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Gender Differences in Adolescent Nutrition: Evidence from two Indian districts

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About this paper

This LANSA paper on Gender Differences in Adolescent Nutrition: Evidence from two Indian districts is based on research undertaken in locations where the Farming System for Nutrition (FSN) study is underway.

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About LANSA

Leveraging Agriculture for Nutrition in South Asia (LANSA) is an international research partnership. LANSA is finding out how agriculture and agri-food systems can be better designed to advance nutrition. LANSA is focused on policies, interventions and strategies that can improve the nutritional status of women and children in South Asia. LANSA is funded by UK aid from the UK government. For more information see www.lansasouthasia.org

Contents

Acronyms

FSN	Farming System for Nutrition
GHI	Global Hunger Index
ICDS	Integrated Child Development Services
ICMR	Indian Council of Medical Research
IFPRI	International Food Policy Research Institute
LANSA	Leveraging Agriculture for Nutrition in South Asia
NIN	National Institute of Nutrition
RDA	Recommended Dietary Allowance
SRS	Sample Registration System
WHO	World Health Organisation

Abstract

Using quantitative data from a one-time survey followed by ethnographic research in two sites in India (Koraput district in Odisha and Wardha district in Maharashtra), this paper seeks to examine the conundrum of gender differentials in adolescent nutrition. While large-scale datasets, as from the National Institute of Nutrition (NIN), suggest that adolescent boys are slightly more undernourished than girls, micro-studies often contradict this finding. In this paper, we explore the possible explanatory factors for this divergence, located in household histories in specific agro-ecological settings. Our analysis reveals that behind every malnourished child, there is (in general) a history of undernourishment, including an impoverished household. The disadvantage is multiplied by the presence of a malnourished mother (sometimes a malnourished father), medical neglect, water scarcity and often a son preference that leads to the birth of several daughters before a son is born. While acknowledging the importance of child malnutrition as a focus of development policy, the paper concludes with a need to pay attention to adolescents, both boys and girls, in order to ensure well-being in adult life.

1. Introduction

India is going through a silent crisis as millions of adolescents and adults, both male and female, across the country and over generations face the burden of undernutrition. India's score in the Global Hunger Index (GHI) computed by the International Food Policy Research Institute (IFPRI) was 28.5 in 2016. While this has improved from 36 in 2008, it still falls in the "serious" category. India ranked 97th out of 118 countries in 2016 (IFPRI 2016).

Despite the high overall undernutrition figures, the global and national discourse on malnutrition in India mostly focuses on children under five years. According to IFPRI, 15.2 per cent of the total population is undernourished, 15.1 of children under five are wasted, 38.7 children under five are stunted and the under-five mortality rate was 4.8 per cent in 2016 (ibid.). The World Bank estimates that India is one of the world's highest ranking countries in terms of the sheer number of malnourished children, with the prevalence of underweight children nearly double that of Sub-Saharan Africa (World Bank 2009).

Children grow up. Adolescence or the period between childhood and adulthood indicates the period from the onset of puberty to the time of complete sexual maturation, defined by the World Health Organisation (WHO) as the age group 10-19 years (WHO 1995). According to 2009 figures, there were 1.2 billion adolescents globally, forming about 18 per cent of the world's population. India's adolescent population was 243 million, or roughly 21 per cent of the total population (UNICEF 2011). This period is typically divided into early (10-13 years), middle (14-17 years) and late (18-20 years) adolescence, depending upon both physical and psychological maturity (Hussein and Khan 2015). The Lancet Commission includes the extended age group of 10-24 years, given that adolescence and young adulthood is a period of transition to employment, financial independence and the formation of life partnerships (Patton et al. 2016: 2426). In this paper, we focus largely on middle and late adolescence, extending to early adulthood.

In India, as a result of relatively low mortality rates of around 0.8/1000 in the 5-14 age group and 3.2/1000 in the 15-19 age group in 2011, as compared to 55/1000 in the under-five group (Census 2011), adolescents are generally considered to be healthier than the other age groups, and hence their health and nutrition problems are not given much prominence (WHO 2014). As early as 1995, age-specific mortality rates for the 15-19 age group was 2.2/1000 for males and 3.4/1000 for females in rural areas and 1.3 and 1.7, respectively, in urban areas (IIPS 1995).

The gender bias against the girl child in Indian society, as reflected in the adverse sex ratios at birth or in the 0-5 age group is well known. For the country as a whole, recent data from the Sample Registration System (SRS) reveals that the sex ratio at birth rose from 906 to 909 between 2007 and 2013, indicating a slow decline in female foeticide. However, in the same period the sex ratio in the 0-4 age group fell from 914 to 909, pointing to the fact that life is not easy for those girls who are born and survive. They are often neglected, discriminated against or in extreme cases even killed. Sharp inter-state differences are however visible. Both these ratios have improved in the traditionally worst performing states of Delhi, Haryana, Rajasthan and the Punjab, but have declined in the better performing states of Assam, Jharkhand, Kerala, Madhya Pradesh, West Bengal and Tamil Nadu (Varma 2015). There are no easy explanations for these inter-state variations, or why and how the situation in the erstwhile better performing states is deteriorating and vice-versa. But it does point to the need for more nuanced studies that explore changes in gender relations across contexts and over time, and the fact that macro-aggregates can often mislead in formulating interventions at the micro-level.

This paper focuses on the nutritional status of adolescents and seeks to understand whether there is any gender bias, and if so, the forms it takes. We hypothesise that ethnicity or caste and locational disadvantage may be playing a bigger role in perpetuating a history of household undernourishment, rather than reflecting particular forms of discrimination against girls or boys in food intakes and nutritional outcomes. The lack of cohort data, however, limits our analysis in terms of transitions through adolescence, and the possible drivers of gendered variance through this period. Nevertheless, we seek to point to the high prevalence of nutritional inadequacy across age groups in poor locales, especially those that are remote and inhabited by a majority of Scheduled Tribe population, and the need, therefore, for broad-based interventions targeted at households and communities, rather than at individuals. The paper is based on baseline survey data collected from 12 villages in two districts of India — Wardha (Maharashtra) and Koraput (Odisha) — as part of a Farming System for Nutrition (FSN) study under the research programme on Leveraging Agriculture for Nutrition in South Asia (LANSA).

The paper is divided into the following sections. After briefly discussing a few key conceptual issues in the next section, Section 3 reviews the relevant literature on adolescent nutrition as the context within which we make our arguments. Section 4 discusses the methodology and study context. In Section 5 we discuss our findings from the field. The final section draws out the main conclusions of the study and the implications for policy and practice.

2. Some Conceptual Issues

Research on the development origins of health and disease has emphasised the importance of the life-cycle approach in identifying appropriate interventions at different stages in the life course to improve population and individual health. While different stages of the life course are recognised as important, from before conception to old age, the focus of much research and policy intervention has been on the mother and child dyad (http://www.southampton.ac.uk/medicine/research/groups/human_development_and_physiology_research_group.page). The intimate and obvious association between the nutritional status of infants and their mothers has led to a specific focus on pregnant and lactating mothers in terms of nutritional interventions. For instance, evidence from Gambia suggests that infants conceived during periods of low food availability had weaker immune systems relative to those conceived during periods of higher food availability (Bourke et al. 2016), hence making a case for maternal micronutrient supplementation.

While early life malnutrition does contribute to life-long immunodeficiency (ibid.), other phases, including adolescence, are under-studied, even though "adolescence offers an opportunity to rectify problems that have arisen during the first decade" (WHO 2014). The recent Lancet Commission noted that within the life course, adolescence is the time of greatest change and exposure to social determinants such as education, employment, marriage, media and peer pressure (Patton et al. 2016: 2441). Attention to adolescents could help reverse the adverse long-term impacts of undernutrition as well as neglect in childhood. A serious engagement with the life-course approach would entail looking at life as a continuous process, with each stage linked to what comes before and after: that is, how individual lives are connected with events and transitions experienced by others around them — close relatives, friends or associates (Locke and Lloyd-Sherlock 2011). And these are not fixed; rather in the case of adolescents, the peer group often plays a bigger part in their lives than family members, though opportunities are shaped by their family circumstances, including number of siblings and other dependents.

For the convenience of analysis and policy influence, lives are divided into age cohorts: the cohorts having both physical and social markers. While patterns of disease burden are similar for boys and girls during adolescence, their constituents and drivers change in late adolescence/early adulthood, with an increase in sexual and reproductive health problems, associated with early marriage for girls and injuries for boys and young men (Patton et al. 2016: 2445). In the context of nutrition, the cumulative/longer-term effects over the life course and across generations are critical in shaping both physical and social outcomes. In this paper, we therefore point to a host of inter-dependencies through a focus on 'linked lives' (Elder 1995), an approach which fits well with the more relational notions of well-being in developing countries (White 2016).

A second key element of our conceptual approach involves a relational understanding of nutritional outcomes. We consider here the multiple intersecting inequalities in the process of negotiating everyday power relations, the linkages between economic disadvantage and cultural-ideological disadvantage (Fraser 1997). While adolescents in general are left out of the nutritional discourse, their contributions devalued, girls tend to the positioned as future mothers, and to that extent receive some attention (more so in the context of the Sustainable Development Agenda (Lancet,

2015: 2227). Their aspirations and contributions are, however, not fully taken into account. On adolescent boys, there is complete silence, and if at all there is any mention, they are positioned as 'trouble makers', and somewhat out of control. While the literature on youth transitions often emphasises the shift from dependence to independence, these are mediated by the location, gender, birth order, economic resources and other structural constraints, but equally strive to negotiate relations of interdependence with other members of the household (Punch 2002). We focus, therefore, on developing a more relational understanding of adolescent experiences, embedded within a wider set of social relations, and the possible implications for nutrition and health.

Such a relational approach from a gender analytical lens implies going beyond a focus on the mother and child to a life-course perspective which also includes male provisioning and contributions to everyday decisions about feeding, health and education, alongside inter-generational influences in these realms (Negin et al. 2016). In fact, contemporary research points to the role of male malnutrition going beyond the conventional ways of considering it in terms of reduced ability to work, reduced incomes and hence increasing the work burden of women. It is postulated that malnutrition in men may change their genetic make-up over generations and thereby contribute to transferring malnutrition to the progeny (Bourke et al. 2016). While this is more of a hypothesis that is yet to be fully substantiated, it does point to the importance of inter-generational research and looking at nutrition/malnutrition as a process and not just as a one-time event that can be ameliorated by food/medication over short periods of time.

