Child feeding practices and its association with nutritional status among children in India: Revisiting Ruel's Method in Indian Context

Introduction

Malnutrition is one of the significant factors contributing to Infant and child mortality in developing countries of the world (Black et al, 2008; Victoria et al, 2008). Nutrition during the first five years has an impact not only on growth and morbidity during childhood, but also acts as a determinant of nutritional status in adolescent and adult life. The sixth report on global nutrition showed that the extent of malnutrition is still incongruously high and progress to reduce it in most regions of the world is slow (United Nations, 2010). According to WHO 2007 estimates, there are around 19.3 and 31.6 percent of underweight and stunted children in the developing countries as compared to 1.5 and 6.0 percent of underweight and stunted children respectively in developed world (United Nation, 2010). Therefore, malnutrition is considered as wide spread public health problem especially in developing countries. The prevalence of underweight and stunted children in India is amongst the highest world, and nearly doubles that of Sub-Saharan Africa with dire consequences for mobility, mortality, productivity and economic growth (Gragnolati *et al*, 2005). Almost half of the preschool children are stunted, two-fifths of them are underweight and one-fifths of them are wasted and nearly 60 million children are underweight in India (IIPS & ORG Macro, 2006).

Although the problem of malnutrition, as believed by nutritionist is multifaceted not just related to food shortage but feeding practices are believe to be the most important for child nutrition (WHO, 1995; Brown et al., 1998). Efforts to quantify child feeding practices have been limited by due to methodological issues (Ruel & Menon, 2002). Most of the research on relationship between child feeding practices and nutrition outcome has focused on single behaviour e.g. exclusive breastfeeding, timing of introduction of complimentary food, duration of breastfeeding etc. (Popkins et al, 1990; Victoria et al, 198; Cohen et al, 1994; Marquis et al, 1997). It was Ruel and Menon who first attempted to create composite age-specific feeding and index to see its association with child nutrition for the Latin American countries. Even after this there have been a few research carried out on child feeding practices and child nutrition. The World Health Organization provided regulated guidelines for child feeding practices in 2008. Despite of the present effort there have been a very few studies which attempted to build a composite index of feeding practices. In Indian context, this kind of study is rare due to data limitation. Therefore, the present study tries to understand the role of child feeding practices on child nutrition using a composite child feeding index. An attempt has been made to create a composite index using Ruel and Menon's method with some modification in Indian context.

Data and Methodology

We used National Family Health Survey, 2005-06 (NFHS-3) for this study which was designed to provide estimates of important indicators on family welfare, maternal and child health, and nutrition in India. This survey is the Indian version of Demographic and Health Survey (DHS), conducted worldwide and considered as one of the most robust in India. Information collected on breastfeeding, complimentary feeding and meal frequencies in the survey were used to construct child feeding index.

Child Feeding Index: The index was created on the basis of current feeding recommendations for children 6-36 months. Age specific feeding indices were created as feeding practices differ by age group of children. We created indices by three age groups 6-9 months, 9-12 months and 12-36 months of children. The variables were used in the indices are a) breast-feeding (whether the mother is currently breast-feeding the child or not); b) use of baby bottles in the previous 24 h (yes/no); c) dietary diversity (whether or not the child received selected food groups in the previous 24 h); and d) feeding frequency (how many times the child was offered solid or semisolid, or soft foods other than liquids in the previous 24 h). Food frequency is ignored due to data limitation. The scoring patterns with variables are shown in the details in table 1.

Table 1 : Variables and scores given to create the child feeding index for children 6-36 months old by age group

Variables	6-9 months	9-12 months	12-36 months
Breastfeeding	No = 0; Yes = +2	No = 0; Yes = +2	No = 0; Yes = +1
Uses bottle	No = 1; Yes = 0	No = 1; Yes = 0	No = 1; Yes = 0
Dietary diversity (past 24 h)	Sum of: (grains + legume + dairy product + egg/flesh/poultry + meat + other)	Sum of: (grains + legume + dairy product + egg/flesh/poultry + meat + other)	Sum of: (grains + legume + dairy product + egg/flesh/poultry + meat + other)
	0 = 0	0 = 0	0 = 0
	1-3 = 1	1-3 = 1	1-3 = 1
	4+ = 2	4+ = 2	4+ = 2
Meal frequency (past 24 h)	0 meals/d = 0	0 meals/d = 0	0-1 meals/d = 0
	1 meals/d = 1	1-2 meals/d = 1	2-3 meals/d = 1
	2 meals/d = 2	3+ meals/d = 2	4+ meals/d = 2
Total score	7 points	7 points	7 points

Outcome Variable: The outcome variable used in the study is acute child malnutrition is height-for-age/stunting status of children. The nutritional status indicators are expressed in standard deviation units (Z-scores) from the median of the reference population. Children (below three years of age) whose height-for-age was below minus two standard deviations from the median reference population were classified as *moderately stunted* and those whose height-for-age was below minus three standard deviations have been referred as *severely stunted*.

