



## Double Burden of Malnutrition of Mother-Child Pairs in the Same Households: A Case Study from the Bengali Slum Dwellers in West Bengal, India

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### KEYWORDS

Height, weight, mother, children, double burden of malnutrition, urban slum

### ABSTRACT

*The coexistence of dual form of malnutrition in terms of mother over-nutrition and child undernutrition might be a major public health issue in developing countries like India due to rapid nutritional transition and life style change. This study was conducted in order to assess the prevalence of dual form of malnutrition of mother-child pairs in the same household among the Bengali slum dwellers in West Bengal, India. Altogether 130 households were identified by considering specific inclusion and exclusion criteria and random sampling. Socio-economic data was collected by using pre-tested questionnaire. The prevalence of overweight mother and stunted child pairs (OM/SC) was 12.31%, whereas the prevalence of normal weight mother and normal weight child pairs (NM/NC) was 25.38%. Socio-economically, normal weight mothers were higher percentage of literacy compare to overweight mothers but most of them were housewives and low household monthly income families. In contrary, over weight mother had higher household monthly income and expenditure although their literacy rate was low and they mostly engaged as housemaid. To understand the patterns and associations of double burden of malnutrition within the same household further investigations with large sample size along with dietary pattern and physical activity level are necessary.*

### Introduction

It has widely been accepted that the double burden of malnutrition is a global challenge, specifically in Low and Middle Income Countries (LMIC) like India (FAO, 2006). The double burden of malnutrition is defined by the co-existence of undernutrition along with overweight or obesity (obesity associated with the diet-related non-communicable diseases) in individuals, households and population levels or one can suffer by undernutrition as well as overnutrition across the life-course (WHO, 2017a). The world statistics shows that currently 462 million adults are underweight, whereas 1.9 billion adults are overweight. It is interesting to observe that the number of adult obese (more than 600 million) is out numbered than underweight adult population. Similarly, there are 155 million of children suffered by stunting and in contrary 41 million children suffered by overweight or obese in their early life (NCDRF Collaboration, 2016). As a result of this paradox, WHO formulated the strategies to reduce the double burden of malnutrition in south-east Asian region within 2025 and also encouraged to conduct more formative research on the social and cultural contexts of double burden of malnutrition along with its determinants for effective intervention in the community as well as household levels, which have immense anthropological importance (WHO, 2017b; 2017c). Generally these decreasing trends of undernutrition and increasing trends of overnutrition is a unique phenomenon of nutrition transition (Doak et al., 2005).

There is a growing body of literatures regarding the prevalence and consequences of double burden of malnutrition throughout the world (Shrimpton and Rokx, 2013; Ramirez-Zea et al., 2014; Prentice, 2018). Interestingly a recent systematic review on the prevalence and predictors of double burden of malnutrition in households level clearly emphasized that urban residence, income and education may have played an important role for double burden of malnutrition but the role of dietary habits and physical activities is remain unclear (Kosaka and Umezaki, 2017). The majorities of the study have also been concentrated on mother-child pairs within households i.e. mother overweight and obesity vs child stunting (Oddo et al., 2012; Ihad et al., 2013). Therefore, there was an obvious role of gender (mother and father) towards the child nutritional status and also on double burden of malnutrition (Vaezghasemi et al., 2014). However, the study in Indian context is lacking and conversely, the recent report of National Family Health Survey (NFHS) pointed out these dilemmas, where 27.1% of stunted children have overweight mother (NFHS-4, 2017).

One of the important vulnerable groups with double burden of malnutrition is the urban slum dwellers (Chakrabarty et al., 2011). The evidence suggested that there was an increasing trend of overweight and its associated non-communicable disease risk factors among the urban slum dwellers in India (Acharyya et al., 2014). Therefore, there is an urgent need to look after this problem in different population of India specifically among the vulnerable groups like urban slum dwellers.

On the basis of the above discussion, it has been postulated that double burden of malnutrition is a real global problem for effective health and nutritional intervention in the community as well as household levels (UNDAN, 2015). Although there are numerous studies on this issue but majorities of them is in macro level (Kosaka and Umezaki, 2017). Therefore, there is an urgent need to conduct in depth micro level study of double burden of malnutrition in household's level by considering the possible associated factors among the vulnerable group like urban slum population due to its negative consequences of urban pull as housing shortage and critical inadequacies in public utilities, overcrowding, unhygienic conditions, insufficient knowledge health care practices and nutritional needs (Ghosh and Shah, 2004). Besides the decadal growth of urban slums in India is enormous i.e. nearly 44% (Census of India, 2011). This necessitated the study of double burden of malnutrition and its associated factors with a hypothesis that the urban slum people may have double burden of malnutrition and which may be due to their differential socio-economic position.

