

Women's empowerment and domestic violence: The role of sociocultural determinants in maternal and child undernutrition in tribal and rural communities in South India

Kavita Sethuraman, Richard Lansdown, and Keith Sullivan

Abstract

Background. Moderate malnutrition continues to affect 46% of children under five years of age and 47% of rural women in India. Women's lack of empowerment is believed to be an important factor in the persistent prevalence of malnutrition. In India, women's empowerment often varies by community, with tribes sometimes being the most progressive.

Objective. To explore the relationship between women's empowerment, maternal nutritional status, and the nutritional status of their children aged 6 to 24 months in rural and tribal communities.

Methods. This study in rural Karnataka, India, included tribal and rural subjects and used both qualitative and quantitative methods of data collection. Structured interviews with mothers were performed and anthropometric measurements were obtained for 820 mother-child pairs. The data were analyzed by multi-variate and logistic regression.

Results. Some degree of malnutrition was seen in 83.5% of children and 72.4% of mothers in the sample. Biological variables explained most of the variance in nutritional status, followed by health-care seeking and women's empowerment variables; socioeconomic variables explained the least amount of variance. Women's empowerment variables were significantly associated with child nutrition and explained 5.6% of the variance in the sample. Maternal experience of psychological abuse and sexual coercion increased the risk of malnutrition in mothers and children. Domestic violence was experienced by 34% of mothers in the sample.

Conclusions. In addition to the known investments needed to reduce malnutrition, improving women's nutrition, promoting gender equality, empowering women, and ending violence against women could further reduce the prevalence of malnutrition in this segment of the Indian population.

Key words: Child nutrition, domestic violence, maternal nutrition, nutritional status, women's empowerment

Introduction

Childhood malnutrition remains highly prevalent in India; 46% of all children under five years of age are stunted [1]. The far-reaching consequences of childhood malnutrition are well established [2–4]. Progress in reducing the prevalence of malnutrition in India has been steady but slow [5, 6]. Overall, investment in nutrition has been inadequate [5]. Program efforts to tackle malnutrition have focused on the provision of services, but these have been plagued with operational setbacks and have often not integrated community participation [5]. The direct causes of childhood malnutrition are inadequate dietary intake, disease, and inadequate care practices [7]. In India, however, the prevalence of low birthweight is 23%, and is not only a consequence of maternal malnutrition but also contributes significantly to subsequent child malnutrition [1, 7–9]. Maternal malnutrition in India, measured by chronic energy deficiency, defined as a body-mass index (BMI) < 18.5 kg/m², affects 47% of rural women [1]. Recent studies have found that maternal nutritional status is significantly associated with the nutritional status of young children, not just of neonates [10]. Additionally, the effects of maternal malnutrition, low birthweight, and childhood malnutrition are compounded by the practice of early marriage, which leads to early and frequent pregnancies [11, 12]. Underlying factors that most likely contribute to malnutrition

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through sociocultural pathways are gender inequity and women's lack of empowerment [9, 13].

Women's empowerment

The extent to which empowering women in this region can bring about improvements in nutrition outcome is yet to be explored. Measuring women's empowerment is challenging, because the term itself is often poorly defined [14–16]. The key underlying concepts that define women's empowerment relate to choices, control, and power [17]. Women's empowerment is conceptualized as a function of women's access to and control over resources, which extends to their decision-making capabilities regarding household decisions, employment, income, household assets and expenditure, fertility, sexuality, and freedom of movement (physical mobility) and their control over material and intangible resources such as information and time; their position within the household vis-à-vis other male and female household members; their experience of domestic violence; and their education [14, 18]. For most women in South Asia, gaining control over resources, in addition to gaining access to resources, is essential [14].

Women's empowerment and child health

Several studies have looked for associations between indicators of women's empowerment and child health outcomes [19–33]. The increase in women's education from 1970 to 1995 is one indicator of women's empowerment that has contributed to a reduction of more than 50% in the prevalence of underweight [23]. Studies have found that secondary education for women confers the greatest benefit and that education is most beneficial to mothers when they also have moderate access to resources and wealth [22, 34]. The association between maternal employment and child health outcomes is inconsistent. Two studies found that among poor women who worked as daily wage laborers, maternal employment significantly increased the risks of child mortality and malnutrition [24, 25]. Qualitative research from India found that because women's wages are so low compared to men's, families prefer that women stay home where their efforts would be more productive for the household [35]. However, studies also show that mothers who contribute more to total household income are less likely to have malnourished children and that the majority of mothers' incomes are used to provide for their children [26, 27]. A meta-analysis of Demographic and Health Survey data from 36 developing countries found that some indicators of women's empowerment, such as the mother's age at marriage, had a significant positive association with children's nutritional status [28]. In a longitudinal study of slum children in Mumbai, India,

poor growth in children was found to be significantly associated with illiteracy, experience of marital disharmony, younger age at marriage, and less decision-making power among mothers [29].

Domestic violence and child health

Several recent studies have also found that maternal experience of physical and sexual violence is significantly associated with an increased risk of under-five mortality, infant and fetal death, and low birthweight [30–33]. Recent surveys have found that the prevalence of domestic violence (defined as physical beating or battering of a woman by a male intimate partner) ranges from 22% to 60% [36, 37]. The prevalence of psychological and emotional abuse (defined as a woman's being threatened with physical abuse, ridiculed, or ignored) is believed to be even higher [36, 37]. The precursors of domestic violence are marital conflict, male control over household wealth and decision-making, poverty, and unemployment [38]. The high prevalence of domestic violence and its impact on child health and survival make it critical to also understand its impact on child nutrition.

Women's empowerment in tribal and rural communities in India

Some tribal communities in India have social norms that enable their women to be more empowered than their nontribal rural counterparts [39, 40]. For example, in these communities women are more involved in decision-making, have greater freedom of movement, are free to choose their marital partners, and can divorce and remarry without stigma [39, 40]. Our study explored the relationship between women's empowerment, maternal nutritional status, and the nutritional status of their children 6 to 24 months of age in tribal and rural communities in South India. We present some qualitative findings and an analysis of cross-sectional data on children's weight-for-age and maternal weight and BMI.

