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Breastfeeding, pregnant, and non-breastfeeding nor pregnant women's food consumption: A matched within-household analysis in India

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ABSTRACT

Objective: Promoting breastfeeding is major maternal and child health goal in India. It is unclear whether mothers receive additional food needed to support healthy breastfeeding.
Methods: Using the latest National Family and Health Survey (2005–2006), we applied multilevel linear regression models to document correlates of nutrition for (n = 20,764) breastfeeding women. We then compared consumption of pulses, eggs, meat, fish, dairy, fruit, and vegetables across a sample of breastfeeding, non-breastfeeding/pregnant (NBP), and pregnant women (n = 3,409) matched within households and five-year age bands. We tested whether breastfeeding women had greater advantages in the 18 high-focus states of India's National Rural Health Mission (NRHM).
Results: Vegetarianism, caste, and religion were the strongest predictors of breastfeeding women's nutrition. Breastfeeding women had no nutritional advantage compared to NBP women, and were disadvantaged in their consumption of milk (b = –0.14) in low-focus states. Pregnant women were similarly disadvantaged in their consumption of milk in low-focus states (b = –0.32), but consumed vegetables more frequently (b = 0.12) than NBP women in high-focus states.
Conclusions: Breastfeeding women do not receive nutritional advantages compared to NBP women. Targeted effort is needed to assess and improve nutritional adequacy for breastfeeding Indian women.

Introduction

India is in the midst of a rapid nutrition transition, characterized by high rates of malnutrition and rising obesity [1]. There is a massive push in global health to promote breastfeeding to help tackle these concerns, as well as to improve cognitive development and reduce infectious disease risk [2–5]. Although the health benefits of breastfeeding are debated in high-income countries [6,7], there is virtually a consensus that breastfeeding is positive for children's development in low- and middle-income settings [8,9]. Save the Children argues that "Mother's milk is effectively a child's first vaccination – and can often be the difference between life and death…In fact, mother's milk is the best food for the baby" [3], and both WHO and UNICEF recommend exclusive breastfeeding for the first 6 months of life, and complementary feeding for at least two years thereafter [4].

The effectiveness of breastfeeding, however, depends significantly on the state of mothers' nutrition. As nutritional needs increase during pregnancy and lactation [10–12], an increase in food consumption is necessary. Macro- and micro-nutrient deficiencies in breastfeeding women may lead to a reduction in the micronutrient and caloric content of breast milk [11,13]. This is especially important in India, where it is estimated that around half of women are anaemic [14] and one-third are underweight [15], representing one of the highest rates of maternal malnutrition in the world. Mothers' malnourishment has also been linked to children's immunological development and survival, even if they are able to breastfeed [16,17]. In spite of the tremendous importance of maternal nutrition during breastfeeding, the predictors of breastfeeding women's nutrition have not been documented. Recent work suggests that there is a socioeconomic gradient in propensity to breastfeed in a Western setting, but that the gradient is not observable among migrants from middle-income countries [18]. Whether there is a socioeconomic gradient in maternal nutrition

Abbreviations: NBP, Non-breastfeeding, non-pregnant women; NRHM, National Rural Health Mission; NFHS, National Family Health Survey.

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is unclear, particularly in middle-income settings. Moreover, there is a dearth of literature investigating intra-household disparities in allocation of food and nutritional resources to breastfeeding women. In India, women's nutritional intake is of particular importance in light of rising food prices following the global recession [19], high rates of maternal malnutrition [20], and evidence of food allocation biases within the household [21,22].

The National Rural Health Mission, India's flagship government program to improve maternal and child health, was introduced in 2005. The program did not explicitly subsidize maternal nutrition, but may have improved nutrition and enhanced opportunities for effective breastfeeding by (1) providing subsidies for healthcare, which may increase the overall financial resources of the household, and, thereby, quantity and quality of available food; (2) improving mothers' access to healthcare, where nutritional counselling associated with regular check-ups may increase awareness of maternal dietary needs during both pregnancy and lactation; and (3) establishing monthly Village Health and Nutrition Days, wherein women can obtain nutritional counselling (amongst other services).

A handful of studies have examined the importance of dietary intake during pregnancy for ensuring maternal, foetal, and infant health [23–25], but empirical evidence on dietary intake during breastfeeding has been scarce. Here, we draw on the large sample size of India's National Family Health Survey to (a) document the sociodemographic correlates of food consumption among breastfeeding women and (b) test whether breastfeeding women are more likely to receive higher quality (and more costly) foods than women who were neither breastfeeding nor pregnant (hereafter NBP), matched within households and by 5-year age bands. As a secondary objective and point of comparison, we also examine pregnant women's nutrition. In light of the push for breastfeeding in particular, we examine whether mothers are in fact receiving a much-needed nutritional advantage. Although increased consumption across a variety of food items is necessary to produce high-quality breast milk [10,26], we hypothesize that breastfeeding women will receive additional low-cost items (such as eggs and vegetables) compared to NBP women, but will not receive additional high-cost items, such as meat and fruit – that is, due to affordability concerns, households may recognize the nutritional needs of breastfeeding women, but may attempt to meet these needs through additional low-cost calories (quantity of food) rather than high-cost nutrients (quality of food). Additionally, we hypothesize that net of household resources, breastfeeding women in areas targeted for intervention by India's National Rural Health Mission (NRHM) – that is, high-focus states – will be more likely to receive a dietary advantage than breastfeeding women in low-focus states as a result of interventions targeting healthcare access and nutrition education.

