



What shapes adolescents' diet and physical activity habits in rural Konkan, India? Adolescents' and caregivers' perspectives

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Abstract

Objective: To explore, adolescents' and caregivers' perspectives, about shaping of diet and physical activity habits in rural Konkan, India.

Design: Five focus group discussions (FGD) were conducted with adolescents and two with caregivers. Data were analysed using thematic analysis.

Setting: FGD were conducted in secondary schools located in remote rural villages in the Ratnagiri district, Konkan region, Maharashtra, India.

Participants: Forty-eight adolescents were recruited including twenty younger (10–12 years) and twenty-eight older (15–17 years) adolescents. Sixteen caregivers (all mothers) were also recruited.

Results: Three themes emerged from discussion: (i) adolescents' and caregivers' perceptions of the barriers to healthy diet and physical activity, (ii) acceptance of the status quo and (iii) salience of social and economic transition. Adolescents' basic dietary and physical activity needs were rarely met by the resources available and infrastructure of the villages. There were few opportunities for physical activity, other than performing household chores and walking long distances to school. Adolescents and their caregivers accepted these limitations and their inability to change them. Increased use of digital media and availability of junk foods marked the beginning of a social and economic transition.

Conclusion: FGD with adolescents and their caregivers provided insights into factors influencing adolescent diet and physical activity in rural India. Scarcity of basic resources limited adolescent diet and opportunities for physical activity. To achieve current nutritional and physical activity recommendations for adolescents requires improved infrastructure in these settings, changes which may accompany the current Indian social and economic transition.

Keywords
Adolescence
Food choices
Diet
Physical activity
Rural India
Qualitative study

Adolescence, the phase during which a child transitions into adulthood, is developmentally second only to infancy in terms of rate of growth. The process of physical and emotional maturation is nutritionally and physiologically

demanding and is characterised by complex psychosocial interactions⁽¹⁾. Optimal growth and development during adolescence is supported by adequate nutrition. Since adolescence serves as the foundation for a healthy

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adulthood, it is imperative that nutrition during this life-course phase is not neglected.

Developing countries like India face a triple burden of malnutrition, describing the coexistence of both under- and over-nutrition. In many areas, under-nutrition is the primary cause of ill-health and stunting in children⁽²⁾. When stunted children reach puberty, the associated physiological changes impose an additional burden on their health, making them vulnerable to diseases in later life^(1,3,4). The prevalence of malnutrition adolescents in rural India is alarming⁽⁵⁾. Studies conducted at our centre in rural Konkan found 41 % of adolescents to be anaemic, while two-thirds were undernourished (BMI < 18.5 kg/m²)⁽⁶⁾. Additionally, over-nutrition is increasingly prevalent in India and is associated with obesity and the development of non-communicable diseases. Many non-communicable diseases, which are generally manifested in later life, have their origins early in fetal life⁽⁷⁾. Adequate nutrition during pregnancy has a major role in optimising outcomes and confers long-term health benefits to the offspring. Adolescents, as prospective parents, assume an important role in shaping the health of future generations; however, large segment of the young population is exposed to poor diet diversity and lack of nutrient-dense food⁽³⁾. Therefore, addressing the nutritional concerns of adolescents has the potential for triple benefit, to adolescents now, in the future, and for their children.

Socio-ecological theory posits that health behaviours are determined by inter-related personal and environmental factors⁽⁸⁾. Food security, including accessibility and availability, is associated with malnutrition in developing countries. As part of their conceptual framework, Turner *et al.*⁽⁹⁾ distinguished between availability, the presence or absence of particular foods, and accessibility, which includes personal and contextual factors^(10,11). There are many other factors during adolescence that may shape diet and physical activity behaviours. In addition, obesity could be attributed to increased consumption of high-fat foods and an inclination towards a sedentary lifestyle during adolescence⁽¹²⁾. To date, adolescents' and caregivers' perspectives on factors influencing their diet and physical activity habits in Konkan, India have not been explored. Adolescents are difficult to engage in behaviour change and unless their perspectives are acknowledged, interventions are unlikely to be effective. A qualitative methodology was chosen to address this gap. This study formed part of Transforming Adolescent Lives through Nutrition (TALENT), an international collaboration aiming to understand adolescents' dietary behaviour and opportunities for physical activity (Barker *et al.*, this issue).