Finally, in the case of India, caste and ethnicity are important markers of social identity, shaping rules and norms around both access to resources and their allocation. We therefore need not just sex-disaggregated analysis but greater nuance based on social identities that shape the expectations from young people, also positioning them in specific ways (Rao 2014). Nutrition problems vary across agro-ecological and socio-cultural settings and include a wide range of issues ranging from food factors like inadequate cereal or protein intakes to non-food factors like water, sanitation and hygiene or even the seasonal intensity of working hours that leave little time for cooking or feeding. It is important, therefore, to locate our analysis within particular ecosystems, both natural and social as well as political economy contexts (Mitra and Rao 2016).

3. Adolescent Malnutrition

Many studies in India, irrespective of the sample size or whether the population was rural or urban, tribal or non-tribal, report the nutritional status of adolescent boys being worse than that of girls. Thus Bannerjee et al. (2011), studying adolescent students across five schools in urban Goa, found 37.8 per cent boys and 27.5 per cent girls underweight. Kodali et al. (2016) similarly found school-going adolescent boys slightly more malnourished than girls in Hyderabad city. While these studies were urban and based on smaller samples, in a seminal study based on data from 12124 adolescents across nine states, 72 districts and 115200 villages, Venkaiah et al. (2002) found the prevalence of undernutrition (<median 72 S.D. of NCHS weight for age) to be much higher among boys (53.1 per cent as against 39.5 per cent among girls). While about 70 per cent of adolescents consumed more than 70 per cent of Recommended Dietary Allowance (RDA) for energy, the intakes of micronutrients such as vitamin A and riboflavin were woefully inadequate. In rural areas, however,

adolescent girls, especially in the older age groups, could be at greater risk of nutritional stress because of early marriage and early conception before completion of their physical growth. They also found a higher incidence of stunting (42.7 per cent) among adolescents belonging to the Scheduled Caste community.

In fact, large datasets point to differences by social category, in particular caste and ethnicity, in the Indian context. Social identity shapes not just access to resources and services, but equally cultural norms, especially around gendered roles and relations, and aspirations. Aurino (2016: 12) rightly notes that while child dietary diversity is positively associated with increases in household consumption levels (that is, reflects household poverty or class status), the implications of caste on diet become visible with age. The effect of caste and ethnicity on adolescent nutrition and the gendered variations therein, are explored further in section 4.

Given that a great majority of our study sample consists of Scheduled Tribes (STs), our results are consistent with large studies, such as that by Rao et al. (2006), which used data collected from 12,789 adolescents (10-17 years) belonging to the STs, and found about 63 per cent of boys and 42 per cent of girls undernourished (<5th BMI age percentiles of NHANES). This is considerably higher than the findings for the mixed population of adolescents noted earlier (Venkaiah et al. 2002). Importantly, they found the mean intake of all food, especially income-elastic foods such as pulses, milk and milk products, oils and fats, and sugar and jaggery, to be lower than the recommended levels, but also lower than that of their rural non-tribal counterparts. Green leafy vegetables were the only exception. A significant association between undernutrition and socio-economic parameters like size of land holding and occupation of head of household was also observed.

While (lower) caste/ethnicity seems to disadvantage adolescent boys, micro-studies also reveal female disadvantage, especially among the poorer and less educated. Chaturvedi et al. (1996) reported prevalence of chronic energy deficiency to be 93.5 per cent among adolescent girls of rural Rajasthan, while Deshmukh et al. (2006) found adolescent girls to be significantly thinner than boys (69.8 per cent in girls and 40.7 per cent amongst boys) in rural Wardha. Out of a total of 764 adolescents who participated in the study, 53.8 per cent were thin; 44 per cent normal and 2.2 per cent overweight. The mean BMI was higher among boys (16.88 $\pm$ 3.09) as compared to girls (15.54 $\pm$ 3.25). They found some interesting correlations with age, education and work status. The prevalence of thinness was significantly higher (57 per cent) in early adolescence than in late adolescence (48.6 per cent); amongst those having education less than 8th standard (60.3 per cent as against 49.6 per cent); and amongst those from families with lower incomes (63.2 per cent as against 38.1 per cent). Interestingly, adolescents doing housework (49.1 per cent) were less thin than students (54.7 per cent) and those in labouring jobs (53.3 per cent). The nature of activity that adolescents engage in is an important issue, to which we return in Section 5.

Each of these studies presents a different picture of nutritional status and gender disadvantage among adolescents. NNMB (2002) reported no sex difference in undernutrition in age group 10-13 years, but in age group 14-17 years, undernutrition was more (73 per cent) prevalent in boys than girls (60.4 per cent). What explains these contradictory findings, with some studies reporting boys to be worse off than girls and others saying the opposite? The different results could partly be related to the different methodologies used and the varying sample sizes. But they also point to the

fact that the differences are due to the multi-causal nature of nutrition outcomes, shaped by the kind of gender relations across particular geographical and socio-cultural contexts. Both the material conditions and their social meanings matter, pointing to the need for a more holistic and relational approach to addressing the problem of undernutrition among adolescents, as among other age groups of children and adults. Posing the problem as one of boys or girls as individuals, doesn't necessarily help find solutions.

Statistical correlations or associations while providing indications do not essentially imply causality. There is hardly any research on what factors lead to the continuation of childhood malnutrition into adolescence or even adulthood and also the numbers involved. In simple terms, how many malnourished boys and girls below five continue in that state in their adolescence? It could also be the case that 'normal' children below five slip into malnourished states in their adolescence. More studies based on longitudinal evidence and cohort data such as the Young Lives data (Aurino 2016) are needed to help understand the pathways through which under/malnutrition is either perpetuated or corrected from childhood through adolescence to adulthood.

4. Methodology and Context

In this paper, we use primary data from 12 villages in two Indian districts — Wardha (Maharashtra) and Koraput (Odisha) — to explore the differentials in adolescent nutritional status by gender and ethnicity/caste and its links to other age groups. Detailed anthropometric, serological and dietary surveys were undertaken by trained investigators to build the baseline of the LANSA project intervention. A total of 1214 households were covered across the two districts. Of these 556 were in Wardha (five villages) and 658 households (across seven villages) were in Koraput district.

This is supplemented with qualitative data, collected mainly through focus group discussions and key informant interviews, with a sub-sample of adolescents and other family members, as well as by observations during a period of intense ethnographic fieldwork at both the sites from January to April 2016. The interviews were conducted separately with boys and girls by male and female researchers, respectively, in order to create a supportive and non-threatening environment for exploring perceptions and biases. Names of all villages and respondents have been changed to ensure both confidentiality and anonymity. Informal conversations in tea shops and common gathering places contributed to deepening the insights. An iterative process, whereby findings were continuously discussed with the villagers, was followed. While there are more undernourished boys than girls in our sample, the differentials in nutritional status do not necessarily reflect 'bias'. The large numbers of undernourished adolescents (girls and boys together), however, does raise the need for urgent action.

Wardha, one of the 36 districts of Maharashtra, falls within the semi-arid Vidarbha region. With a population of 1.3 million, according to the 2011 Census, it has a literacy rate of 86.99 per cent (males 91.92 per cent and females 81.81 per cent) and sex ratio of 946 females per 1000 males. The child sex ratio was 919 girls per 1000 boys. 67 per cent of the population is rural. Scheduled Castes comprise 14.5 per cent and Scheduled Tribes 11.5 per cent of the population (http://www.censusindia.gov.in/2011census/dchb/2708_PART_B_DCHB_%20WARDHA.pdf). Rain-

fed agriculture with mono-cropped Bt cotton is the norm, though some sorghum and pigeon peas are also cultivated. The district has received a lot of attention in the last decade due to the high rate of farmer suicides, a result of agrarian distress (Sainath 2014). The study villages comprise a mix of SC (12 per cent Mahar), ST (42 per cent Gond), OBC (21 per cent mostly Mali), and other castes 25 per cent.

Koraput, one of the most backward districts of Odisha and India, had a similar population of 1.37 million in 2011 (http://www.census2011.co.in/census/district/422-koraput.html). Unlike Wardha, the sex ratio of 1032 females per 1000 males and child sex ratio of 979 females per 1000 males is generally favourable to women and girls. This could also be related to the fact that Koraput is a largely rural and tribal district, with STs comprising 50.56 per cent of the population and SCs 14.25 per cent. Located in the semi-humid tropics, and mostly rain-fed, the district is famous for its indigenous rice varieties, the farming of which is predominantly done by women. Gender gaps however persist in the access to opportunities. The average literacy rate was 49 per cent, with 60 per cent for males and 38.55 per cent for females. The study villages have 9 per cent SCs, 42 per cent STs, 46 per cent OBCs and 3 per cent others. The demographic details of both sets of villages are shown in **Annex 1**.

4.1 The Nutritional Context

Before discussing the specifics of adolescent nutrition, it is important to understand the overall nutrition context. Undernutrition is widespread across all age groups in both sites. Out of a total of 556 households surveyed in Wardha, only 112 households (20.14 per cent) did not have a single undernourished person, and in the case of Koraput, out of 658 households, this was true for only 98 (15 per cent) (**Table 1).** Undernutrition is here being measured in terms of thinness, that is, low body mass index (BMI) adjusted for age (Cole et al. 2007).

