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ORIGINAL ARTICLE

Traditional food consumption and nutritional status of *Dalit* mothers in rural Andhra Pradesh, South India

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Objectives: To describe prevalence of malnutrition and their correlates of nutrient and traditional food consumption in rural *Dalit* mothers.
Design: In a cross-sectional study, we used socio-cultural questionnaires, anthropometric measurements and clinical eye examinations during the rainy season in 2003. Food frequency questionnaires and 24-h recalls were conducted during both summer and rainy seasons.
Setting: *Dalit* mothers with young children were recruited from 37 villages in the Medak District of rural Andhra Pradesh, India.
Subjects: *Dalit* mothers ($n=220$) participated.
Results: The prevalence of chronic energy-deficient (CED) mothers (body mass index $<18.5\,kg/m^2$) was 58%. Illiterate women and active women were more likely to have CED than those literate and non-active (relative risks (RR) = 1.6 and 1.4, respectively, $P\leqslant 0.05$), but literacy and activity level were not significant in multivariable analyses including sanitation and number of children $\leqslant 5$ years of age. Increasing levels of fat intake, as a percent of total energy, was significantly associated with lower risk of CED (RR of the lowest 25th percentile compared to those in the 75th percentile or above was 1.6, $P\leqslant 0.05$), findings that remained significant in multivariable analyses. Consumption of pulses (g/day) was also inversely related to CED in univariate and multivariable analyses. Carbohydrate intake, as a percent of total energy, was inversely related to percent energy from fat ($r=-0.96$, $P\leqslant 0.01$), and, although positively related to CED in univariate analyses, carbohydrate consumption was not significant in multivariable analyses. Mothers' age in years and income was positively related to vitamin A deficiency.
Conclusions: These results confirm that CED and vitamin A malnutrition among *Dalit* women are predominant problems in this area. Increased consumption of local traditional *Dalit* food (particularly sorghum, pulses, vegetables and animal source food) should be incorporated as an important component of intervention strategies to improve nutritional status.
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Introduction

Major nutritional problems in low-income Asia include early childhood growth failure, iron deficiency, vitamin A deficiency and low birth weight (Krishnaswami, 1998; Stephenson *et al.*, 2000; Allen and Gillespie, 2001; Vijayaraghavan, 2002). In India, chronic energy-deficient (CED) mothers and growth-retarded young children are most common in rural, illiterate, scheduled caste households with small-size landholding (Measham and Chatterjee, 1999; Laxmaiah *et al.*, 2002). The scheduled caste representing the untouchables, called *Dalit*, is below the four distinct classes in the Hindu religion (Seenarine, 1996), and today, the majority of *Dalit*

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families are illiterate, landless and working in farm labor (Annamalai, 2002).

From 1998 to 1999, the second Indian National Family Health Survey (NFHS-2) assessed nutritional status in ever-married women aged 15–45 years (International Institute for Population Sciences, 2000) and reported 17% of *Dalit* women to have a measured height below 145 cm. Women in rural India and from scheduled castes were reported to have mean body mass index (BMI) of 19.6 and 19.5 kg/m^2, respectively, and 41 and 42% with CED. Similarly, the National Nutrition Monitoring Bureau (NNMB) (2002) reported rural women aged $\geqslant$18 years in Andhra Pradesh to have grade 1 (23%), grade 2 (12%) and grade 3 (8%) CED. They reported the absence of night blindness and conjunctival xerosis in rural Indian adults, and 0.4% prevalence of Bitot's spots. Other surveys conducted in six states reported that 3–16% of pregnant women suffered from night blindness (Chakravarty and Sinha, 2002; Pathak *et al*., 2003).

Inadequate energy intake in mothers results in low body weight, inadequate weight gain during pregnancy and low birth weight infants (WHO, 2000). The specific causes of protein energy malnutrition in children vary in different settings, but deficiencies of micronutrients have been associated with linear growth faltering, as have prolonged infections and inadequate care (Stephenson *et al*., 2000).

Interventions with specific nutrients have shown conflicting results, and it is suggested that emphasis should be made on the importance of overall dietary quality (Allen, 1994). Vitamin A deficiency occurs when body stores are depleted to the extent that physiological functions are impaired. The main causes are inadequate intake of vitamin A rich foods and severe and repeated illnesses (Food and Nutrition Board, 2001). Iron deficiency is prevalent in all groups in India, but adverse consequences are most common among pregnant women, preschool children and women of reproductive age (Gopalan *et al*., 1988; Stephenson *et al*., 2000). Children aged 12–23 months from rural illiterate *Dalit* mothers were reported to have particularly high levels of iron deficiency (International Institute for Population Science, 2000).