Methods

Setting

This study was carried out in two villages in the Ratnagiri district, a rural part of the Konkan region of Maharashtra, India⁽¹³⁾. Although the villages have electricity, access roads

are poorly lit with limited power supply. Farming is the main occupation of the village inhabitants; the main crop of Ratnagiri district is rice. Vegetables and fruits are generally imported from other districts as the hilly terrain has fragmented holdings making cultivation difficult. Basic commodities such as groceries are available in the local weekly market shared by 10–12 villages. In general, the population here belongs to lower socio-economic strata. Government-run schools are generally located close to the highways meaning that children living in remote areas must walk long distances to school. This study was conducted by the BKL Walawalkar Hospital and Research Centre. This is the only multispecialty hospital with state-of-the-art medical facilities along the Konkan belt. The trust which runs the hospital has initiated several local welfare schemes and, as a result, staff have good rapport with surrounding communities.

Research design and participants

Students studying in Grade V were selected to represent the younger adolescent age group (10–12 years) and those studying in Grade X formed the older adolescent group (15–17 years). A total of 112 adolescents were recruited from the selected schools to participate in a demographic survey, which included a diet diversity questionnaire. A subset of willing survey respondents were conveniently sampled for participation in focus group discussions (FGD). FGD were used to explore adolescents' and their parents' (hereafter, caregivers) perceptions of influences on adolescent diet and physical activity and to collect their ideas about effective health interventions⁽¹⁴⁾. Seven FGD were conducted: two with 10–12 year olds, three with 15–17 year olds, one with caregivers of the 10–12 year olds and one with caregivers of the 15–17 year olds. Girls and boys, adolescents and caregivers, participated separately. FGD were facilitated and observed by researchers who had worked as psychologists in the community for 2 years, were well-acquainted with the community and had a good relationship with local schools. These researchers received training from the TALENT collaboration in qualitative research prior to the commencement of the project and on-going support during the data collection.

Data collection

Contextual data

Anthropometric data collection comprised height (to the nearest 0.1 cm) and weight (in kg) and was used to calculate BMI. The WHO's definition to stunting was used (height Z-score < -2)⁽¹⁵⁾. Ten food groups were used to calculate dietary diversity by adding individual scores (either 1 or 0) with 10 being the maximum.

Focus group discussions

FGD were carried out (June–September 2018) using separate semi-structured FGD guides for adolescents and caregivers (see online supplementary material). All FGD were



conducted in schools, except one which was held at the research centre. Each FGD consisted of 8–10 participants and lasted 45–60 min. A facilitator guided the discussions and an observer recorded the proceedings. R.C. and S.S. facilitated and observed the FGD, alternating their roles. All were audio-recorded. At the start of each FGD, the researchers introduced themselves, the purpose of the study, and asked participants if they were happy for the audio-recording to begin. Discussions were held in the participants' local language, Marathi.

Data analysis

The audio-recorded FGD were transcribed verbatim into the local Marathi language. Subsequently, the recordings were translated into English by R.C., C.J. and U.B. to enable discussion of findings across the TALENT group. The accuracy of translations was judged by listening to the audio-recordings while matching them with the translations. The transcripts were analysed thematically, guided by Braun and Clarke's approach⁽¹⁶⁾ and using the qualitative analysis software NVivo (version 12). The researchers immersed themselves in the data, (re)reading the transcripts thoroughly. To begin, emerging themes were identified which informed the development of an initial coding framework. The data were then coded inductively by U.B., R.C. and S.S.. The coding pattern was subsequently checked by experts (P.H.J. and S.W.) to ensure accuracy and the patterns emerging from the data were discussed. After scrutiny and discussion among the research team, similar codes were grouped together and categorised. These categories were revised and eventually developed into themes and sub-themes.