Table 1 Nutrition status of households in Wardha and Koraput

Type of Malnourishment In Household	**Wardha**	**%**	**Koraput**	**%**
Everyone normal out of total households	112	20.14	98	15.0
Total Number of Households (1)(N)	556		658	
Of the households with a severely malnourished Child aged 5-17				
Everyone in the household malnourished	12	27.3	19	33
Father malnourished, mother normal	12	27.3	13	23
Father normal, mother malnourished	13	29.5	13	23
Both parents normal, siblings malnourished	2	4.5	10	17.5
Child the only malnourished person in household	5	11.4	2	3.5
Total number of households with a severely malnourished child	44		57	

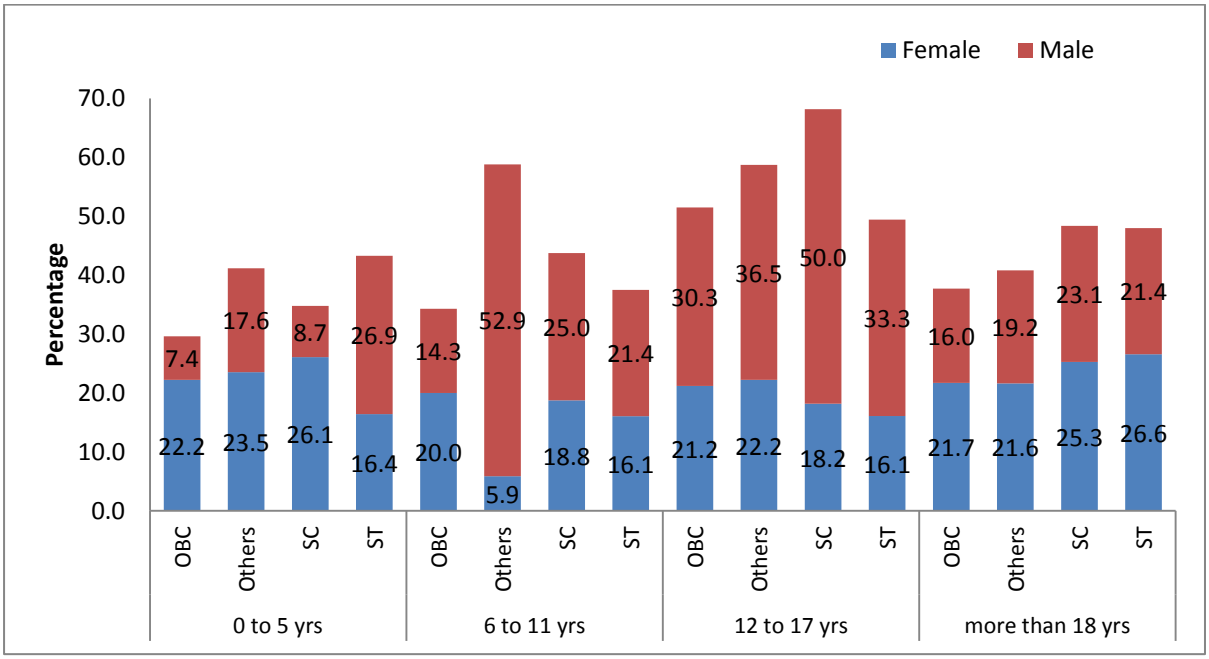
- In Wardha, there are 57 such children belonging to 49 households and in Koraput 75 children who belong to 63 households. Five children in Wardha and six in Koraput live in

women-headed households, with their mothers or grandparents, rather than with siblings, so are not shown separately in this table.

These results are alarming. 80 and 85 per cent of households, respectively, across two very different agro-ecological zones and population compositions like Wardha and Koraput, have at least one member undernourished. Such large numbers of undernourished persons across all age groups point to a generic, rather than age-specific problem, and a failure across the board of policies and interventions targeted at improving nutritional outcomes and overall well-being.

Disaggregating the data by caste/ethnicity, to identify the possible contribution of differential access to resources (land and employment) and services, confirms the findings of research that note persistent discrimination and exclusion by social group (Shah et al. 2006; Thorat and Newman 2010). Scheduled Castes and Scheduled Tribes generally do worse than the other groups in both sites, though with some variations in the early years. The two graphs below present data for the two sites, disaggregated by gender, caste/ethnicity and age.

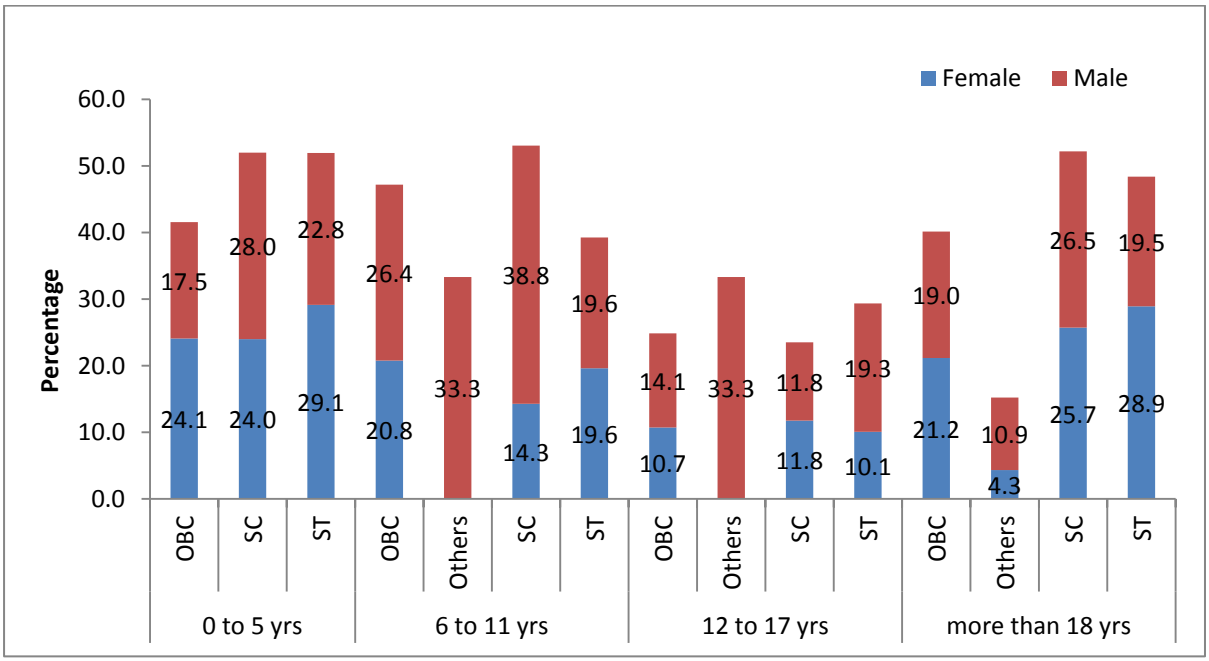
Figure 1.1 Undernutrition status in Wardha by caste, age and gender



Source: Baseline Survey (2014) FSN Study under LANSA

In terms of general trends, boys in the age-groups of 6-17 years appear more nutritionally disadvantaged than girls in both sites, with OBCs (Other Backward Castes) in Wardha being the only group to reveal a slight son preference in early adolescence. While Koraput presents a U-shaped curve for female disadvantage, high in early childhood and adulthood, Wardha presents a more stable situation, with greater equity in adult nutrition than generally expected (**Figure 1, Annex 1).**

Figure 1.2 Undernutrition status in Koraput by caste, age and gender



Source: Baseline Survey (2014) FSN Study under LANSA

Food intakes and dietary diversity (**Tables 2.1 and 2.2**) reveal an interesting contrast across the two sites, especially among the Scheduled Castes. In Wardha, the SCs appear to be doing marginally better than other caste groups in terms of consumption, though these differences are statistically insignificant in terms of nutritional outcomes, given that they do worse than the other groups in adulthood (**Annex 1, Tables 3a and 3b**). In Koraput, people of all caste groups primarily consume cereals, though the Other Castes, usually salaried and better off, appear to have more access to vegetables. The Scheduled Caste diets are worst in Koraput, with very little diversity. This is because Scheduled Castes here largely constitute the group of landless labourers, with no self-production, and very little time available apart from their daily wage-work for foraging and collection of locally available greens, roots and tubers or forest products.

The interesting point to note is that caste is not a homogenous category across India. How it is experienced and its implications for nutrition and well-being vary with context. In Wardha, the Scheduled Castes have been exposed to a history of mobilisation and struggle for rights, led by Dr. B.R Ambedkar in the 1950s and 60s. Most of them are educated and have access to, or aspire to, salaried jobs, which provide security of incomes and hence relative stability in terms of basic consumption. In Koraput, where livelihoods and well-being are much more dependent on land and forests, the landless Scheduled Castes are at a disadvantage. The focus here has also been on tribal development; the Scheduled Castes hence remain an excluded group.

Table 2.1 Household dietary diversity (per cent) by caste, Wardha

Caste	Sub caste	n	Low Dietary Diversity	Moderate Dietary Diversity	High Dietary Diversity
OBC	Dhobi, Kalar & Wani	30	16.7	33.3	50.0
	Mali	76	30.3	42.1	27.6
	Total	**106**	**26.4**	**39.6**	**34.0**
Others	Bhoi, Lodhi, Gavali, Lohar, Gadi, Dhangar	30	46.7	20.0	33.3
	Gowari	97	37.1	34.0	28.9
	Total	**127**	**39.4**	**30.7**	**29.9**
SC	Mahar & Mang	66	34.8	30.3	34.8
	Total	**66**	**34.8**	**30.3**	**34.8**
ST	Gond	222	37.4	32.9	29.7
	Ozha & Pradhan	4	50.0	50.0	0.0
	Total	**226**	**37.6**	**33.2**	**29.2**

Source: Baseline Survey (2014) FSN Study under LANSA

Table 2.2 Household dietary diversity (per cent) by caste, Koraput

Caste	Sub caste	n	Low Dietary Diversity	Moderate Dietary Diversity	High Dietary Diversity
OBC	Gouda, Kamara	57	35.1	36.8	28.1
	Mali	101	19.8	30.7	49.5
	Rana	148	34.5	32.4	33.1
	Total	**306**	**29.7**	**32.7**	**37.6**
Others	Karan, Brahmin & Benayat Odia	13	23.1	23.1	53.8
	Total	**13**	**23.1**	**23.1**	**53.8**
SC	Dombo & Barik	54	53.7	29.6	16.7
	Total	**54**	**53.7**	**29.6**	**16.7**
ST	Bhumia	134	29.1	38.8	32.1
	Gadaba	52	46.2	34.6	19.2
	Paroja	76	38.2	38.2	23.7
	Pentia	1	0.0	0.0	100.0
	Total	**263**	**35.0**	**37.6**	**27.4**

Source: Baseline Survey (2014) FSN Study under LANSA

Finally, what is also striking is the absence of much difference in dietary diversity scores across caste groups in Wardha. This can be explained by the fact that the mainstay of agriculture is cotton cultivation, a cash crop. Diets therefore are largely determined by availability and prices in the market, hence there is not much difference between those engaged in agriculture or in other types of jobs. In Koraput on the other hand, dietary diversity is highest amongst the other caste groups, those with resources, but also the Malis among the OBCs. Malis are professional vegetable cultivators; hence consume more vegetables in their own diets compared to the other groups. Some of the Scheduled Tribe groups like the Bhumias, all farmers, do better than the other tribes and the landless Scheduled Castes do the worst.

