



## Impact of poverty on the health of Rural Women of India

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ARTICLE INFO	ABSTRACT
<p><b>Original Research Article</b> Received on November 12, 2024 Revised on November 15, 2024 Accepted on November 18, 2024 Published on December 17, 2024</p> <p><b>Article Authors</b> Aarti Bishnoi, Swati Ojha</p> <p><b>Corresponding Author Email</b> <a href="mailto:aartibishnoi70@gmail.com">aartibishnoi70@gmail.com</a></p>	<p>This study was aimed at identifying the perceived barriers and facilitators to fruit and vegetable consumption among women living in rural communities in Haryana, India. We used qualitative methods and held 9 focus group discussions and 12 one to one interviews. The Data collection was stopped when no new information emerged. We used inductive thematic coding to analyses the data. Women aged 18-40 years were recruited from eight villages surrounding the city of Sirsa, Haryana. Women knew that fruit and vegetables are beneficial to health and expressed that they wanted to increase intakes of these foods for themselves and their children. Seven main reasons were identified as being barriers or facilitators to fruit and vegetable consumption such as: personal factors; household dynamics; social and cultural norms; workload; time pressure; environmental factors and cost. The conclusion we got was Rural Indian women consumed fruit and vegetables infrequently and said they would like to consume more. Several potentially modifiable factors affecting intakes were identified. Value chain analyses of fruit and vegetables in these communities are important to identify opportunities to intervene to increase consumption.</p>
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Micronutrient deficiencies are prevalent among women of reproductive age in Low and Middle Income Countries (LMIC) (Darnton-Hill, Mkparu, 2015; Bhutta *et al.*, 2013). WHO states that malnutrition is directly or indirectly linked to major causes of death and disability worldwide? It is estimated that South Asia faces the greatest hunger burden, with about 281 million undernourished people (United Nations, 2016). Sustainable Development Goal 2 is to “end hunger, achieve food security and improved nutrition and promote sustainable agriculture” (United Nations, 2016). In order to attain this goal, it is important to have a clear understanding of the barriers to a sustainable nutritious diet for all.

Diets in many rural parts of India are often poor quality, carbohydrate-based (Isharwal *et al.*, 2009 and National Institute of Nutrition, 1994) and lacking in micronutrient-rich foods (Pathak, 2004). Micronutrient intakes are usually inadequate when access to a diverse and high quality diet is limited (Darnton-Hill, Mkparu, 2015; Allen, 2005 and Nguyen *et al.*, 2012). This may be because a diverse diet is unaffordable (Darnton-Hill, 2005) locally unavailable or unacceptable for cultural or religious reasons (Briones, 2015). Also, average fruit and vegetable intakes are below the recommended 5 portions or 400g per day (National Institute of Nutrition, 1994; Radhika *et al.*, 2008; Chopra *et al.*, 2012) with rural intakes lower than those in urban areas (Miller *et al.*, 2016).

Our study was conducted in villages surrounding the city of Sirsa in the State of Haryana. The climate in this area is hot and dry and the agricultural land is mainly rain-fed and used for commercial crops including cotton, Rice and Wheat (Das *et al.*, 2014). The majority of the work forces are occupied within the agriculture industry. Less than 20% of households in rural Haryana have a refrigerator (International Institute for Population Sciences, 2018) and approximately 30% of women in the State report never consuming meat, fish or eggs (International Institute for Population Sciences, 2018). Dietary data from the villages around Sirsa indicates that wheat, rice and sorghum (millet) are the staple cereal foods (Bhaskar *et al.*, 2017). Intakes of virtually all micronutrient-rich foods have been reported to be below 20% of the Recommended Daily Intake (RDI), for example mean daily consumption of green leafy vegetables is less than 10g/day and fruit is 16g/day compared with a RDI of 100g/day for both food groups. Half of the women were chronically energy deficient (BMI<18.5kg/m<sup>2</sup>) and over 75% of non-pregnant non-lactating women were anaemic (Bhaskar *et al.*, 2017).

This study focuses on fruit and vegetables because a large proportion of the Indian population is vegetarian and therefore these foods are acceptable to the majority. Furthermore their consumption is associated with reduced risk of micronutrient deficiencies and non-communicable disease (Wang *et al.*, 2014 and Lim *et al.*, 2012). The most recent Global Burden of Disease analysis estimated that 4.9 million deaths per year were attributable to low fruit intake (Lim *et al.*, 2012) and 1.8 million were attributable to insufficient vegetable intake and as such fruit and vegetables are an essential component of a healthy diet. We recognize that there are other foods such as pulses, meat, fish, eggs, nuts, whole grains that are also important and we would advocate that barriers and facilitators to consumption of these foods is studied in detail. These food groups are beyond the scope of the present study. There have been few reports from LMICs concerning determinants of fruit and vegetable consumption. The majority of studies have been conducted in Europe and North America (Krolner *et al.*, 2011; Rasmussen *et al.*, 2006 and Yeh *et al.*, 2008).