Results

In total, fifty 10–12 year olds (twenty-five boys, twenty-five girls) and sixty-two 15–17 year olds (thirty-five boys, twenty-seven girls) took part in the survey (see Table 1). Adolescents in both the age groups had mean BMI values below WHO averages⁽¹⁶⁾. Stunting was apparent in 16% of the 10–12 year olds. Among older adolescents, stunting was observed in 40% boys and 8.7% girls. Twenty of these younger adolescents (ten boys, ten girls), twenty-eight of the older adolescents (ten boys, eighteen girls) and sixteen of their caregivers participated in the FGD. Average years of parental education (father and mother) were 5.7 and 6.5, respectively, among parents of older adolescents, compared with 4.9 and 5.7 years, respectively, for the younger group. Approximately 80% of fathers of older adolescents and 69% of younger adolescents were employed. A substantial number of mothers (66% in older and 87% in younger) were not employed.

Analysis of data derived from FGD led to the emergence of three key themes: (i) adolescents' and caregivers' perceptions of the barriers to healthy diet and physical activity, (ii) acceptance of the status quo and (iii) salience of the

social and economic transition. These main themes are presented in the text below, followed by a conceptual diagram outlining the key findings.

Theme 1: Adolescents' and caregivers' perceptions of the barriers to healthy diet and physical activity

Availability of food

Adolescents revealed that their consumption of fruits and vegetables was very low, and that availability was an important limitation to their food choices. Most of the participants mentioned that the vegetables and fruits were not always available in the local markets, making it difficult for them to buy. Food availability was equated with ability to buy produce at the market and grow food at home. From these data, participants' felt that availability had a large influence on food consumption despite the locally available, nourishing seasonal fruits and vegetables:

P: We don't get root vegetables or fruits that often . . . only once a month (FGD 1, older girls)

One girl said she believed there to be greater food availability in cities and explained how this influenced local nutrition:

P: We have limited choice of vegetables in our village. You get more in urban areas. If we get those we will get better nutrition. (FGD 1, older girls)

Access and affordability of food

In accordance with Turner *et al.*'s⁽⁹⁾ conceptual framework of food security, availability precedes accessibility whereby certain foods cannot be accessible without being available⁽¹⁰⁾. However, adolescents in this study perceived both availability and accessibility as barriers to a healthy diet. Even when certain foods were available, they were not always accessible. The remote villages in Konkan do not have easy access to markets, which are usually held just once a week, on a fixed day. Limited transport options meant that the villagers had to walk long distances (>30 min) to the market.

Purchasing power was another factor which determined how often groceries were bought. Most parents explained that this happened 'whenever we have money':

F: How often do you buy groceries?

P: Some of us every 4 months, some every 6 months (FGD 7, parent of older adolescent)

P: . . . Depends on money (FGD 7, parent of older adolescent)

Seasonality

Seasonality was another important factor determining food availability. The Konkan region of Maharashtra is well known for fruits like Alphonso mangoes and jackfruit. Consumption of these when in season (approximately 2 months) contributes significantly to the nutrient intake in