Traditional food systems have the potential to be sustainable, economically feasible, culturally acceptable and rich nutrient sources, but have not yet been fully explored for their role in combating malnutrition as part of the diet diversification approach (Gibson and Hotz, 2001; Tontisirin *et al*., 2002). For two decades, the Deccan Development Society (DDS), a local non-governmental organization, has supported *Dalit* women farmers in Medak District of Andhra Pradesh to form into volunteer groups – sanghams – to practice their traditional agriculture, which is based on organic mixed cropping systems. This traditional food system produces rich sources of energy, protein, minerals and vitamins, including iron and vitamin A, and includes several varieties of sorghum, millet, pulses, cultivated and uncultivated green leafy vegetables, vegetables and cultivated and wild fruits (Deccan Development Society, 2002). This research describes prevalences and correlates of chronic energy deficiency, protein energy malnutrition, clinical vitamin A deficiency symptoms and iron deficiency (pallor) in *Dalit* mothers living in villages with DDS-sanghams in the Medak District in rural Andhra Pradesh.

Subjects and methods

This research was developed and carried out based on the guidelines of participatory health research with Indigenous Peoples (WHO/CINE, 2003). Ethics approval was obtained from the Human Research Ethics Committee of McGill University in Montreal, Canada. Sangham leaders and each recruited mother signed informed consent forms. Two hundred and sixty-three *Dalit* mothers with young children (6–39 months) were recruited from 37 villages in six townships in Medak District. All recruited *Dalit* households were members in the village DDS-sangham. One mother per household was included. If the household had two eligible mothers, one who was at home was chosen. Mothers aged $<$15 years and/or with twins were excluded. Two hundred and twenty mothers participated, and were contacted in summer and rainy seasons. Forty-three (16%) of the recruited mothers did not participate: 19 were working in the nearby city (7%), seven recently delivered a child (3%) and 16 were absent from the village at the time of the survey (6%); one mother refused to participate.

Food patterns and nutrient intakes

The seasonal food frequency questionnaires (FFQ) were adapted from the FFQ used by the Center for Indigenous Peoples' Nutrition and Environment (CINE). During summer, an 83-item FFQ was used, and during the rainy seasons, a 106-item FFQ was used. Both were created from existing information of the DDS on availability and personal preferences. We included the same 31 items of food grains, nuts and oil seeds, pulses and animal foods during both seasons. Fruits, green leafy vegetables, vegetables, roots and tubers were included in the FFQ according to seasonal availability. In summer, the FFQ consisted of 14 vegetables, six cultivated green leafy vegetables, 10 wild green leafy vegetables, 11 cultivated fruits and 11 wild fruits. In the rainy season, the FFQ consisted of 15 vegetables, 14 cultivated green leafy vegetables, 36 wild green leafy vegetables, six cultivated fruits and three wild fruits.

Frequencies were reported as the number of days that a particular food item was consumed during the particular season. For the purpose of frequency interviews, a season referred to 2 months (60 days). The mother's consumption frequencies (days per season) of nuts and oil seeds, vegetables, roots and tubers, animal foods, green leafy vegetables, eggs, milk and milk products, meat and fruits were averaged from the summer and rainy seasons. The average frequencies of sorghum, rice and pulses consumption, expressed in days per season, were combined with the

average amount of sorghum, rice and pulses consumed during summer and rainy seasons obtained from 24-h recalls to estimate average amount consumed per day. Mothers' nutrient intakes were calculated from a minimum of two 24-h recalls obtained during the summer and rainy seasons. Twenty-four hour recalls were obtained according to standard procedures adapted from the NNMB surveys. Nutrient intakes were estimated using Candat (Canadian Nutrient Data Analysis Toronto, Version 5.1, 1988 Godin Incorporated, London, Ontario, Canada) based on nutrient values from the Indian food composition tables (Gopalan *et al*., 1988).

Anthropometric measurements

A socio-cultural questionnaire, anthropometric measurements and an eye examination were administered during the rainy season. Portable height rod sets (Galaxy Informatics, Delhi, India) were used to measure height of mothers with an accuracy of 1 mm. Weight of mothers was measured on a digital balance (SECA BELLA 840, Hamburg, Germany) with an accuracy of 100 g. Women with a BMI $<18.5\,kg/m^2$ were classified as CED using standard cutoff points (James *et al*., 1988). Pregnant women ($n=14$) were excluded from the analyses on CED.

