333%) due to hypertensive disorders of pregnancy. Among direct causes second highest 18 cases (14.999%) of maternal mortality were due to a ruptured uterus, the third highest was 12 cases (09.999%) of Septicemia, 06 cases (04.999%) of obstructed labor, 06 (04.999%) of Hemorrhage, 02 cases (01.666%) of unsafe Abortion, 02 cases (01.666%) of Pulmonary Embolism and 01 case (0.833%) due to Aspiration. Indirect causes of maternal mortality maximum of 15 cases (12.5%) of Malaria 10 cases (08.333%) were due to Anemia and 02 cases (01.666%) were of Sick cell Anemia. The result of the present study showed that in the Tertiary level of care of Bastar in the year 2008 - 2009, 2009 – 2010, and 2010 - 2011 the total maternal deaths were 35, (n=35), 27 (n=27), and 26 (n=26) respectively. The Maternal Mortality Ratio was 1615.881, 1168.325, and 1000.769 Per 1, 00,000 live births in the year 2008 - 2009, 2009 – 2010, and 2010 – 2011 respectively. In the year 2008 - 2009, maternal mortality percentage among Tribal women was 85.714%, and was 100% in the year 2009 – 2010 and 2010 – 2011.

### **Nutritional status of tribal and non-tribal women**

Nevertheless, Uttarakhand has a very strong native food culture and traditions. The state like the entire India has undergone nutritional transitions. Despite nutrition transition trends in Uttarakhand, several regions of the state are rich in crop and wild-harvested foods (Bisht et al., 2018). Traditional food habits are still prevalent and play a great role in the contemporary food habits of a large number of communities. It is well acknowledged that the dimensions of nature and culture of food define the whole health picture of the

individual including emotional, mental, and spiritual health. It has been observed that traditional food habits are still playing contemporary food habits in several tribal communities of Uttarakhand.

Uttarakhand is the home to five tribes (Tharus, Jaunsari, Buxas, Bhotia, and Ban Rajis) which have been scheduled in the constitution of India. They have very high diversity in terms of habitat, population density, ethnicity, socio-cultural norms, livelihoods, languages, and the ways they interact with each other and the rest of their neighbors (Tolia, 2010).

As per Census 2011, the contribution of Tharu to the tribal population in Uttarakhand is maximum i.e. 31.29% and they are distributed in Udham Singh Nagar, Nainital, Pauri, and Dehradun. Jaunsari contributes 30.37% of the tribal population in Uttarakhand and they are distributed in Dehradun, Uttarkashi, and Tehri. Bhoksa represents 18.51% tribal population of Uttarakhand and they are mainly distributed in Dehradun, Nainital, Udham Singh Nagar, Pauri, and Haridwar. Bhotia contributes 13.4% and is distributed in Almora, Chamoli, Pithoragarh, Bageshwar, and Uttarkashi districts of Uttarakhand. The lowest contribution to the tribal population of Uttarakhand is by the Raji tribe (0.24%). This tribe is mainly restricted to Pithoragarh and Champawat district of Uttarakhand.

Jaunsaris are found in the Central Himalayas. They are believed to be the descendants of Pandava of Mahabharata. They inhabit Jaunsar-Bawar (Upper Dehradun district), Rawain, and Purola (Uttarkashi). They are different from their Garhwali neighbors in their dress style and unique cultural practices. The main source of income for the livelihood of Jaunsaris comes from agriculture and pastoralism. They extract wool from sheep and manufacture woolen stuff.

Bhotias have Mongolian ethnic origin. They are known to live traditionally in the high Himalayan region, close to the Tibetan border. They are subdivided into three main groups Jadhvs (Uttarkashi), Marchas (mainly traders), Tolchas (farmers) of Chamoli, and Shaukas of Pithoragarh. The main occupations of Bhotias are agriculture and pastoralism; the weaving of woolen yarn and woolen stuff is part of their traditional customs. The main food in the diet of Bhotias includes millet, potatoes, barley, rice, and wheat. All Bhotias are known for drinking liquor, there is hardly any socio-religious ceremony in which liquor is not served (Prasad and Kapoor, 1998). They are also fond of smoking beer, tobacco, and cigarettes.