Table 1 Anthropometry and socio-demographic characteristics of the adolescents

	Age groups							
	10–12 years (n50)				15–17 years (n62)			
	Boys		Girls		Boys		Girls	
Anthropometry	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>n</i>	25		25		35		27	
Weight (kg)	26.8	4.5	29.7	5.2	45.9	9.2	42.9	7.5
Height (cm)	135.0	6.8	136.5	7.8	160.6	9.8	155.9	5.6
Height-for-age Z	-1.21	0.84	-1.21	1.02	-1.36	1.24	-0.85	0.79
Stunting (%)	16		16		40		8.7	
BMI (kg/m ²)	14.7	2.2	15.8	1.7	17.7	1.8	17.6	2.3
BMI-for-age Z	-1.58	1.35	-0.84	1.07	-1.27	0.97	-1.37	1.09
Thin (%)	37.5		16.0		22.9		21.7	
Overweight (%)	4.2		0		0		0	
Obese (%)	4.2		0		0		0	
Dietary diversity score*	8.1	2.7	7.1	3.5	8.1	3.0	6.7	2.2
Socio-demographic data								
Ownership of mobile phones, <i>n</i> (%)	0	0	0	0	12	34.3	11	40.7
Average screen time (h/d)	1.2	0.7	1.4	0.8	1.4	0.8	2.1	0.7
Education in years								
Mother								
Mean			4.9				5.7	
SD			3.2				3.5	
Father								
Mean			5.7				6.5	
SD			4.1				3.7	
Mother's occupation (%)								
Paid employed			26				11.3	
Self-employed			8				1.6	
Not employed			66				87.1	
No response			0				0	
Father's occupation (%)								
Paid employed			80				69.4	
Self employed			12				22.6	
Not employed			4				8.0	
No response			4				0	
Household members								
Adults								
Mean			3.3				3.6	
SD			1.7				1.5	
Children								
Mean			2.5				2.1	
SD			1.2				1.1	

Height-for-age Z, BMI-for-age Z, stunting, thin, overweight and obese are defined using WHO 2007.

*Dietary diversity score was calculated based on the consumption of the following ten food categories: **1.** Either grains or white roots/tubers; **2.** Either orange-coloured vegetables/roots or orange-coloured fruits; **3.** Other vegetables; **4.** Other fruits; **5.** Either organ meats or meat/poultry or fish/seafood; **6.** Eggs; **7.** Milk/milk products; **8.** Green leafy vegetables; **9.** Nuts/seeds; **10.** Beans/peas/lentils.

this population who are otherwise deprived of these nutrients for the rest of the year. Seasonality also determined consumption of certain vegetables. Participants reported, for example, going without green leafy vegetables during the monsoon season.

P: Just now it's [the] season so we eat mango, jackfruit (FGD 2, older adolescents)

P: Don't get many leafy vegetables in the rainy season (FGD 6, parents of younger adolescents)

Lack of dietary diversity

Discussions revealed that adolescents' staple diet consisted of cereals (rice or wheat), millets (sorghum, pearl millet and finger millet), pulses and vegetables and lacked dairy

products and fruits, giving the diet diversity score in the range of 6.7–8.1 (see Table 1). There was not much variation reported in the adolescents' meal patterns. The parents backed their claims about the monotony of their diets, but some mothers had innovative ways of modifying dishes:

P: If same thing is cooked again and again we also get bored. They [adolescents] don't like ladies fingers (okra). We sprinkle gram flour and make it crispy, then they will eat (FGD 6, parent of younger adolescent)

The younger adolescents were provided with one meal in school through the government's midday meal scheme. However, parents felt the quality and adequacy of these meals was debatable:



P: They have mid-day meal in school... It is not very nutritious. Sometimes vegetable is there, sometimes it is not there, sometimes only pulse and rice. (FGD 6, parent of younger adolescent)

Other influences on food choices

There was a feeling of excitement when adolescents discussed food that they purchased and ate outside of the home. Purchasing street food was a rare opportunity for the, usually older, adolescents to express some dietary autonomy. However, their parents' choices often took precedence and it was with the family that they occasionally visited restaurants in a nearby town. Generally, participants were not able to say how often they ate away from home, suggesting that it was infrequent.

Adolescents were also able to express some dietary autonomy during school break-times, although not very often. Adolescents largely felt that peers were not an influence on these choices. Rather, pocket money given by parents and the availability of cheap, appealing food within the vicinity of schools were more influential. Commonly purchased items included candies, packets of chips (Kurkure) and Indian Chinese food, readily available from roadside food vendors. These foods were also valued because they offered a change from the monotony of their daily diets.

