



Photos (from left to right): Enumerator giving orientation and showing the accelerometers to adolescents; enumerator giving wearing instructions on accelerometer; data collection in progress; girl adolescent doing household chores

Adolescents in rural Telangana, India: Evidence on differences in time use, physical activity, and food intake across lower caste groups

KEY MESSAGES

- Caste plays a visible and critical role in Indian society. It affects occupation, asset endowments, access and utilisation of resources, household and parental characteristics, societal and institutional factors, which in turn affect adolescent health and nutrition
- Combining data from traditional surveys and accelerometers, this study provides insights into the role of caste in defining nutritional adequacy of adolescents.
- Adolescent's Calorie Adequacy Ratios are significantly different across caste groups: backward caste, schedule caste.
- Differences in wealth influences the allocation of time and energy on different activities among adolescents within the caste category.
- Inter- and intra-caste gender differences exists in terms of time use and energy expenditure on different activities.

RATIONALE

There are 253 million adolescents in India, half of whom are malnourished¹, ensuring good adolescent health is therefore crucial for India's development and human capital investment². Adolescence is a unique, transitional stage of physical and psychological development, and behaviours and preferences adopted during this period influence present and future health, including nutritional outcomes³. While changes in diets and physical activity patterns greatly affect adolescent nutritional adequacy, caste also plays a profound role through socio-economic opportunities for rural livelihoods⁴. Nonetheless, the role of caste in determining nutrition dimensions that shape adolescent lives has not received attention in the literature^{5,6}. This study contributes to filling this gap by shedding light on caste-based variances in patterns of physical activity, food intake, and calorie adequacy of adolescents of different ages and by sex. By targeting disadvantaged groups such insights have the potential to inform the design/redesign of interventions enhancing the health and nutritional status of adolescents.

METHODS

While adolescent health and nutrition are interrelated with social, cultural, and economic trajectories⁷, in rural India caste has a profound influence in defining socio-economic opportunities, livelihoods, and activity spaces by determining household's endowments, occupation, parental characteristics, and access to resources, which in turn shape adolescent opportunities.

RECOMMENDATIONS

- Policy interventions to enhance adolescent nutritional adequacy must explicitly consider the socio-economic categories-based energy expenditure dimension.
- Appropriate policy interventions enhancing adolescent's health and nutrition need to be assessed and designed based on caste, gender, and age-wise differences in food intake and physical activity demands.
- Programmatic interventions targeting disadvantaged groups must consider the differences in occupational patterns, physical activity demands and constraints on access, and utilisation of resources and infrastructure associated with caste.

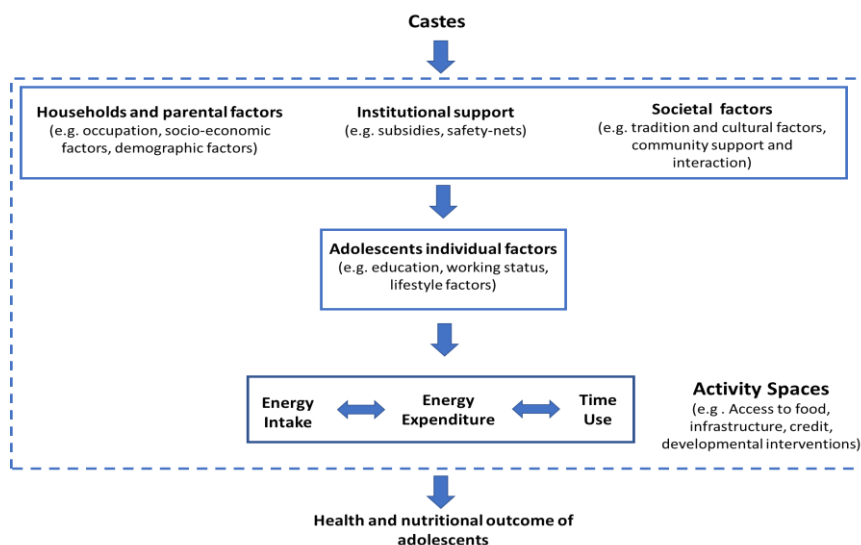


Figure 1: Conceptual framework: Factors shaping the health and nutritional outcomes of adolescents.