Eye examination

Night blindness (XN) was self-reported by mothers for themselves currently and for their last pregnancy, including which month of pregnancy. Standardized terms for night blindness in Telegu were used, as is the procedure of the National Institute of Nutrition, Hyderabad. Physical examination of eyes in mothers and children was carried out by well-trained interviewers to assess the prevalence of clinical vitamin A deficiency symptoms including Bitot's spot (X1B), conjunctival xerosis (X1A) and corneal xerosis (X1A) classified by the World Health Organization (McLaren and Frigg, 2001). Iron deficiency was classified using white or pallor vs pink inside of the lower eye lid (Semba and Bloem, 2001).

Statistical analysis

Descriptive statistics were used to provide means, standard deviations (s.d.) and percentages. Unadjusted relative risks (RR) and 95% confidence intervals were calculated for categorical risk factors. Beta coefficients and standard errors (s.e.) and *P*-values were obtained from multivariable logistic regression analyses in which nutritional exposures were evaluated for their associations with outcomes taking into consideration important correlates. Correlates for chronic energy deficiency, clinical vitamin A deficiency and iron deficiency in mothers were separately examined. The following variables were considered in univariate and multivariable analyses: mother's age (years), number of children $\leqslant 5$ years of age (one vs more), breastfeeding or pregnancy status (lactating, pregnant, neither), activity level (moderate vs low), income above or below poverty line (household income >1000 rupees per month), literacy (ability to read and write vs other) and lack of sanitation (i.e., an open-field toilet). One woman was both pregnant and lactating and was considered pregnant for all analyses. The nutritional variables explored for their association with CED, clinical vitamin A deficiency symptoms and iron deficiency (pallor) are presented in Table 1. Nutritional factors that were correlated with each other in bivariate analyses were not entered together into multivariable models. Statistical analysis was conducted with SAS version 8 (SAS Institute Inc., Cary, NC, USA).

Table 1 Variables of interest for determinants of chronic energy deficiency, clinical vitamin A deficiency symptoms and iron deficiency (pallor) in *Dalit* mothers[a]

Variable	*Index category*
Variables for chronic energy deficiency (BMI $<18.5\,kg/m^2$)	
Energy intake	kcal/day
Carbohydrate intake	% of energy
Fat intake	% of energy
Dietary fiber intake	g/day
Rice consumption	g/day
Sorghum consumption	g/day
Pulses consumption	g/day
Frequency of nuts and oil seeds	Days
Frequency of vegetables, roots and tubers	Days
Frequency of animal foods (meat, egg, milk, milk products)	Days
Variables for clinical vitamin A deficiency (Bitot's spot, conjunctival xerosis, night blindness)	
Nutritional supplement (enriched flours)	Yes
Fat intake	% of energy
Vitamin A intake (retinol equivalents)	(μg RE)/day
Sorghum consumption[b]	g/day
Pulses consumption[b]	g/day
Frequency of green leafy vegetables	Days
Frequency of egg, milk and milk products	Days
Frequency of fruits	Days
Variables of interest for iron deficiency (white eye pallor)	
Nutritional supplement (enriched flours)	Yes
Iron–folic tablets	Yes
Energy intake	kcal/day
Dietary fiber intake	g/day
Iron intake	mg/day
Vitamin C intake	mg/day
Rice consumption[b]	g/day
Sorghum consumption[b]	g/day
Pulses consumption[b]	g/day
Frequency of green leafy vegetables	Days
Frequency of meat	Days

Abbreviation: BMI, body mass index.
[a]Dietary intake and consumption frequencies from summer and rainy seasons in 2003.
[b]Obtained from averages of 2–4 24-h recalls and food frequency questionnaire during summer and rainy seasons.

Results

The average age of the mothers was 24.3 years (s.d. = 3.9) (Table 2). Sixteen percent of the mothers were below 145 cm in height. Mean BMI was slightly below the cutoff point (BMI $\geqslant$18.5 kg/m^2) for healthy body weight (James *et al.*, 1988). Fifty-eight percent of mothers were classified as CED, with 10% of these classified as severely malnourished (BMI <16 kg/m^2). One percent were classified as overweight (BMI $\geqslant$25 kg/m^2). The majority of women were illiterate (78.6%), had on open-field toilet (94.1%) and were currently lactating at the time of the study (80.9%). In addition, 41.4% of the women had a household income below the poverty line. The majority of women were characterized as moderately active owing to their work in agricultural fields (70.9%). Literate women were less likely to have an open-field toilet and less likely to be characterized as active (Fischer's exact test, $P\leqslant 0.01$).