P: I like the taste and if it is more spicy, then I like it better. (FGD 4, older boys)

P: It tastes better than [a] meal. (FGD 3, younger boys)

When adolescents and caregivers were asked who decided the menu at home, the most common answer was mothers. However, mothers took into consideration the preferences of the entire household.

P: My mother asks everybody. She takes consensus and then cooks. (FGD 1, older girls)

Opportunities for physical activity

Adolescents understood the association between physical activity and health:

P: If we do physical activity we will remain healthy.

P: Bones become strong. (FGD 2, older girls)

Despite some knowledge of the health benefits, in general, physical activity was not a priority for adolescents. None made purposive efforts to stay fit. Adolescents participated in sports requiring limited equipment and infrastructure (e.g., kabaddi, kho-kho and wrestling). These were usually played after school.

Gender differences in physical activity habits were evident. Girls indicated that they preferred indoor, whilst boys favoured outdoor games. One caregiver gave a lack of other girls to play with as the reason for her daughter not

being more active. There was no suggestion that she might play with boys:

P: My daughter does not have friends here, as we do not have many females here. (FGD 7, parent of older adolescent)

Household chores such as fetching water, farming activities, washing clothes, cleaning utensils and household cleaning constituted a major part of physical activity for adolescents, particularly girls:

F: What work you do at home?

P: Fetch water, wash clothes, clean vessels, clean the house. (FGD 2, older girls)

Fetching water required significant physical activity, since in rural India water scarcity is a major problem especially in summer. People must fetch water in pots from either a common borewell, a well, river or a common tap, often up to 2 km from the village. The few schools and lack of transportation mean that children walk to school for up to 60 min' each way.

P: Our school is very far away from our home. We have to walk a lot. That itself is an exercise. (FGD 2, older girls)

Adolescents also had some opportunities for engaging in physical activity in school, with fixed hours for physical education.

P: In school we have physical training class sometimes. (FGD 3, younger boys)

Little encouragement from caregivers, few places to play and a general lack of infrastructure were the main reasons cited for not participating in sports. Older adolescents and their caregivers also mentioned academic studies as a barrier:

P: Parents tell [you] to do work and not to play. (FGD 5, younger adolescent)

P: They come home [from school] and sit down for studies. (FGD 7, caregivers of older adolescents).

Theme 2: Acceptance of the status quo

Lack of adolescent voice

In general, younger adolescents seemed reticent to discuss the topics of these focus groups. This may reflect the local culture which discouraged young people from talking freely to 'outsiders'. The older adolescent groups were, however, more vocal and engaged more in discussion. Adult participants may also have lacked confidence to express their opinions in front of the research team, whose high levels of education may have been inhibiting.

Fatalistic view of circumstance

Adolescents' acceptance of their current lives was striking. With limited exposure to the outside world, they appeared content. When asked about what changes they would like to make to their lives, they were silent, which could be interpreted that there was nothing they would like to change. When the facilitator probed further, however, the adolescents began to create a wish list of changes they would like to see in their environment. This list consisted primarily of basic infrastructure such as better roads, improved power and water supplies, and more facilities:

P: There is no shop of any kind near our house or nearby area. Some facility of that kind needs to be there. (FGD 1, older girls)

P: Plenty of tree plantations or gardens. (FGD 1, older girls)

The initial fatalism of both all participants could be a learnt response having become accustomed to accepting and coping with the restrictions of their limited resources. This was reflected in some of the discussion about the availability of food.