Another tribe Rajis is considered as the most underdeveloped tribal community of Uttarakhand. They are also known as Van-Rawat, Van Raji, or Van-Manush who claim to be the Rajputs of the original inhabitants of Central Himalayas. They inhabit Southern Pithoragarh (now Champawat district). Until recently, most of the members of the community are known for hunting and gathering wild products. At present their main occupation is agriculture and animal husbandry. They are still dependent on the forest produce; the cereals they grow are generally of poor quality and low yielding. They are known for making wooden bowls (Naswa, 2001).

Tharu is the most dominant tribe in Uttarakhand and inhabits the Tarai region of the state. They grow rice, maize, wheat, barley, lentils, peas, potatoes, sugarcane, and mustard as the main crops. Animal husbandry is the main occupation along with agriculture. Women are involved in sowing, weeding, and harvesting while men are involved in fishing and hunting. Foraging and gathering are done for collecting wild berries, nuts edible roots, and herbs for medicinal uses.

Another tribe Bhoksa is also known from the Tarai region of Uttarakhand. They are mostly inhabited in the Dehradun and Nainital districts in the foothills of the Himalayas. Most of them still live in rural villages and the Head of the village with the council of elders is supposed to make legal and economic decisions for the village. Presently some of the young Bhoksa people are leaving the traditional way of life and migrating to cities for better economic and educational opportunities. The main foods in the diet of Bhoksa people include fish, rice, wheat, vegetables, and milk products.

The selected locale Pithoragarh is inhabited by two tribes Bhotiya and Raji. Studies on the Raji tribe of Pithoragarh suggest that they are in the transitional phase between hunter-gatherer and pre-agriculture economies. Several reports (Tiwari, 1986; Samal et al. 2001; Pandey 2008; Kapoor et al., 2009; Pandey and Sharma 2015; Joshi et al. 2018) are available on the anthropogenic, developmental, and livelihood parameters of the Raji tribe. Most men in the tribe are laborers; few of them are forest product collectors. Females are mainly concerned with household activities along with the collection of firewood and grass either for domestic uses or to sell them in the local market. Both males and females catch fish from nearby rivers. Rice is the staple food that is consumed with wild vegetables.



Only a few studies have been carried out on the anthropometric measurements or nutritional status of the Raji tribes in Pithoragarh. Alam and Jha 2018 studied the health and nutritional status of the Raji tribe using anthropometric profiles such as height, weight, waist and hip circumferences. The findings of the study reported a lack of awareness, poor concern for a health checkup, poor lifestyle, and lack of balanced diet and nutritional requirements. The mean BMI of Raji tribes was found significantly lower as compared to other tribes of India. Also, the hemoglobin was 13.17 and 10.70 for males and females respectively indicating that the hemoglobin was low in females. In another study, Kapoor et al. 2008 studied anthropometric characteristics, nutritional status, and cardiorespiratory functions of Raji tribes. All the anthropometric and physiological dimensions such as lung functions, structural chest dimensions, muscular strength, stature, weight, and body circumferences showed a significantly negative correlation with age. Blood pressure and pulse rate showed significant positive correlations with age. People above 50 years of age were underweight.

Although some reports are available on the culture, food, and socio-economic dimensions of Bhotiyas of Pithoragarh (Bergmann, 2016; Bhandari et al., 2016; Rawat et al., 2019), a wide of the survey of the literature suggests that anthropometric measurements or nutritional status are poorly worked out. Kandpal et al. 2016 carried out an observational, cross-sectional study on Rang Bhotias, of Dharchula, Pithoragarh. The findings reveal hypertension, high BMI levels, MS, and abdominal obesity were the important health concerns among the studied populations. In a total sample of 288 participants (104 males and 184 females), high BMI (56.6 %), hypertension (43.4 %), metabolic syndrome (39.2 %), and abdominal obesity (33.7 %) were the most prevalent cardiovascular disease risk factors observed in the population. Age was found as a significant risk factor for all the abnormalities except elevated fasting blood glucose. The status of the tribe was found to be susceptible to various common disorders.