A systematic review concluded that availability was a key factor in the USA and European populations (Jago *et al.*, 2007). A study in an urban slum in North India (Diamond-Smith *et al.*, 2016) among pregnant women reported that the majority of women were aware that they should eat green leafy vegetables frequently but in fact a quarter of them ate once a month or less. The women reported lack of availability of vegetables, and that they had few decision making powers and low status within the household. The choice about what they ate was not necessarily their own. A qualitative study in the Hisar district of Haryana aimed to understand why newly married rural women tended to be underweight (Chorghade *et al.*, 2006). The factors they identified were isolation from their own families, inability to relax in their in-law's home and eat adequately, high workload, lack of financial autonomy and regular fasting. These are complex findings and it is clear that there is not one single cause of underweight and therefore unlikely to be one remedy. A recent report from an urban setting in Fiji found that participants had positive perceptions of fruit and vegetables and were aware of their health benefits. However lack of access to high quality, affordable fruit and vegetables was an important barrier to consumption of these foods (Morgan *et al.*, 2016).

The Leveraging Agriculture for Nutrition in South Asia Consortium leads several projects in India and the rest of South Asia to improve nutrition and health through identifying opportunities to intervene in agriculture, markets and the food system. A recent report by (Maestre *et al.*, 2017) described a series of 5 requirements for foods to be purchased and consumed such as:

- Consumers must be aware of the beneficial effects of improved nutrition and diet diversity for themselves and household members
- They must be able to determine which foods are nutrient-rich
- Nutrient-rich foods should be physically available either by home production or from markets
- Foods must be affordable to consumers
- Foods must be acceptable to consumers in terms of appearance, preparation, social and cultural norms and taste.

The Ottawa Charter for Health Promotion states that “Political, economic, social, cultural, environmental, behavioural and biological factors can all favour health or be harmful to it” and advocates a social-ecological model for health promotion (WHO, 1986). The social-ecological model (Jago *et al.*, 2007; Stokols, 1992 and McLeroy *et al.*, 1988) broadly defines barriers to health behaviours to occur at the individual, interpersonal and environmental or ecological level. Respectively, examples of such barriers are: taste preferences, expectations of others in the household and community, access to land upon which to grow fruit and vegetables or opportunities to obtain paid work. Our aims were to explore perceived barriers and facilitators to fruit and vegetable consumption among women of reproductive age inhabiting rural villages around the city of Sirsa, Haryana. Suggest approaches and potential interventions to increase consumption of micronutrient-rich foods.

## **Materials and Methods**

This study was qualitative in design and comprised 9 focus group discussions and 12 one to one interviews aimed at understanding barriers and facilitators to consumption of fruit and vegetables by women and their families. We decided to conduct interviews in addition to focus group discussions as it was thought some women may feel more comfortable discussing the research topic on a one to one basis. For the purposes of this study the terms ‘fruit’ and ‘vegetable’ were considered to refer to all edible fruit and vegetables including leafy vegetables, roots and starchy vegetables and fresh and dried or preserved foods were included.

## **Setting and Participants**

The data collection took place from July 2024 to December 2024 in 8 villages in the Sirsa District of Haryana. This region is highly dependent on agriculture for food and income. It is a challenging environment with temperatures regularly exceeding 45°C (113 Fahrenheit) in the summer months (April, May and June) and frequently poor, unpredictable rainfall (June - September). The Government of India uses the terms Scheduled Tribes, Scheduled Castes, and Other Backward Castes to describe groups that are socially, educationally or economically disadvantaged (Census Data, 2011).

We selected the study villages in order to recruit women from each of these castes. Within the villages, a convenience sample of women was selected based on eligibility and willingness to participate. Women were eligible to take part if aged 18-40 years and this was based on self-reported age. We also recruited approximately equal numbers of married and single (widowed, divorced, separated and unmarried) women and approximately equal numbers of landed and landless women (women who lived in households that owned or did not own land respectively).

## **Focus Group Discussions and Interviews**

A total of 9 focus group discussions (FGDs) were held with 88 women (of these 40 women were single and 38 were landed). The FGDs were held in the villages where the women lived in community centers or at one of the women’s homes. No financial or other incentives were offered but tea and snacks were provided to the women prior to the discussion. In order to encourage open discussion the women were grouped by caste and land ownership status. The FGDs were led by a facilitator and an observer was present to take notes and prompt the facilitator where necessary. All discussions were held in the local language of Haryanvi and Hindi. They were digitally audio tape-recorded, transcribed and translated to English. The facilitator transcribed and translated the discussions with input from the observer.

In addition to the FGDs, twelve one to one interviews were held. The interviews were also conducted at community centers or in the women’s homes, tape-recorded, transcribed and translated to English. Facilitators, observers and interviewers were trained in qualitative methods prior to conducting the research. The FGDs and interviews were guided by a schedule (available on request) which was informed by discussions at two stakeholder workshops held in Hissar and Sirsa in May 2024. Briefly, women were invited to reflect on their likes and dislikes in terms of fruit and vegetables, meal times in their households, how decisions were made about food choices, preparation and intake, their daily activities, seasonal influences on diet and any other factors that affected their food intakes.