Subjects and methods

Study population

This study was undertaken in the Mysore region of Karnataka, India (a rural region), between November 1998 and August 2000. The first phase used qualitative methods, and the second quantitative. The study population included the scheduled caste, backward caste, and one scheduled tribe. To obtain a sample in which the level of empowerment differed among women, the Soliga tribe and a neighboring rural community were selected. This tribe was selected because it was known

to have social norms conducive to empowering women, whereas the opposite was true for women in the rural communities [40]. The Soliga tribe lived in the forested areas of southern Karnataka, and the neighboring rural community included scheduled and backward caste families. The distance to the nearest major town or city was more than 20 km for the tribal community and 5 to 8 km for the rural villages. Originally, access to this tribe and the neighboring rural population was obtained through Vivekananda Girijana Kalyana Kendra (VGKK), a local nongovernmental organization that has served this population in an area known as the BR Hills (Biligiri Renganna Betta Hills) since the 1970s.

Survey design

Qualitative research was undertaken primarily to inform the design of the questionnaire, verify the relevance of the conceptual framework to these communities, and confirm differences between the tribal and the rural women in terms of empowerment. A conceptual framework for women's empowerment specific to the South Asian context was adapted from the literature [14, 16, 18, 41]. The study participants were asked a range of questions related to women's empowerment, such as their impressions of women's involvement in household decision-making. The main methods of qualitative data collection were semistructured interviews with women of childbearing age (15 to 49 years) and focus-group discussions among same-sexed groups. A total of 148 semistructured interviews, 19 focus-group discussions with women, and 11 focus-group discussions with men were completed; the number of participants per focus-group discussion ranged from 6 to 12. The qualitative data were coded and analyzed manually.

The questionnaire was developed from these data and from review of the literature and relevant survey tools [1, 14, 41]. The overall design of the questionnaire and the format of the close-ended questions followed Babbie's [42] guidelines. The questionnaire was translated into the local language, Kannada, back-translated to ensure accuracy of content and semantic and conceptual equivalence, and then pretested. The interviewers were trained, and reliability tests were performed to ensure consistency in the methods of asking questions and recording answers. The questionnaire was field-tested and piloted on a randomly selected subsample of respondents. A local calendar was developed to obtain children's birth dates, and a letter was drafted to obtain oral informed consent. To meet the ethical guidelines on researching domestic violence, a counsellor was hired at this time and was available to the interviewers and respondents at all times for the duration of the study [43]. Every effort was made to ensure the respondents' privacy and maintain confi-

dentiality during interviews. With a few exceptions, such as when a community center was not available, all the interviews were conducted in the *anganwadi* centers (child-feeding centers of the national Integrated Child Development Scheme). If other family members accompanied the women, they were asked to remain outside the centers; the counsellor played the role of gatekeeper at this time.

Anthropometry

Children 6 to 24 months of age were enrolled in the study. Children's weight was measured to the nearest 0.1 kg with a Salter scale (CMS Weighing Equipment, London, UK) and recumbent length to the nearest 0.5 cm with a Starter mat (Starters, Norwich, UK). Maternal weight was measured to the nearest 0.1 kg with a digital adult scale (THD 305, CMS Weighing Equipment) and maternal height to the nearest 0.1 cm with a portable stadiometer (Leicester Portable Measure, Leicester, UK). Maternal and child hemoglobin was measured in a fingerprick sample with a HemoCue (HemoCue, Sheffield, UK). All measurements were performed by the first author.

Ethical approval for this study was obtained from Vivekananda Girijana Kalyana Kendra (VGKK), the local nongovernmental organization in BR Hills, and the Institute for Child Health/Great Ormond Street Hospital, London.

Sampling methods

Sample size calculations were based on a difference of 11% in height-for-age between the tribal and rural children at 80% power and 5% significance level according to the findings of the previous National Family Health Survey survey of Karnataka undertaken in 1992/93 [44]. The final sample size was 406 for the tribal cell and 406 for the rural cell. Measurements and interviews were completed on 405 rural and 415 tribal mother-child pairs. The responses were recorded by the interviewers on paper questionnaires. A random cluster sample was drawn for the rural villages, including the villages for the pilot study. Seven villages were randomly selected, and all the children and mothers from the scheduled and backward caste neighborhoods within them were enrolled in the study; five eligible participants declined to participate. For the tribal mothers and children, the total population of the Soliga tribe in the state of Karnataka was 25,000, and a census sample was used to obtain adequate numbers of children for this cell; two eligible participants declined to participate. Only one eligible child per household was included in the sample. An oral invitation to participate in the study was extended to eligible subjects. Oral informed consent was obtained from the mothers for themselves and on behalf of their children.

Statistical methods

The questionnaires were double-entered into a template created in Epi Info version 6 (Centers for Disease Control and Prevention, Atlanta, GA, USA). The data were extracted, verified, and cleaned. The anthropometric data were converted into z scores based on the NCHS (National Center for Health Statistics) reference standards. The subsequent statistical analysis was performed with the statistical package SPSS, version 11 (SPSS, Chicago, IL, USA). Basic descriptive analysis, factor analysis, and bivariate analyses were performed on the data set. Both multivariate linear stepwise regression and multivariate forward conditional logistic regression were performed. The biological variables, such as hemoglobin, maternal height, maternal weight, and

maternal BMI, were entered as actual values. The independent variables were grouped into four categories for analysis. The first consisted of only the biological variables, including maternal height or weight, children's hemoglobin, children's dietary intake, children's morbidity, and children's immunizations. The second set consisted of the nutrition and health variables, including health-care seeking, food security, child feeding, and maternal reproductive health. The third set consisted of the women's empowerment variables, including the mother's decision-making capabilities, freedom of movement, employment, and experience of domestic violence. The fourth set consisted of all the socioeconomic variables, including education. All of the significant variables from the previous four regressions were then included in a final regression analysis.

