Review Article

# Demographic Dynamics and the Changing Faces of Nutrition Literacy in India: A Tryst with the Transition among Communities Over Two Decades

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**Abstract**

**Aims and Objective:** The development of a nation depends on well-nourished individuals. A country's economic independence also depends on adequate food supply for all sections of its population and the proper selection of the right kinds of food, called nutritional literacy. This review will show the transition of dietary selection and practices across India over the last two decades and its impact on health. **Materials and Methods:** We conducted a literature search to review the evidence of the last two decades. The literature search was done using the PubMed search engine and the MeSH words "Nutrition Literacy, Dietary Practices, Diet Transition, Nutrition transition, India and Food pattern." Evidence from the last two decades was collectively reviewed, and observations on the transition in nutrition literacy were summated. **Results:** The literature search revealed 18 articles, out of which 13 articles were included in this review based on inclusion–exclusion criteria. Nine were review articles, and five were cross-sectional studies. The studies done over the last two decades on nutrition culture revealed that most of the studies related to transition have been done during the second decade of the twenty-first century. Most have found that the shift has been happening more among the urban poor and rural rich people. Indian diets have diversified and shifted away from cereals towards processed food. **Conclusion:** It was found that there is a shift in feeding preferences in diet-deprived sections in India. The findings are similar in rural and urban areas where the poor fall prey to the food fads, make poor nutrition choices, and gradually develop chronic ailments. Such a transition over the years clearly shows that a malnourished child, having faulty feeding practices, becomes prey to the triple burden of hidden hunger, lack of nutrition, and repercussions of chronic non-communicable diseases, including dental ailments.

**Keywords:** *Demography, dental problems, India, nutrition literacy, transition*

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## Introduction

The development of a nation banks on well-nourished individuals who can toil, reflect, and contemplate critically, thereby bestowing the new skills learned toward the progress of communities. A country gathers economic independence with an adequate food supply and gradually eliminating dietary deficiencies.[1] However, it has been discerned that when nations with ubiquitous diet deprivations start getting abundant food supply, there is a habitual manifestation of a shift in feeding preferences, work culture, amusement, and inactivity. This becomes the harbinger of negative consequences of the transition, leading to an epidemic of non-communicable diseases in low to middle-income countries. This transition

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is detrimental to nutrition literacy, which assists in maintaining and improving health through selecting the right foods.[2,3]

The nutritional scenario regarding preferences, choices, practices, and overall literacy in India has experienced remarkable shifts in the last few decades. The troughs of food scarcity, nutritional deficiencies, deprivation, famines, malnutrition, and droughts have stood the tests of time. The national programs of our country for nutrition have always served the purpose of confronting the dearth and pitfalls, but they still need to superintend the insidious genesis.[4]

In the late twentieth century, as countries grappled with the challenges of combating infectious diseases, there was not enough awareness and understanding of the impending complexities and fatal consequences caused by widespread food insecurity and chronic undernutrition. The Green Revolution fatigue initiated a consequential retaliation, wherein the household food security improved and severe manifestations of malnutrition depleted due to better access to health care. However, there was limited awareness of their right to choose proper food as well as reflect upon the concept of "Hidden Hunger," which arose out of micronutrient deficiencies.[5,6] India has also encountered a steep and steady upsurge in urban migration in the last two decades. Besides offering job opportunities and rogue living conditions, the migration also offered a shift in their feeding patterns, resulting in a dual burden. Along with chains of poverty, obesity rates began to rise. The young population in India must be leveraged by investing more in access to nutritious diets, healthy promoting lifestyles, making them more nutrition literate and providing a sanitary environment.[4-7]

This nutritional transition was paradoxical since those who had experienced calorie deprivation and faltering growth in early childhood due to poverty and deprivation, subsequently, with better access to food and low physical activity, fell prey to non-communicable diseases, oral health problems, and obesity. Nutrition literacy empowers individuals to make informed choices about their diet that support general and oral health. Barker's hypothesis linking low birth weights and early nutritional deprivation with obesity in adulthood and accompanying metabolic disorders focuses the spotlight on the crucial importance of a "life-cycle approach" to nutrition.[1] This review will show the transition of dietary selection practices and nutrition literacy across India over the last two decades and its impact on health.