We used thematic analysis to identify emerging themes from both the FGDs and the interviews. Analysis was conducted at the group level and an inductive coding approach was used. Three transcripts were used to create an initial coding frame and this was applied to all further transcripts. The coding frame was continually discussed and adapted based on new information from the transcripts. The final template was applied to all transcripts by me.

## Results and Discussion

Table 1 shows the participant characteristics. Examples of the fruit and vegetables mentioned during the data collection are shown in table 2. We identified seven main themes as reported barriers or facilitators to fruit and vegetable consumption during the data analysis. These were such as: Personal factors, Household dynamics, Social and Cultural Norms, Workload, Time pressures, Environmental Factors and Cost.

**Table 1. Participant Characteristics**

		Median(IQR)/N (%)
<b>Age(years)</b>		<b>29(23,37)</b>
Marital status	Single	40(45)
	Married	48(55)
Household land ownership	Landed	38(43)
	Landless	50(57)

**Table 2. Examples of fruit and vegetables mentioned in the focus group discussions and interviews**

Fruit	Vegetables
Mango	Carrot
Guava	Spinach
Banana	Fenugreek
Apple	Bottlegourd
Orange	Pumpkin
Grapes	Amaranth
Custard Apple	Tomato

These themes are now presented with illustrative quotes:

### Personal Factors

These included the women's own likes and dislike of certain foods "Fenugreek and spinach are the only two green leafy vegetables I like" (Interviewee 5, married, landless, age 23 years).

Some women reported that wild green leafy vegetables grew abundantly locally and were freely available but they said that these vegetables were considered 'dirty' or 'poor people's food' by members of their communities. It was usually the younger women who dismissed these vegetables and claimed that they did not know how to prepare them "Old women eat indigenous plants but youngsters think they are bad for health "They look dirty" (FGD participant, single, landless). Other factors included the woman's state of mind and health complaints such as stomach ache which affected their appetite. Some women said that they got bored of eating certain fruits or vegetables. Women generally knew that fruit and vegetables were beneficial for health and had the cooking skills to prepare vegetables. Many women expressed a preference for their children to consume any fresh fruit or vegetables that were available, "My daughters have (fruit), and this is more than enough. I am not bothered about myself. I overcome my craving (interviewee 8, married, landed, age 28).

### Household Dynamics

Many women reported that decisions about what to eat were made by their husbands or their mothers and fathers-in-law. "There is a big family; hence there is no option for us to decide. Whatever, vegetables we get, we prepare" (Interviewee 3, married, landed, age 30 years). Women in India usually go to live with their husband's parents after marriage. Often in such extended family households, women eat after the rest of the family. For example, "Women do not get to eat proper meals the way they are supposed to. Men get a proper meal". (FGD participant, married, landless) Children's likes and dislikes were considered important in terms of which fruit and vegetables were consumed. Some women said that if there was fruit in the house, it was given to the children first and if anything was left over the rest of the family would eat it.

### Social and Cultural Norms

Women talked about the norm that men would shop in the market and therefore choose which foods were consumed within the household. It was reported that for some castes it was not considered acceptable for a woman to go to market.

Also, the time and workload burdens on women were not alleviated by their husbands because it would be improper for a man to do household work, and others in the community would gossip if this happened “How can he husband help me? If he helps me with household chores, then everybody in the village will gossip about him or say bad things (interviewee 11, married, landed, age 32 years). Fasting is an important aspect of the culture in these communities and often women would undertake complete or partial fasts. There are many beliefs about the detrimental effects of certain foods during pregnancy or lactation, for example papaya is considered to be harmful during pregnancy as it is believed to cause miscarriage. Certain foods are described as being ‘hot’ or ‘cold’ and if consumed at the wrong times they could be harmful to health. Family traditions were reported as being important and advice from elders about which foods are harmful or beneficial was often heeded. For example “Papaya is hot this means if you have it during pregnancy then there is more chance of miscarriage. My grandmother said (interviewee 10, married, landless, age 28 years).

### **Workload**

Many women stated that their appetite for some foods including fruit and vegetables was affected by the daily activities they performed. These activities included getting children ready for school, cooking, household work, farm work. “We have to fetch water, wash utensils, get flour from the mill, and go to the farm. That is what women have to do. After that she gets to eat”. (FGD participant, married, landless). Some women said that they felt so tired at the end of the day that they did not feel like eating a big meal and simply wanted to eat a small amount of bread or rice “I get tired in the evenings”. So I do not have meals, somehow I gulp a morsel or two and go to bed (interviewee 3, married, landed, age 30 years).

### **Time Pressure**

Travel to the farm for work and time spent at work itself was a major component of the women’s daily routine. The routine was often influenced by the time of year. Women who plucked cotton for a living would spend as much time as possible working during the cotton picking season and some reported missing meals so that they could work all day.