5. Understanding Adolescent Nutrition: Field Insights

Having discussed the general nutritional context across the population groups, we turn specifically to examine adolescent undernutrition. Age- and sex-specific BMI values for children and adolescents in both sites, graded as per WHO definitions (of -2 SD cut-off) (Cole et al. 2007) point to more adolescent boys being undernourished than girls (**Tables 3.1 and 3.2**). This is true of both adolescent sub-age groups (10-14 and 15-17 years). Interestingly in Wardha, boys in the cohort 15-17 years are more undernourished than those in the younger adolescent group, contrary to Aurino's (2016) study in Telengana and Andhra Pradesh, which found boys at age 15 doing much better than younger boys. In Koraput, however, our findings confirm that levels of undernutrition reduce in the older cohort of adolescent boys.

Table 3.1 Distribution (%) of school age and adolescent children according to age/sex specific BMI values* by SD classification, Wardha

Particulars	N	NUTRITIONAL GRADES							
		Undernutrition		Normal	Over-nutrition		Overall Undernutrition		
		Severe	Mod-erate		Over-weight	Obese			
		<Med. – 3SD	– 3SD to – 2SD	– 2SD to + 1SD	+ 1SD to + 2SD	≥ + 2SD	<Med. – 2SD	95% C I	
								L L	UL
5-9 years:									
Boys	50	6.0	28.0	64.0	2.0	0	**34.0**	33.1	34.9
Girls	53	3.8	22.6	73.6	0	0	**26.4**	25.7	27.1
10-14 Years :									
Boys	88	26.1	36.4	37.5	0.0	0.0	**62.5**	62.0	63.0
Girls	87	12.6	28.7	56.3	2.3	0.0	**41.4**	40.8	41.8
15-17 Years:									
Boys	43	32.6	44.2	23.3	0.0	0.0	**76.7**	76.0	77.6
Girls	39	7.7	28.2	64.1	0.0	0.0	**35.9**	34.7	37.1

Source: Baseline Survey (2014) FSN Study under LANSA

Table 3.2 Distribution (%) of school age and adolescent children according to age/sex specific BMI values* by SD classification, Koraput

Particulars	n	NUTRITIONAL GRADES							
		Undernutrition		Normal	Over-nutrition		Overall Undernutrition		
		Severe	Mod-erate		Over-weight	Obese			
		<Med. – 3SD	– 3SD to – 2SD	– 2SD to + 1SD	+ 1SD to + 2SD	≥ + 2SD	<Med. – 2SD	95% C I	
								L L	UL
5-9 Years :									
Boys	149	14.1	38.9	46.3	0.0	0.7	**53.0**	45.0	61.0
Girls	186	8.1	30.1	61.3	0.5	0.0	**38.2**	31.2	45.2
10-14 Years :									
Boys	136	16.2	25.7	56.6	1.5	0.0	**41.9**	33.6	50.2
Girls	159	6.3	22.0	71.7	0.0	0.0	**28.3**	21.3	35.3
15-17 Years:									
Boys	86	9.3	18.6	72.1	0.0	0.0	**27.9**	18.4	37.4
Girls	72	2.8	8.3	88.9	0.0	0.0	**11.1**	3.9	18.4

Source: Baseline Survey (2014) FSN Study under LANSA

Among girls, levels of undernutrition decline in later adolescence in both sites, perhaps to a greater degree in Koraput than Wardha. On the face of it, there is no gender discrimination against girls in both places, at least in terms of the z-adjusted BMI scores. But what is the explanation for this? Several factors potentially contribute to this outcome: the important ones perhaps being the high value placed on girls' and women's labour in subsistence activities in Koraput, the relatively low access to education and consequent low returns to education for boys, greater access to ecosystems resources and services controlled by women, and the relative parity in dietary intakes.

A starting point for examining reasons for the differences (but not necessarily causalities) in the nutritional status of adolescents of different groups mentioned above is an exploration of gender-differentiated dietary intakes of the adolescents and links to their activity patterns. It has to be kept in mind that the diet of the households studied, as in most of South Asia, is primarily cereal based.

5.1 Dietary Intakes

Analysis of the dietary intakes shows that in Wardha there is an overall dietary deficit (measured in terms of the difference from the Recommended Dietary Allowance) for both boys and girls, except in the case of boys in the age group 10-12 years (Please see **Annex 2** for details). In the age groups 13-15 and 16-17 years, the dietary deficit (for cereals, the most critical component of the diet) is higher for boys than girls (for the age group 13-15 years it is 28 per cent and 12.4 per cent for boys and girls, respectively, while in the 16-17 age group it is 37.5 per cent and 10 per cent, respectively).

One possible explanation for male disadvantage might emerge from the definition and calculation of the RDA itself, as while nutrient/food intakes are comparable between boys and girls, undernutrition is higher among boys. It is therefore important to first clarify this concept.

The RDA or Recommended Dietary Allowance for Indians emerges from a Report of the Expert Group of the Indian Council of Medical Research**.** Drawing on a large-scale sample from 18 Indian states, representing different contexts, locations (urban, rural) and social groups (tribals, socio-economic strata), the RDAs are based on i) BMR (determined basically by body size), ii) physical activity levels and iii) physiological status of normal, healthy individuals, and are gender dependent. While RDA for energy is based on mean requirements, for all other nutrients Mean+2SD is taken as the cut-off level. While the RDAs are the same for boys and girls till the age of 10, boys tend to be taller and heavier than girls during adolescence, which becomes more pronounced by the time they reach adulthood. Therefore, the RDAs are relatively higher for boys as compared to girls, for the same age, even if the activity levels are comparable. While energy expenditures are taken into account in the calculation of physical activity, given the illegality in India of child labour, the Indian Council of Medical Research (ICMR) cannot consider boys and girls as engaged in 'heavy' work, and recommend separate RDAs for them.

This is particularly apparent from focus group discussions with adolescent girls in Koraput. Here, across age groups, the dietary survey data provides evidence of calorie surplus, higher among girls than boys. In a focus group in Kolpur village, 15-year-old Minati, slight in appearance, noted that she had been engaged with agricultural work — especially paddy transplanting, weeding and harvesting — on big farms near the district capital. She leaves early, having filled her stomach with leftover rice from the previous day, and returns in the evening to another meal of rice. She and the other girls with her buy and eat biscuits if they feel hungry during the day. But she added, "I don't feel hungry any more". Girls like her are very aware that women's work in their context is endless and non-stop, they don't have the same opportunities as men/boys, and hence their aspirations too remain constrained. So while survey data may reveal calorie surpluses, substantial undernutrition and energy deficiency persists, given the levels of activity. Malabsorption is also caused by numerous other factors like chronic diarrhoea, parasitic infestations, sickle cell disease, anaemia and so on, given the lack of basic amenities and health care services as well as the health-seeking behaviour and sanitary practices in the region.

5.1.1 Dietary diversity, agriculture and access to ecosystem services

We have already commented on caste-based, household-level dietary diversity across the two sites to note a general lack of dietary diversity across groups in Wardha (a cash-based economy), and some differences in Koraput, based particularly on class and caste status (**Tables 2.1** and **2.2**). Aurino (2016) notes that gender-based gaps in dietary diversity as well as overall improvements start emerging among the older cohort adolescents, those at age 15. Our data from Koraput does reflect an improvement in the nutritional status of older cohort adolescents, both boys and girls, though boys still appear to be at a disadvantage. In Wardha, while there is some improvement in the nutrition status of girls in the older cohort, this is not the case for boys: a rather puzzling result, and

for which we don't yet have any answers. It could also be an anomaly in the data, given the relatively small sample size.

To some extent, an improvement in the nutritional status of the older cohort of adolescents, especially boys, is intuitive, as in much of rural India boys of this age are already in the workforce. They earn a wage, and occasionally can afford to buy food in the market. But this is only occasional. Bhabesh and Krishna, of Sakhi village in Wardha district, both Dalit youth in their early 20s, are neighbours and close friends, having grown up together. Krishna is very undernourished and looks so. Both dropped out after completing class 12 but want to pursue undergraduation through correspondence courses. Sometimes they go to work together as wage labour. They were carrying huge lunch boxes and it did not take much persuasion for them to share the contents with us. A large pile of chappatis and a very watery dal was all that they had. No vegetables, not even pickles in the fare. Krishna explained, "When we go out to work, the women in the household pack a big pile of rotis. They get hard during the day so the dal is watery." Bhabesh added, "See, dal is about Rs 150 a kilo. How can we have thick dal? Obviously we cannot eat all the rotis. We do not throw away what we cannot eat but take it back home. The women eat it."

A second element that could potentially contribute to the dietary diversity of older cohort adolescent boys is their freedom of movement in the sense that they can go to surrounding forests/water bodies to hunt small game. Norms of social propriety do not allow girls that freedom. While most of the villages in Wardha district selected for the study are dry, with hardly any tree cover or water bodies, Shampur has a dam constructed by the irrigation department in the 1980s, and though now silted, the area beyond still retains some forests and small game. The village boys hunt small ruminants, wild fowl and sometimes a boar but do not mention these things to surveyors due to fear of reprisal by the forest department. Interestingly, they cook these in the fields to avoid being detected by the forest department guards, but take some of the cooked food back home for the women. Some families eat crabs from the stream. As a villager put it, almost every family, barring the vegetarians like the Gowaris (cattle breeders and herders) who are the only ones consuming milk and milk products, eat non-vegetarian meals procured from the ecosystem on alternate days but not on fasts. The overall nutrition status of these villagers is better than that of the others, though due to the clandestine nature of these foods, they are not captured in the diet surveys.

In Sakhi, adolescent boys recounted stories, heard from their grandfathers, about the settlement of the village, and the awarding of small plots of land for cultivation. Bt cotton and a small amount of red gram, 80 per cent of which is sold, comprise the main crops today. Depredation of crops by wild boars and nilgai is very common, so the men sleep at night in the fields to guard these crops. There is a recent notification that the land will all be absorbed under the Bor National Park, and this would make cultivation even more risky and uncertain. There is no forest produce available nor are there any fruit trees in the village. Bhagesh says that even a decade ago "there were a lot of trees in the village including some *ber* trees (Indian Jujube). But they have all disappeared."

In the Koraput villages too, small game is hunted by the boys. During the paddy season, crabs and snails are caught in the paddy fields and consumed. A range of roots and tubers, fruits and greens are available in the forests, as also in community lands near ponds and farm bunds. The latter are largely collected and cooked by women. Here, a major threat to the ecosystem is emerging from eucalyptus

plantations promoted by paper industries gradually taking over the uplands and midlands used mainly for the cultivation of millets and vegetables by women. Chandrama, a young Paroja woman in Kolpur village, said that representatives from the company spoke to her husband and convinced him of the profitability of this step. She was against it, but he felt that cash was needed for so many things in the present day, and just food was not enough. Education, health, all were expensive. She tried to convince him that "contentment (sukh) could only be achieved if we have grains from our own land", but to no avail.