## Materials and Methods

We conducted a literature search to review the evidence of last two decades and summate key findings. The literature search was done using PubMed search engines and the MeSH words "Nutrition Literacy, Dietary Practices, Diet Transition, Nutrition transition, India and Food pattern." Original articles, reviews, case reports, multicentric studies, technical reports or any other historical articles in English medical journals among all age groups were included from 2000 to 2020 over 20 years. Any other paper not fitting into the ambit of our objective and outcome, whether abstracts, duplicate, retracted publications, interviews, editorials, directory, research support, controlled trials, education handouts or any newspaper articles beyond the duration, were excluded. The search strategies were repeat checked by two other reviewers using the peer review checklist and a similar process was followed for data charting. The key findings were tabulated.

## Results

The literature search revealed 18 articles, out of which 13 articles were included in this review based on inclusion–exclusion criteria. Nine were review articles, and five were cross-sectional studies as mentioned in Table 1. Most of the studies have been done on children and adolescents. The studies done over the last two decades on nutrition culture revealed that most of the studies related to transition have been done during the second decade of the twenty-first century. Most of them have found that the shift has been happening more among the urban communities. The urban poor, however, have been showing greater increases in their rate of transition as well as nutrition literacy. In rural areas, it is the rural rich who are affected. Hidden hunger is relevant across all strata due to micronutrient deficiency. In addition, the studies also revealed that dietary patterns are changing globally towards more intake of simple refined carbohydrates, fats and lower intake of complex carbohydrates and the consumption of processed food is increasing, causing overweight, malnutrition, comorbidities and obesity.[6] Sugar consumption is decreasing in urban but increasing in rural areas.[7-9] Obesity increased in middle-income families, probably among those who moved up the scale from deprivation. The most commonly consumed food was refined grains.[10,11] In overweight states (Kerala, Punjab, Delhi) obesity problem expanded from urban rich to urban poor; the rise was higher among the urban Poor. Among the urban rich, married women are mostly affected.[12] Consuming more energy-dense food is causing diet-related non-communicable diseases.[10,13-15]

