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Double burden of malnutrition among mother-child DYADS in urban poor settings in India

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Abstract

Introduction: Low-and middle-income countries are undergoing nutrition transition wherein presence of under and over-nutrition in the same household is increasing. **Aims & Objectives**: This study explored the coexistence of under and over-nutrition among mother-child dyads in an urban poor setting in India. **Material & Methods**: Data was collected from 225 dyads in urban poor settings of Delhi. Anthropometric measurements (weight, height, waist-circumference, hip circumference in mothers and weight, height, MUAC in children) were taken from a random sample of mothers aged >18 years with children aged 3-5 years. Prevalence of underweight, stunting, wasting and overweight/obesity were determined in children, while corresponding proportions of underweight and overweight/obesity were determined in mothers, based on BMI and waist circumference. **Results**: Of the 225 children, 19% were stunted, 12% were underweight, 4.8% were wasted, while 20% were overweight/obese. Among their mothers, 8.4% were underweight, 20% were overweight/obese and 23% had waist circumference > 88cm. A large proportion of overweight and obese mothers (33% and 30% respectively) had stunted, wasted or underweight children. Among the overweight/obese children, 12% had underweight, and 22% had overweight/obese parentage. Among, all dual burden households, the nutritional status of child correlates with that of mother. **Conclusion**: One-third mother-child dyads revealed the existence of double burden of malnutrition characterized by high prevalence of undernutrition, stunting and wasting in children, and overweight/obesity in mothers within the same household. It is crucial to understand the pathways to this coexistence, and to test effectiveness of context-specific interventions to curb associated future health risks.

Keywords

Double Burden of Malnutrition; Mother-Child Dyads; Overnutrition; Same Household; Undernutrition

Introduction

Double Burden of Malnutrition (DBM), defined as the **"coexistence of an underweight child and overweight mother within the same household"** is rapidly growing among different population groups in developing and transitional countries like India.(1,2) In a descriptive study, Shukla *et al* (2002) has confirmed the double burden of malnutrition, i.e. the co-existence of under-and overnutrition, in

South Asian region.(3) In most of the cases, there is an undernourished child living with an overweight/obese mother. (2,3,4,5,6,7,8,9,10,11,12)

Nutritional status of the Indian population varies significantly, with extremely high rates of childhood undernutrition (ranging from 20% to 80%), high prevalence of overnutrition (>50%), and some with both. (13) As per the NFHS-4 data (2015-16), 20 per cent women (15-49 years) are overweight/obese. (14) With childhood undernutrition, risk of adult obesity also increases. (2,15,16,17,18)

In India, over the years, the progress in women's nutritional status has been less impressive and obesity has reached epidemic proportions, affecting 5% of the country's population. (19)

Traditionally, under-nutrition and over- nutrition have been treated as distinct health problems, however, with globalization and changing diet and lifestyle, the co-existence within countries, communities and households has become inevitable. (2,6,9,16,20,21)

Aims & Objectives

To assess the anthropometric profile of the mother-child (aged 3-5 years) dyads in order to determine the prevalence of double burden of malnutrition

Material & Methods

A cross-sectional study was conducted on 225 mother-child dyads (child aged 3-5 years) residing in urban poor settings in New Delhi, India.

The sample size is determined using the prevalence of underweight children in Delhi as 26.5% (NFHS-3 Report, 2009). Using the formula $4pq/d^2$, relative error assumed to be 10 per cent, a sample size of 225 households should be taken for the proposed study. Assuming design effect 2 and further 20 percent non-response rate among respondents, a final sample of 190 households was arrived at. And further few extra sample was taken and hence the sample of 225 was finalised for the study.

The children were recruited from ICDS Kirti Nagar project area based on the number of slums with registered children (3-5years) in each aanganwadi centre using probability proportionate to size (PPS) sampling technique. This study was approved by the Institutional Ethics Committee of the Institute of Home Economics, New Delhi, India in September, 2014. An informed consent form was sent to all parents or guardians responsible for the children within the desired age group. All children whose parents authorized their participation were included in the study.

Multiple anthropometric measures were collected from the children and their mothers. For children, weight (kg) was measured using a standard electronic scale to the nearest 0.1 kg, height (cm) using stadiometer to the nearest 0.1cm and MUAC readings were taken using tri-colored tape developed by WHO to the nearest 0.1 cm; three concordant readings were taken for each subject. The nutritional status of the children was assessed using WHO Anthro software (3.2.0 version) and respective z-scores was computed for Height-for-age (HAZ), weight-for-height (WHZ), weight-for-age (WAZ), MUAC-for-age (MUACZ). The children were classified as stunting, wasting, and being under-weight, if the mean values were < 2 standard deviation (SD). For mothers, height, weight and waist-circumference (WC) and hip circumference were measured, and their Body Mass Index (BMI) and Waist-hip ratio (WHR) were calculated. BMI was calculated as weight (kg) divided by height squared (m). Maternal anthropometrics were also collected using standardized techniques; heights and weights were measured, and their BMIs were calculated. Weight was recorded to the nearest 0.1 kg and height to the nearest 0.1cm using standardized. Body Mass Index (BMI) was calculated as weight (kg) divided by square of in metre (m). The measurement was taken thrice, and BMI calculated with assessment through standard BMI WHO guidelines as appropriated later in Asians. (22,23)