Many women also talked of spending time working on household chores and childcare activities. I don’t have a full meal in the morning because I have to rush to the farm (FGD participant, single, landless). Another woman said “I don’t like having unfinished work. I am ok if do not get food but I am happy if I finish all my work within time” (interviewee 11, married, landed, age 32 years). This indicates that work takes priority over preparing and eating food for some women.

### **Environmental and Practical Factors**

These included season of the year. Summer was reported to be a time when fruit and vegetables were in short supply, expensive and often of poor quality. Many women reported preserving certain vegetables to be consumed during the summer. Water availability was an important factor governing whether households could maintain kitchen gardens and therefore grow their own fruit and vegetables. Cold-storage facilities were often lacking so it was not possible for households to store vegetables for any length of time, particularly in the hot summer months. Availability of land for growing fruit and vegetables was mentioned; “Those who have space can cultivate green vegetables at home. Those who do not have space cannot cultivate. They do not have any option other than buying (vegetables) (FGD participant, single, landless). The location of the family dwelling was also important. Some villages had weekly markets or door to door vendors. Some women did not have access to either of these and relied on larger markets. This made it difficult to obtain fresh foods regularly “Whenever we go to Sirsa city we get (fruit). Every day we cannot have fruit. We go to Sirsacity once in one or two months (interviewee 4, married, landed).

### **Cost**

Most women stated that cost was a major factor in terms of the fruit and vegetables they consumed. The decision about which vegetables to buy in the market was often based on the price, and this was considered more important than quality. Many women talked about being poor and having to manage on very low incomes. They often mentioned compromising by buying small amounts of fruit or vegetables and giving these to the children before eating themselves. Food price inflation was mentioned.

When there is inflation, they mostly invest their money in the farm and in the house; hence they create a thrifty condition in the home (interviewee 1, married, landed, age 24 years). Seasonal fluctuations in prices were also discussed. During summer, the vegetable which is 5 rupees (0.08 US\$) per 250 grams becomes 20-25 rupees (0.32-0.40 US\$) per 250 grams (FGD participant, married, landless). The cost of traveling to markets was also an important consideration and some women stated that the trip to a town market to buy fruit and vegetables was only made when there was another reason to visit the town such as going to hospital or going to work as a daily wage labourer.

## Discussion

We used qualitative research methods to examine factors that influenced consumption of fruit and vegetables by women of reproductive age in a rural Indian community. We found that factors operating at the intra and inter-individual, household, environmental and economic levels were perceived to prevent women from consuming adequate fruit and vegetables as part of their diet. Personal food dislikes, preferences of other household members, distribution of food within the household, social and cultural norms, summer season, lack of availability and access, and cost were all reported as barriers to fruit and vegetable intakes. Water availability and access to land, which allowed for the cultivation of fruit and vegetables in a kitchen garden, were important facilitators.

It would appear from our findings and those of other research (Jago *et al.*, 2007 and Morgan *et al.*, 2016) that knowledge of health benefits of fruit and vegetables is not necessarily a barrier to consumption of a quality diet. The women in the present study said that they knew fruit and vegetables were beneficial to health and often this led them to give the majority of healthy food, particularly fruit, available to their children. The implication of this finding is that education programmes aimed at increasing knowledge of the health benefits of fruit and vegetables are unlikely to be an effective strategy on their own. On the other hand changing women's attitudes to indigenous vegetables and increasing their knowledge of how to prepare these foods may be an effective strategy as described below.

The social-ecological framework states that behaviour is affected by such as: factors unique to the individual; relationships with others (e.g. friends and family and the environment in which the behaviour occurs including physical, political and cultural; and the interactions between all three (Jago *et al.*, 2007; Stokols, 1992 and McLeroy *et al.*, 1988). The model has been used in a wide variety of settings and population groups to study barriers to health behaviours and to identify interventions that will lead to positive health outcomes (Robinson, 2008; Townsend and Foster, 2013). Using this framework, the women's behaviour can be considered to be affected by such as: individual, inter-personal, environmental and economic factors.

## Individual-Level Factors

We identified personal taste as a factor in determining which fruit and vegetables were consumed. Dislikes of particular foods were reported and these tended to be varieties of green leafy vegetables and indigenous vegetables. Promoting increased usage of indigenous vegetables offers an attractive potential for intervention as these foods grow readily in the climatic and environmental conditions. Such vegetables include *Hibiscus cannabinus* (Ambadi) and *Portulaca oleracea* L. (Ghol). They tended to be disliked by younger women who considered them to be dirty and also claimed that they did not know how to prepare and cook them. Other reports from India state that there are a large number of such indigenous plants that are nutritious and could provide a sustainable vegetable supply as well as the potential to generate income (Konsam *et al.*, 2016).