BOX 1. Selected responses on various themes in the qualitative survey

Rural Community	Tribal Community
Women's employment	
<p>"I work as an agricultural wage laborer. They pay me 13 rupees a day. I would prefer to stay home, but I have no choice. It's a luxury to stay home, so I have to work outside."</p> <p><i>Interviewee, 25 years old, no formal schooling</i></p> <p>"If we want to work anywhere or change jobs, we have to get our husbands' permission. Once we are a part of a household, we have to ask for such things."</p> <p><i>Women's focus-group discussion</i></p> <p>"Many women stay home. They are not interested in working as coolies (daily wage laborers). Only those who are very poor work as coolies, because they have no option."</p> <p><i>Women's focus-group discussion</i></p>	<p>"I don't like to work outside the home. I do fieldwork. I like my fieldwork. I don't want to work as a daily wage laborer."</p> <p><i>Interviewee, 46 years old, no schooling</i></p> <p>"We like our fieldwork; we don't want to work on other people's land."</p> <p><i>Women's focus-group discussion</i></p>
Control of household finances	
<p>"Here, I need my husband's permission to get a loan. If he says OK, you can get a loan, then I can get a loan from another woman. Women can only get loans from other women."</p> <p><i>Interviewee, 22 years old, no formal schooling</i></p> <p>"We give what we earn to our husbands—we hand over everything, we can't keep any. They ask us why we are saving it, who are we saving it for. So we can't keep anything, we hand it all over to the men. When men get money, some will give us a little, but most men keep their money. We women buy the supplies when men give us money."</p> <p><i>Women's focus-group discussion</i></p>	<p>"When I don't have any money I get credit and buy the necessary supplies for the house. When I get some 10 to 20 rupees or so from my husband, or by selling something, or after I have worked and earned it back, then I pay back the money I owe."</p> <p><i>Interviewee, 35 years old, 4 years of formal schooling</i></p> <p>"Some men keep the money they earn and buy the household supplies, others give the money to their wives to manage. Women manage money so much better—so women deal with it, the men would spend it all. If we have 10 rupees we save it, the men would spend that 10 rupees.... Either the men or the women buy the household supplies"</p> <p><i>Women's focus-group discussion</i></p>
Choice in marriage	
<p>"The elders sit, discuss, and decide upon a marriage. They want the consent of the boy and girl, but the marriage is agreed upon by the family, the parents have to do it."</p> <p><i>Women's focus-group discussion</i></p>	<p>"The boy and girl have to agree and want to marry each other, and then they go to the forest and return. Those who can afford it may celebrate this; others just go to the forest."</p> <p><i>Women's focus-group discussion</i></p>

Results

Qualitative findings

Analysis of the qualitative data revealed that the tribal and rural women were similar in terms of socioeconomic status, access to basic resources, and dietary practices. Tribal and rural men also had similar social roles across both groups. However, in terms of women’s empowerment, tribal women differed in important ways from rural women. At the outset, all of the themes being explored were given an equal weight. Analysis of the data did, however, reveal some interesting patterns; selected responses from participants are given in **box 1**.

Nuclear families tended to predominate in tribal communities, whereas joint families were more common among the rural communities. Tribal women were traditionally the primary subsistence farmers because men often migrated for work; thus, these women stated that they preferred to work on their own land (**box 1**). Rural women, however, were not the primary subsistence farmers; those who were allowed to work and could find work did so as daily

agricultural wage laborers (**box 1**). Overall, women had fewer choices than men in type of employment;

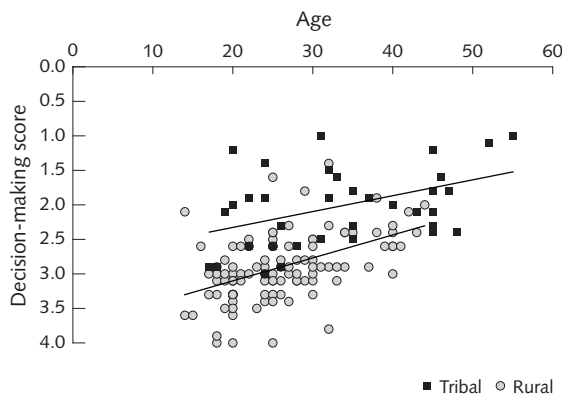


FIG. 1. Women’s decision-making capabilities according to age(data from semi-structured interviews, $n = 148$). Scoring: 1 = wife decides, 2 = joint decision, 3 = husband decides, 4 = elders decide. Each decision was assigned a score based on the respondent’s answer, and the total of these scores was divided by the number of decisions made, resulting in a score ranging from 1 to 4; the closer the score to 1, the greater a woman’s decision-making capability

BOX 1. Selected responses on various themes in the qualitative survey (continued)	
Rural Community	Tribal Community
Health care	
“Women can’t go to the health center; in our houses women don’t have permission to do that. They get in trouble; he (the husband) may ask, Why did you borrow money when I was not there? Why did you go when I was not there? She will get in trouble. For this reason she can’t go until he comes. This depends on the family.” <i>Men’s focus-group discussion</i>	“No one decides when we should go to the health center; we just go when our children are sick. Can we wait for the men if they are not around? So we just go.” <i>Women’s focus-group discussion</i>
Choice of number of children	
“My husband and my parents-in-law decided on the number of children I should have.” <i>Interviewee, 25 years old, 1 year of formal schooling</i>	“I decided that this many children were enough and had a tubectomy.” <i>Interviewee, 35 years old, no formal schooling</i>
Freedom of movement	
“Here the men scold us if we go alone and ask us why we are going alone?” <i>Women’s focus-group discussion</i>	“They have no fear. They are brave and they don’t really need permission. They go quite far. There are no problems on their way; no one troubles them on the way.” <i>Men’s focus-group discussion</i>
Domestic violence	
“We always have fights, problems, and beatings. This is always there, it is normal. What can we do? Run away? Do we leave them then? We have to stay. We have to stay with the men whether they beat us or scold us. We have to stay—what else can we do?” <i>Women’s focus-group discussion</i>	“Communally we are against violence, men do trouble their wives, but people react to beatings in a house...they get involved and say it is wrong, not acceptable and not right...they ask why are you hitting her, and they fight for her.” <i>Women’s focus-group discussion</i>
“No one gets involved when there is violence. No one says anything.” <i>Women’s focus-group discussion</i>	

they tended to work fewer days than men; and their wages were significantly lower than men's. Those who worked for wages had no choice, and they tended to come from poorer households that depended on their meager wages.