In Wardha too, fertile plots upstream of the watershed are fast being converted into commercial eucalyptus plantations, destroying the streams and wells and sapping whatever nutrients are left in the soil. Some agricultural lands of villages like Sakhi, Shampur and Shamli have already been converted into plantations. A small but perennial stream and a well recharged by it have dried up in Shamli over the last two years as the adjacent eucalyptus plantations have grown.

This shift in access to land and resources gives a clue to why in some contexts adolescent boys or young men might do better and in some contexts worse. Where they have access to jobs and are highly mobile, they are likely to be able to access a diversity of food too; however, in circumstances of poverty, and where they feel responsible for providing for their families, their parents and siblings, their own diets and nutrition take a back seat.

5.2 Consumption patterns

Adolescents know about and enjoy a variety of foods, even though they may not explicitly link this to their nutritional status. There are however several constraints to consumption — the prices of commodities, religious and cultural practices including vegetarianism as symbolic of status, and the lack of awareness and information about health and nutrition.

5.2.1 Prices

Adolescents, especially those in the workforce, are very aware of market prices. Krishna, of Sakhi village in Wardha, explained: "Usually on Fridays, the day of the weekly Kharangana market, we buy vegetables and occasionally chicken. However, given the high prices everyone gets just a piece, or a taste of the chicken. Fruits too are very expensive. Of course we love mangoes, oranges, apples and pineapples, but how to buy them? There is money just enough to buy the staples. Fruits are a luxury. Every season we buy mangoes once or twice and everyone in the household gets a few slices. Many households in our village cannot even afford that." The monthly supply of cheap foodgrains from the public distribution system, mostly wheat, acts as a lifeline.

Fledderjohann et al. (2016) show that between 2001 and 2008 food inflation — especially of high protein meat and dairy products — was associated with worse child mortality outcomes. These adverse associations were concentrated in the most deprived states. The methodology used in this paper is not only interesting but relevant for the country as a whole. The researchers used Rounds 2 and 3 (2002—08) of the Indian District Level Household Survey and calculated the neonatal, infant

and under-five mortality rates in 364 districts, and merged them with district-level food price data from the National Sample Survey Office. Their findings are in line with the Report on Price Volatility and Food Security by the High Level Panel of Experts on Food Security and Nutrition, which found unprecedented volatility in food prices between 2007-2011, undermining the food and nutrition security of millions of the world's poor (CFS-HLPE 2011).

A similar narrative about food choices and prices emerged from Koraput. The FGDs revealed a strong preference for chicken, well cooked and spicy. The boys noted that fruits like oranges and apples are "good for nutrition, they are given to convalescents, but are too expensive." Plantains are good too. But fruits are expensive. However, here, as some forest cover is still left, the villagers consume available roots and tubers. Calories mainly come from eating plenty of rice, the women generally eating the leftover rice after soaking it overnight, with a few chillies, tamarind and onions. The dal, as observations showed, is watery and thin, too expensive to afford for most.

5.2.2 Religious Practices

A second constraint to consumption is the growth of saints and shrines across both sites that recommend, as a first step of initiation, certain lifestyle changes including those in diets. Several Bhumia households in Kotra village of Koraput noted that they had been converted to a form of Hinduism a few years ago by a local 'baba'. He recommended that in order to improve their lives and be free of illnesses, they should become complete vegetarians, giving up the occasional crabs, chicken or small game they consumed. The baba also recommended weekly fasts for cleansing their body and mind, and additionally for the women to wear a black string on their arm, to keep away the 'evil eye'. Among the STs, the Bhumias, as evident from the survey data presented in **Table 2.2**, have the highest degree of dietary diversity. It would however not be entirely surprising if there is a decline in this level over the next few years, with the emergence of new religious and social taboos.

This trend is now well entrenched in Wardha. Almost every village has at least one baba, though in some there are several. Sailani Baba, a Sufi saint who is also known as ghodewale (horse riding) or talwarwale baba (sword wielding) in Anji (the headquarters of Wardha block), has adherents mostly in Sakhi village; his followers do not eat pork, and are only allowed halal chicken. Pratibha, 45, married when she was 16, had three sons at one-year intervals, but none survived. "They didn't suffer any prolonged illness. They just died. Someone did *karni (*black magic)," she says. *Karnatins* (women who perform black magic) abound in this region and everybody across all ethnic groups has faith in them as do many NGO field workers. Usually women are *karnatins* but sometimes "powerful men go to Bengal, learn the black arts and come back to practise them. My father ate up eight of his sons," says Prabhat of Sakhi. Pratibha went to the shrine of Sailani Baba and prayed to him for a child. A son and two daughters followed at 12-month intervals. While the two daughters are normal, the son, Vishesh, is undernourished, as is Pratibha.

Karnis and babas mask the hard reality of existence of women like Pratibha. Under- age marriage, probably a poor diet in her parents' home and definitely in the marital home, coupled with hard work day in and out in the fields as well as at home, a drunkard husband and task-master of a mother-in-law, has contributed to her as well as her child's undernourished status. Six pregnancies at one-year intervals, regular fasting even during pregnancy and while lactating, did not help matters.

On an average, women, except the Mahars (SC), fast 120 days a year in these villages. Some Gond women fast thrice a week, on Mondays, Tuesdays and Thursdays, just drinking black tea throughout the day. Men generally fast on Saturdays.

Pratibha still toils in the fields, sometimes even for wages on others lands. Her husband's alcoholism has meant reduced earnings. Since this is a mono-cropped area, most vegetables and pulses have to be bought from the market. Lack of resources has meant persistent undernutrition. And this has been aggravated by taboos, which are socially monitored through the faith in godmen and godwomen.

5.2.3 Health and Nutrition Awareness and Information

The Gonds in Wardha district consider themselves Nagvanshis or descendants of the snake god; so they do not cultivate or eat roots and tubers, nor drumsticks and various gourds, except bitter gourd. Mangesh (30) and his wife Manjula (27), Gonds of Sakhi village, feel that violations of such taboos can be fatal. They had three children — the first, a son, died two years ago. They are convinced that it was the work of a *karnatin*. Their third child, also a son, died last year. A local NGO persuaded them to cultivate sweet potatoes, going against the taboo. Both are inconsolable, more so as Manjula had an operation after the last child was born and the surviving daughter is undernourished like her mother. They are certain that violating the taboo as well as the black magic jointly ruined their household.

Examination of the medical papers (Mangesh is one of those persons who has kept them properly) revealed that the first child died of cerebral palsy and the second of sickle cell disease. But no one, health and NGO workers included, bothered to go through the papers and explain things to the couple. Several other villagers while discussing food and cultivation taboos mention Mangesh's experience to reinforce the importance of taboos. Thus, while as a region Wardha is more modernised than Koraput, with people having access to technologies, mobile internet, proximity to Nagpur and Wardha, old beliefs remain.

Part of the problem is the poor supply of health and nutrition knowledge by both qualified health personnel (including doctors, nurses, health workers) and NGO functionaries. Thus, when Sunita's five-year-old grandson died of sickle cell disease a few years ago, the doctor in Wardha explained that "it's a genetic hereditary disorder caused because your ancestors used to eat the flesh of cattle." Unfortunately, even the NGO personnel working in the area are not aware of the nuances of the disease. There is no universal screening of the population by the government for sickle cell disease despite various studies reporting its prevalence ranging from 2.9 to 22.2 per cent of the sampled populations (Deshmukh et al 2006). Incidentally, sickle cell disease is prevalent even in Koraput (Das et al 1967; ICMR 2003).

Interestingly, not many of the young people know much about puberty, childbirth and nutrition. In a focus group discussion with girls, held at the Khiching school, in Koraput, the girls said that teachers never discuss the issue of sex or sexuality with them. "They only tell us how to stay neat and clean". When the girls first get their periods, they are introduced to a series of rituals by the *Dishari*, the local medicine men, who use a combination of astrology, common sense and simple observation to

diagnose and treat diseases using herbal medicines. The girls observe menstrual taboos, start fasting through the year, and do not eat onions or oily foods during periods to avoid menstrual odours. Both genders consider periods dirty and polluting. Most deliveries are at home, assisted by an elder woman or the untrained village birth attendant. Immunisation and vaccinations are catching up, but many of the adolescents were not immunised. Given the poor health infrastructure, irrespective of their caste/ethnic background, people rely on *Disharis*, believing in them almost blindly not only for health care, but also agricultural and other rituals.

Almost every school in Wardha and Koraput has a chart or some kind of a pictorial representation of nutritious food and balanced diets. However, none of the girls remembered any discussion on nutrition. Starting from the imagery that is totally urban middle class, even the food items shown are not relevant simply because they are not available or accessible due to high costs or climatic conditions. The NGO interventions in nutrition also rely substantially on such pictorial representations, showing foods and lifestyles far removed from the realities of the people's lives. They also reinforce gender inequalities as the women are generally presented as the cooks and the food servers. In fact, this was one reason that several of the girls in Koraput were clear that if they had a choice, they would like to be reborn as boys in their next birth, so they wouldn't have to cook food.

Epidemiological data reveals that nutritional inadequacy greatly increases susceptibility to severe infections, and is an important risk factor for illness and death (Bourke et al. 2016; Franca et al. 2009), particularly affecting millions of pregnant women and young children (Black et al 2013). The causal relationship of malnutrition with immune suppression and infection is also aggravated by the profound effect of many infections on nutrition itself. For example, gastrointestinal parasites can lead to anaemia and nutrient deprivation (Bourke et al. 2016).

Yet health services hardly respond to the emergent health needs of adolescents, including the need for sexual and reproductive health information, as discussed in the next section. Only 17 per cent of adolescents in India utilise health services, even though the five major preventable risk factors of cardiovascular diseases such as hypertension, diabetes, dyslipidemia, obesity and rheumatic fever take root during either childhood or adolescence (Hussein and Khan 2015). A further reason is the adolescents' desire for privacy and confidentiality, as also a non-judgemental attitude on issues they consider sensitive or even embarrassing in local contexts of social conservatism and sexual taboos before marriage.