Moving away from consumption of indigenous plants as part of the diet is occurring in many settings (Scalcoand Rodrigues, 2013) and has been attributed to the proximity of villages to cities, contact with non-indigenous populations and obtaining financial resources. These changes lead to greater consumption of fruit and vegetables that are sold in markets and the perception that such foods are somehow superior to indigenous plants. Interventions that aim to increase knowledge of preparation methods and to change the perceptions of these nutritious and readily available foods particularly among younger women could be a low cost means of improving diets.

## Inter-Personal Factors

Women reported that they ate after other household members and that their diets were less varied than the rest of the family. After marriage women tend to move in to their husband's family homes and often have a lower status than other members of the family. Decisions about which foods are eaten and how food is distributed in the household are usually made by the mother-in-law and husband. This has been observed in a previous study in rural India (Chorghade *et al.*, 2006). Religious and social norms were observed to have an impact on which foods can be eaten by women particularly during pregnancy and lactation. Certain foods are considered to be 'hot' or 'cold' and to be avoided during pregnancy and lactation respectively. These beliefs have been documented and studied previously and are described as food taboos (Meyer-Rochow, 2009). The evolution of such taboos, which are generally not representative of Indian national dietary recommendations, is thought to be due to the group cohesion and sense of belonging that they bring (Colding, 1997). Other suggestions are that they are developed in order to conserve resources (Meyer-Rochow, 2009). Such beliefs are very much part of the culture and it is questionable whether and how they should be challenged. Any approach would require 'buy-in' from the community and their input in developing educational interventions. It has been reported that milk was avoided by the Khasi tribe in the north east of India until recent years when intakes started to increase (Agrahar-Murugkar and Pal, 2004). Understanding how the beliefs about milk as a 'taboo' food have changed and/or why the behaviour of the Khasi tribe has changed may provide insight.

Social norms also have an impact on how food is distributed within the household with women usually eating after all other family members and often being left with smaller quantities and less variety of food. Evidence from the Young Lives study in Andhra Pradesh and Telangana suggests that this custom starts in early life. This longitudinal study found that boys consume a more diverse diet than girls between 5-15 years and that the disparity between genders increases with age (Aurino, 2016). The disparity was largely driven by boys consuming more protein- and vitamin-rich foods than girls.

The size of the difference in dietary intake between boys and girls was not associated with maternal education, poverty or living in a rural/urban residence. The authors argue that this finding supports interventions aimed at improving the diets of children and adolescent girls. It is noteworthy that the National Food Security Act (The Gazette of India, 2013) brought about a change such that the oldest woman above the age of 18 years became head of the household for issuing ration cards for public distribution of food grains. This has been described as a progressive step based on women's lack of autonomy regarding household food acquisition and spending (Rai *et al.*, 2015). Women also reported that it was not socially acceptable for men to assist with chores in order to relieve them of time and workload pressures. A report of a qualitative study investigating food insecurity in Kenya recommended that cultural change interventions whereby men were supported to ensure food and nutrition security was achieved for all members of the household would be beneficial (Pelto *et al.*, 2015). Furthermore, an intervention study in Tamil Nadu, India found that the introduction of lifelong learning activities to increase economic and knowledge empowerment among men and women led to changes in gender relations including greater decision-making of women as a result of their increased economic contribution to the household (Raj *et al.*, 2013). However, this finding must be balanced with evidence that increased participation in agricultural work has been associated with adverse outcomes in terms of healthcare-seeking behaviour and child survival due to reduced time available for caring activities (Bhalotra, 2010).

## Environmental and Economic Factors

Access and affordability were important factors in determining whether fruit and vegetables were consumed. Season had a strong influence on cost and availability of fruit in particular. In the summer months, the majority of families that did not have their own fruit trees or plants did not consume fruit at all, and vegetables were consumed only on the day of purchase. Often families relied on door-to-door vendors to obtain vegetables which were more expensive than they would be at the market. Conversely there were times of the year when fruit and vegetables were plentiful and the cost was low.

Interventions should be designed and targeted with these seasonal variations in mind. A more detailed understanding of the supply chain actors and activities is required in order to develop interventions that might enable fruit and vegetable supply to increase whilst keeping the prices stable. We have conducted interviews with value chain actors and the results of these will be published in a separate article.

### **Study Strengths and Limitations**

We grouped women for the FGDs based on their caste and other factors such as age and land ownership in order to make the women feel as comfortable as possible so that they would share their views freely. We recruited women based on their availability and willingness to take part in a focus group or interview. It is possible that the factors affecting fruit and vegetable consumption among women who were not able and/or unwilling to participate were different from the themes we identified. Furthermore, our findings are likely to be context specific. Our aim in this study was to obtain insight from the women as to their perceived barriers to fruit and vegetable consumption. In order to determine how and where to target intervention efforts, some quantitative data from a larger more representative sample is likely to be useful. Such a survey would be designed based on the responses in the present study. Time and resource constraints meant that we selected two food groups to study in detail. Future research would include discussion with the women about other factors impacting their health.