**Table 1: Transition in dietary practices across India from 2000 to 2020**

| Title | Year | Methodology | Major findings | Specific recommendation |
|---|---|---|---|---|
| The double burden of malnutrition: etiological pathways and consequences for health.[5] | 2020 | Review and comment | Long lasting malnutrition can have interconnected biological pathways, gut microbiome imbalance, inflammation, metabolic dysregulation, and impaired insulin signaling. Life course exposure to early undernutrition followed by being overweight increases the risk of non-communicable disease. | Mitigation by working on societal driving factors, that is, rapidly changing diet, norms of eating, physical activity |
| Dietary transition in India: Temporal and regional trends, 1993 to 2012[8] | 2019 | Review of household consumption | Triple burden of Malnutrition + micronutrient deficiency + obesity. Indian diets have steadily diversified and shifted away from cereals and more towards milk, processed food-heavy diets. | Micronutrient deficiency needs attention since it'll increase burden of oxidative stress injury |
| Nutrition transition and obesity among teenagers and young adults in South Asia.[2] | 2017 | 4-stage systematic search | 19% overweight. Risk factors associated: skipping breakfast, fast food consumption, extra salt, and watching TV while eating (teenagers). | Regional preventive strategy |
| Impact of nutrition transition and resulting morbidities on economic and human development.[6] | 2017 | Series review | Dietary patterns are changing globally towards more intake of simple refined carbohydrates and fats and a lower intake of complex carbohydrates. Upsurge in co-morbidities arising from nutrition transition. Massive impact on the Indian Economy | Create stringent mandates and awareness. Explore healthier diet options. |
| Development and evaluation of nutrition transition-FFQ in South India.[7] | 2017 | NT–FFQ survey | Concordance for eating while watching TV, frequent snacks, red meat, fried ready-to-eat food. (Adolescents) | Need to quantify the nutrition transition and put a check. |
| Association between full service and fast-food restaurant density, dietary intake and overweight/obesity among adults in Delhi, India.[11] | 2017 | Cross-sectional population-based | The most common full-service and fast-food restaurants were Indian Savory (57%), followed by sweet shops (26%) and Western (14%). The most common consumption was refined grains; most customers were obese, alcoholic, and had moderate physical activity. | Further research is needed to explore association prospectively. |
| Going global: Indian adolescents' eating patterns.[13] | 2016 | Cross-sectional Survey using FFQ | Consumed more energy-dense food. Private school students took up traditional expensive foods (dairy, homemade sweets and added fats) more than public school students who ate more traditional (tea, coffee, eggs) and mixed food (snack, street food) | Promote diversity and health fullness of global food by considering the preferences. |
| Overweight prevalence among Indian women by place of residence and SES: Contrasting patterns from "underweight states" & "Overweight states" of India.[12] | 2015 | Secondary data analysis | In overweight states (Kerala, Punjab, Delhi) obesity problem expanded from Urban rich to Urban poor; the rise was higher among the Urban Poor. For underweight states (Bihar, MP, Odisha), obesity is spreading more among the urban rich among married women. | Design state and SE strata-specific approaches to arresting the rapid growth |
| Food choices and consequences for the nutritional status: Insights into nutrition transition in a hospital community[10] | 2015 | Nutrition calculation software | 42% of underweight children belonged to Class 1 families. Most of the overweight children belonged to Class 2. In Class 3 families, there were normal-weight children. Underweight children came from poorer households. There was increased obesity in middle-income families, probably among those who moved up the scale from deprivation. | Most commonly associated with maternal education, and so this needs to improve. |
| Nutrition transition in India: Secular trends in dietary intake and their relationship to diet-related non-communicable diseases.[10] | 2015 | Review and literature search | India is facing—diet-related non-communicable diseases and widespread undernutrition leading to a socioeconomic burden. The transition has resulted in a 7% decrease in energy from carbohydrates and a 6% increase in fats. Resulting in adverse perinatal events, LBW, Metabolic syndromes and early childhood catch-up growth. | Multi-sectoral preventive approach early childhood approach across life cycle |

**Table 1: Continued**

| Title | Year | Methodology | Major findings | Specific recommendation |
|---|---|---|---|---|
| The adherence of packaged food products in Hyderabad, India with nutritional labelling guidelines.[14] | 2010 | Packaged products assessed | 52% displayed information based on energy, protein, sugar, fat, meeting the minimum requirements of FSSAI. But only 27% met the minimum criteria as per Codex. It also needs reporting of sodium & saturated fat. Significant variation in compliance for leading brands and food groups. | The majority need to meet the labelling guidelines. These warrants review. |
| The nutrition transition and adolescents' diets in low- and middle-income countries: a cross-cohort comparison.[9] | 2006–2013 | Changes in dietary diversity (DD) | DD was stable in India. Indians were more likely to consume eggs (+32%), and milk (+12%). No marked gender disparity or Urban-rural differences, but regional predilection within the nation is present. Sugar consumption decreased in urban but increased in rural areas. Increased animal-source food like eggs and milk is associated with increased per capita income (adolescents). | School-based policies for healthy diets. Global context-specific policies to avert negative health consequences. |
| Trends in diet, nutritional status, and diet-related noncommunicable diseases in China and India: the economic costs of the nutrition transition.[15] | 2001 | Review | Adult-onset diabetes is more common in India. Projections were that India's Costs for Undernutrition would decline initially but would rapidly increase for both under and overnutrition by 2025. | – |