5.3 Aspirations, sexuality and alternate priorities

Other elements driving consumption, as also adolescent behaviour, include the aspirations of the youth. Education is an important one. In Wardha, most boys wanted to go for higher education (at least graduation) and take up urban white- collar jobs. The girls too had educational and job aspirations; however, they showed preferences for a nursing career or becoming a teacher. It was interesting to note from interviews with girls in Shampur village that most of them took up cotton plucking on weekends and holidays during the seasons, , as this helped them earn money to finance their education. While perhaps there is no gender discrimination in the allocation of food, girls

clearly have to engage, often with hard physical work, in order to raise the resources necessary for fulfilling their aspirations. Nutrition, however, was not a priority for either the boys or girls.

In Koraput, girls like Minati, mentioned earlier, wanted to study, but was withdrawn from school to look after her younger brother, while her mother went for wage work. While accepting that they will always remain involved in subsistence agriculture and domestic work, girls now aspire to marry an educated man, possibly with a job. Boys too wanted to move out of agriculture as they recognised the drudgery involved in agricultural work, and also the lack of adequate returns. In the absence of educational opportunities, they sought jobs in the informal sector like driving or becoming mechanics.

Apart from work- and career-related aspirations, adolescence is also a time for exploration of sexuality. Focus group discussions revealed adolescent boys' desire to be slim but muscular, comparing themselves to contemporary male film stars. Girls too prefer slim, healthy and smart boys. Ultra-thin boys, as Raimati from Kolpur village, Koraput, put it, are not desirable as "their ears and eyes merge", but most importantly they can't work.

Not surprisingly, during adolescence, both girls and boys emphasised that having a boyfriend or a girlfriend was essential. The caste/ethnic group of the 'friend' was immaterial, as while marriage has to be within the same group, this is more an exploratory friendship, shaped partly by peer group pressure, as noted also by Tolley (2015) in his study of young men in a Gujarati village. Mihir (a Mali) who has a Gond girl friend of the same village said, "If we don't have a girlfriend we will not be able to face our peer group. Such boys are considered impotent or transgenders. But marriage is a different matter. Take my girlfriend. She is just a year younger. I am in class 10. She is in class 9. By the time I finish my studies and get a job, I will be about 25. She would have been married off by her parents. Also she is a Gond. The question of marriage does not arise."

Most adolescent boys are perpetually anxious that someone will poach their girlfriend, as sexual activity is central to their identity vis-à-vis their peer group. Ashutosh, very thin, of Shampur village, had three girlfriends, but being in a small area the girls soon found out that he had multiple partners at the same time, and dumped him. Rather depressed, he says, "Look, what can I do. Someone stole my first girlfriend. The second one gave up on me as I am not muscular. So I decided to have three so that there is always someone." Meetings usually take place for a little while in the fields or in the local market on Fridays. Courting is having a plate of noodles or bread omelette together or gifting each other a bar of chocolate. Food is a courting device, yet its links to diets, good health, or even 'muscularity' are not well understood.

5.4. Son preference

While discrimination against daughters is not visible, especially in the distribution of food within the household, the persistence in both sites of strong preference for a son often leads to a large family. Several girls are followed by a boy, who is then undernourished. Ishwar Domb, 46, of Kotra village, Koraput, has seven children. Barring the parents and the first child, a girl, the entire family is undernourished. "If there is no boy in the family there is nothing. My father and all the elders said I

needed a son. The first son came after five daughters. He was rather weak. Everyone said that just in case something happens to him I should have another son. But after the last one, Babul, was born a year ago, my wife got an operation done." Ishwar is virtually landless. He ekes out a living by working as an agricultural labourer, working on MGNREGA worksites, migrating for labour work to nearby districts and sometimes making bricks. The PDS rice helps a lot. But he says he is tense about his daughters' marriage as the dowry rates are going up sharply.

Kalpana Madavi, a Gond woman of Suli village in Wardha, claims to have been married at 15 when she was studying in class 4. Her husband has 15 acres of irrigated land. Kalpana got pregnant a year after marriage. The first born child was a daughter. Two more daughters followed at three-year intervals and finally a son was born. She got a ligation done in the Primary Health Centre after the birth of her son. She says, "Both of us wanted a son, so we had three daughters before he was born." The son, Akash, appears to be severely undernourished.

Several indigenous methods of sex determination are commonly practised in Wardha. These include getting a blade of grass from the banks of a water body and asking the pregnant woman to split it. If it breaks vertically, it is believed that the child will be a boy and if horizontally, it will be a girl. Also, if the foetus be a male, the abdomen does not distend as much as in the case of a female. In case of female foetuses, the mother puts on a 'dried' look and vomits a lot. However, these indigenous predictions often go wrong. Those who can afford it now go to Nagpur for sex determination tests at private clinics and abort the foetus if female. The costs vary between Rs. 3000 and 5000. This is usually resorted to for the second pregnancy in case the first child is a girl.

While one can discard these beliefs as superstitions, they do influence the ideologies, behaviour and eating habits of adolescents, both boys and girls, especially post-puberty. Girls are socialised for marriage, trained in cooking and other domestic tasks, caring and serving other members of the family. Many of them resent such socialisation, and are quite aware of the differential treatment meted out to boys in their age groups, yet often have little choice but to accept the reality. Boys, in turn, are under pressure to find jobs and start providing for their families. When high in the birth order, and undernourished (especially amongst the STs), they realise that their families' hopes and expectations rest on them. They engage in hard labour in difficult working and living conditions, with poor diets, contributing to high male morbidity in the middle years. In fact, current male mortality in the 15-59 age group across Indian states is 40 per cent more than that of women, but with current interventions seeking to reduce maternal mortality, male mortality is projected to become double that of women by 2030 (Ram et al. 2015).

5.5 Gendered socialisation and state institutions

Finally, young people are influenced considerably by state interventions in terms of their likes and dislikes. Integrated Child Development Services (ICDS) centres provide take-home rations to pregnant and lactating women. While quite nutritious, there is little information on how to use these powders, often alien to local diets. In Wardha, following a few cases of diarrhoea attributed to the poor quality of these take-home rations, all the women discarded them, or fed them to the cattle. No attempt was made to discuss the matter rationally.

In Koraput, eggs are distributed to young children and pregnant and lactating mothers quite regularly, twice a week, through the ICDS centres. However, women in Kadaguda village found it difficult to eat the eggs on their own, without sharing it with their children; hence they requested the anganwadi workers to provide them 4 eggs at one time, once a fortnight, which they could cook and share with the family. While eggs then are an occasional treat, the nutritional goals are not met. This raises the question of the need to pay attention to gendered socialisation in planning interventions. Mothers in any part of the country are unlikely to consume eggs as individuals, and not share them with their children. All the discussions with the adolescents too revealed the need for a household-based strategy in terms of institutional interventions.

Schools do serve mid-day meals, but despite proclamations to the contrary, the fare is almost the same every day: khichri or rice and dal in Koraput. Sometimes rotis and a curry with lots of water and potatoes are dished out in Wardha. Fruits are supposed to be given at least once a week, but this is rarely the case. Eggs were earlier provided, but these have now been discontinued. Despite these drawbacks, mid-day meals do provide some food to children from poor households. Adolescents, unfortunately, especially in the upper cohorts, have usually dropped out of school; or even if they continue to study, they are not entitled to these meals. This may also explain the poor nutritional status of adolescents.

The government of Maharashtra has been trying to promote kitchen gardens in school premises for a long time, an effort that led the Planning Commission's Education Division to issue a circular to this effect to all state governments (http://planningcommission.nic.in/aboutus/committee/strgrp11/11str_eledu.pdf.). However, Meshram and Kale, school teachers in the study villages in Wardha, pointed out several problems. Firstly, who would plant and maintain the vegetable plots? One cannot expect young children to do this, especially given the scarcity of water, and the labour involved in fetching water from a distance. Teachers don't get the time from their teaching. The task ultimately falls on the mid-day meal cook and helper who seem reluctant to take it on, as it adds to their work, with no rewards. "We are more than willing to give the premises to the villagers to plant vegetables if they come forward. But there are no takers." This holds true in Koraput as well. "Why can't the local adolescents and youth be involved in such activities through the formation of proper institutions like clubs?" asks Sudhir, who works as a driver in Koraput.

6. Conclusions

While Indian policies and research as well as ameliorative action by the state and civil society organisations focus on child (0-5) and maternal malnutrition, the overall situation is rather grim, especially in tribal-dominated parts of the country. Our study, based on a limited sample of 12 villages in two districts, Wardha and Koraput, situated in two distinct agro-climatic zones, found that just about 20 per cent and 15 per cent households, respectively, did not have anyone who was undernourished. Notions of a life-cycle approach or focussing on the first 1000 days have remained restricted to the mother and child, and other members have been ignored.

This paper has sought to understand better the issue of inter-generational transmission of undernutrition. Adolescent undernutrition, especially of boys, has largely been neglected in policies and research. Our study, in consonance with several others, has found adolescent boys to be as disadvantaged as girls, if not more, in terms of their nutritional status. We argue that it would be misleading to say that this is an example of reducing gender bias in society. Gender biases exist, but in different forms. However, this finding does point to the need to look at families as a whole, as most adolescents who were very thin (a proxy for severe undernutrition) had one or more undernourished household members in both the districts. Understanding how lives are linked, and disadvantage both emerges and is perpetuated due to the particular positioning of individuals within a web of relationships (with parents, siblings, friends and others), becomes important if a holistic approach to overcoming widespread under- and mal-nutrition is to be developed. A piecemeal target-oriented approach that relies more on medical solutions and focuses on 'children', 'pregnant' /'lactating mothers' or 'adolescent girls' as individuals, and doles out pills and feeds will not solve the problem, except in very severe cases. This is because undernutrition is multi-causal and essentially a social phenomenon with intricate physiological and psychological interconnections. It is a vicious cycle. Undernutrition leads to chronic diseases that alter the immune system leading to further undernutrition due to malabsorption.

It is however not necessary that a child born undernourished should grow up so. Our study underscores the importance of contextualising the problem in specific agro-ecological and social contexts. Decline in access to environmental resources and consequent changes in diets (decline of millets, for instance, or of animal proteins), intensified by the commercialisation and industrialisation of agricultural production, alongside socio-cultural norms on appropriate and status-giving foods, contribute to persistent undernutrition. In Wardha, lower dietary diversity is linked to a near-total reliance on markets and the lack of affordability due to food inflation, while in Koraput, despite shrinking ecosystem services there is still a higher dietary diversity as people depend on the forests surrounding their villages for many edible products.

These gains are however offset by poor health and knowledge infrastructure. In fact, the overall opportunities frontier in Koraput is much lower than in Wardha.