### **Conclusion**

We conclude from this qualitative work that there are multiple factors affecting the women health in this community. Identifying modifiable factors and designing interventions to enable increased intakes of fruit and vegetables by rural women should be a high priority. A value chain analysis of actors and activities within supply chains of exemplar foods is to be conducted in the study area to facilitate with selecting and designing successful interventions. The objective of such interventions would be to create an enabling environment which would remove barriers at the household, community, environmental and economic levels.

At the household level, it would be important to increase awareness and change attitudes among all family members around ensuring that women are adequately nourished and rested, particularly during pregnancy and lactation. At the community level, we suggest tackling conceptions about indigenous green leafy vegetables that are nutritious and grow abundantly in these areas, but that are considered to be unfit for consumption. Working with communities to reduce the time and workload burdens on women by breaking down gender stereotypes around household chores is also likely to be beneficial. Such social changes will take time and perseverance but this should not be a reason to discount them. Most importantly, the community should take ownership of the challenges and be involved in solution design and implementation.

In terms of environmental and economic factors, it is of course essential to address the access availability, affordability and sustainability issues. The majority of rural poor in India rely on markets to obtain fruit and vegetables therefore supply-side interventions will be necessary to increase consumption. Including dried fruit and vegetables in the public distribution system along with cereals and other foods could be considered. In addition poverty and lack of employment for the rural population must be addressed at the district, state and national levels. Migration to cities is increasing and there must be an incentive for people to remain in rural areas and a means for them to earn a living wage. Recommendations for actions would ideally be informed by analysis of quantitative survey data from a larger and representative sample of women. This would enable prioritization and targeting of interventions. In the interim, based on the findings of the current study, the following recommendations are made:

- Discussion between members of the Government Ministries of Agriculture, Health and Women and Child Development, Education, and Agencies at state and national level about the range of different factors impacting on diet quality. It is important to secure government support for actions.
- Anganwadi centers are part of the Indian public health-care system. Part of their role is to provide nutrition education to communities.

- Such education programmes could incorporate a focus on the barriers identified in the current study. For example, educating all members of the household about the potential benefits of consuming nutritious indigenous plants.
- Anganwadi staff could also act as facilitators to find solutions within households to the challenges of workload and time pressures on women.
- Schools could also be engaged in interventions. Children and youth could be educated about the nutritive value of indigenous crops and if considered appropriate could be encouraged to play a role in addressing social norms in relation to gender imbalances in workload and food distribution within household.

## References

- Darnton-Hill, I., Mkparu, U. C. (2015) Micronutrients in Pregnancy in Low- and Middle-Income Countries, *Nutrients*, 7(3):1744-1768. doi: 10.3390/nu7031744.
- Jiang, T. N., Christian, P., Khatry, S. K., Wu, L., West, K. P. (2005) Micronutrient deficiencies in early pregnancy are common, concurrent, and vary by season among rural Nepali pregnant women, *Journal of Nutrition*, 135(5): 1106-1112. doi: 10.1093/jn/135.5.1106.
- Salam, R. A., Das, J. K., Bhutta, Z. A. (2014) Multiple Micronutrient Supplementations during Pregnancy and Lactation in Low-to-Middle-Income Developing Country Settings: Impact on Pregnancy Outcomes, *Annals of Nutrition and Metabolism*, 65(1): 4-12. doi: 10.1159/000365792.
- Bhutta, Z. A., Salam, R. A., Das, J. K. (2013) Meeting the challenges of micronutrient malnutrition in the developing world, *British Medical Bulletin*, 106(1): 7-17. doi: 10.1093/bmb/ldt015.
- World Health Organization (2013) Essential nutrition actions: improving maternal, newborn, infant and young child health and nutrition, World Health Organization; Geneva: 2013.
- Black, R. (2003) Micronutrient deficiency - an underlying cause of morbidity and mortality, *Bulletin of the World Health Organization*, 81(2): 79-79.
- Bhaskaram, P. (2002) Micronutrient malnutrition, infection, and immunity: An overview, *Nutrition Reviews*, 60(5): S40-S45. doi: 10.1301/00296640260130722.
- United Nations (2016) Sustainable Development Goals, <http://www.un.org/sustainabledevelopment/hunger/>.
- Isharwal, S., Misra, A., Wasir, J. S., Nigam, P. (2009) Diet and insulin resistance: A review and Asian Indian perspective, *Indian Journal of Medical Research*, 129(5): 485-499.
- Misra, A., Khurana, L., Isharwal, S., Bhardwaj, S. (2009) South Asian diets and insulin resistance, *British Journal of Nutrition*, 101(4): 465-473. doi: 10.1017/S0007114508073649.
- National Institute of Nutrition (1994) Report of Urban Survey - Slums (1993 - 94), *Indian Council of Medical Research*, Hyderabad.
- Pathak, P., Kapil, U., Kapoor, S. K., Saxena, R., Kumar, A., Gupta, N., Dwivedis, S. N., Singh, R., Singh, P. (2004) Prevalence of multiple micronutrient deficiencies amongst pregnant women in a rural area of Haryana, *Indian Journal of Pediatrics*, 71(11): 1007-1014. doi: 10.1007/BF02828117.
- Allen, L. H. (2005) Multiple micronutrients in pregnancy and lactation: An overview, *American Journal of Clinical Nutrition*, 81(5): 1206S-1212S. doi: 10.1093/ajcn/81.5.1206
- Nguyen, P. H., Lowe, A. E., Martorell, R., Nguyen, H., Pham, H., Nguyen, S., Harding, K. B., Neufeld, L. M., Reinhart, G. A., Ramakrishnan, U. (2012) Rationale, design, methodology and sample characteristics for the Vietnam pre-conceptual micronutrient supplementation trial (Preconcept): a randomized controlled study, *BMC Public Health*, 12(1): 898. doi: 10.1186/1471-2458-12-898.
- Darnton-Hill, I., Webb, P., Harvey, P. W. J., Hunt, J. M., Dalmiya, N., Chopra, M., Ball, M. J., Bloem, M. W., de Benoist, B. (2005) Micronutrient deficiencies and gender: social and economic costs, *American Journal of Clinical Nutrition*, 81(5): 1198S-1205S. doi: 10.1093/ajcn/81.5.1198.