Table 2 Characteristics of *Dalit* mothers[a]

Variable	*Description*	*Mothers (N = 220)*
Age	Mean years (s.d.)	24.3 (3.9)
Weight[b]	Mean kg (s.d.)	40.9 (5.7)
Height	Mean cm (s.d.)	150.0 (5.0)
Mid–upper arm circumference	Mean cm (s.d.)	22.5 (2.0)
BMI[b]	Mean kg/m^2 (s.d.)	18.2 (2.2)
BMI	Grade 0 (BMI $\geqslant$18.5 kg/m^2) (%)	42
	Grade 1 (BMI <18.5 kg/m^2) (%)	28
	Grade 2 (BMI <17.0 kg/m^2) (%)	20
	Grade 3 (BMI <16.0 kg/m^2) (%)	10
Literate	Read and write (%)	79
Open-field toilet	Lack of sanitation (%)	94
Women's status	Lactating (%)	81
	Pregnant (%)	6
	Neither (%)	13
Active	Work in fields and other agricultural activities (%)	71
Clinical vitamin A deficiency		
None	No symptoms (%)	84
Night blindness (XN)	Self-reported (%)	7
Bitot's spot (X1B)	Examined (%)	5
Conjunctival xerosis (X1A)	Examined (%)	6
Reported night blindness during pregnancy	Yes (%)	35
Iron deficiency		
Inside of lower eye lid	White (pallor) (%)	10

Abbreviation: BMI, body mass index; s.d., standard deviation.
[a]Mean (s.d.) or percentage; data collected during rainy season 2003.
[b]N = 207 (pregnant mothers excluded).

Mean energy intake of mothers was 2665±634 kcal (median 2652). Protein and fat each comprised 10% of total energy (s.d. of protein 0.009 and s.d. of fat 0.03), and carbohydrate was 79% of energy (s.d. 0.03). Mean vitamin A intake was 233 Retinol Equivalents (s.d. 331 and median 103). Ascorbate was 24.7 mg (s.d. 32.3) and iron was 17.3 mg (s.d. 7.15). The major sources of energy were white refined rice and unrefined sorghum.

In the evaluation of CED (Table 3), mothers who had only one child $\leqslant$5 years of age had a 45% greater risk of CED (BMI <18.5 kg/m^2) compared to mothers with two or more children $\leqslant$5 years of age (RR = 1.45, $P\leqslant 0.05$); and mothers without sanitation in their homes had a fourfold excess risk (RR = 4.1, $P\leqslant 0.05$) of CED. Illiterate women and active women were more likely to have CED than literate and non-active individuals (RR = 1.6 and 1.4, respectively, $P\leqslant 0.05$), but literacy and activity level were not significant in multivariable analyses including sanitation and number of children $\leqslant$5 years of age (Table 3). Increasing level of fat intake, as a percent of total energy, was significantly associated with lower risk of CED (RR of the lowest 25th percentile compared to those in the 75th percentile or above was 1.6, $P\leqslant 0.05$), findings that remained significant in multivariable analyses. Pulses consumption (g/day) was also inversely related to CED in univariate and multivariable analyses. Carbohydrate intake, as a percent of total energy, was inversely related to % energy from fat ($r = -0.96$, $P\leqslant 0.010$), and, although positively related to CED in univariate analyses, carbohydrate consumption was not significant in multivariate analyses. Consumption of vegetables, roots and tubers was inversely related to CED in analyses adjusting for sanitation, children $\leqslant$5 years of age and pulses (g/day) ($P\leqslant 0.05$). As vegetables, roots and tubers consumption was significantly related to fat intake, these two variables were not considered in the same model. Similarly, intake of pulses (g/day) was highly related to energy intake ($r = 0.48$, $P\leqslant 0.001$), and not included in the same model. Total energy, mothers' age, lactation status and income level were not related to CED in univariate or multivariable analyses. There was too little variability in the percent of energy from protein to evaluate this variable as a determinant of CED (i.e., 25th percentile was 9.8 and the 75th percentile was 10.9).