Our conceptual framework (Figure 1), was developed from in-depth interviews with key informants, it examines the role of caste on adolescent health and nutritional outcomes through its association with socio-economic endowments and opportunities. These factors then influence physical activity, energy expenditure, time-use, and food intake. The study triangulates household and individual data with key informant interviews (KII's). Combining an innovative method that integrates data on energy expenditure derived from research-grade accelerometers³, 24-hour recall food intake, and time-use data over five consecutive days, we followed 380 adolescents in Khammam and Mahbubnagar districts of rural Telangana, India. The survey data were collected from October 2019 to March 2020 while the six KII's were conducted in September 2021. The sample is made up of 45% Scheduled Caste (SC) and 55% Backward Caste (BC) adolescents. Caste is a socially stratified axis of Indian society and is subdivided into different groups in a hierarchy based on socio-economic status. SC and BC are at the lower hierarchy. However, SC's have been socially and economically disadvantaged for centuries, as compared to BC's. The study also carried out six key informant interviews to map the policy landscape and provide insight on access and utilisation of support programs for different caste groups.

Finding #1: Caste has a significant effect on Caloric Adequacy Ratio.

Figure 2 shows the Caloric Adequacy Ratio (CAR) distributions among early (10-14 yrs.) and late (15-19 yrs.) adolescents by sex and caste. To maintain adolescent's overall health, nutritional status, and well-being, daily energy intake should match energy expenditure (CAR equals 1). Our results show CAR's are significantly different across caste groups for late adolescent boys and girls. Insights from the KII's revealed that caste-based policies supported the nutrition and educational needs of SC adolescents more than the BC adolescents. Due to economic necessity, BC adolescents are taking part in agricultural operations in addition to household chores, which is resulting in a negative balance of calorie adequacy. Results underline the importance of caste's role in shaping household activities that influence opportunities for adolescents. Programmatic interventions are most effective when they consider nutritional intake and energy expenditure dimensions with respect to socio-economic categories.

Finding #2: Caste and endowment shape the allocation of time and energy.

We observed a significant difference in time and energy spent on education, economic, leisure, and travel activities between caste groups. SC boys spent a significantly higher proportion of time and energy (+5%) on educational activities than BC boys. Whereas BC boys spent a significantly higher proportion of their

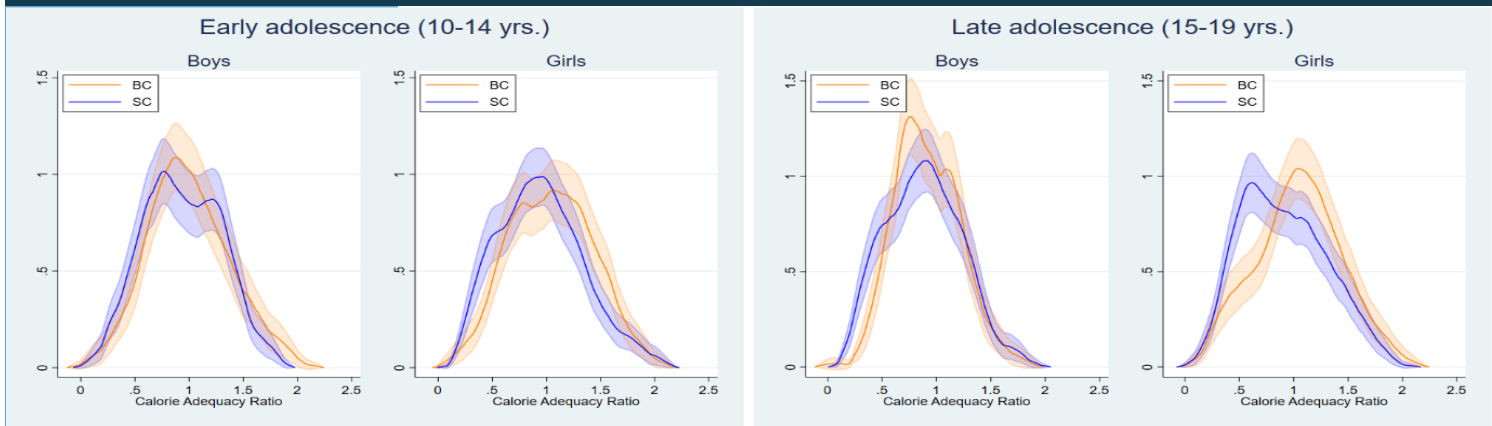


Figure 2. Caloric Adequacy Ratio (energy intake/energy expenditure) among early (left) and late (right) adolescents, by sex and caste (backward caste (BC) in orange and schedule caste (SC) in blue).