The main objective of the present study is therefore to estimate the prevalence of double burden of malnutrition (both undernutrition and overweight) within households (mother and their respective children) and also to find out the association of certain socio-economic factors with the prevalence of double burden of malnutrition among the Bengalee Hindu Slum Dwellers population.

## **Materials and methods**

### *Population and the study area*

For the present study, the Bengalee speaking Hindu religious households was selected. They perhaps considered to be the most populated caste group in West Bengal, India, where 70.54% of the population identifying themselves as Hindu. Bengalee Hindu populations are distributed throughout the 23 districts of West Bengal. Out of the 23 districts, the most populated district is North 24 Parganas with a population around 10 lakhs (11.4% of the total population of West Bengal). The district town of North 24 Parganas district is Barasat, which comes under the jurisdiction of Barasat Municipality (Census of India, 2011). The Barasat town is one of the major urban centres of North 24 Parganas with

a well connected communication system. It is an important business hub for nearby rural villagers, which attract them to come in the Barasat town. As a result the urban growth rate of the population has become very high. The growth of urban population is reflected to increase the urban slum. It was evident that in 1991 the number of urban slum in Barasat Municipality areas was only 54 and now it becomes 159 (including all types of slum) with a population more than 50 thousand and the majorities are Hindu (Kar, 2012). Therefore, the study will be conducted in urban slums of Barasat Municipality areas of West Bengal, India. For the present study, the slum may be identified as “a compact area of at least 300 populations or about 60 – 70 households of poorly built congested tenements in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities” (Census of India, 2011).

### *Inclusion criteria*

Data were collected from Bengalee Hindu household having at least one child aged 2-10 years with no health disabilities along with their parents; specifically mother was non-pregnant and non-lactating aged 15 to 49 years. “Identified Urban Slum” was selected as per Census of India, 2011.

### *Sample size and sampling*

A total of 130 mother-child pairs were selected for the present study from two major slums namely Hatkhola Colony and Dijohori Das Colony under Barasat Municipality areas. However the sample was collected by using random sampling after considering total households of each slum area and also as per inclusion criteria.

### *Study Design*

The study was conducted in two phases: The first phase was cross-section study, where 130 mother-child pairs were identified as per inclusion criteria and then in the second phase, a comparative analysis was done mainly between contrasting nutritional groups between parents and children (e.g. overweight/obese mother and stunted children “OM/SC” vs normal mother and normal children “NM/NC”) in the selected households.

### *Data collection and data analysis*

Pre-structured and pre-tested schedule was used to collect the cross-section data of household socio-economic and socio-demographic characteristics (age, sex, education, occupation, income, expenditures of different forms, household assets, housing condition, etc) from the sampled households. Afterward anthropometric measurements [height (cm), weight (kg) and waist circumferences (cm) for mothers; height (cm), weight (kg) and Mid Upper Arm Circumference (cm) for children], was collected by using standard procedure from the household members (Weiner and Lourie, 1981). In this present study mothers' overweight were categorized according to their body mass index (BMI) and the BMI was  $\geq 23.00 \text{ kg/m}^2$  indicate overweight and  $\geq 18.5 \text{ kg/m}^2$  indicate normal weight (Pan and Yeh, 2008). Separate anthropometric indices were used for adults (Body Mass Index) and children (height for age Z score “HAZ”) for assessing nutritional status (WHO, 1995). Socio-economic parameters (Per capita income, expenditure, etc) were categorized as per median values of the present data set. The schedule question was validated and moderated accordingly. The ethical clearance was taken from IEC, West Bengal State University, Barasat and also from the before the commencement of the present study.

### *Statistical analysis*

Category-wise distribution and/or descriptive analysis were calculated on all the parameters related to anthropometric measures and socio-economic parameters. Then associations of double burden of malnutrition with household socio-economic characteristics were examined by cross-tabulation. The significance level was assessed by using Contingency chi-square test. All analyses were conducted with SPSS 16.0 version.  $p$  values  $<0.05$  was considered statistically significant.