Tribal women customarily had greater decision-

making power from a younger age, and overall decision-making power increased with age for both the tribal and the rural women (**fig. 1**). Tribal women had more control over household finances and were at liberty to obtain credit or borrow money from whomever they chose if needed (**box 1**). Rural women,

TABLE 1. Child and maternal characteristics in the sample

Characteristic	Tribal (<i>n</i> = 415)	Rural (<i>n</i> = 405)	Entire sample (<i>n</i> = 820)
Child characteristics			
WAZ	-2.2 ± 1.0	-1.8 ± 1.0	-2.0 ± 1.0
HAZ	-1.4 ± 1.0	-1.2 ± 1.0	-1.3 ± 1.0
WHZ	-1.7 ± 1.1	-1.4 ± 1.0	-1.6 ± 1.1
Hemoglobin (g/dl)	9.3 ± 1.3	9.4 ± 1.6	9.4 ± 1.5
Age (mo)	13.8 ± 6.0	15.2 ± 5.9	14.5 ± 6.0
Maternal characteristics			
Height (cm)	151.9 ± 5.5	151.8 ± 5.0	151.85 ± 5.2
Weight (kg)	40.2 ± 4.8	42.0 ± 5.7	41.1 ± 5.3
Hemoglobin (g/dl)	11.0 ± 2.0	11.8 ± 1.8	11.4 ± 1.9
BMI (kg/m ²)	17.4 ± 1.7	18.2 ± 2.2	17.8 ± 2.0
Age (yr)	21.8 ± 4.7	21.5 ± 3.9	21.7 ± 4.3
Age at marriage (yr)	15.0 ± 2.6	15.1 ± 2.9	15.1 ± 2.8
Years married	6.8 ± 4.4	6.4 ± 3.7	6.6 ± 4.1
No. of pregnancies	2.36 ± 1.3	2.14 ± 1.0	2.3 ± 1.2
Age at birth of 1st child (yr)	16.8 ± 2.6	16.9 ± 2.8	16.8 ± 2.7
No. of living children	2.2 ± 1.2	2.0 ± 1.0	2.13 ± 1.1
Education (yr)	1.3 ± 2.4	4.0 ± 4.3	2.62 ± 3.7
Child anthropometry: percentage of children below z score cutoffs ^a (<i>n</i> = 820)			
WAZ			
< -1	87.7	79.3	83.5
< -2	61.7	45.4	53.7
< -3	21.7	11.6	16.7
HAZ			
< -1	63.6	51.6	57.7
< -2	27.2	22.2	24.7
< -3	5.3	5.2	5.2
WHZ			
< -1	75.9	67.9	72.0
< -2	43.2	30.7	36.9
< -3	9.9	3.5	6.7
Maternal BMI: percentage of nonpregnant mothers below grade of chronic energy deficiency			
	<i>n</i> = 389	<i>n</i> = 358	<i>n</i> = 747
Normal (18.50)	20.1	35.8	27.6
Grade I (17.00–18.49)	33.9	28.8	72.4
Grade II (16.01–16.99)	25.4	20.4	40.9
Grade III (<16.00)	20.6	15.1	17.9

BMI, body mass index; HAZ, height-for-age z score; WAZ, weight-for-age z score; WHZ, weight-for-height z score

a. Z-score cutoffs: < -1 = mild malnutrition; < -2 = moderate malnutrition; < -3 = severe malnutrition (Based on NCHS reference standards.)

however, were not as involved in household finances and they were rarely permitted to obtain credit (**box 1**). Decision-making clearly differed between tribal and rural women. Three domains of decision-making are illustrated in **box 1**, which involve marriage, health-seeking, and childbearing. In the tribal community, the norm for marriage was elopement; dowries were never exchanged and the union was by mutual consent (**box 1**). In contrast, in the rural community, decisions about marriage were more formal; marriages were arranged by the elders and parents, and dowries were commonly demanded of the bride's family (**box 1**). Consent from the bride and groom was sought, if at all, only after the marriage had been finalized by a prior contractual agreement.

Tribal women were at liberty to take their children to a health-care center as needed, without receiving prior permission (**box 1**). For rural women, this process was more complex, with other family members often deciding when and whether to take a child to the health-care center (**box 1**). Most tribal women had the freedom to decide how many children to have and when and whether to have a tubectomy; however, the need for sons was still important to them, since sons carry the lineage forward (**box 1**). In contrast, rural women were not at liberty to decide how many children to have; this aspect of their life was decided for them by husbands and elders (**box 1**). Tribal women had greater freedom to travel alone, whereas rural women were admonished when they ventured anywhere alone (**box 1**). Responses to domestic violence also differed between tribal and rural communities. In the tribal community, women stated that family members became involved in cases of violence and communally condemned such behavior (**box 1**). In the rural communities, domestic violence was perceived as a normal daily occurrence that women felt they had to accept, and they felt that no one would become involved to stop the violence (**box 1**).

Quantitative findings

Moderate malnutrition in children, maternal malnutrition, and anemia were highly prevalent in the study sample (**table 1**). Malnutrition was significantly more prevalent in the tribal community (**table 1**). The mean values for anemia in children were not significantly different between the two groups (**table 1**). The characteristics of the tribal and rural women in the sample, such as maternal age and age at marriage, were not significantly different across the sample (**table 1**). Some degree of malnutrition was seen in 83.5% of the children and 72.4% of the mothers (**table 1**). In terms of demographic characteristics (**table 2**), the tribal subjects were more likely to come from nuclear families, whereas joint families were significantly more common among the rural subjects. Tribal families had more limited access to electricity, education, and health

care than rural families. Tribal families were more food insecure, were more likely to purchase food on a weekly basis, and reported more days without food

TABLE 2. Socioeconomic, food security, and health characteristics of the sample ($n = 820$)