Most of the recent reports confirm that the health conditions of the tribal population are poor and they are more vulnerable to several diseases as compared to other groups due to poverty, illiteracy, malnutrition, non-availability of safe drinking water, unhygienic living conditions, poor maternal and child health services. However, some of the previous reports (Gupta et al., 1980) confirm that dietary habits and other livelihood modes are often suited to their advantage and provide adequate nutrition, and they may enjoy good health. The recent deterioration of the health of Indian tribes may be attributed to the transition from their early occupation to the present occupation. Shifting from agriculture or hunting to daily wagers is considered as a severe shock and the major reason for the deterioration of their health (Kapoor and Dhall, 2016).

## Conclusion

Annual report National Family Health Survey (NFHS)-4, 2015-2016 conducted by the Ministry of Health & Family Welfare shows that the Infant Mortality Rate (IMR) was more i.e. 44.4 per 1000 live births in STs as compared to the average IMR i.e. 40.7 per 1000 live birth of the country. The situation appears the same in the Under 5 Mortality Rate (U5MR) i.e. it was more (57.2 per 1000 live births) in STs as compared to the average (49.7 per 1000 live births) of the country. Likewise, the percentage of females aged from 15 to 49 years with anemia was also higher (59.8%) in tribal as compared to the national average (53%). The tribal population was found for a higher HIV prevalence (0.46%) than the other belonging to other castes.

Most of the studies on the health, nutrition, and anthropogenic parameters carried on the tribal populations reported that the tribal population living in India is more vulnerable than other populations. In a recent study, Kshatriya and Acharya, 2016 concluded that the Indian tribal population is suffering from the triple burden of obesity, undernutrition, and cardiovascular disease risk. In the survey of 1066 men and 1090 women belonging to 9 major tribal groups (Santals, Oraons, and Koras, Santals, Bhumijis, and Bathudis, Dhodias, Kuknas and Chaudharis) of India. A high prevalence of undernutrition and hypertension was observed among the Koras (51.9% and 10.6%, respectively), Bathudis (51.3% and 12.1%, respectively), and Oraons (49.6% and 16.5%, respectively). The prevalence of overweight and hypertension was most alarming. The prevalence of overweight or obesity among the women was 10.9% and 1.5%, respectively, with 14.0% hypertensive women. The prevalence of overweight and obesity among men was 14.8% and 1.7%, respectively, with 9.2% hypertensive men. Undernutrition was highly prevalent among men and women. Data from the past 30 years on systolic blood pressure (SBP) and body mass index (BMI) revealed that the studied tribes were at a higher risk than the general Indian population.

However, the Indian government is making efforts to tackle the problem of malnutrition. Several programmes and schemes with the potential to improve the nutritional status of the country have been started over the years. Some of them are National Rural Health Mission (2005-06), National Horticulture Mission (2005-06), Mahatma Gandhi National Rural Employment Guarantee Scheme (2005-06), Janani Suraksha Yojana (2006-07), Total Sanitation Campaign/ Nirmal Bharat Abhiyan, Midday Meals (2008-09), Integrated Child Development Services Scheme (2008-09), National Rural Livelihood Mission (2010-11), Jannai Suraksha Karyakaram (2011), Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A) approach (2013), Rashtriya Kishor Swasthya Karyakram (2014), India Newborn Action Plan (2014), National Health Policy, 2017, Poshan Abhiyan (2017-18), etc. Looking at the critical scenario of malnutrition, the government of India has also released a National Nutrition Strategy to reduce all forms of malnutrition by 2030. Despite all these efforts, malnutrition persisted in India which indicates a clear need for reforms in existing programs to ensure food and nutritional security at micro and macro levels. Attention must be paid to small and medium towns which have poor access to safe drinking. Advance contingency plans for vulnerable populations in terms of geographical inaccessibility and climate adversity need to be initiated by the government.

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