As presented in Table 2, 16% of mothers currently suffered from one or more signs of clinical vitamin A deficiency including night blindness, Bitot's spot and conjunctival xerosis. Mothers' age in years and income were positively related to vitamin A deficiency. Twenty percent of women with an income above the poverty line had symptoms compared to 11.0% of women below the poverty line (χ^2, $P = 0.07$), a difference that became significant in multivariable analyses including mothers' age (Table 3). Mothers' breastfeeding or pregnancy status (lactating, pregnant or neither), activity level, number of children $\leqslant$5 years of age, sanitation and literacy were unrelated to vitamin A deficiency in univariate and multivariable analyses. For dietary

Table 3 Prevalence and RR and adjusted OR of correlates of chronic energy deficiency and vitamin A deficiency symptoms in *Dalit* mothers

Variable	*Category*	N	%	*RR*	*Adjusted OR (95% CI)*
Chronic energy deficiency (BMI <18.5 kg/m²)					
No. of children ⩽5 years age[a]	One	139	64	1.5*	2.54 (1.39–4.99)
	⩾Two	61	44	1.0	
Open-field toilet[a]	Yes	194	61	4.1*	7.99 (1.66–38.81)
	No	13	15	1.0	
Fat intake[a]	% of energy				
	<25th%ile	51	75	1.6*	2.97 (1.19–7.42)
	26–74th%ile	104	54	1.1	0.99 (0.47–2.11)
	⩾75%ile	51	47	1.0	
Vegetables, roots and tubers[b]	days/ seasons	207	—	—	0.99 (0.98–0.99)
Pulses[a,c]	g/day	207	—	—	0.99 (0.98–0.99)
Clinical vitamin A deficiency[d]					
Age[e]	Years	220	—	—	1.12 (1.02–1.23)
Income >poverty line of 1000 Rupees/month[e]	Yes	91	20	1.8	2.41 (1.02–5.20)
	Below	129	11		
Sorghum consumption[e]	g/day	208	—	—	0.99 (0.99–0.99)
Dairy[f,g]	L, I, high	220	—	—	0.69 (0.42–1.12)
Night blindness during past pregnancy					
Dairy[f]	Low	56	42.9	2.0*	2.74 (1.26–5.94)
	Intermediate	94	39.4	1.8*	2.38 (1.18–4.82)
	High	70	21.4	1.0	1.0

Abbreviations: BMI, body mass index; CI, confidence interval; OR, odds ratio; RR, rate tatio.
[a]Model includes number of children aged ⩽5 years (1 versus more), sanitation (open field or toilet), fat intake and intake of pulses.
[b]Including 20 species of vegetables, roots and tubers (green leafy vegetables excluded). Model includes age, number of children aged ⩽5 years (1 versus more), sanitation (open field or toilet) and intake of pulses.
[c]Includes seven different pulses (chickpea, black gram, green gram, khesaridal, lentil, pigeon pea and dry pea).
[d]Bitot's spot, conjunctival xerosis and/or night blindness.
[e]Model includes age, income (above versus below poverty line) and sorgham.
[f]Includes eggs, cow and buffalo milk, curd, butter milk and ghee.
[g]Model includes age, income (above versus below poverty line) and dairy intake.
*$P \leqslant 0.05$ (see text).

exposures, sorghum was significantly and inversely related to vitamin A deficiency ($\beta = -0.004$, s.e. $= 0.002$, P-value $= 0.04$), and the consumption of dairy products (coded as low, intermediate and high consumption for eggs, cow and buffalo milk, curd and ghee) was protective (but not statistically significant) against vitamin A deficiency ($\beta = -0.420$, s.e. $= 0.257$, $P = 0.10$) in analyses adjusting for mothers' age and income level. Also, sorghum was positively related to iron intake ($r = 0.49$, $P \leqslant 0.001$), and iron intake was positively related to intake of vitamin A ($r = 0.34$, $P \leqslant 0.001$) and vitamin C ($r = 0.53$, $P \leqslant 0.001$) (not shown). No food or nutritional variables, other than sorghum and dairy products, were significant or of border line significance in univariate or multivariable analyses.

Approximately one-third of the women reported symptoms of night blindness during their pregnancies. Of these, 75% said it occurred in the last trimester. Mothers' age was positively related to night blindness during pregnancy, and current consumption of eggs, milk and milk products was negatively associated with the occurrence of night blindness during pregnancy. Women currently consuming low, intermediate or high amounts of dairy products had corresponding prevalence rates of night blindness during the last pregnancy of 42.9, 39.4 and 21.4% (providing RR of 2.0 and 1.8, respectively, with the highest consumption group serving as the referent group). These findings were significant in age-adjusted analyses (Table 3). No other nutritional variables were identified as significant determinants of night blindness during pregnancy.