Characteristic	Tribal (%)	Rural (%)
Socioeconomic		
Family structure		
Nuclear	76.4	54.4
Joint	18.8	39.3
Other***	4.8	6.2
Type of house ^a		
Pucca	75.4	83.9
Kuccha**	24.3	16.1
Houses with electricity***	20.0	63.9
Household food security		
Frequency of food purchases		
Daily	53.5	78.0
Weekly	39.0	14.4
Monthly	7.5	7.7
Days without food in past month		
0	34.5	49.4
1–3	45.3	41.7
≥ 4–8***	20.3	8.9
Days without food in past week		
0	25.5	40.2
1	16.4	22.5
≥ 2***	58.1	37.2
Food production (farming)		
No production or no land	45.8	56.9
Woman and others	35.7	2.0
Husband and others***	18.6	41.1
Health-seeking behavior		
Time to health center		
< 1 h	68.8	92.7
≥ 2 h	28.3	5.7
Type of health center		
Government	56.6	26.4
Private***	42.9	72.1
Cost per health-center visit (rupees)		
0	23.5	12.1
< 100	64.9	73.5
> 100	11.3	13.1
Obtained credit for last health-center visit*	87.5	82.5
Obtained credit for health-center visit without husband's permission*	44.0	37.8

* $p < .05$; ** $p < .01$; *** $p < .0005$

a. Pucca houses are houses with cement, asbestos, or tile roofing; kuccha houses are houses with thatched roofing.

(table 2). Tribal women, however, were significantly more likely to be involved in subsistence farming. Most subjects in both groups had to borrow money to pay for health care; rural subjects were more likely to use private health care (table 2). Child-feeding practices were similar across the sample, and more than 80% of the children were still being breastfed at the time of the study (table 3). Many mothers introduced complementary foods at an appropriate age (about 6 months), but diversity of the diet was poor (table 3). Tribal women had greater decision-making capabilities and freedom of movement than rural women (table 4). Tribal women were also more likely to be employed (table 4). However, the prevalence of domestic violence did not differ significantly between tribal and rural women (fig. 2).

Bivariate associations with children's weight-for-age were as expected (table 5). The biological variables maternal weight, children's dietary intake, and children's missed immunizations had the strongest association with children's weight-for-age. The next set

of variables that were highly associated with children's weight-for-age consisted of the mother's mobility within the village (a function of her having the freedom to go to the local shops and her natal home if it

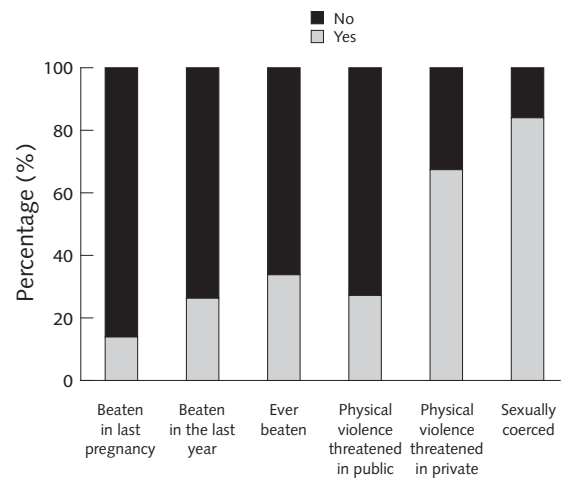


FIG. 2. Prevalence of domestic violence ($n = 820$)

TABLE 3. Child-feeding practices^a

Practice	Tribal (%)	Rural (%)
Breastfeeding		
Time from birth to initiation		
< 2 h	54.9	61.4
1 day	27.9	23.3
2–3 days	16.5	15.3
Colostrum given	51.2	51.5
Prelacteal feeds given	62.7	56.7
Currently breastfeeding	90.8	86.9
Complementary feeding		
Age when solids introduced (mo)		
< 4	7.4	6.1
4–6	53.3	54.0
7–11	21.5	24.0
≥ 12	8.2	8.3
Not yet started	9.6	7.4
Who feeds child		
Mother	78.1	85.7
Child	9.2	2.5
Others	3.6	4.4
Foods offered		
Energy-dense foods	62.9	65.4
No food	37.1	34.6
Nutrient-dense foods	17.1	13.3
No. of food groups offered		
1	53.0	42.2
2	33.0	44.9
≥ 3	4.3	5.2

a. All values are nonsignificant.

TABLE 4. Women's capabilities: decision-making and physical mobility

Capability	Tribal (%)	Rural (%)
Decision-making		
Woman involved in major family decisions*	41.7	12.4
Marriage		
Couple decided upon marriage independently of others*	27.0	5.4
Family paid dowry*	1.9	40.8
Woman involved in family-planning decisions*	38.4	24.5
Woman involved in health-care-seeking decisions*	33.9	21.0
Employment		
Woman decided to work for wages*	23.1	7.4
Woman currently working for wages*	27.2	11.4
Control over food		
Woman obtains credit for food*	15.4	5.5
Woman buys household food*	50.1	16.5
Mobility: woman goes alone		
Shopping within the village*	55.3	21.3
To fields*	39.5	8.2
No land (families that do not own land)	45.8	57.2
To market*	11.4	3.0
To natal home*	50.5	23.8

* $p < .0005$

was nearby), the mother's being currently employed, the mother's having control over the household food supply, and the mother's having had antenatal care during her most recent pregnancy. Of the remaining variables, those that are related to family structure also had strong associations with child weight-for-age, in particular the mother's higher position within the household and her greater involvement in decision-making. Maternal education had only a weak association with children's weight-for-age in this sample.

However, both maternal and paternal education had a strong association with maternal weight and BMI in bivariate regression analyses (**table 5**). Several of the women's empowerment variables also had a strong association with maternal weight and BMI. Among these, the mother's experience of psychological abuse and sexual coercion had the strongest association with both maternal weight and maternal BMI.