It is important to address the aspirations and priorities of adolescents, as one way of reversing nutritional handicaps. Hardly any intervention at present, by state or non-state actors, engages with them, forgetting the fact that they are the next generation, and embedded in relations of interdependence with other groups in the population.

References

Aurino, E (2016). Do boys eat better than girls in India? Longitudinal evidence from Young Lives. *Working Paper 146*. Young Lives. Oxford.

Bannerjee, K, Prakash Babu, Kopparty, S, Vallabhuni, R, and G. R. Kalapala (2011). Mid-day Meal Programme and Adolescent Undernutrition - an Epidemiological Study in Hyderabad, India. *Journal of Pharmacy Practice and Community Medicine.*, 2(1):16-20.

Black, R. E, Victora, C. G, Walker, S.P. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *Lancet*; 382:427–51.

Bourke, C. D, Berkley, J. A and A. J Prendergast (2016). Immune Dysfunction as a cause and Consequence of Malnutrition, *Trends in Immunology*, Vol 37, No 6 (June)

Census of India (2011) Estimates of mortality indicators. Accessed on 3/11/16 at http://www.censusindia.gov.in/vital_statistics/SRS_Report/11Chap%204%20-%202011.pdf

Chaturvedi S, Kapil U, Gnanasekaran N, Sachadev HP, Pandey RM, Bhanti T. (1996) Nutrient intake amongst adolescent girls belonging to poor socioeconomic group of rural area of Rajasthan. *Indian Journal of Pediatrics,* Mar; 33(3): 197-201.

Cole T.J, Flegal K.M, Nicholls D and A.A.Jackson (2007) Body mass index cut offs to define thinness in children and adolescents: international survey. BMJ 335:
194. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1934447/pdf/bmj-335-7612-res-00194-el.pdf accessed on 7/11/16.
Committee on World Food Security (CFS) (2011) Price Volatility and Food Security. A report by the High Level Panel of Experts on Food Security and Nutrition. Rome.

Das, S.R, Mukherjee, D. P and D.B. Sastry (1967): Sickle Cell Trait in Koraput and other parts of India, *Human Heredity*, Vol 17, No. 1

de Onis M, Dasgupta P, Saha S, Sengupta D, Blossner M. (2001). The National Centre for Health Statistics reference and the growth of Indian adolescent boys *American Journal of Clinical Nutrition* Aug; 74(2): 248253

Deshmukh PR, S.S. Gupta, M.S. Bharambe, A.R. Dongre, C. Maliye, S. Kaur and B.S. Garg (2006): Nutritional Status of Adolescents in Rural Wardha, *Indian Journal of Pediatrics*, Volume 73—February.

Deshmukh PR, BS Garg, N Garg, NC Prajapati, MS Bharambe (2006): Prevalence of Sickle Cell disorders in Rural Wardha, *Indian Journal of Community Medicine,* Vol 31, No 1, Jan – March.

Elder, G.H. (1995) 'The Life Course Paradigm: Social Change and Individual Development', in P. Moen, G.H. Elder and K. Luscher (eds) *Examining Lives in Context: Perspectives on the Ecology of Human Development*, pp. 101–39. Washington, DC: APA Press.

Fledderjohann J, Vellakkal, S, Zaky Khan, Shah Ebrahim and David Stuckler (2016) Quantifying the impact of rising food prices on child mortality in India: a cross-district statistical analysis of the District Level Household Survey, *International Journal of Epidemiology*, Vol 45, no 2, 554–564

França, T.G.D, Ishikawa, L.L.W, Zorzella-Pezavento, S.F.G, Chiuso-Minicucci, F, da Cunha M.L.R.S, and A. Sartori (2009): Impact of Malnutrition on Immunity and Infection, *Journal of Animal Toxins including Tropical Diseases*, 15(3):375.

Fraser, N (1997) *Justice Interruptus: Critical reflections on the post-socialist condition*. Routledge. London and New York.

Hussein, R.A and P.S. Khan (2015). Comparative study of the nutritional and health status among adolescent students (boys and girls) in rural area, Chandragiri, Chittoor district. A.P, *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 14(9) Ver III (September).

Indian Council of Medical Research (2003): ICMR Bulletin, Vol 3, No 10, October.

Indian Institute for Population Sciences (IIPS), 1995: National Family Health Survey (MCH and Family Planning) India 1992-93, Bombay India.
International Food Policy Research Institute (2016): Global Hunger Index – Getting to zero hunger, IFPRI, Washington DC

Kodali, P. B, Kopparty, S, Vallabhuni, R and G. R. Kalapala (2016) Mid-day meal programme and adolescent undernutrition: An epidemiological study in Hyderabad, India. *Journal of Pharmacy Practice and Community Medicine.* 2(1): 12-17.

Lancet, The (2015). Editorial: Adolescent health – boys matter too. *The Lancet*. Vol 386, December 5, p 2227.

Locke, C and P. Lloyd-Sherlock (2011) Qualitative Life Course Methodologies: Critical Reflections from Development Studies. *Development and Change* 42(5): 1131–1152.

Mitra, A and N. Rao (2016). Families, farms and changing gender relations in Asia. In: FAO and MSSRF (eds.) Family farming: Meeting the zero hunger challenge. New Delhi. Academic Foundation: 41-124.

National Nutrition Monitoring Bureau (2002) Diet and nutritional status of rural population. *NNMB Technical Report No. 21*. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad, 2002.

Negin, J, Coffman, J, Vizintin, P and C. Raynes-Greenow (2016). The influence of grandmothers on breastfeeding rates: a systematic review. *BMC Pregnancy and Childbirth.* **DOI:** 10.1186/s12884-016-0880-5.
Palmer, A. C (2011): Nutritionally mediated programming of the developing immune system. *Advances in Nutrition* 2, 377–395

Patton, G. C et al. (2016) Our future: a Lancet Commission on adolescent health and wellbeing. *The Lancet*. Vol 387. June 11. Pp 2423-78.

Planning Commission (n.d). The Report of the Steering Committee on Elementary Education and Literacy for the Eleventh Five Year Plan (2007-12). Education Division. New Delhi. Chapter on Mid-day Meals. pp 25. Accessed on 14/4/17 at
http://planningcommission.nic.in/aboutus/committee/strgrp11/11str_eledu.pdf

Punch, S (2002) Youth transitions and interdependent adult-child relations in rural Bolivia. *Journal of Rural Studies*. 18: 123-133.

Ram, U, Jha, P, P. Gerland et al. (2015). Age-specific and sex-specific adult mortality risk in India in 2014: analysis of 0·27 million nationally surveyed deaths and demographic estimates from 597 districts. *Lancet Global Health.* Vol. 3, December. pp e 767-775.

Rao K. M, Balakrishna, N, Laxmaiah, A, Venkaiah, K and GNV Brahmam (2006). Diet and nutritional status of adolescent tribal population in nine States of India, Asia Pacific Journal of Clinical Nutrition, 15(1): 64-71

Rao, N (2014) Caste, Kinship and Life-course: Rethinking Women's Work and Agency in Rural South India. *Feminist Economics,* 20(4): 78-102.

Sainath, P (2014) Maharashtra crosses 60,000 farmer suicides. July 15th. http://psainath.org/maharashtra-crosses-60000-farm-suicides/

Shah, G, Mander, H, Thorat, S, Deshpande, S and A. Baviskar (2006) *Untouchability in rural India*. Sage. New Delhi.
Shahabuddin A.K, Talukdar K, Talukdar M.K, Hassan M, Seal A, Rahman Q, Mannan A, Tomkins A and A. Costello (2000) Adolescent nutrition in a rural community in Bangladesh. *Indian J Pediatrics* Feb; 67(2): 93-98.

Thorat, S., and K. Newman (ed) (2010). *Blocked by caste: economic discrimination in modern India*. New Delhi: Oxford University Press.

Tolley, G (2015) Love and Sexuality in a Gujarati village: men and pre-marital relationships. *PhD thesis*. School of International Development. University of East Anglia. Norwich.

UNICEF (2011), *The State of the World's Children 2011: Adolescence an Age of Opportunity*. New York: United Nations Children's Fund.

Varma, S (2015) 'More girls being born, but fewer surviving' The Times of India, New Delhi edition, p. 7, Friday January 2nd.

Venkaiah K, Damayanti K, Nayak MU, Vijayaraghvan K (2002). Diet and nutritional status of rural adolescents in India. *Eur J Clin Nutr*; 56(11): 1119-1125.

White, S.C. (2016). Introduction: the many faces of wellbeing. In: White, S.C with C. Blackmore (eds.) *Cultures of wellbeing: method, place, policy.* London. Palgrave Macmillan: 1-46.

World Bank (2009) *World Development Report 2009: Reshaping Economic Geography.* Washington D.C. The World Bank. Table 2 p 354.

World Health Organisation (1995): World Health Organization Physical Status: The Use and Interpretation of Anthropometry Technical Report Series: 854; Geneva. WHO. pp. 263-308.

World Health Organisation (2014) Health for the World's Adolescents: A second chance in the second decade. Geneva. WHO.