- Briones Alonso, E. (2015) The impact of culture, religion and traditional knowledge on food and nutrition security in developing countries, *Food Secure*.
- Radhika, G., Sudha, V., Sathya, R. M., Ganesan, A., Mohan, V. (2008) Association of fruit and vegetable intake with cardiovascular risk factors in urban south Indians, *British Journal of Nutrition*, 99(2): 398-405. doi: 10.1017/S0007114507803965.
- Murty, K. V., Reddy, K. J. (1994) Dietary patterns and selected anthropometric indices in reproductive age women of a slum in urban: Kurnool, *Indian Journal of Public Health*, 38(3): 99-102.
- Chopra, H., Chheda, P., Kehoe, S., Taskar, V., Brown, N., Shivashankaran, D., Subbulakshmi, G., Rao, S., Gandhi, M., Muley-Lotankar, P., Potdar, R., *et al.* (2012) Dietary Habits of Female Urban Slum-dwellers in Mumbai, *Indian Journal of Maternal and Child Health: Official publication of Indian Maternal and Child Health Association*, 14(2): 1-13. e-pub ahead of print 2013/02/13.
- Miller, V., Yusuf, S., Chow, C. K., Dehghan, M., Corsi, D. J., Lock, K., Popkin, B., Rangarajan, S., Khatib, R., Lear, S. A., Mony, P., *et al.* (2016) Availability, affordability, and consumption of fruits and vegetables in 18 countries across income levels: findings from the Prospective Urban Rural Epidemiology (PURE) study, *Lancet Glob Health*, 4(10): e695-703. doi: 10.1016/S2214-109X(16)30186-3.
- Das, P. K., Bhavani, R. V., Swaminathan, M. S. (2014) A Farming System Model to Leverage Agriculture for Nutritional Outcomes, *Agricultural Research*, 3(3): 193-203.
- International Institute for Population Sciences (2018) National Family Health Survey (NFHS4), India, 2015-16: Maharashtra, Maharashtra International Institute for Population Sciences; Mumbai.
- Vijaya Bhaskar, A. V., Nithya, D. J., Raju, S., Bhavani, R. V. (2017) Establishing integrated agriculture-nutrition programmes to diversify household food and diets in rural India, *Food Security*, 9(5): 981-999.
- Wang, X., Ouyang, Y., Liu, J., Zhu, M., Zhao, G., Bao, W., Hu, F. B. (2014) Fruit and vegetable consumption and mortality from all causes, cardiovascular disease, and cancer: systematic review and dose-response meta-analysis of prospective cohort studies, *Br Med J*, 349doi: 10.1136/bmj.g4490.
- Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., Adair-Rohani, H., Amann, M., Anderson, H. R., Andrews, K. G., Aryee, M., Atkinson, C., *et al.* (2012) A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010, *Lancet*, 380(9859): 2224-2260. doi: 10.1016/S0140-6736(12)61766-8.
- Krolner, R., Rasmussen, M., Brug, J., Klepp, K. I., Wind, M., Due, P. (2011) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature. Part II: qualitative studies, *Int. J. Behav Nutr Phys. Act.*, 8: 112. doi: 10.1186/1479-5868-8-112.
- Rasmussen, M., Krolner, R., Klepp, K. I., Lytle, L., Brug, J., Bere, E., Due, P. (2006) Determinants of fruit and vegetable consumption among children and adolescents: a review of the literature, Part I: Quantitative studies, *Int. J. Behav Nutr. Phys. Act.*, 3: 22. doi: 10.1186/1479-5868-3-22.
- Yeh, M. C., Ickes, S. B., Lowenstein, L. M., Shuval, K., Ammerman, A. S., Farris, R., Katz, D. L. (2008) Understanding barriers and facilitators of fruit and vegetable consumption among a diverse multi-ethnic population in the USA, *Health Promot, Int.*, 23(1): 42-51. doi: 10.1093/heapro/dam044.
- Jago, R., Baranowski, T., Baranowski, J. C. (2007) Fruit and vegetable availability: a micro environmental mediating variable? *Public Health Nutr.* 10(7): 681-689. doi: 10.1017/S1368980007441441.
- Diamond-Smith, N. G., Gupta, M., Kaur, M., Kumar, R. (2016) Determinants of Persistent Anemia in Poor, Urban Pregnant Women of Chandigarh City, North India: A Mixed Method Approach, *Food Nutr. Bull.*, 37(2): 132-143. doi: 10.1177/0379572116637721.

