# Socio-Demographic Characteristics, Nutrition Profile and Health Related Practices of Soliga Tribes in Karnataka, India

**P. Puneetha[1], Sudha Sairam[2], Asna Urooj[3], U.V. Mani[4]**

*[1]Research Scholar, [2]Guest Faculty, [3]Professor and Chairperson, [4]Emeritus Professor, Department of Food Science and Nutrition, University of Mysore, Mysore*

## Abstract

Nutritional status is an important influence on overall health and wellbeing of a population. One of the vulnerable group is tribal population. The main tribe found in Karnataka is Soliga tribal community, majority of them have low economic status. Hence, malnutrition can be the most common condition arising in this community due to inadequate intake of dietary nutrients. In this purposive, free-living study, the detailed information on the population distribution, nutritional status, nutrient intake of Soliga community (30-65 years) were assessed using standardised questionnaires which included health and lifestyle related Knowledge, Attitude and Practice (KAP) questions. Anthropometric measurements were assessed using standard method. The dietary and nutrient intakes were collected using food frequency questionnaires and 24-hour dietary recall method. The tribal colonies mainly depended on minor forest produce and manual labour for livelihood, and majority of the study population were economically deprived. The BMI was normal in men, whereas women were undernourished. The 24-hour dietary recall data revealed that the subjects followed 2 major meals, about 97% population consumed mixed type of diet, the intake of macronutrients was lower than the recommended dietary allowances. The KAP survey revealed that subjects possessed good health and hygiene related knowledge and attitude, but poorly practiced. Constant monitoring of nutritional status and bridging the gaps in nutritional KAP of the tribal population can provide early warning of any deterioration in their health and nutritional status, hence facilitating effective planning and implementation of nutrition interventions in this unique population.

***Keywords:*** *Soliga tribes, Nutrient intake, Nutritional status, Knowledge, Attitude and Practice (KAP), Primitive Tribes, RDA.*

## Introduction

Malnutrition is one of the health issues which seek immediate attention from all the health sectors, as it is one of the risk factor for development of several health problems. The prevalence of malnutrition is not restricted to population of any age group or economical status. It is seen in most affluent population as obesity, overweight or as malnutrition in other population particularly under privileged as undernutrition.[1] This includes the tribes and primitive tribes living in interior forests in many parts of India. The tribal populations are recognised as socially and economically vulnerable. Their lifestyles and food habits are different from rural and urban population. They depend on minor forest produce and manual labour for livelihood, and do not have adequate income. Their food consumption pattern is dependent on the vagaries of nature and varies from extreme deprivation (in the lean seasons) to high intakes (in the post-harvest period).[2]

Higher prevalence of undernutrition in tribal population is due to poverty, lack of awareness, failing to utilize the available nutrition supplementation programmes from government. Additionally, poor

**Corresponding Author:**
**Dr. Sudha Sairam**
Guest Faculty, Department of Studies in Food Science & Nutrition, University of Mysore, Mysore
Current Designation: Assistant Professor, Department of Nutrition & Dietetics-FLS, JSS AHER, Mysore
e-mail: sudhasairam16@gmail.com

environmental sanitation and lack of safe drinking water; increased morbidity from water-borne infections, environmental conditions that favour vector-borne diseases, lack of access to health care facilities resulting in increased severity or duration of illnesses.[1,3]

Soliga tribes are an aboriginal forest tribe inhabiting in the states of Karnataka and Tamil Nadu since time immemorial.[4,5] The tribes are constituted in southern parts of India. They are described themselves as "Children of Bamboo". The dialect of the tribe is Soliga Nudi in Kannada script being used for writing.[6] In Karnataka they are mainly distributed in the interior of the forests, skirting the slopes of the Biligirirangana (B.R) Hills and Mahadeshwara (M.M) Hills of Chamarajanagar district.[4]