Questionnaire cum interview schedule was used to elicit information on socio-economic status and dietary patterns from primary caregivers (mothers). Besides anthropometric assessment, data on health profile of the mother-child dyads, obstetric history of the mothers, child details (age, birth order, morbidity, vaccination etc.), feeding practices, hygiene and sanitation practices, access to health services and physical activity pattern of the child and the mother was collected. A 3 day 24-hour dietary recall and semi-quantitative Food Frequency Questionnaire was used to collect information on dietary habits of the mother-child dyads. Data was analyzed using statistical packages for social sciences (SPSS) version 20.0. Statistical analyses included descriptive statistics and student's t-test.

Results

A total of 225 Mother-child dyads with children aged 3-5 years participated in the study. The care-givers of these children were mainly in the age group of 20 and 29, with a mean age of 22 at the birth of their first child. Majority of them were Hindu (86%); 50 percent belonged to SC/ST caste; 38 percent were illiterate while 30 percent had middle/secondary education as their highest educational and were mainly working (88.80%) (Table 1).

Table 2 represents the anthropometric profile of the mother-child dyads with child aged 3-5 years and their respective measurements. The mean for weight, height and MUAC in children were 13.03±6.21 kg, 93.74±7.74 cm and 12.11±1.55 cm respectively. Majority of the children were males (155; 68.80%). Mean weight of the mothers was 52.7 + 11.06; height 150.5 + 6.37 and waist-to-hip ratio was 0.86 + .08, reflecting increase adiposity levels in women. Corresponding mean values for z-scores as computed using WHO standards for weight-for-age, height-for-age and weight -for-height in children were -1.5+1.1, -2.03+1.5, -0.6+1.3 respectively

Table 3 shows the prevalence of undernutrition and overnutrition in children and their mothers within the same household. Of the 225 children, 19% were stunted; 12% were underweight; 4.4% wasted and 20% were overweight/obese. Mean weight(s) of the children differ significantly in all the three categories for weight-for-age; height-for-age and weight-for-height ($p<0.05$; $p< 0.01$) as well as compared with nutritional status of the mothers. The BMI of the mother with the normal weight child was 22.9+4.1; with stunted child was 20.5+5.22 kg/m2 showing the prevalence of different dual forms of malnutrition within the same household. BMI of mothers with overweight/obese child was comparatively higher (26.7+3.51) as compared to normal-child normal mother and underweight child-underweight mother pair. This difference in case of undernourished child and over nourished mother was found to be statistically significant.

Cross tabulation between the nutritional status of the mother and the child revealed the coexistence of under and over-nutrition (double burden) within the same household. 52.9 percent of underweight mothers have stunted children while 11.3 percent had overweight/obese children. Almost 30 percent of normal weight mother's had underweight child within the same household. Overweight/obesity was also prevalent in the same household where 43 overweight/obese mothers had overweight/obese children. This means that under and over-nutrition exists parallelly at the household/community level with different forms of malnutrition prevailing in the same setup (Figure 1).

Discussion

There is accumulating evidence that with improvement in socio-economic conditions and changes in lifestyle and diet both in terms of quality and quantity; obesity and diet related non-communicable diseases may escalate in countries with high levels of under nutrition especially in developing countries like India. (2,24) In the current study, 225 mother-child pairs were enrolled form urban poor settings in order to assess their nutritional profile to find out the prevalence of double burden of malnutrition existing within the same household i.e. occurrence of both undernutrition and overnutrition together. The study is in concordance with the literature, showing the prevalence of double burden among mother-child dyads at household level. (2,11,12,25,26) Nearly one-third dyads revealed the existence of double burden of malnutrition, evidence supported by a review done by Tzioumis and Adair in 2014; and a case study on developing countries on double burden by FAO in 2006. (4,25)

Undernutrition is largely present in children in the form of underweight, stunting and wasting paired with overweight/obesity in the mothers, supported by NFHS-4, for the state of Delhi where 35.7% children are undernourished and overnutrition among women has escalated to 34.9%. (14) As reviewed, the immediate causes of undernutrition in children are low intake of nutrients as well as frequent infections such as diarrhoea, acute respiratory infections, measles etc resulting in poor absorption as well as loss of the nutrients consumed. In a study in urban Delhi, Bhargava and colleagues found that low- and middle-income adults who were undernourished in infancy, childhood and adolescence were prone to develop overweight, abdominal obesity, hypertension and diabetes by the time they were 30 years of age. (27)

It is also established from the findings that overweight/obesity not only confines to affluent population but is an emerging concern in poor sections of the society as proved in other studies as well. (4,5,8,11,12) It was observed that a large

proportion of underweight children had overweight/obese parentage (30%). Overweight/obesity was also prevalent in the same household with overweight/obese mothers-child pairs affecting both childhood as well as adult-life in terms of future risk relating to NCDs or cardio-metabolic risk as reflected in other studies also. (7,17,21,24,26)