P: Just now there are not many vegetables. So we have pulses. Children have to eat it. They get bored but we can't do much. Market is not close by. So they are forced to eat pulses. (FGD 6, parent of younger adolescents)

P: It's a village and we may not get all the vegetables we want, so we eat whatever is available. (FGD 2, older girls)

Theme 3: Salience of social and economic transition

The data indicate that few adolescents in this region owned a smartphone or a computer (see Table 1). Limited and erratic power supply to the village was the main deterrent to use of these devices. Although their access to digital media was limited, the availability of televisions was increasing, and some described the effect that television advertisements had on them. Caregivers spoke about the influence of media and advertising with some frustration. Most caregivers, in this case mothers, succumbed to

adolescents' demands, believing their desires were shaped by advertisements:

P: They see these fried food items on TV and then we have to cook them. (FGD 6, caregivers of younger adolescents)

There was also some evidence that cultural norms for physical activity are also changing in response to local social and economic transition. Displacement of physical activity, by sedentary pursuits, such as watching TV could be an indication of the beginnings of transition to a more inactive lifestyle:

F: Which games do your children play?

P: They don't play much. They watch more TV. (FGD 6, parent of younger adolescent)

The access within the vicinity of school to cheap, sugary and salty foods described by adolescents may be another indication of transition. Cultural changes in how girls' education is perceived also indicate a step towards societal transition in Dervan. One adolescent girl expressed hope for a change in the traditional and conservative attitudes of people in general towards girls.

P: There are many boys and girls from outside who are staying here for education. Rather than making fun of them . . . change the attitude of people about [girls'] education so that many more students come in. (FGD 2, older girls)

As shown in Fig. 1, adolescents perceived their current diet and physical activity opportunities to be lacking in diversity, driven by necessity rather than choice, and largely based on tradition and home-cooked foods. In contrast, they aspired towards variety and choice over their diets and opportunities for physical activity. They indicated a desire for a more modern diet and capacity to challenge the status quo. The adolescents suggested that improved availability and accessibility including education, purchasing power, transport and infrastructure would allow them to realise these aspirations.

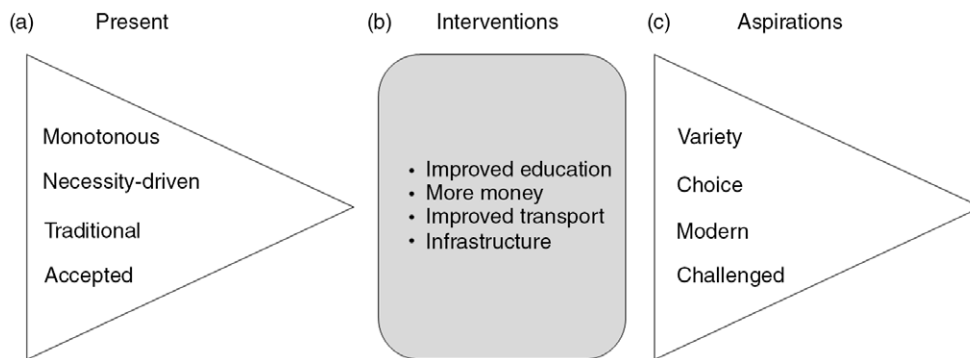


Fig. 1 Thematic map depicting adolescents' perspectives on their (a) current diet and physical activity opportunities, (b) aspirations for the future and (c) the focus of the interventions that would lead to these aspirations being realised



Discussion

This study was conducted in order to understand influences on the health of adolescents in rural India, in relation to their diet and physical activity. Using FGD, we have identified some important constraints to rural adolescent food choices and engagement with physical activity. It appears that, in the struggle to meet the basic necessities of life, adolescents and their caregivers in this underdeveloped part of Konkan were often unable to prioritise a good quality diet or physical activity outside of what was required by chores and transportation. When asked what they thought could be done to improve adolescent diet and physical activity, participants required encouragement to think about anything that could be changed. Ultimately, infrastructure improvements that would increase their access to food, water and education were the only solutions suggested.

Baseline prevalence of underweight and stunting was high, especially among boys, who are likely to be more physically active. Despite their heightened physical activity, they face the same barriers to healthy diet as the girls, including food availability, food access and affordability. It is possible that this imbalance is reflected in stunting and underweight among them.