The Soliga community, for their survival, they mainly depend on shifting cultivation which is the traditional form of agriculture for centuries and along with hunting.[6,7] B.R. Hills forest is declared as tiger reserve in December, 2010 as BRT wildlife sanctuary.[9] Due to extensive deforestation, frequent natural calamities like drought and fire in forest, peoples are restricted to access into forest has led to the change in the traditional dietary practices, acute shortage and non availability of food and change in lifestyle pattern of Soliga tribes.[10] These conditions clearly indicate the need for continuous monitoring of nutritional status of the Soliga population which can provide early warning of any deterioration in the nutritional status in the tribes, so that appropriate intervention can be initiated. Hence, research studies identifying the nutritional deficiencies and health risk factors should receive attention and based on these data, specific intervention programmes can be taken up to improve nutritional status of vulnerable population. With this background**,** in the present study the anthropometric status, dietary intake and nutritional status of Soliga tribes spread around the B.R. Hills region in Karnataka were assessed using appropriate tools and method.

## Materials and Method

**Research Design:** Research was carried out by observations, questionnaire, and personal interviews with soliga tribes across the B.R. Hills. The study is purposive in nature. It is learnt from the review of literature that, there are hardly few studies on the life style, nutritional status, dietary habit and KAP in reference to nutrition of the Soliga tribes with socio-economic and cultural background. The aim of the study is to describe the diet and dietary habit and nutritional status for these tribes.

**Study Area:** Located in Chamarajanagara district, Karnataka, Indiathe Soliga tribes have been living in B.R. Hills for centuries.[5,7] They live in a tribal settlement called "Podu", each comprising of a group of 10 to 50 huts. Totally 61 podu are situated inside as well as in the periphery of the BRT Wildlife Sanctuary area, out of which 8 Podu were selected for the study. They are as follows-Yarakanagadde Podu, Seegebetta Podu, Kalyani Podu, Manjigundi Podu, Hosa Podu, Purani Podu, Bangle Podu and Muthagadagadde Podu.

**Selection of Subjects:** The study was conducted on free living subjects who are residing in B.R. Hills belonging to Soliga community. Around 100 subjects were recruited (50 women and 50 men) aged between 30-65 years old, and exclusion criteria was pregnant and lactating mothers, below 30 and above 65 years and subjects with severe clinical conditions. Human Ethical clearance was obtained from the Institutional Human Ethics Committee, University of Mysore, Mysore, Karnataka, India for conducting the present study. (IHEC-UOM No 49a/M.Sc/2015-16). All the subjects were included in the study based on their willingness to participate and were assured of confidentiality of the information collected.

**Data Collection:** The data such associo-economical status, anthropometric measurements, dietary pattern, 24 hour dietary recall were collected using standardized questionnaires and appropriate tools. Mean nutrient intake and nutrient deficit was analysed by comparing the actual intake with RDI as per ICMR guidelines of 2010.[11,12]

**Statistical Analysis:** Data were entered into Microsoft Excel (2007) and analysed using the SPSS version 16.0 (SPSS inc., Chicago, IL, USA).

## Results and Discussion

**Socio-economic and demographic profile of the study group:** The BRT wild life sanctuary area spreads over 571.06 sqkms. Approximately around 2,905 families were residing in the study area and all were mostly dependent on forest resources for their livelihood. The selected study population belonged to settelemts viz., Seegebetta Podu, Kalyani Podu, Manjigundi Podu, Yarakangadde Podu, Purani Podu, Hosa Podu and Bangle Podu.

The demographic data showed that the subjects were native to the tribal habitat and followed Hindu religion,

the population distribution consisted more between age group of 30-50 years. Literacy rate was only 25%, with education only up to primary school, about 95% had nuclear family type. The type of physical activity was heavy in men (74%) as they worked in nearby coffee plantation as daily wage labourers; remaining were involved in agriculture or as daily wages work. About 46% of women were observed doing heavy physical activity which included collection of water from distant water resources, grinding, collecting wood etc. Since the source of income for most of the subjects was through daily wages, the annual income of 77% of subjects ranged between INR Rs.5,000/- to Rs.10,000/-.