Notes: BC: Backward caste (in orange), SC: Schedule caste (in blue). 95% confidence intervals computed over 1,000 bootstrapped repetitions. Two-sample Kolmogorov-Smirnov test for equality of distribution: Early-adolescence boys ($p=0.396$), early-adolescence girls ($p=0.103$); late-adolescence boys ($p=0.017$); late-adolescence girls ($p=0.000$).

time and energy (+5%) on economic, leisure, and travel activities. Results show linkages between occupational patterns and asset ownership in defining the energy expenditure of BC's. Table 1 reports more granular insights into the effect of wealth on the proportion of time and energy spent on different activities between adolescents of wealthier versus lower wealth households within the same caste. Results show late adolescent boys from wealthier BC households allocate 5% more time and spend 11% more energy on economic activities compared to lower wealth BC boys. Similarly, late adolescent girls from wealthier BC households allocate 3% more time and 5% more energy to economic activities compared to their counterparts of lower wealth. Furthermore, lower wealth early and late adolescent BC boys spend more energy (13% and 15% respectively) and allocate more time (5% and 7% respectively) on educational activities compared to wealthier BC boys. We do not observe any effect of wealth in the allocation of time and energy on economic and educational activities of SC category adolescent boys or girls.

Due to economic necessity and domestic need, late adolescent boys and girls of wealthier BC's are required to be involved in unpaid economic work. However, lower wealth households own little to no agricultural land regardless the caste membership and therefore adolescents do not tend to be engaged in agricultural activities. Therefore, policies supporting the agricultural system may have an indirect effect on adolescent's engagement in unpaid work and increase educational opportunities and access to nutritional programs. For example, subsidies of small mechanised agricultural tools may release adolescent's burden of working in the fields as well as adult's physical effort and the effects is likely higher for households owning larger plots.

Finding #3: Gender differences are still profound.

Among caste groups, there are significant inter- and intra-caste gender differences. Boys tend to be more engaged in economic activities compared to girls of the same age group. Cultural and socio-economic factors shape the gendered allocations of time and energy on economic, educational, domestic, travel, and leisure activities. For instance, domestic activities remain a predominantly feminine domain. Insights from the KII revealed that most lower caste parents are not sending their daughters to residential school, due to a lack of awareness on the return of higher education, which can have a transformational impact in an adolescent girls' life. Further, their tradition and cultural taboos restrict girls' mobility. Policy efforts are needed to sensitise parents of adolescents on gender differences and the importance of girls' education (combined with empowering both SC and BC girls to participate in educational activities and skill-based work to help them climb the social ladder). Policies should also specifically focus on measures to mitigate gender differences. Gender differences in societies are grounded in poor socioeconomic status, inadequate decision-making power, insufficient understanding and appreciation of the importance of appropriate care of family, thus playing a central role in the intergenerational cycle of malnutrition

Table 1: Percentage difference between the top and bottom wealth in the proportion of time and energy expenditure spent on different activities, by sex and age and caste (Scheduled Caste (SC) and Backward Caste (BC)).

	Boys				Girls			
	Early Adolescence		Late Adolescence		Early Adolescence		Late Adolescence	
	SC	BC	SC	BC	SC	BC	SC	BC
Education								
Time	-0.033	-0.051**	-0.033	-0.078***	-0.025	-0.025	0.018	-0.011
Kcals	-0.072	-0.132***	-0.068	-0.154***	-0.074	-0.096***	-0.032	-0.084**
Economic								
Time	0.022*	0.025**	0.008	0.054***	0.023**	0.021*	0.004	0.029***
Kcals	0.048**	0.049**	0.017	0.114 ***	0.043**	0.039*	0.009	0.053 ***
Domestic								
Time	0.026***	0.008	0.031***	0.015	0.038***	0.044***	0.006	0.046***
Kcals	0.043**	0.018	0.046***	0.025	0.061***	0.085***	0.003	0.092***
Leisure								
Time	0.063***	0.033*	0.021	0.031*	0.001	-0.009	0.014	-0.024
Kcals	0.105***	0.037	0.005	0.016	-0.025	-0.038	0.005	-0.067***
Travel								
Time	-0.025***	0.033***	0.022***	0.029***	-0.019**	0.001	0.004	0.001
Kcals	-0.073***	0.029	0.039**	0.029	-0.029	-0.001	0.042 **	0.029*

Note: The table reports differences in the marginal effects of ANOVA, using Bonferroni corrections for multiple comparisons. *** 1 percent significant ** 5 percent significant, * 10 percent significant.

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