Although there are many studies documenting the nutritional status of adolescents^(17–19), very few explore adolescents' own perceptions or those of their caregivers of the factors influencing their diet and physical activity habits and their relation to health^(20,21). Malnutrition among adolescents is highly prevalent in developing countries^(22,23). The effects of impoverishment are more pronounced in rural parts of the country where people are lacking in basic resources. Many of the adolescents and their mothers who took part in this study displayed a fatalistic acceptance of the diet and physical activity restrictions they experienced and required prompting and encouragement to begin thinking about what might be changed.

Limitations to food choices

Food availability and accessibility have been identified as two dimensions of food security which may be important determinants of adolescents' dietary pattern^(24,25). Data from the study reported in this paper suggest that the food choices of adolescents in Konkan were limited by both dimensions, especially with respect to fruits and vegetables which depended on seasonality. No policies to address seasonality or the impact of seasonality on food availability in Konkan currently exist.

When foods were available, accessibility acted as a barrier including limited transport options and purchasing power. In tandem, societal and economic transition is leading to increasing availability and accessibility of cheap dense 'junk' foods from food vendors outside of schools. This is consistent with previous suggestions that food prices

as well as vendor and product characteristics affect how affordability and convenience are perceived⁽⁸⁾. These findings are also consistent with the results from a qualitative study among women of reproductive age in rural Maharashtra⁽²⁵⁾. Quantitative studies have confirmed that consumption of vegetables was low in rural compared with that of urban areas⁽²⁵⁾. Data from this and other studies indicate that differences in eating patterns between urban and rural areas could be attributed to seasonal availability, lack of transportation and storage facilities in rural areas, thus making access to fresh produce more problematic. Consequently, diets have been found to be much less diverse in rural areas which is likely to lead to suboptimal nutrient intake⁽²⁶⁾. Arimond *et al.*⁽²⁷⁾ found that the consumption of monotonous diets, similarly to those described by participants in the current study, was associated with micronutrient deficiencies in women living in resource poor settings. Interestingly, in contrast to the findings of this study, no barriers to healthy eating were reportedly perceived among rural children in South India⁽²⁸⁾. These authors, however, reported that rural adolescents were generally less vocal than urban adolescents and that their responses to questions raised were limited in content. To address the potential for limited discussion among adolescents in this study, the researchers were trained by experienced qualitative researchers in how to facilitate discussions with adolescents. Despite this, the researchers of this study reported similar observations in their field notes. Specifically, that many of the adolescents were shy and quiet, which may reflect the participants' socio-cultural context.

Influences on food habits

Peer influences are commonly found to have significant impact on adolescents' behaviour in general and food choices⁽²⁰⁾. The study reported here suggests that, in this community, the influence of family members was a more important determinant of adolescents' diet than peers. A previous study has shown that parental role modelling of healthy eating was a positive influence on the food behaviour of secondary schoolchildren in urban Kolkata, India and increased their consumption of fruits and vegetables⁽²¹⁾. In contrast, urban Indian adolescents residing in South India and in Canada resorted to unhealthy eating in the company of friends and siblings⁽²⁸⁾. It seems reasonable to conclude that both parents and friends are important influences on young people's diets. What was striking in the data reported in this paper was that even in a situation like rural Konkan where choices are so constrained, adolescents still chose to spend the small amount of money and exercise what limited autonomy they had by buying cheap sweets and drinks from vendors outside school. Ironically, the junk food was more affordable than healthy alternatives like fruits. This behaviour may of course be influenced by the media to which they are



exposed since the influence of television on food habits of adolescents is well-documented⁽²⁹⁾.