The morbidity profile data collected was limited with only two subjects confirmed with diabetes and hypertension, whereas obesity, leprosy and CVD was observed in one person each. This can be attributed to lack of knowledge on non-communicable diseases (NCD's) and less access to PHC facility in that region. The study region had only two health care setup, one Government Ayurvedic hospital, non-functioning during study period and a hospital run by Vivekananda Girijana Kayana Kendra (VGKK).

**Anthropometric assessment of selected subjects:** The mean anthropometric measurements of subjects are presented in Table 1. The somatic status of the subjects assessed showed that subjects irrespective of belonging to different podu possessed similar physical stature and anthropometric parameters such as height, weight, MUAC, waist and hip measurements. Similar pattern was observed in the WHR & BMI classification.

**Classification based on WHR:** The classification of subjects as per WHR ranges (Figure 1) showed that 40% of men and 70% of women subjects had normal WHR. 52% and 8% of men population had WHR between 0.81-0.9 (abdominal obesity-1) and less than 0.9 (abdominal obesity-2) respectively. The higher WHR in men can be attributed to the change in food intake pattern, i.e., introduction of foods other than their traditional foods.

**Classification based on BMI:** The classification of subjects as per BMI grading is represented in Figure 2. From the data on BMI, it was observed that 54% men and 58% women were under normal BMI category, 28% & 32% were undernourished and 16% & 4%overweight respectively. Obesity (grade I) was observed in 2% and 6% of men and women respectively. The anthropometric assessment showed that most of the subjects had normal BMI which may be due to the geographical condition, consumption of available foods and rigorous physical activity. The prevalence of malnutrition was higher in women than men, similar trend was observed in the prevalence of overweight or obesity. Many research studies supports the prevalence of malnutrition and micronutrient deficiencies in tribal population, the incidences of overweight & obesity indicates the phase of nutrition transition, acceptability of foods other than traditionally followed food pattern.

**Dietary Assessment of the selected subjects:**

**Food frequency record:** The variety and food consumption pattern was recorded using Food frequency Questionnaire (FFQ) according to food groups. The subjects predominantly consumed rice and finger millet daily (100% subjects), followed by wheat (71%) and Jowar (54%) subjects. The commonly used pulse were toor dhal (96%), followed by green gram dhal (70%), black gram dhal (57%), horse gram dhal (77%), cow pea (81%) and field bean (80%). Black gram dhal was consumed by 31% subjects once in a month. Significantly higher percentage of subjects consumed locally grown roots and tubers such as carrot (74%), potato (86%), onion (100%), radish (46%), and tomato (100%). Other vegetables like beans and brinjal were consumed on weekly basis. Green leafy vegetables (GLV) such as *Solanumnigrum* (Ganikesoppu in Kannada) and *Alternantherasessilis* leaves (Honganne in Kannada) were consumed by 54% of subjects once in a week since they were the forest produce and locally available. It was observed that the consumption of vegetables and GLVs was seasonal and subject to availability.

In the fruit group banana was the only fruit used once in a week by 69% of subjects. Other fruits like apple (65%), orange (71%), mango (72%), sweet lime (65%), pomegranate (65%), papaya (57%), guava (65%), jack fruit (72%), watermelon (64%), and pomela fruit (Kannada name–Chakotha) (60%) were consumed occasionally. Milk was consumed daily by only 43% subjects, butter-milk by 6%, curd by 5%, clarified butter (ghee) was never consumed by the subjects. About 45% of the subjects were reported to consume egg once in a week, whereas meat (91%) and poultry (84%) was on monthly basis, consumption of fish was very rare. The less frequency of these foods groups can be attributed the lower income status and less availability of the product.

Among confectionaries, jaggery was main source of sweetener, used daily by 99% subjects, occasionally intake of sugar. Majority of subjects expressed non consumption of bakery or junk foods, chocolates, commercial fruit juice and carbonated beverages. The intake of nuts and oilseeds was dependent mainly if self-cultivation or on availability. About 59% subjects included coconut in the diet weekly and groundnut (54%) twice in a week. Among fats and oils, currently only commercially available refined sunflower oil was consumed as it was distributed by Government under Tribal Welfare schemes.