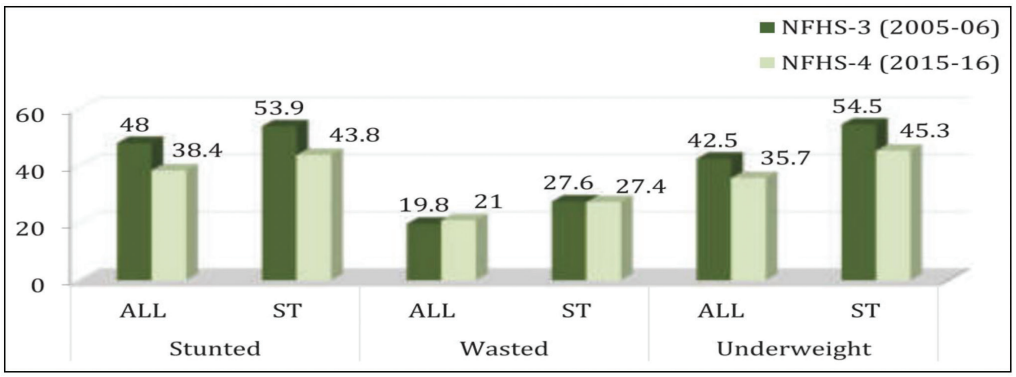


**Figure 1:** Comparison of Nutritional status of tribal communities, India. *NFHS = National Family Health Survey, ST = scheduled tribe

Figure 1 shows the trend of nutrition status and how it has decreased for stunting, wasting and underweight in India, but the tribal community still has a higher burden to get the better of. India's stunting rates have made a 10% downward shift over 10 years, whereas, those for wasting have shown an increase (19%–21%), and that of underweight has decreased from 42.5% to 35.7%. The overall figures for tribal communities show higher figures as compared to national statistics, although, the specific ranges for wasting, stunting and underweight categories have shown slight decrease, over the 10-year period of assessment.[16,17]

As in Figure 2, the comparison shows that States with a higher percent of tribal population such as Andhra Pradesh, Madhya Pradesh, Odisha, Rajasthan, and Assam, also have greater numbers of rural tribals below poverty line as compared to the urban tribals. The literacy rates of tribals from Odisha, MP, and Andhra Pradesh, however, are comparable, but the literacy rates for Assam and Himachal Pradesh tribals are too high. Interestingly, the forest areas in regions of MP and UP tribal areas have depleted maximum, and it is here that the rates of crime and atrocities toward the tribal people are also found to be the highest. This shows that forest land area, atrocities, poverty, education, and nutrition status are relatable.[17,18]

## Discussion

Nutrition during the earlier years of the first decade of the twenty-first century mostly indulged with setbacks