To assess the nutritional status of children with respect to reference population, Z-scores (standard deviation scores) are employed. Z score is defined as:

Z-score = (observed individual value – median value of the reference population)/

(Standard deviation of value in the reference population)

Explanatory variables: The most important independent variable used is composite child feeding indices to see its age specific association with child nutrition. The child feeding indices has been categorized into three- low, average, high-based on score. Other explanatory variable used in the study are different socio-economic characteristics like wealth index, birth order, sex of child, religion, mother's educational status, infrastructure development like improved sanitation.

We used descriptive statistics, bivariate and multivariate methods for the purpose of analysis. Multinomial logistic regression was used to find association of child feeding practices and other socio-economic variable on child nutrition.

Preliminary Results

Result shows wide diversity in feeding practices in India by different regions and socio-economic status. Wide differences by region, economic status, sex of the child and maternal Education is observed. The proportion of child getting better child feeding is high among rich, male children, southern region and high educated mothers than poor, female child, eastern region, and illiterate mothers respectively. There is wide diversity in giving animal product in India and the meal frequencies vary widely across age group of child. Bivariate results shows stunting is very high among children with poor feeding practices. The multinomial logistic regression shows HAZ score (height-for-age) is strongly associated with child feeding indices especially in the age group 6-9 month category of children. The variable sanitation, religion and caste has been used as a controlled variable in the model. Other explanatory variables like mother's education and wealth index has also a strong association with stunting status of children as shown in the table2. Thus it is important to strengthen maternal education to improve feeding which simultaneously improves child nutrition.

References

Brown, K. H., Black, R. E., Lopez de Roman˜ a, G. & Creed de Kanashiro, H. (1989) Infant feeding practices and their relationship with diarrhea and other diseases in Huascar (Lima), Peru. Pediatrics 83: 31–40.

Brown, K., Dewey, K., & Allen, L. (1998) Complementary Feeding of Young Children in Developing Countries: A Review of Current Scientific Knowledge. WHO, Geneva, Switzerland.

Cohen, R. J., Brown, K. H., Canahuati, J., Rivera, L. L. & Dewey, K. G. (1994) Effects of age of introduction of complementary foods on infant breast milk intake, total energy intake, and growth: a randomised intervention study in Honduras. Lancet 344: 288–293.

Marquis, G. S., Habicht, J.-P., Lanata, C. F., Black, R. E. & Rasmussen, K. M. (1997) Breast milk or animal-product foods improve linear growth of Peruvian toddlers consuming marginal diets. Am. J. Clin. Nutr. 66: 1102–1109.

Popkin, B. M., Adair, L., Akin, J. S., Black, R., Briscoe, J. & Flieger, W. (1990) Breast-feeding and Diarrhea Morbidity. Pediatrics 86: 874–882.

Ruel M.T. & Menon P. (2002) Child Feeding Practices are associated with child nutritional status in Latin America: Innovative uses of the Demographic and Health Surveys. J. Nutr. 132:1180-1187.

Victora, C. G., Smith, P. G., Vaughan, J. P., Lombardi, C., Teixeira, A.M.B. & Fuchs, C. (1989) Infant Feeding and Deaths due to Diarrhea. A Case-control Study. Am. J. Epidemiol. 129: 1032–1041.
World Health Organization (1995) The World health Organization's infant-feeding recommendations. Bull. WHO 73: 165-174.

World Health Organization (2007) The World health Organization's Conclusions on Indicators for Assessing Infant and Young Child Feeding Practices. Bull. WHO**,** Geneva, Switzerland.

Table 2 : Result of Multinomial Regression

	Coef. (6-9 mo)	Coef. (9-12 mo)	Coef. (12-36 mo)
	Moderately Stunted		
Child Feeding Index			
Feeding score Low (1-3)	1®	1®	1®
Feeding score Medium (4-5)	-0.55**	-0.18*	-0.03
Feeding score High (6-7)	-1.22***	0.06	-0.06*
Sex of Child			
Male	1®	1®	1®
Female	0.20	-0.22	-0.08
Mother's Educational Status			
No education	1®	1®	1®
Primary	-0.11	-0.50**	0.02
Secondary	-0.24	-0.50***	-0.06
Higher	-0.59	-1***	-0.53***
Wealth Index			
Poorest	1®	1®	1®
Poorer	-0.02	-0.16	-0.16*
Middle	-0.09	-0.31	-0.37***
Richer	-0.33	-0.26	-0.40***
Richest	-0.51	-0.63*	-0.87***
	Severely Stunted		
Child Feeding Index			
Feeding score Low (1-3)	1®	1®	1®
Feeding score Medium (4-5)	-0.61**	-0.33	-0.02
Feeding score High (6-7)	-1.27**	-0.63	-0.31***
Sex of Child			
Male	1®	1®	1®
Female	-0.18	-0.24	-0.25***
Mother's Educational Status			
No education	1®	1®	1®
Primary	-0.46*	0.05	-0.22***
Secondary	-0.62***	-0.15	-0.61***
Higher	-1.77***	-0.55	-1.06***
Wealth Index			
Poorest	1®	1®	1®
Poorer	0.02	-0.56**	-0.35***
Middle	-0.21	-0.52**	-0.61***
Richer	-0.58*	-0.81***	-0.93***
Richest	-0.40	-2.05***	-1.57***

*p<0.1 **p<0.05 and ***p<0.01