**Nutrient intake assessment using 24-hour dietary recall method:** The mean nutrient intake and nutrient deficit of the study population are presented in Table 2. The detailed information of food consumption was recorded using 24 hour dietary recall method. The actual nutrient intake of the subjects was compared with the prescribed Indian RDA and accordingly the nutrient deficit was calculated. The energy deficit was observed in 36% of men & 27% women, but the mean protein intake (66%) was similar in both gender. Fat intake was observed to be very less than RDA with percentage of women (84%) showing higher deficit in fat intake deficit than men (74%). Although the energy, protein and fat intakes were inadequate when compared to RDA, it did not reflect on their body weight as BMI was in Normal range for majority of the subjects irrespective of the podu.

**Government initiative:** To ameliorate the nutritional status of the tribal population, the Department of District Tribal Welfare office, Chamarajanagara district, Chamarajanagara initiated the scheme "Poustika Aahara Yojane" (nutritious food supplement) from the year 2011. Under this scheme selected food items were supplied to target groups every year for a period of 6 months: particularly during rainy season (June to November). This scheme has been successfully implemented in the Chamarajanagara district giving better nutritional support for the target population, who are socio-economically deprived because of unemployment, severe environmental conditions and also to prevent migration of the tribal population. Along with this program, the tribes were also provided with the monthly ration from public distribution system (Society Ration) which included Finger millet (15 kg), Lentil (5 kg), Horse gram (3 kg), Cow pea (1 kg), Green gram (1 kg), Jaggery (4 kg), Cooking oil (2 lt), Egg (45 no.) and Ghee (Clarified butter-1 kg). It is noteworthy that the food and nutritional security of tribal communities mainly depended on natural food sources available in forest or self-farming and various assistance programmes provided by the Governmental agencies.

**Nutrition and health related KAP among selected subjects:** The questions on the diet, nutrition and hygiene related knowledge, their attitude towards them and related practices were asked as yes or no format, and are presented in Tables 3 and Table 4. It was observed that most of the subjects possessed fair knowledge regarding food and various food groups and cooking method. They also had the good knowledge on health and hygiene aspects, and ill effects of consumption of alcohol, smoking, chewing of tobacco. About 67% of the study population had good knowledge of common illness and traditional medications. The subjects were aware of the beneficial effects of foods they consumed but lacked the knowledge regarding macro and micro nutrients present in the food items.

The subjects knowledge on health and hygiene aspects did not reflected in their attitude and practices. About 77% of subjects did not consume meals on time and followed minimal or no exercise regime. 80% of the subjects had the habit of skipping meals. Around 66% of study population were taking medications without doctor prescription. The subjects were unaware of effects of cooking and processing on food and practiced poor to fair hygiene and sanitation aspects. The KAP questions revealed the characteristic traits in knowledge, attitude and behaviours about health and hygiene related factors, which is very essential to improve knowledge and also to bridge the gaps between knowledge and implementation.

**Limitations:** The study did not cover the other podutribes residing in the BRT Sanctuary, due to the following reasons, 1) Limited time period, 2) Difficulty in access to interior podu of the forest due to lack of transportation and presence of wild life, 3) Availability of the subjects and 4) Conservative nature of the subjects. However, inspite of these limitations the insights gathered from the data are valuable, covering the objectives of present study and could lead to plan better strategy and design specific research study for future work.

**Table 1. Mean anthropometric measurements and indices of selected subjects (n=100)**

| Age: 30-65yrs | Gender | |
|---|---|---|
| | Men (n = 50) | Women (n = 50) |
| Height [cm] | 156.52 ± 8.70 | 148.76 ± 7.38 |
| Weight [Kg] | 49.46 ± 9.23 | 43.33 ± 6.94 |
| Waist [cm] | 70.5 ± 9.36 | 67.9 ± 7.88 |
| Hip [cm] | 84.26 ± 7.41 | 84.78 ± 8.98 |
| MUAC [cm] | 23.11 ± 2.86 | 22.6 ± 2.69 |
| BMI | 20.30 ± 3.23 | 19.50 ± 2.72 |
| WHR | 0.83 ± 0.05 | 0.76 ± 0.05 |