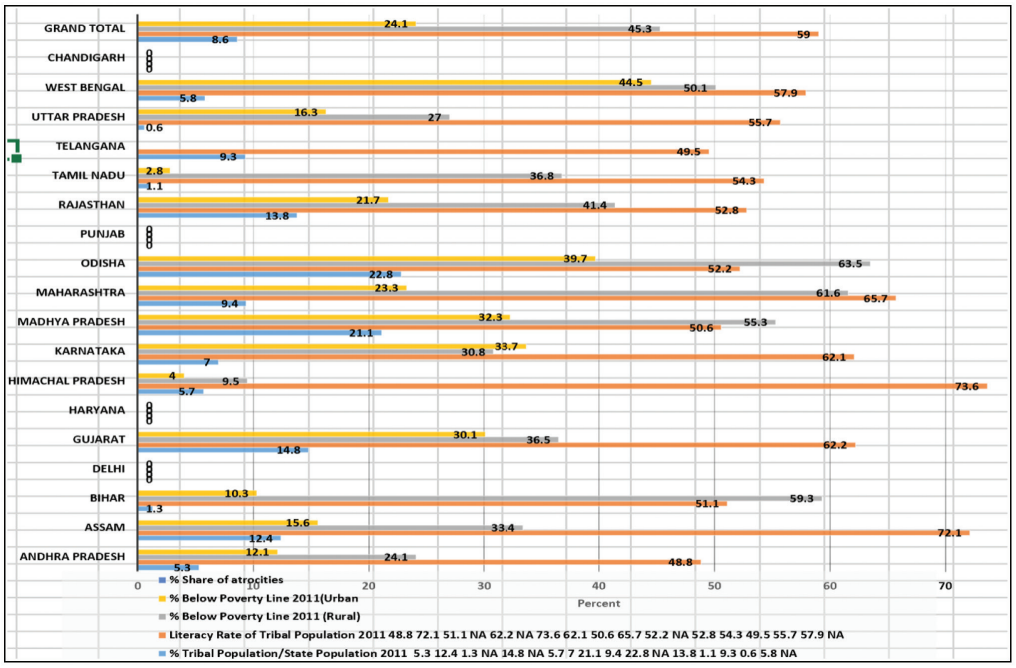


**Figure 2:** A state-wise comparison of demography and nutritional problems among the tribal communities in India

of undernutrition. Nutrition patterns for both strata showed a clear picture among adolescents in schools. Students from higher strata mostly went for a non-vegetarian diet, fried junk food, aerated sugary drinks, or energy-dense refined packaged food items.[7-9] They frequently visited restaurants and also preferred incessant snacks. The canteen visits, snacking, fast food joints, etc., all hatched a habitual pattern that the students from lower/middle strata started going around with. They, however, could prefer street food, locally branded packaged items or homemade energy-dense foods; based on their levels of affordability or family norms. Omitting the tiffin from homes or morning breakfast had become a regular thing. The frequency of snacking in school canteens or the food vendors outside schools had become the fad that all students, irrespective of their family status, wished to follow.[13] Indian diets have steadily diversified and shifted from cereals to milk and processed food. The findings of studies done during the second decade suggested that urban poor have been showing greater increases in their rate of transition as well as nutrition literacy. Increased incidence of obesity observed in middle-income families, probably among those who moved up the scale from deprivation. Exposure to early undernutrition followed by being overweight increases the risk of non-communicable disease.[5,10] Similar studies show a widespread shift from communicable to non-communicable diseases concentrated in low- and middle-income countries and accompanied by a global trend toward increased consumption of energy-dense, processed foods, known as the nutrition transition.[9,10,19,20] The convergence and the transposition in diets are more pronounced for adolescent or young adult groups since they are most exposed to and influenced by the food environment factors, advertisements, or promotions. It happened more commonly in developed megacities earlier because the noted changes in the diet diversity patterns or composition also reflect the extent of influence of the global economic forces on food systems, which penetrates the metropolitan cities first. In simple words, the more global trading or global economic forces a city is exposed to, the faster the transition of the dietary benchmark.[9]

A study done on 641 students from Class IX and XI in the urban and rural schools of Chandigarh in 2001 revealed that snacking was a well-established trend set up across all classes of society. Although it was more affordable among the higher socio-economic class, it was rampant across all strata (Table 1S). Traits among rural adolescents showed that most of them were vegetarian, did not bring tiffin to schools, avoid morning breakfast, and prefer eating food outside. A mere 15% brought healthy foods in their tiffin snacks. Approximately one-third of the students practiced fasting on special days. On the other hand, most of the urban adolescents were vegetarian, but the number was less than rural adolescents. Most of the urban students preferred junk food and regular snacks. Very few students practiced fasting. The family traits, anthropometric assessments,

and knowledge about diet and obesity is mentioned in Table 1S. Considering the knowledge of students, it was found that 93% of rural adolescents were unaware of balance diets as compared to 88% in urban areas. However, more urban adolescents knew about obesity and its repercussions.[21]