In the multivariate regression analysis (**table 6**), the biological variables explain the greatest variance

TABLE 5. Bivariate regression analysis of the independent variables on the dependent variable weight-for-age ($n = 820$) and maternal weight and maternal BMI for nonpregnant mothers ($n = 747$)

Independent variables	Child weight-for-age z score		Maternal weight (kg)		Maternal BMI (kg/m ²)	
	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
Biological variables						
Maternal weight (kg)	69.3	< .0005	—	—	—	—
Maternal BMI (kg/m ²)	43.1	< .0005	—	—	—	—
Child hemoglobin (g/l)	28.4	< .0005	—	—	—	—
Maternal hemoglobin (g/l)	14.1	< .0005	—	—	—	—
Nutrition and health variables						
Missed immunizations	25.7	< .0005	—	—	—	—
Antenatal care and cost	21.2	< .0005	17.9	< .0005	19.4	< .0005
Private health care	10.4	< .005	9.4	< .005	7.0	< .01
Age at first pregnancy and child mortality	—	—	6.3	< .05	—	—
Energy-dense foods	17.4	< .0005	—	—	—	—
Breastfeeding practices	5.9	< .05	—	—	—	—
Health decisions and woman's mobility	5.3	< .05	—	—	—	—
Food insecurity	4.9	< .05	—	—	—	—
Family type and food purchasing	14.8	< .0005	—	—	—	—
Time, cost, and health decisions	8.7	< .005	—	—	—	—
Women's empowerment variables						
Mobility within the village	24.7	< .0005	5.9	< .05	7.6	< .01
Mother's control over food supply	22.7	< .0005	5.7	< .05	5.8	< .05
Mother's current employment and income	22.7	< .0005	—	—	—	—
Mother's position in household and involvement in decision-making	17.0	< .0005	—	—	—	—
Mother's previous employment	12.1	< .005	9.1	< .005	12.1	< .005
Family type and mobility around village	9.4	< .005	—	—	—	—
Women's decisions	7.1	< .01	—	—	—	—
Psychological abuse and sexual coercion	5.2	< .05	11.3	< .005	10.8	< .005
Natal home and distance	4.3	< .05	6.6	< .05	12.0	< .005
Socioeconomic variables						
Family structure and income	18.0	< .0005	—	—	—	—
Family type and size	17.6	< .0005	—	—	—	—
Husband's education	8.3	< .005	39.8	< .0005	41.7	< .0005
Maternal education (years in school)	7.4	< .01	31.5	< .0005	36.4	< .0005
Mother currently illiterate	7.5	< .01	24.8	< .0005	35.5	< .0005
Family's employment security	—	—	16.5	< .0005	15.3	< .0005
Household water and sanitation	5.8	< .05	10.7	< .005	11.6	< .005
Household assets	—	—	4.4	< .05	—	—

BMI, body-mass index

TABLE 6. Multivariate regression analysis of cross-sectional weight-for-age data ($n = 820$)

Variable	Weight-for-age (z score)											
	Model 1 Biological variables		Model 2 Nutrition and health variables		Model 3 Socioeconomic variables		Model 4 Women's empower- ment variables		Model 5 Final model I		Model 6 Final model II	
	b	t	b	t	b	t	b	t	b	t	b	t
Maternal weight	0.25	7.51****	—	—	—	—	—	—	0.23	7.14****	0.23	7.01****
Maternal hemoglobin	0.08	2.43*	—	—	—	—	—	—	0.08	2.50**	0.08	2.42*
Child hemoglobin	0.10	3.02****	—	—	—	—	—	—	0.09	2.72**	0.10	2.90****
Missed immunizations	-0.11	-3.43****	—	—	—	—	—	—	-0.10	-3.05****	-0.09	-2.84**
Energy-dense foods	-0.23	-5.66****	—	—	—	—	—	—	-0.20	-5.05****	-0.20	-5.00****
Nutrient-dense foods	-0.17	-4.21****	—	—	—	—	—	—	-0.12	-3.70****	-0.15	-3.71****
Breastfeeding practices	—	—	-0.08	-2.28***	—	—	—	—	—	—	—	—
Who feeds child	—	—	0.07	2.01*	—	—	—	—	—	—	—	—
Antenatal care and cost	—	—	-0.11	-3.21***	—	—	—	—	—	—	—	—
Family type and food purchasing	—	—	0.10	2.84*	—	—	—	—	—	—	—	—
Woman's control over food supply	—	—	0.10	2.76**	—	—	—	—	—	—	—	—
Private health care	—	—	0.07	2.12*	—	—	—	—	0.08	2.34**	0.07	2.06**
Time, cost, and health decisions	—	—	-0.10	-3.06***	—	—	—	—	-0.08	-2.58**	-0.09	-2.83**
Water and sanitation	—	—	—	—	-0.07	-2.15*	—	—	—	—	—	—
Family structure and income	—	—	—	—	0.14	4.10****	—	—	—	—	—	—
Maternal employment and income	—	—	—	—	—	—	-0.11	-2.86***	-0.12	-3.70****	—	—
Mother's position in household and involvement in decision-making	—	—	—	—	—	—	0.11	3.33***	0.09	2.65**	0.08	2.55*
Mobility within the village	—	—	—	—	—	—	0.10	2.53*	—	—	0.09	2.78**
Natal home and distance	—	—	—	—	—	—	0.07	2.02*	—	—	—	—
Psychological abuse and sexual coercion	—	—	—	—	—	—	-0.07	-2.10*	—	—	—	—
Interaction term	—	—	—	—	—	—	—	—	—	—	-0.07	-2.21*
Maternal employment and food insecurity	—	—	—	—	—	—	—	—	—	—	—	—
Constant	—	-9.62****	—	-57.71****	—	-56.58****	—	-57.53****	—	-9.60****	—	-9.66****
No. of observations	820	820	820	820	820	820	820	820	820	820	820	820
Adjusted R^2	0.151	—	0.062	—	0.025	—	0.056	—	0.182	—	0.182	—

BMI, body-mass index

* $p < .05$; ** $p < .01$; *** $p < .005$; **** $p < .0005$

(15.1%) in the sample. The socioeconomic variables explain the least, and in fact are excluded in the final models (models 5 and 6). The nutrition and health variables and the women's empowerment variables explain a similar proportion of the variance in the sample.