Ten percent of women were classified as iron deficient based on pallor under the eye lid (Table 2). In univariate analyses, income, breastfeeding or pregnancy status (lactating, pregnant or neither), literacy, activity level and number of children ⩽5 years of age were not significantly related to iron deficiency. In multivariable analyses, mothers' age (in years; $\beta = 0.18$, s.e. $= 0.06$, $P \leqslant 0.01$), being currently pregnant vs not pregnant and not lactating ($\beta = 2.5$, s.e. $= 1.3$, $P \leqslant 0.05$), and being active ($\beta = -1.1$, s.e. $= 0.58$, $P = 0.06$) were correlates of iron deficiency. No food or nutritional variables were identified as correlates of iron deficiency in this population. Meat consumption was extremely low with little variability, and not significant.

Discussion

Traditional food (fat, pulses and vegetables-roots-tubers) showed protective associations against CED after adjusting

for the number of children under 5 years of age and sanitation. Paradoxically, women with only one child had a higher prevalence of CED. We speculate that this may be a result of infertility in malnourished women.

Sorghum consumption showed a protective association for clinical vitamin A deficiency symptoms when adjusting for age and income. This may occur because sorghum (as roti) is consumed in meals with vegetables and fat. Our results show that mothers with higher fat and pulses intakes and more frequent consumption of vegetables, roots and tubers were at reduced risk for CED.

For women with night blindness during the last pregnancy, higher current consumption of dairy products (buffalo milk, cow milk, curd, buttermilk) was protective, and no other variables were significant. In our study, the reported percentage of mothers suffering night blindness, Bitot's spot and/or conjunctival xerosis at the time of the survey, and especially the prevalence of night blindness during the past pregnancy, is high in contrast to other Indian data noted earlier.

Consumption of traditional food has been shown to improve vitamin A status. In Bangladeshi men with low vitamin A diets, the daily consumption of cooked and pureed Indian spinach (*Basella alba*) had a positive effect on vitamin A stores (Haskell *et al*., 2004). After a 3-year intervention program of nutrition education and health promotion emphasizing local cultural food in native people living on the west coast of British Columbia, mean plasma retinol and mean carotene increased by 16% from baseline in 20 to 60-year-old adults (Kuhnlein and Burgess, 1997). In our study, the amount of sorghum consumed every day was negatively associated with clinical vitamin A deficiency symptoms, and low frequency of eggs, milk and milk product consumption was positively associated with night blindness during pregnancy. Interestingly, mothers from households with an income above poverty line were at greater risk for clinical vitamin A deficiency, which may be explained by lower intake of traditional food such as sorghum and the green vegetable dishes with which it is usually consumed. Many of these vegetables are uncultivated leafy greens harvested during wedding in the fields.

It was reported that 87% of pregnant women in India suffer from iron deficiency (WHO, 2000). Reported prevalences in ever-married rural women aged 15–45 years in Andhra Pradesh was 16% for moderate (7.0–9.9 g Hb/dl) and 2% for severe (<7.0 g Hb/dl) iron deficiency, which was similar in women from scheduled caste (International Institute of Population Science, 2000). Our study identified 10% of the mothers as iron deficient using the subjective measure of eye pallor. However, our work, like others, has not been able to prove that food or nutritional variables are correlates of iron status.

This study had limitations, in particular with regard to constraints of data collection for anthropometry and clinical symptoms during one season – the rainy season. Dietary data were collected in two seasons, summer and rainy, and averaged for data analysis. Ideally, seasonal variations in women's health and diet would have been conducted in three major seasons of the *Dalit* annual cycle in Medak District, and combined to give an annual estimation. Despite these constraints, finding positive effects of traditional dietary items during the season of most health risk is important.

In conclusion, *Dalit* women are likely the most disadvantaged of Indian subpopulations. The prevalence of CED was similar and prevalence of night blindness during pregnancy was higher among *Dalit* mothers in the rural Medak District in comparison to national and state data reported for rural women from scheduled castes. Consumption of traditional *Dalit* food items including sorghum, pulses, vegetables, roots, tubers, eggs, milk and milk products were negatively associated with prevalences of CED and clinical vitamin A deficiency symptoms in mothers.

Greater consumption of protective items in the traditional *Dalit* food system should be encouraged to improve nutritional status. Indeed, high frequencies of CED, night blindness and clinical vitamin A deficiency indicate a need for public health intervention for *Dalit* women, which should include promotion of locally available, traditional food.

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