Another study to compare the nutrition trend of tribal people in rural versus urban Odisha assessed consumption patterns, anthropometry, and food product analysis. Biochemical profile was done among approximately 4000 households by a cross-sectional-based survey conducted during the second decade of the twenty-first century. A comparison of the study findings shows that rural tribals have a greater population of tribals, are less literate, and belong majorly to Below Poverty Line and low Socio-economic strata with very less average per capita income. On the other hand, the urban tribals had lesser forest coverage, better road and communication, depended more on junk food, and had a higher risk of non-communicable diseases. The random blood sugar, triglycerides and cholesterol values were much higher among the urban tribals as compared to the rural tribals [Figure 1S].[22] The tribal urbans were mostly migrants who initially spent life in deficiency, but gradually started managing their survival. They are no longer earning just hand to mouth. So, these sections of urban poor start spending just enough income on the whims and fads of their children. As a result, they feed upon based on peer trends, advertisements or options at local shops. Similar studies have mentioned that such instances of overweight after an initial period spent in deficiency results in greater harm, thereby, predisposing more to the jaws of triple burden. Much of the household trends depends on the level of literacy of mothers. So, we can well speculate that these mothers originally from poor backgrounds may tend to overcompensate, so that their children do not suffer the deprivations they suffered in their childhood.[10,18] It also appears that this section is mostly busy with their work and their basic priorities are education of their kids and material possession. They enjoy food which are usually local non-branded and packaged. We have insufficient data in India which can actually scrutinize the standards of these food items.[23,24] According to NHFS data, there is higher prevalence of stunting and wasting among triable community [Figure 1]. The dilemma of our fight against these intertwined problems needs a strategic and region-specific response with particular focus on vulnerable groups, who are already encountering their own levels of hardships. Using region specific dialects, hooking around success stories and a demand driven approach will improve utilization of the existing governmental policies.[25-27] Another case study done on Indian population related to urbanization and eating practices also suggests that nutrition transition is more in urban population than in rural population. They found that urban residents spend more on processed food and prefer eating outside food.[28] The results of above mentioned studies are in alignment with our results that the shift has been happening more among the urban communities.

The rise in overweight or micronutrient deficiency steadily started increasing among all masses of population. This triple burden would not only cripple our existing economy but would also juxtapose a future, where our adolescents of today would turn out to be a demographic burden upon our nation with high incidences of diabetes, hypertension, or other metabolic syndromes. Furthermore, the studies have shown association of diet with periodontal inflammation and incidence of dental caries. Micronutrient deficiency has also been linked with periodontitis.[29-31] However, with the rise in multiple facets of the nutrition problems, and more specifically relating to obesity and dental problems, the recommendations and education, needs to be started early during school days. Studies have shown a positive association between obesity and primary dentition caries. It's no more how much you can take; rather, it depends more on how better it can be digested and how promptly we can choose the best dietary options.[29,32,33]

Concepts of balance diet, Recommended Dietary Allowances—RDA and Food standardizations need to be more stringent. Fasting, which used to be curbed entirely, can be considered an option with proper guidance. Workplaces also need to modulate the culture, enhance nutrition literacy, and provide mandatory breaks for some physical activity. For those urban poor, who toil hard and binge eat energy-dense food at the end of the day, the government should provide mandatory food breaks and items at workplaces and ensure they are consumed. The major limitation of the study is the need for more evidence. The online literature search was limited to only one database. It is essential to review existing rich sources of information before planning future research prospects.

## Conclusion

It was found that there is a shift in feeding preferences in diet-deprived sections in India. The findings are similar in rural and urban areas where the poor fall prey to the food fads, make poor nutrition choices, and gradually develop chronic ailments in the future. The

shift has been happening more among the urban poor and rural rich. The transition toward more energy-dense and processed foods increases the risk for chronic non-communicable diseases, obesity, and dental problems. Our study findings suggest that children in their development years need to focus more on mindful eating to prevent non-communicable chronic diseases. Yester years' recommendations mostly served the purpose of improving upon maternal literacy, advice on diet consumption and enhancing policies.

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### Conflicts of interest

None.

### Authors contributions

Authors VB & SP did the design, intellectual content & methodology. MP and SP did the data extraction and Analysis. VB, SP & MP did the draft review and manuscript edits. Final manuscript proofing was done by MP.

### Ethical policy and Institutional Review board statement

Exempted Review.

### Patient declaration of consent

Not applicable.

### Data availability statement

Not applicable.