MUAC- Mid Upper Arm Circumference, BMI- Body Mass Index, WHR- Waist Hip Ratio

**Table 2. Mean nutrient intake of selected subjects with nutrient adequacy (n=100)**

| Nutrients | Actual dietary intake | | RDI* | | Nutrient deficit (%)* | |
|---|---|---|---|---|---|---|
| | Men (± SD) | Women (±SD) | Men | Women | Men | Women |
| Energy (Kcal) | 1731.65±559 | 1619.49±666 | 2730 | 2230 | 1000(36) | 611(27) |
| Protein (g) | 39.94±12.37 | 36.85±14.51 | 60.0 | 55 | 20.11(34) | 18.18(33) |
| Fat (g) | 10.43±10.03 | 8.98±10.15 | 30 | 25 | 22.17(74) | 20.7(83) |
| Dietary fibre (g) | 49.73±10.48 | 45.57±10.50 | 40 | 40 | 161.4(81) | 167.57(84) |
| Calcium (mg) | 622.59±299 | 493.27±165 | 600 | 600 | 22.03†(4) | 106.8(18) |
| Iron (mg) | 15.15±5.79 | 14.14±6.98 | 17 | 17 | 1.91(11) | 2.85(17) |
| Thiamine (mg) | 1.07±0.80 | 0.80±0.23 | 1.4 | 1.1 | 0.49(35) | 0.29(26) |
| Riboflavin (mg) | 0.61±0.16 | 0.50±0.15 | 1.6 | 1.3 | 0.99(62) | 0.79(61) |
| Niacin (mg) | 7.08±2.59 | 6.86±3.12 | 18 | 14 | 10.92(61) | 7.13(51) |
| Vitamin-C (µg) | 43.12±22.39 | 39.69±12.59 | 40 | 40 | 2.86†(7) | 1.69(4) |
| β Carotene (µg) | 894.99±278 | 814.73±284 | 4800 | 4800 | 3910.39(81) | 3984.97(82) |

**Note:** Values in parenthesis indicate percentage (%) intake of nutrients, RDI- Recommended Dietary Intake, * represents recommended intake of nutrients and † represents excess nutrient

**Table 3. Health and hygiene related knowledge and attitude among subjects (n=100)**

| Sl No | Health and hygiene related knowledge and attitude | Yes | No |
|---|---|---|---|
| 1 | Food is important for health | 87 | 13 |
| 2 | Food is consumed | | |
| | to fill the stomach | 95 | - |
| | to maintain good health | - | - |
| | Both | 5 | - |
| 3 | Cereals, pulses and millets are major source of most nutrients | 43 | 57 |
| 4 | Consuming ragi ball (finger millet pudding) is better than rice | 78 | 22 |
| 5 | Fruits and vegetables are good for health | 86 | 14 |
| 6 | Water is important for health | 18 | 82 |
| 7 | Sprouted/fermented foods are good for health | 58 | 42 |
| 8 | Green leafy vegetables are good for health | 76 | 24 |

| Sl No | Health and hygiene related knowledge and attitude | Yes | No |
|---|---|---|---|
| 9 | Chapathi and ragi ball are rich in fibre | 67 | 33 |
| 10 | Washing of chopped vegetables leads to leaching of micronutrients | 43 | 57 |
| 11 | Steaming is better than deep frying or baking | 70 | 30 |
| 12 | Consumption of unsafe foods can lead to food borne diseases | 61 | 39 |
| 13 | Soft/liquid diet helps in fast recovery in medically ill patient | 67 | 33 |
| 14 | Do you think following regular meal timing good for health | 23 | 77 |
| 15 | Do you think regular physical activity or exercise helps to maintain good health condition | - | 100 |
| 16 | Do you prefer eating outside/junk food | 7 | 93 |
| 17 | Does excess of bakery food consumption be avoided | 64 | 36 |
| 18 | Do you prefer fruits overjunk foods | 100 | - |
| 19 | Do you believe eating of unripe papaya may lead to abortion | 65 | 35 |
| 20 | Do you know smoking, consumption of alcohol or tobacco and its products (Khaini, Zarda, Paan Masala) are injurious to health | 100 | - |