Constraints on physical activity

The contribution of physical activity to the health and well-being of adolescents is widely recognised^(30,31). The Indian National Policy on education recommends 60 min of moderate to vigorous intensity physical activity for young adolescents, per day⁽³²⁾. However only 8 % of Indian adolescents are reported to meet this requirement⁽³³⁾. Challenges to increasing physical activity among the rural adolescents who took part in this study include lack of facilities for formal sports, lack of encouragement, lack of school sports activity and above all academic burden. These findings are consistent with other studies conducted in both rural and urban settings^(34,35). Physical activity for rural adolescents in this study took the form of household chores and walking to school. All housework in rural areas is done manually which is both time and energy consuming. In this setting, adolescents perceived routine schooling and household activities to be adequate physical activity and did not feel it necessary to engage in any additional exercise. Gender differences in relation to physical activity were reported with boys being more physically active than girls⁽³⁵⁾. It is not clear from the discussions, however, whether girls' physical activity in performing household chores was thereby discounted. In rural parts, the barriers to physical activity outweigh the opportunities which are limited. Moreover, with early signs of transition detectable, the physical activity quotient may be expected to dip further unless timely steps are taken to provide more opportunity for young people to engage in physical activity.

Implications of the findings

In many developing countries, more than 50 % adolescents have poor quality diets, receive inadequate nutrition and hence fail to achieve their growth potential⁽³⁶⁾. The study reported here highlights some important needs to be met if adolescents are to maximise their growth. The data presented identify some significant challenges faced by this group which may be used to design and develop intervention strategies at local and national level. At the local level, policymakers can take cognisance of these constraints and recommendations can be made to improve the infrastructure of rural areas to address the health of adolescents.

The data presented here support clear recommendations for programmes to improve the availability and accessibility of foods, to make healthy foods like fruits and vegetables affordable, create more opportunities for adolescents to engage in physical activity and encourage the young people to engage positively in the development of their community. Some interventions to improve lifestyle behaviour among adolescents have been tried in urban India^(37,38) and have shown improvement in behavioural as well as anthropometric and metabolic parameters⁽³⁸⁾.

Another intervention using food system-based approach to address nutrition deficiencies is in progress in India⁽³⁹⁾. It should also be noted that adolescents displayed excitement about spending rare pocket money on 'junk' foods from street vendors. Therefore, behavioural interventions alongside those to improve food availability and accessibility are needed to engage adolescents in healthy choices.

Strengths and limitations of the study

A major strength of this study was that it was well conceived, with the participating researchers having received qualitative research training. There was also excellent cooperation from the participating schools. Using FGD as the method of data collection gave adolescents the opportunity to express themselves which led to the evolution of rich data. Finally, while the focus of previous research on adolescent nutrition has been on girls, this study has engaged both older and younger boys and girls, and their parents in the study, providing a contextualised picture of the issues determining adolescent nutritional status.

However, there were some limitations. All but one FGD was conducted in a school setting where the students were attending classes but we attempted to mitigate this by allotting time specifically for the FGD, away from their classes. The FGD observers also noted that fear of being ridiculed by classmates might have been a factor that inhibited free discussion and honest responses. Introductory ice-breakers were carried out to build rapport and encourage adolescents to feel comfortable. Participants shared a similar cultural and environmental background producing limited variation in their responses. Therefore, semi-structured interviews in addition to FGD may be helpful in the future to gain individual experiences and perspectives. Finally, some misinterpretation of participant's statements was a possibility, as the analysis was not conducted in the original language. However, the transcripts were checked thoroughly against the audio data and original translations.

Conclusion

The objective of the current study was to explore the influences on diet and physical activity among rural Indian adolescents. Several significant constraints to healthy diet and physical activity were identified in this population. As the situation currently stands, these adolescents have little choice in relation to their diet and physical activity. The findings reflect the need for comprehensive intervention strategies targeted to improve availability and accessibility of diverse foods and create opportunities for physical activity for adolescents. This study underlines the need for developmental policies to implement improvements in rural infrastructure in order to fulfill the ambition to have healthy, fit and disease-free future generations of Indians.



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Supplementary material

For supplementary material accompanying this paper visit <https://doi.org/10.1017/S1368980020001731>

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