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## Supplementary Data

**Table 1S: Findings from Nutritional Assessment among Adolescents in government Schools of Rural and Urban Chandigarh, 2001**

| Variables | Parameters | Frequencies (Percentage) | |
|---|---|---|---|
| | | Rural (*n* = 180) | Urban (*n* = 147) |
| Family Traits | Housewife Mothers | 171 (95%) | 125 (85%) |
| | Illiterate Mothers | 42 (23.3%) | 24 (16.3%) |
| | Joint | 37 (20.5%) | 15 (10.2%) |
| Adolescent Traits | Veg diet | 136 (75.5%) | 81 (55.1%) |
| | Did not bring tiffin to School | 139 (77.2 %) | 53 (36.5 %) |
| | Brought healthy foods in tiffin | 27 (15%) | 54 (36.7%) |
| | Do not Consume Morning breakfast | 21 (11.6 %) | 6 (4.08 %) |
| | Visit canteen during school hours routinely | 69 (38.3%) | 39 (26.5 %) |
| | Eat from Vendors outside Schools | 49 (27.2 %) | 27 (18.3 %) |
| | Prefer regular Snacks | 62 (34.4 %) | 74 (50.3 %) |
| | Preference for Junk Food | 78 (43.3 %) | 98 (66.6 %) |
| | Practice fasting | 65 (36.1 %) | 20 (13.6 %) |
| Anthropometric Measurements | BMI >25and beyond | 5 (2.7%) | 2 (1.4 %) |
| | BMI <18.5 | 113 (63.5 %) | 100 (71.9 %) |
| Knowledge | Unaware about Balance Diet | 169 (93 %) | 130 (88.4 %) |
| | Unaware about Micronutrient deficiencies | 161 (89.5 %) | 125 (85 %) |
| | Unaware about Obesity | 128 (71.1 %) | 88 (59.8 %) |
| | Unaware about daily Caloric Requirements | 166 (92 %) | 119 (80.9 %) |

BMI – body mass index

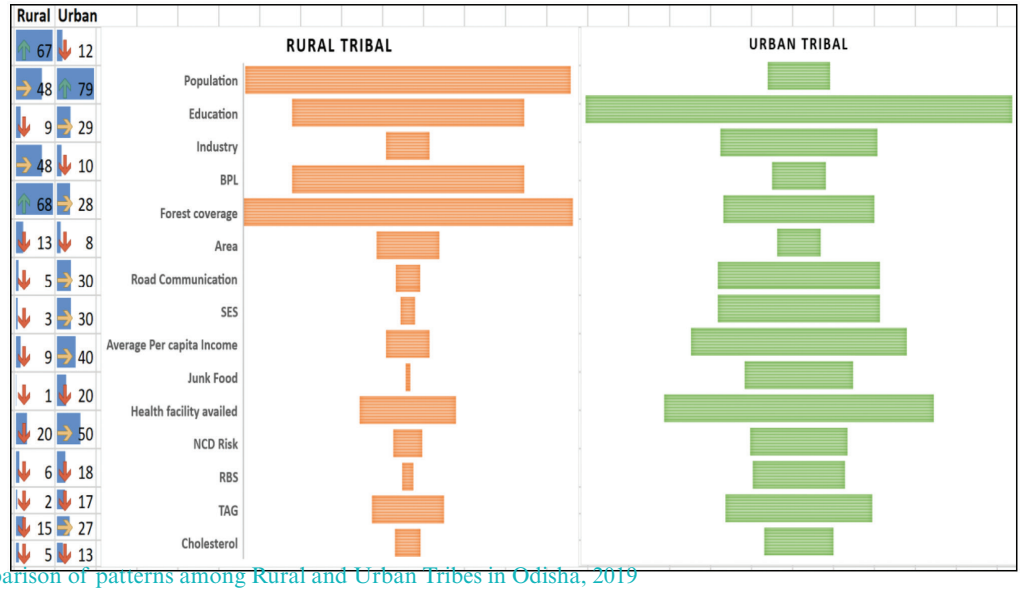


**Figure 1S:** Comparison of patterns among Rural and Urban Tribes in Odisha, 2019