**Table 4. Health and hygiene related practices among subjects (n=100)**

| Sl No | Health and hygiene related practice | Yes | No |
|---|---|---|---|
| 1 | Do you follow 3 major meals per day | 20 | 80 |
| 2 | Do you consume the following | | |
| | a. Milk | - | - |
| | b. Tea | 100 | - |
| | c. Coffee | - | - |
| 3 | How often do you consume fruits | | |
| | a. Daily | 2 | - |
| | b. Weekly | 11 | - |
| | c. Monthly | 3 | - |
| | d. Occasionally | 84 | - |
| 4 | Do you drink around 2 lt of water per day | 72 | 28 |
| 5 | Do you drink boiled water, when safety of the water is in doubt | 35 | 65 |
| 6 | Do you re-use the oil which is used once or twice | 99 | 1 |
| 7 | Do you wash vegetables and fruits thoroughly before use? | 79 | 21 |
| 8 | Do you use thoroughly cleaned utensils for cooking/eating purpose | 53 | 47 |
| 9 | Do you regularly clean the cooking and food storage area | 76 | 24 |
| 10 | Do you cook foods in vessels covered with lids | 53 | 47 |
| 11 | Do you smoke/consume alcohol/tobacco every day | 38 | 62 |
| 12 | Do you follow myths and believe in any particular food | 1 | 99 |
| 13 | Do you maintain good personal hygiene | 76 | 24 |
| 14 | Do you brush your teeth and take bath every day | 24 | 76 |
| 15 | Do you wash hands before eating | 78 | 22 |
| 16 | Do you wash hands after defecations with water or soap | 80 | 20 |
| 17 | Do you go for regular health check-up | 11 | 89 |
| 18 | Do you take any medications without physician's prescription | 94 | 6 |