WHO policy brief (2017) on Double burden of Malnutrition states that "combating malnutrition in all its forms is one of the greatest global health challenges" and so far it is understood that there are different forms of malnutrition existing in the community especially at the household level. (24) It is urgent to treat and end all the forms of malnutrition. In a household where undernutrition is already there in the children, overweight/obesity in adults in the family especially in mothers posing a serious challenge. Undernutrition and overweight, obesity or NCDs now coexist in many countries, with women disproportionately affected at the population level. (25) While rates of undernutrition are declining in many countries, the dramatic increases in overweight, obesity and associated NCDs place heavy tolls on individuals, families, economies and health-care systems. (24)

Conclusion

The study revealed the prevalence of dual forms of malnutrition i.e. undernutrition and overnutrition among mother child dyads residing in urban poor settings. It is well established that there is always an elevated risk of developing non-communicable disease/metabolic risk when associated with an unhealthy household with any form of malnutrition in the family. Awareness among the population for this coexistence; coupled with nutrition education and lifestyle modification, could help in reducing the problem to some extent

Recommendation

A large sample or cohort study to estimate the prevalence of double burden and associated cardio-metabolic risk factor, targeting urban poor households in the community is desirable as overweight/obesity in India and elsewhere been treated as problem of affluence

Limitation of the study

As the present study was confined to only a small set up of urban poor households with small sample size, the prevalence of double burden of malnutrition cannot be generalized to the local community.

Relevance of the study

As per the review, researches on double burden of malnutrition related to the mother and the child has primarily focused on urban areas, and the association has not been adequately explored in rural areas of low income countries like India. The present study has helped to find out the prevalence of double burden of malnutrition in urban poor settings in India with potential cardio-metabolic risk in dual burden households in life ahead. Therefore, it is crucial to understand the pathways for this concurrent situation of double burden challenging present policy and programs which needs to be redirected.

Authors Contribution

RM & SP are responsible towards conception and design of the study. RM collected the data and drafted the manuscript. RM and TA are responsible for data analysis and its interpretation. RM & SP are responsible for the intellectual content. All authors have made a final approval of the submitted version.

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Tables

TABLE 1 DEMOGRAPHIC PROFILE OF THE CARE-GIVERS OF THE CHILD (MOTHER) (N=225)

Demographic profile	Variables	Frequency (%)
Age (years)	20– 29 30 – 39 >40	158 (70.20%) 66 (29.32%) 1 (0.40%)
Religion	Hindu Muslim Any other	197 (87.6%) 24 (10.7%) 4 (1.70%)
Caste	General SC/ST OBC Other	91 (40.4%) 113 (50.20%) 19 (8.40%) 2 (0.80%)

Highest educational attainment	None Primary Middle Secondary College/Graduate	86 (38.20%) 50 (22.20%) 32 (14.20%) 37 (16.4%) 20 (8.9%)
Occupation	Working Non-working	200 (88.8%) 25 (11.1%)

TABLE 2 ANTHROPOMET RIC PROFILE OF THE MOTHER-CHILD DYADS (N=225)

Parameter	Mean + S.D	Range
Child's weight (kg)	13.0+6.21	8.0-21.0
Child's height (cm)	93.7+7.74	94.5-114
MUAC (cm)	15.2+ 1.5	11.2-18.9
Mother's weight (kg)	52.7+11.06	41-95
Mother's height (cm)	150.5+6.37	135.5-171
Waist circumference (cm)	80.75+10.93	60.0- 121.8
Hip circumference (cm)	93.78+11.6	68-130

TABLE 3 DESCRIPTIVE STATISTICS AND TEST OF DIFFERENCES BASED ON NUTRITIONAL STATUS OF CHILDREN (N=225)

Variables	Height-for-Age		Test of Difference (t-test)	Weight-for-Age		Test of Difference (t-test)	Weight-for-Height			Test of Difference (f-test)
	Stunted	Normal		Underweight	Normal		Wasted	Normal	Overweight/ obese	
	(< -2 SD)	(≥ -2 SD)		(< -2 SD)	(≥-2 SD)		(< -2 SD)	(-2 to 2 SD)	(> 2 SD)	
	n (%)									
	43 (19.11)	182 (81.00)		27 (12.00)	198 (88.00)		10 (4.44)	170 (75.56)	45 (20)	
Mother's BMI (in kg)	20.5±5.22	23.5±4.32	p<0.01	19.9±4.33	22.99±4.1	p<0.05	20.3±4.09	23.54±3.3	26.76±3.51	p<0.05

Test of difference:
****t-test sig at p< 0.01; P<0.05, f-test at p<0.05***

Figures

FIGURE 1 COEXISTENCE OF UNDER-AND OVER- NUTRITION AMONG MOTHER-CHILD DYADS WITH THE SAME HOUSEHOLD