Consistently, maternal weight and children's hemoglobin had a strong positive association with children's weight-for-age (**table 6**). Missed immunizations and lack of energy- and nutrient-dense foods showed a strong negative association with children's weight-for-age. Belonging to a joint family rather than a nuclear family had a positive association with children's weight-for-age. In the final models (models 5 and 6), the nutrition and health variables and the women's empowerment variables that remain in the models include the mother's position in the household, her involvement in decision-making, the family choosing private health care, her being currently employed, and the time, cost, and delay involved in seeking health care. Both maternal employment and the time, cost, and delay involved in seeking health care have an inverse relationship with children's weight-for-age. In model 6, because maternal employment interacts with

the mother's mobility and household food insecurity, these two were introduced as interaction terms in the regression. In this final model, both the mother's physical mobility within the village and her position in the household and decision-making involvement have a positive association with children's weight-for-age. Both models 5 and 6 explain 18.2% of the variance in the sample.

Table 7 presents a multivariate logistic regression that compares the upper and lower quartiles of children's weight-for-age. The trends seen here are similar to those seen in **table 6** for the multivariate regressions. Higher maternal weight and children's hemoglobin level reduce the risk of low children's weight-for-age, whereas missing immunizations and not being offered energy- or nutrient-dense foods significantly increase the risk of low weight-for-age. In the final model (model 5), using private health care reduces the risk of children's low weight-for-age, but both maternal employment and the mother's experience of psychological abuse and sexual coercion significantly increase the risk of low weight-for-age.

Table 8 presents the findings of multivariate regression analyses of maternal weight and BMI. In **table 8A**,

TABLE 7. Multivariate logistic regression of cross-sectional weight-for-age data comparing upper and lower quartiles ($n = 522$)

Variable	Weight-for-age z score				
	Model 1 Biological variables Exp B	Model 2 Nutrition and health variables Exp B	Model 3 Socioeconomic variables Exp B	Model 4 Women's empowerment variables Exp B	Model 5 Final model Exp B
Maternal weight	0.894***	—	—	—	0.895***
Child hemoglobin	0.808*	—	—	—	0.807*
Missed immunizations	4.841**	—	—	—	5.836**
Energy-dense foods	5.013***	—	—	—	4.017***
Nutrient-dense foods	8.028***	—	—	—	8.898***
Who feeds child	—	0.713*	—	—	—
Antenatal care and cost	—	1.569**	—	—	—
Family type and food purchasing	—	0.755*	—	—	—
Private health care	—	0.637**	—	—	0.582**
Time, cost, and health decisions	—	1.265*	—	—	—
Family type and size	—	—	1.489***	—	—
Maternal employment and income	—	—	—	1.699*	2.168**
Mother's position in household and involvement in decision-making	—	—	—	0.695*	—
Mobility within the village	—	—	—	0.639*	—
Psychological abuse and sexual coercion	—	—	—	1.426*	1.429*
Constant	138.574***	7.419*	6.236***	7.807***	157.923***
No. of observations	522	522	522	522	522
-2 log likelihood	347.377	386.956	418.615	386.748	317.344

* $p < .05$; ** $p < .005$; *** $p < .0005$

for both models 1 and 2, the variables associated with the dependent variables are similar. The husband's education, the mother's close proximity to the natal home, and use of private health care are positively associated with maternal weight and BMI. Lower parity is also positively associated with maternal BMI. Lack of antenatal care for the mother, less employment security for the family, and the mother's experience of psychological abuse and sexual coercion are negatively associated with maternal weight and BMI. The adjusted R^2 values for these models are low, as expected given the type of data; adult weight is more likely to be affected by external influences not captured by these data. Similarly, in **table 8B**, mothers have a 32% increased risk of having low BMI if they experience psychological abuse and sexual coercion. Lower parity for the mother, having control over the food supply, and being close to her natal home reduced the risk of low BMI. The husband's education also marginally decreased the risk of low maternal BMI.

Table 9 presents findings from additional analysis. The mother's position in the household and involve-

ment in decision-making were positively associated with her having been previously employed and the husband's level of education. A shorter duration of marriage and maternal experience of psychological abuse and sexual coercion were both negatively associated with maternal involvement in decision-making. Similarly, the mother's mobility within the village was negatively associated with maternal employment; this is consistent with how the data were coded (high mobility was given a low score, and low mobility a high score). Working mothers were more mobile within and around the village. Previous maternal employment experience had a positive association with mobility within the village, whereas maternal experience of physical violence had an inverse relationship with mobility within the village.

Discussion

The qualitative data agree well with the quantitative findings, suggesting that the survey tool successfully measured women's empowerment. The qualitative

TABLE 8. Multivariate regression analysis with maternal weight and BMI as dependent variables and multivariate logistic regression analysis by BMI less than and greater than 18.5 kg/m²

A. Multivariate regression analysis with maternal weight and maternal BMI as dependent variable (nonpregnant mothers) (n = 747)

Variable	Model 1 Maternal weight		Model 2 Maternal BMI	
	b	t	b	t
Husband's education	0.174	4.708**	0.183	4.849**
Mother currently illiterate	—	—	-0.103	-2.623****
Antenatal care and cost	-0.91	-2.515****	-0.073	-1.980****
Parity, birth order, and birth interval	—	—	0.107	3.033**
Private health care	0.088	2.459****	0.073	2.073****
Family's employment security	-0.090	-2.470****	—	—
Psychological abuse and sexual coercion	-0.089	-2.494*	-0.071	-1.980****
Natal home and distance	0.072	2.022****	0.101	2.854*
Constant		179.150**		57.403**
No. of observations		747		747
Adjusted R^2	0.086		0.104	

B. Multivariate logistic regression of nonpregnant mothers: BMI less than or greater than 18.5 kg/m² (n = 747)

Variable	Exp (B)	95% CI
Husband's education	0.947**	0.909–0.988
Parity, birth order, and birth interval	0.769*	0.649–0.911
Mother's control over food supply	0.722*	0.589–0.885
Psychological abuse and sexual coercion	1.321*	1.110–1.572
Natal home and distance	0.766*	0.643–0.914
Constant	1.900	
No. of observations	747	
-2 log likelihood	810.186	

BMI, body-mass index; CI, confidence interval

* $p < .05$; ** $p < .01$; *** $p < .005$; **** $p < .0005$

TABLE 9. Predictors of women's decision-making capabilities and freedom of movement ($n = 820$)

Predictor	Decision-making factors: mother's position in household and decision-making involvement		Freedom-of-movement factors: mobility within the village	
	b	t	b	t
Maternal employment and income			-0.498	-17.680*
Mother's previous employment	0.123	3.547*	0.321	11.390*
Physical violence			-0.059	-2.068*
Psychological abuse and sexual coercion	-0.072	-2.169*		
Husband's education	0.096	2.781*		
No. of years married	-0.245	-7.197*		
Constant		4.690**		0.000
No. of observations		820		820
Adjusted R^2	0.117		0.361	

* $p < .05$; ** $p < .0005$

findings in this study revealed that women's empowerment varied according to community norms and the women's age. These data provided a strong base from which quantitative measures could be developed to measure women's empowerment. Few studies have applied this level of rigor to develop a context-specific survey tool that comprehensively captures the concepts represented within an empowerment framework.