- Chorghade, G. P., Barker, M., Kanade, S., Fall, C. H. (2006) Why are rural Indian women so thin? Findings from a village in Maharashtra, *Public Health Nutr.*, 9(1): 9-18. doi: 10.1079/phn2005762.
- Morgan, E. H., Vatucawaqa, P., Snowdon, W., Worsley, A., Dangour, A. D., Lock, K. (2016) Factors influencing fruit and vegetable intake among urban Fijians: A qualitative study, *Appetite*, 101: 114-118. doi: 10.1016/j.appet.2016.03.003.
- Maestre, M., Poole, N., Henson, S. (2017) Assessing food value chain pathways, linkages and impacts for better nutrition of vulnerable groups, *Food Policy*, 68: 31-39.
- World Health Organization (1986) Ottawa Charter for Health Promotion, Geneva.
- Stokols, D. (1992) Establishing and maintaining healthy environments, toward a social ecology of health promotion, *Am Psychol.*, 47(1): 6-22. doi: 10.1037//0003-066x.47.1.6.
- McLeroy, K. R., Bibeau, D., Steckler, A., Glanz, K. (1988) An ecological perspective on health promotion programs, *Health Educ. Q.*, 15(4): 351-377. doi: 10.1177/109019818801500401.
- Government of India Ministry of Home Affairs (2011) Census Data, 2011, India: Government of India.
- Robinson, T. (2008) Applying the socio-ecological model to improving fruit and vegetable intake among low-income African Americans, *J. Community Health*, 33(6): 395-406. doi: 10.1007/s10900-008-9109-5.
- Townsend, N., Foster, C. (2013) Developing and applying a socio-ecological model to the promotion of healthy eating in the school, *Public Health Nutr.*, 16(6): 1101-1108. doi: 10.1017/S1368980011002655.
- Konsam, S., Thongam, B., Handique, A. K. (2016) Assessment of wild leafy vegetables traditionally consumed by the ethnic communities of Manipur, *Northeast India J. Ethnobiol Ethnomed.*, 12: 9. doi: 10.1186/s13002-016-0080-4.
- Scalco, N., Rodrigues, E. (2013) Changes in the acquisition and consumption of food plants and their relationship with indigenous perceptions of health in a Guarani village, Sao Paulo, Brazil, *Public Health Nutr.*, 16(10): 1820-1826. doi: 10.1017/S136898001200434X.
- Meyer-Rochow, V. B. (2009) Food taboos: their origins and purposes, *J. Ethnobiol. Ethnomed.*, 5: 18. doi: 10.1186/1746-4269-5-18.
- Colding, J. F. C. (1997) The relations among threatened species, their protection, and taboos, *Ecol. Soc.*, pp: 1.
- Agrahar-Murugkar, D., Pal, P. P. (2004) Intake of nutrients and food sources of nutrients among the Khasi tribal women of India, *Nutrition*, 20(3): 268-273. doi: 10.1016/j.nut.2003.11.008.
- Aurino, E. (2016) Do boys eat better than girls in India? Longitudinal evidence on dietary diversity and food consumption disparities among children and adolescents, *Econ. Hum. Biol.*, doi: 10.1016/j.ehb.2016.10.007.
- Ministry of Law and Justice GoI (2013) The Gazette of India, Government of India; New Delhi, The National Food Security Act.
- Rai, R. K., Kumar, S., Sekher, M., Pritchard, B., Rammohan, A. (2015) A life-cycle approach to food and nutrition security in India, *Public Health Nutr.*, 18(5): 944-949. doi: 10.1017/S1368980014001037.
- Pelto, G. H., Armar-Klemesu, M. (2015) Identifying interventions to help rural Kenyan mothers cope with food insecurity: results of a focused ethnographic study, *Matern. Child Nutr.*, 11(Suppl 3): 21-38. doi: 10.1111/mcn.12244.
- Raj, R., Thamizoli, P., Balasubramanian, K. (2013) Gender and Life Long Learning: Impact on Women's Empowerment.
- Bhalotra, S. (2010) Fatal fluctuations? Cyclicity in infant mortality in India, *J. Dev. Econ.*, 93: 7-19.