Methods

We utilize secondary nationally representative data from Round 3 (collected December 2005 to July 2006) of the National Family and Health Survey (NFHS-3), India's Demographic and Health Survey (DHS). These data, the most recently available, were obtained from a third party [27], and were completely anonymized prior to download; no ethics board review was required. The NFHS includes information on a wide variety of household and individual level variables, including reproductive histories, breastfeeding, food item consumption for mothers and children, and anthropometry. Following standard DHS data collection design, data were collected using a multistage stratified design across 29 states and territories [28]. The full sample includes 124,385 married and unmarried women aged 15–49. In our first set of models, documenting predictors of breastfeeding women's nutrition, we restricted our sample to the (n = 20,764) currently breastfeeding women in the data. Models for meat and fish consumption (n = 15,385) excluded vegetarians.

In our comparative models, we employed a matched design to correct for potential endogeneity, focusing our analysis on a subsample of women of the same age in the same household. Unlike methods comparing consumption between households, this matched design allowed us to compare women facing the same household resource constraints. The subsample was restricted to households with at least one pregnant or breastfeeding woman and one NBP woman in the same 5 year age band; households with only one woman, without at least two women in the same age band, or with no pregnant or breastfeeding women, were dropped. In a small subset of cases, 2 NBP women were matched to 1 breastfeeding (92 households) or pregnant woman (90 households). Similarly, there were 22 households with 2 breastfeeding women matched to 1 NBP woman, and 5 households with 2 pregnant women matched to 1 NBP woman. Additionally, because there were no pregnant women over the age of 40 and only 5 breastfeeding women over age 40 in the subsample, comparisons for these groups were not possible; women aged 40 and over were dropped, resulting in a final matched sample of (n = 3,409).

The sample was further disaggregated by pregnancy and breastfeeding status, and vegetarians were excluded from models of meat and fish consumption. For models comparing breastfeeding (n = 1,314) and NBP women (n = 1,244), pregnant women were excluded, resulting in a sample of 2558 (n = 1,737 with vegetarians excluded); similarly, breastfeeding women were excluded from models comparing pregnant (n = 463) to NBP women (n = 503 in full models; total n = 966; n = 694 with vegetarians excluded). Missing data (<1% for all variables included in the analyses) were handled using listwise deletion; 7 additional cases were dropped due to missing values on one or more of the consumption measures (n = 3,402).

Analytic strategy

The dependent variables used in the analysis are based on self-reported frequency of consumption of each of 7 food items separately (milk or curd; pulses or beans; green leafy vegetables; fruit; eggs; fish; chicken or meat). Specifically, women were asked "How often do you yourself consume the following food items: never, occasionally, weekly, or daily?" Higher values indicate more frequent consumption, with values ranging from 0 (never) to 3 (daily consumption). In order to control for unobserved heterogeneity within the household, we applied multilevel linear regression models to examine the association between breastfeeding status and food consumption frequency:

$$Nutrition_{i,j} = \alpha + \beta_{\text{Sociodemographics}i,j} + \beta_{\text{HouseholdCharacteristics}i,j} + \mu_{i,j} + \varepsilon_{i,j}$$

Here, i is the woman and j is the household. Women's self-reported consumption of food items is represented by Nutrition on the left-hand side. Sociodemographics refers to women's age (years), education (years), parity (continuous), vegetarianism (vegetarian = 1), caste[1] (dummies for scheduled caste, scheduled tribe, and other backwards caste; reference group other/no caste), religion (dummies for Muslim, Christian, and other religion; reference group Hindu), age of the breastfeeding child in months (in the non-comparative models only), and marital status (married = 1).

[1] Caste is a system of social stratification unique to India. The groups known collectively as scheduled castes and scheduled tribes are officially recognized by the Indian government as being the most socially and economically disadvantaged groups [29]. Though legally banned, the caste system continues to have lasting effects. For example: children from scheduled castes and tribes face greater mortality risks than those from other castes; women in scheduled tribes have the highest total fertility rates; anaemia rates are higher among those from scheduled castes and tribes; and contraceptive use is highest among women who do not belong to any caste or tribe.