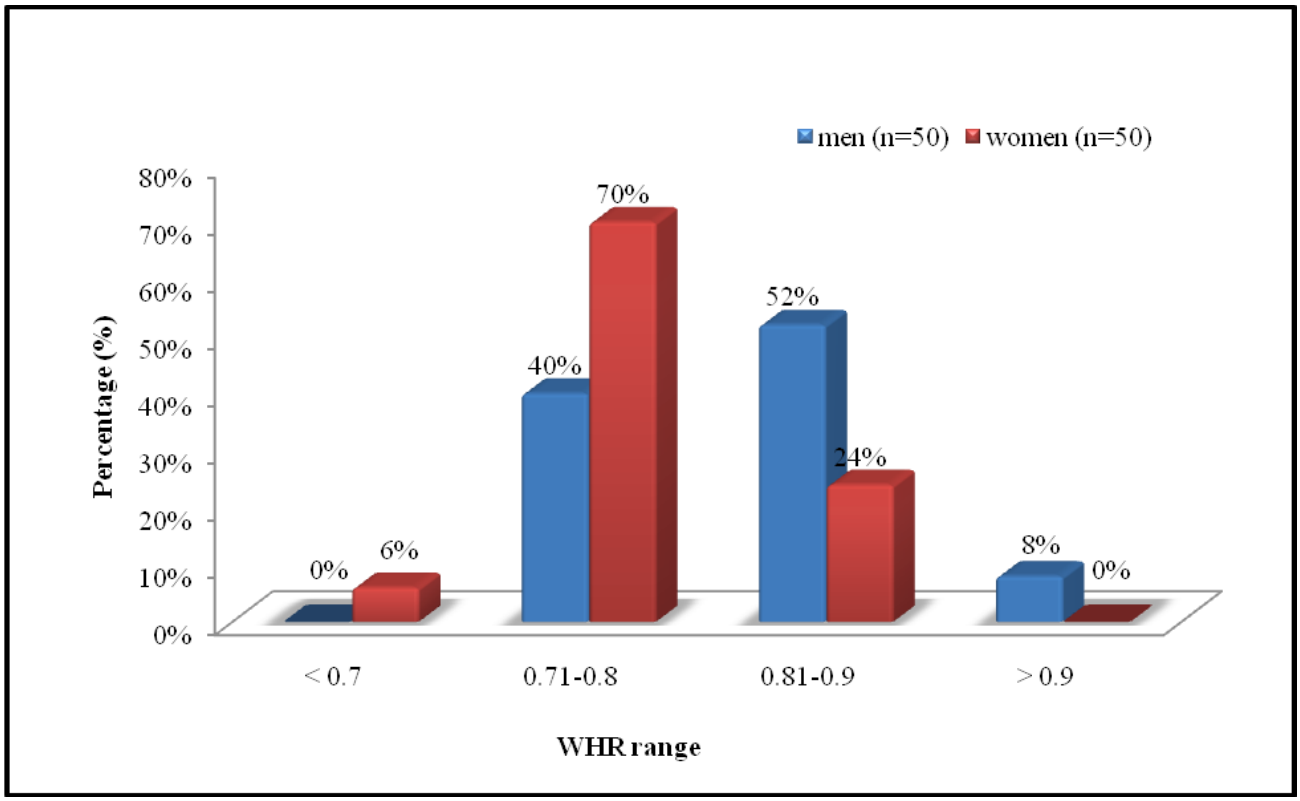


**Figure 1. Classification of subjects based on WHR (n=100)**

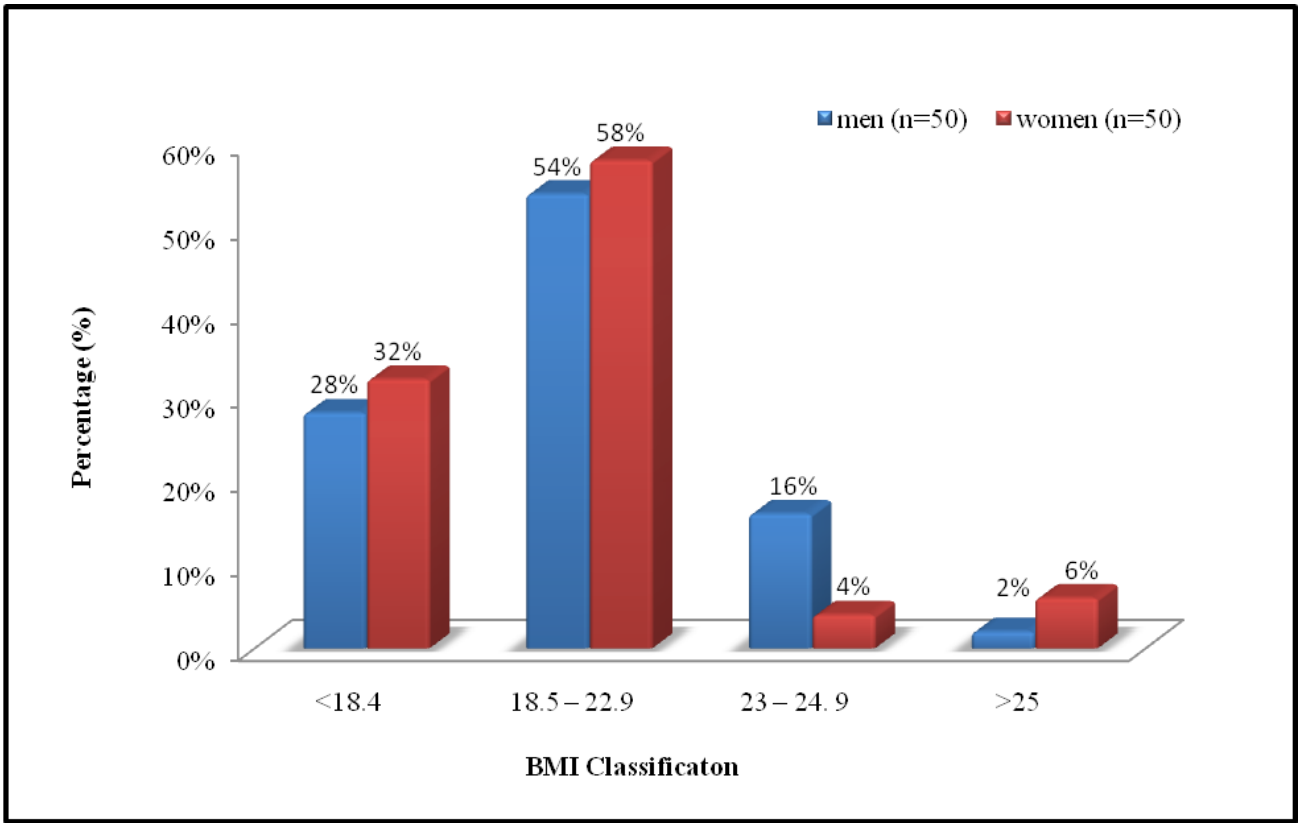


**Figure 2. Classification of subjects based on BMI (n=100)**

## Conclusion

The Soliga tribe is one of the primitive tribe of Karnataka residing mainly in B.R. Hill region. Previous research studies on Soliga community have focussed on the diversity, distribution and ecology, but studies on the dietary intake of primitive tribes are very few. **Till date there are no reports on the food frequency intake, nutrient intake and nutrient deficit in Soliga tribal community, hence this study is first ever survey conducted covering these aspects.** Further studies overcoming the limitations and covering the larger Soliga population enables to continuously monitor any changes in the dietary pattern and lifestyle practices. Research studies not only facilitate effective implementation of nutritional interventions, also helps in protect and safe documentation of the rich traditional and indigenous ecological knowledge which is passed on from generations.

**Financial support and sponsorship:** Self

**Conflicts of Interest:** Authors declare that **t**here are no conflicts of interest.

## References

1. Das S, Bose K. Nutritional deprivation among Indian tribals: A cause for concern. Anthropological Notebooks. 2012 Sep 1;18(2).
2. Rao V, Babu R. Nutritional Status of Baiga Tribe of Baihar, District Balaghat, Madhya Pradesh. Nutrition & Food Sciences. 2014.
3. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990–2020: Global Burden of Disease Study. The lancet. 1997 May 24;349(9064):1498-504.