After controlling for the known immediate and underlying causes of malnutrition, this study finds that women's empowerment variables are significantly associated with child weight-for-age and maternal nutritional status. Where young mothers are empowered to make decisions and have greater freedom of movement, their children's nutritional status tends to be better. Conversely, young mothers' experience of violence disempowers them and undermines their own and their children's nutritional status. The strong positive association between maternal nutritional status and children's weight-for-age shows that malnutrition is intergenerational in nature [7]. The socioeconomic variables have a weak association with child weight-for-age, suggesting that the sample is relatively homogeneous in these terms. Moreover, maternal education did not remain in the final models, suggesting that the variable and its effect are negligible in the sample. The health-seeking behavior variables reflect how much families can and do invest in their children's health and also how effective they are in obtaining resources, such as credit, to go to the health center. As in other studies, current maternal employment had a strong negative association with child weight-for-age, which most likely reflects poorer households that are more food insecure in which mothers must work for wages [24, 25]. This also explains the significance of the interaction term between current maternal employment and food insecurity, why more tribal women worked for wages, and the higher rates of malnutrition among the tribal children. This inverse relation-

ship with children's weight-for-age also suggests that these families may not have had access to adequate child-care arrangements. Fewer rural women in our sample worked outside the home, and this most likely reflects the facts that they belong to joint families and have little choice in whether to work or not, and also that families decide to keep young mothers at home to look after their young children, as noted in Desai and Jain's study [35]. Interestingly, previous maternal employment (before marriage or the birth of their first child) predicts greater decision-making capabilities and freedom of movement in mothers, which suggests that it empowers women.

Mean maternal age at the time of the study was low, and early marriage and childbearing were the norm, as elsewhere in India. Nonetheless, the degree of variation in empowerment among mothers is important to note, because young mothers with young children are usually the focus of nutrition programs. It suggests that although younger women are probably still less empowered than older women, there is room to empower them even within the existing sociocultural context.

There are, however, two examples in the data where empowerment itself is not enough to prevent child malnutrition. Although tribal women are more empowered than rural women, child-feeding practices are the same in the two groups. This suggests that even though tribal women are more empowered, tribal and rural mothers alike do not have enough knowledge about appropriate feeding practices. Similarly, the higher rate of malnutrition in tribal children is most probably a consequence of the remote, resource-poor settings in which they live. It also suggests, however, that where access to information and resources is extremely limited, empowerment alone is insufficient to prevent malnutrition.

Although community responses to domestic violence were different in the tribal and rural communities, the quantitative data revealed that the prevalence of vio-

lence was not significantly different. Violence is most likely a consequence of poverty, which is common to both groups. But the difference in how the community responds does suggest that there is a fundamental difference in how women are valued in these communities. As in other studies, psychological abuse is more prevalent than physical violence, and the overall prevalence of violence is consistent [36, 37]. Among mothers who experience psychological abuse, 50% also admitted to having experienced physical violence. The independent associations seen between psychological violence and mothers' empowerment, maternal nutritional status, and children's nutritional status suggest that this form of violence operates through two pathways. Psychological violence directly exacerbates malnutrition and indirectly disempowers mothers, which also exacerbates malnutrition.

In general, tribal communities are more disadvantaged economically and tend to have higher rates of malnutrition, as seen here [44]. Tribal communities need much greater access to information, opportunities, and resources to improve women's and children's nutritional status. In contrast, rural communities have relatively greater access to resources, but women's lack of empowerment limits their ability to use these resources. Enabling gender equality is therefore important and can be achieved through women's self-help groups and transformation of health and nutrition programs to better address the needs of women and children in these settings.

Conclusions

The larger social context, and gender inequality in particular, play a role in the prevalence of malnutrition at the community level in this region of Karnataka, India. Moreover, these findings seem to suggest that the combination of empowerment with knowledge and resources can further reduce malnutrition significantly, more than any one of these inputs alone. Further research on the nexus between women's empowerment, domestic violence, and nutrition outcomes is clearly needed. In particular, given the high prevalence of domestic violence in developing countries, there is a need to understand the extent to which women's experience of violence undermines nutrition outcomes, women's caring capacity, and women's ability to become empowered. At a broader

level, it is necessary to implement strategies to end violence against women.

These findings add to the body of evidence that concerted efforts are needed to improve women's nutritional status overall and that they should target women before, during, and after pregnancy. Strategies to raise the age of marriage and delay first pregnancy are also important in this context. In this study, the poorest families pay a high price when mothers have to work; at the household level, families lack alternatives in terms of income generation and child care. Women urgently need better child-care alternatives and a wider range of income-generation and employment opportunities from which they may obtain incomes equal to those of men.

Continued efforts on the part of existing programs that address malnutrition, seek to make families food secure, and enable access to health care are necessary. However, these study findings suggest that existing and new nutrition programs would benefit from parallel efforts to promote gender equality and empower women and girls. Further operations research is needed in community-based nutrition programs to determine whether empowering women can have a multiplier effect on improving nutrition outcomes, and how this can be achieved. At the community level, a next step for nutrition programs is understanding and overcoming the constraints women face because of their lack of decision-making authority, restricted freedom of movement, experience of domestic violence, and lack of access to and control over resources such as time and money. Addressing these gender constraints could lead to better-designed nutrition programs and improved program effectiveness for a greater and more sustainable impact on reducing malnutrition.

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