Annex 1

Table 1a: Demographic profile of villages, Wardha district

Block	Panchayat	Village(s)	No. of Households	Total Population	Population	
					Male	Female
Arvi	Sakhi	1.Sakhi	143	576	300 (52)	276(48)
		2.Sitapur	71	264	137 (52)	127 (48)
Karanja	Suli	3.Shampur	123	491	249 (51)	242 (49)
		4.Shamli	45	199	111 (56)	88 (44)
		5.Suli	174	724	380 (53)	344 (47)
Total			556	2254	1177 (52)	1077 (48)

(Percentages within parentheses)

Source: Baseline Survey (2014) FSN Study under LANSA

Table 1b: Demographic profile of villages, Koraput district

Block	Panchayat	Village(s)	No. of Households	Total Population	Population	
					Male	Female
Boipariguda	Chandrapada	1.Kotaguda	77	360	171 (47)	189 (53)
		2.Kolpur	128	513	246 (48)	267 (52)
		3.Kotra	94	422	194 (46)	228 (54)
	Bodaput	4.Khiching	59	251	120 (48)	131 (52)
		5.Kadaguda	180	774	362 (47)	412 (53)
		6.Kanakguda	92	409	195 (48)	214 (52)
		7.Khuntiguda	28	116	54 (47)	62 (53)
Total			658	2845	1342 (47)	1503 (53)

(Percentages within parentheses)

Source: Baseline Survey (2014) FSN Study under LANSA

Table 2a: Distribution of number of households by social groups, Wardha

Villages	SC	ST	OBC	Others
Sakhi	15 (10)	45 (32)	7 (5)	76 (53)
Sitapur	27 (38)	28 (39)	-	16 (23)
Shampur	4 (3)	32 (26)	81 (66)	6 (5)
Shamli	20 (44)	3 (7)	-	22 (49)
Suli	2 (1)	124 (71)	31 (18)	17 (10)

(Percentages within parentheses)

Source: Baseline Survey (2014) FSN Study under LANSA

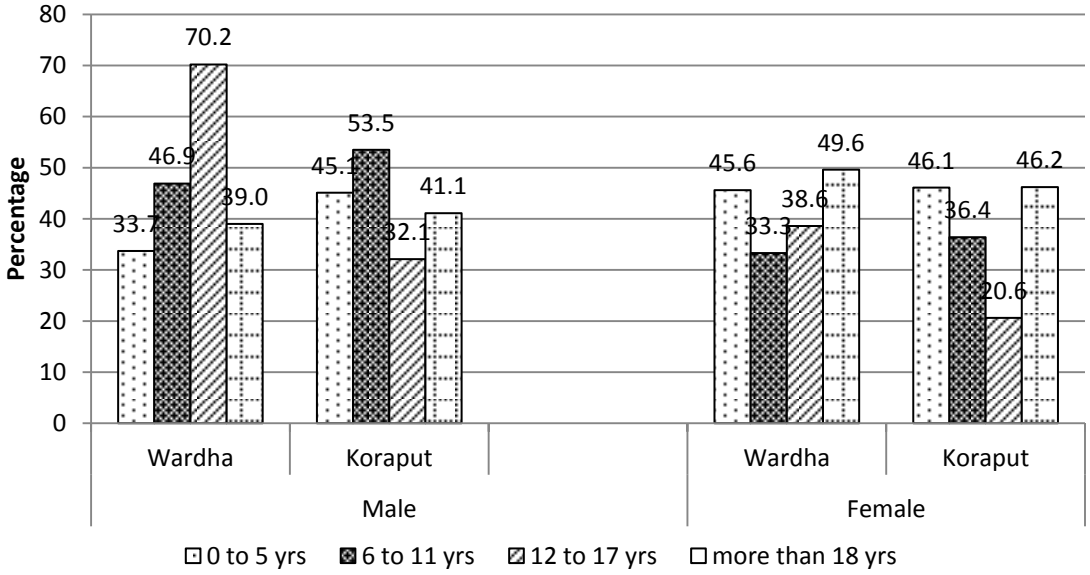
Table 2b: Distribution of number of households by social groups, Koraput

Villages	SC	ST	OBC	Others
Kotaguda	-	3 (4)	74 (96)	-
Kolpur	-	102 (80)	26 (20)	-
Kotra	20 (21)	59 (63)	15 (16)	-
Khiching	3 (5)	1 (2)	50 (85)	5 (8)
Kadaguda	37 (21)	83 (46)	45 (25)	15 (8)
Kanakguda	1 (1)	2 (2)	89 (97)	-
Khuntiguda	1 (4)	23 (82)	4 (14)	-

(Percentages within parentheses)

Source: Baseline Survey (2014) FSN Study under LANSA

Figure 1: Undernutrition status in by age and gender in Wardha and Koraput



Source: Baseline Survey (2014) FSN Study under LANSA

Table 3 Distribution (%) of 5 to 17 years children and adolescents according to nutritional status by socio-economic and demographic characteristics

Particulars	N	FSN Wardha		χ^2,p	FSN Koraput			χ^2, p
		Normal	Under-nourished		N	Normal	Under-nourished	
Community								
OBC	**80**	58.8	41.2	7.1 NS	**372**	65.1	34.9	1.5 NS
Other	**89**	44.9	55.1		**21**	52.4	47.6	
SC	**39**	41.0	59.0		**104**	64.4	35.6	
ST	**152**	57.9	42.1		**291**	63.2	36.8	
Family Size								
1 to 4	**138**	53.6	46.4	6.3 **	**138**	71.7	28.3	4.8 NS
5 to 7	**205**	55.1	44.9		**558**	61.8	38.2	
8 & above	**17**	23.5	76.5		**92**	65.2	34.8	
Home garden (HG)								
Without HG	**279**	53.4	46.6	0.1 NS	**360**	63.9	36.1	0.0 NS
With HG	**81**	51.9	48.1		**428**	64.0	36.0	
Drinking water								
Dug well	**121**	48.8	51.2	3.0 NS	**167**	64.7	35.3	0.1 NS
Piped water	**171**	52.6	47.4		**124**	64.5	35.5	
Tube well/ Bore well	**68**	61.8	38.2		**497**	63.6	36.4	
Sanitation								
Toilets	**78**	55.1	44.9	0.2 NS	**-**	-	-	-
Open defecation	**282**	52.5	47.5		**788**	64.0	36.0	

*, **, ***, #: statistically significant at 10%, 5%, 1% and 0.1% levels of significance, NS: Not Significant

Annex 2

Table 2.1 Wardha dietary intakes (g/day)

Study Group		Cereals & Millets	Pulses & Legu-mes	Green Leafy Veg.	Roots & Tubers	Other Veg.	Nuts & Oil Seeds	Condi-ments & Spices	Fruits	Fish & Other Sea Foods	Meat & Poultry	Milk & Milk Prod.	Fats & Edible Oils	Sugar & Jaggery
10-12 years Boys (n:19)	**Mean**	320.9	41.1	11.2	25.5	29.3	1.8	10.7	15.6	0.0	6.2	18.1	17.6	20.1
	±SD	120.2	33.2	23.2	19.2	35.3	3.4	6.2	20.6	0.0	19.1	22.8	10.4	17.7
RDA		**300**	**60**	**100**	**100**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**35**	**30**
10-12 years Girls (n:25)	**Mean**	220.6	40.8	5.8	17.9	33.5	0.6	9.3	8.7	0.0	6.9	20.4	16.3	23.2
	±SD	102.4	29.6	11.7	20.2	50.8	1.8	5.8	5.7	0.0	25.9	30.1	11.1	16.5
RDA		**240**	**60**	**100**	**100**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**35**	**30**
13-15 years Boys (n:20)	**Mean**	304.3	57.6	4.7	25.4	22.0	1.2	13.2	26.0	0.0	11.6	9.7	23.1	25.9
	±SD	147.5	56.8	14.7	24.2	33.6	2.1	8.3	45.5	0.0	37.6	14.1	15.2	16.3
RDA		**420**	**75**	**100**	**150**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**45**	**20**
13-15 years Girls (n:37)	**Mean**	288.9	45.2	14.2	25.3	26.7	1.1	10.2	8.6	0.0	2.4	12.1	18.4	23.6
	±SD	104.7	34.6	23.2	19.3	43.0	2.5	4.5	8.5	0.0	10.9	20.3	11.1	14.0
RDA		**330**	**60**	**100**	**100**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**40**	**25**
16-17 years Boys (n:6)	**Mean**	280.9	42.1	5.5	15.0	27.0	0.7	11.8	8.0	0.0	0.0	13.7	17.1	24.2
	±SD	141.9	41.2	13.4	16.2	42.0	1.6	7.0	8.5	0.0	0.0	31.1	9.5	11.6
RDA		**450**	**90**	**100**	**200**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**50**	**30**
16-17 years Girls (n:15)	**Mean**	297.0	53.3	7.3	23.9	25.4	0.5	12.8	25.5	0.0	2.3	13.6	18.3	17.8
	±SD	101.7	46.0	15.8	26.5	26.2	1.5	7.0	54.4	0.0	9.0	19.6	11.8	19.0
RDA		**330**	**75**	**100**	**200**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**35**	**25**

Table 2.2 Koraput dietary intakes (g/day)

Age Group		Cereals & Millets	Pulses & Legu-mes	Green Leafy Veg.	Roots & Tubers	Other Veg.	Nuts & Oil Seeds	Condi-ments & Spices	Fruits	Fish & Other Sea Foods	Meat & Poultry	Milk & Milk Prod.	Fats & Edible Oils	Sugar & Jaggery
10-12 years Boys (n:12)	**Mean**	549.4	34.9	21.9	64.5	40.7	0.5	8.9	0.0	0.0	17.2	0.0	9.8	7.2
	±SD	161.1	19.8	19.6	39.1	66.4	0.4	4.4	0.0	0.0	31.8	0.0	5.6	5.4
RDA		**300**	**60**	**100**	**100**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**35**	**30**
10-12 years Girls (n:24)	**Mean**	523.9	31.7	23.0	62.7	42.8	0.4	7.8	14.6	4.5	2.5	3.9	10.7	11.8
	±SD	185.9	27.7	36.7	44.7	43.6	0.4	5.5	71.4	22.1	12.2	19.2	11.2	8.6
RDA		**240**	**60**	**100**	**100**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**35**	**30**
13-15 years Boys (n:11)	**Mean**	634.0	50.3	11.2	71.0	91.8	0.9	14.6	0.0	0.0	9.2	0.0	9.3	11.8
	±SD	109.9	31.8	25.1	57.6	127.1	0.8	7.9	0.0	0.0	30.5	0.0	7.2	4.7
RDA		**420**	**75**	**100**	**150**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**45**	**20**
13-15 years Girls (n:13)	**Mean**	557.1	37.8	23.1	93.5	57.0	0.7	7.6	0.0	9.6	4.6	6.8	10.0	12.8
	±SD	228.5	22.2	36.2	60.9	50.1	0.6	4.2	0.0	34.5	16.6	24.4	7.7	9.6
RDA		**330**	**60**	**100**	**100**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**40**	**25**
16-17 years Boys (n:6)	**Mean**	546.6	48.2	3.2	79.8	26.9	1.1	10.8	0.0	0.0	0.0	0.0	22.8	14.4
	±SD	113.8	21.5	7.7	60.7	39.7	0.9	6.3	0.0	0.0	0.0	0.0	33.4	6.0
RDA		**450**	**90**	**100**	**200**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**50**	**30**
16-17 years Girls (n:6)	**Mean**	467.4	29.7	0.0	151.8	122.6	0.8	9.9	0.0	0.0	0.0	5.4	18.9	14.5
	±SD	83.4	22.1	0.0	87.8	71.5	0.6	3.7	0.0	0.0	0.0	13.3	7.8	7.9
RDA		**330**	**75**	**100**	**200**	**200**	**-**	**-**	**100**	**-**	**-**	**500**	**35**	**25**