4. Kumar S. Genetic Profile of JenuKuruba, Betta Kuruba and Soliga Tribes of Southern Karnataka and their Phylogenetic Relationships. The Anthropologist. 2008 Jan 1;10(1):11-20.
5. Heggade P, Heggade OD. Economic Empowerment of Tribal Women in Karnataka: A Case Study in Mysore and Chamarajanagara Districts. Studies of Tribes and Tribals. 2012 Dec 1;10(2):173-81..
6. Zaraska NA. Health behaviours of the Soliga tribe women. Master's thesis, school of rehabilitation therapy, queen's University, Ontoria, Canada 1997. Available from: http://www.collectionscanada.gc.ca/obj/s4/f2/dsk2/ftp04/mq22434.pdf
7. Naveena NL, Subramanya S, Setty S. Diversity and distribution of stored grain insects among the Soliga Tribal settlements of Biligirirangana Hills, Karnataka, India. Journal of Stored Products Research. 2015 May 1;62:84-92..
8. Sushma M, Jayashankar M, Vinu AK. Traditional Knowledge on few Medicinal Plants of Biligirirangana Hill, Karnataka, India. Indian Journal of Pharmaceutical and Biological Research. 2018 Jan 25;6(03):23-9.
9. Sinha AK. Nutritional security along with Food security: A major need in tribal areas. Asian Mirror–Int. J. Res. I. 2014:1-4.
10. Kothari CR. Research methodology, New delhi. New age international publishers. 2004;2.
11. Indian Council of Medical Research (2010) Nutrient requirements and recommended dietary allowances for Indians. National Institute of Nutrition, Hyderabad, India.
12. Indian Council of Medical Research (2011) Dietary guidelines for Indians—a manual. National Institute of Nutrition, Hyderabad, India.