### *Results and Discussion*

Table 1 shows the proportion of mother - child pairs among the study sample households. Out of 130 mother-child pairs with fulfilled selection criteria, the percentage of normal weight mothers and normal weight child pairs (NM/NC) was 25.38%, whereas 12.35% mother-child pair of double burden of malnutrition (i.e. mother overweight / obese vs stunted child). However in national level, 27.1% of mothers had stunted children (NFHS-4, 2017) and indicated an alarming trend of double burden of malnutrition. The remaining mother-child pairs that obtained from the present study were UM/NC (11.54%), OM/NC (28.46%), UM/SC (7.69%), NM/SC (14.62%). For the purpose of comparative analysis 33 NM/NC and 16 OM/SC pairs were included in this study. The remaining pairs were excluded as it did not comply with our criteria for data analysis. Similar study design was adapted by Khor and Sharif (2003) for exploring undernutrition status of overweight mothers among the Malay households in rural Malaysia and found 38.57% of cases. After a decade, Ihab et al., (2013) found similar trends with 29.6% cases and they also suggested a big challenge in rural Malaysia especially for food intervention programs to be implemented in the future. In 2017, Asian Development Bank, also highlights similar increasing trends of intra-household double burden of malnutrition in India, which may be due to the reflection of nutrition transition in the Indian subcontinent (Dang and Meenakshi, 2017). It urges to explore the community and areas specific studies in India, which may be under reported yet. In this context, a cross-section study in the poor urban setting in Delhi also revealed that One third mother-child dyads characterized by high prevalence of undernutrition, stunting and wasting in children, and overweight/obesity in mothers within the same household (Malik et al., 2018).

Table 2 represents the mean and standard deviation of anthropometric characteristics and age of mother-child pairs which mention that the mean age of normal weight mothers ( $27.02 \pm 4.81$  years) and overweight mothers ( $27.42 \pm 4.79$  years) had almost similar. In case of stunted child ( $6.06 \pm 3.48$  yrs) and normal child ( $6.07 \pm 2.79$  yrs) the mean age difference was not also statistically significant ( $p > 0.05$ ). The mean body weight of normal child was higher ( $16.27 \pm 5.22$  kg) compared stunted child ( $15.56 \pm 7.31$  kg). Whereas the normal mothers mean body weight were lower ( $46.24 \pm 4.54$  kg) in compare to overweight mothers ( $55.31 \pm 7.07$  kg). The mean height of both mothers and child were also differed. The mean BMI value of overweight mothers and normal mothers were differed significantly ( $p < 0.01$ ) i.e.  $26.34 \pm 2.82$  kg/m<sup>2</sup> and  $20.42 \pm 1.41$  kg/m<sup>2</sup>, respectively. The mean waist circumference of overweight mothers was higher ( $83.75 \pm 8.11$  cm) than normal weight mothers ( $72.75 \pm 4.93$  cm). From this study we also found that the HAZ of stunted ( $-2.68 \pm 0.96$ ) and normal ( $-0.87 \pm 0.92$ ) child were also differed. But all negative value suggested their poor nutritional status. The mean upper arm circumference value was higher in normal weight child ( $16.59 \pm 1.97$  cm).

Table 3 shows the socio-demographic characteristics of the sampled households as per OM/SC and NM/NC. It was observed that 73.5 % HHD were illiterate, where 68.8% of the households had OM/SC. In contrary, 69.4% of mothers were literate with 62.5% of them had overweight mother and stunted children. Most of mothers with OM/SC engaged in household activities as non-earner (75.0%). On the

other hand, economically, more percentage of OM/SC cases were belonged to family income higher the median value of per capita family income (Rs. >1666.0). similar observation was noted in expenditure pattern as more percentage of OM/SC cases (68.8%) were belonged to family income higher the median value of per capita family expenditure (Rs. >1200.0), which was statistically significant ( $p < 0.05$ ). OM/SC was higher in lower no. living room group ( $\leq 2$ ) (68.0%) and OM/SC was higher in  $\leq 5$  household size group (56.2%). OM/SC was higher in  $\leq 2$  no. of children among the overweight mother (81.2%) and they were in the  $\leq 30$  age group in years (68.8%).

Apart from the socio-demographic characteristics, dietary pattern and physical activity levels are the two important and fundamental features to understand the causative pathways of double burden of malnutrition in household level (OM/SC); however it is beyond the scope of the present study. The general socio-demographic and economic features showed that the majorities of the slum households belonged to lower socio-economic group and that may be associated to improper consumption and distribution of food habits of the studied mothers. Baiotis and Lino (2002) recommended that over-nutrition mother in poor and food insufficient households could be engaged in binge eating with cheaper and less nutritious (more calorie dense) food when food is available. On the other hand, overweight and obesity in the mothers engaged in household duties may be associated to the level of physical activity not being in balance with energy intake (Kim et al., 2017).

## Conclusion

In spite of the limitation of the present study mainly with lower sample size, it gives a hint on a serious public health issue on rising trends of double burden of malnutrition in terms of mother overweight/obesity and child stunting among the urban Hindu slum dwellers in West Bengal, India, where pattern of expenditure may have played a vital role. To understand the patterns and associations of double burden of malnutrition within the same household further investigations with large sample size along with dietary pattern and physical activity level including qualitative approaches such as home-stay observations and informal interviews, in order to capture more closely actual intake of overweight women are necessary as suggested by others.

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**Author's contributions** *PP collected data, dataset tabulation and helped to draft the initial manuscript. SC designed the study, analyzed the data and drafted the manuscript. Both the authors finally approved the manuscript*

**Conflict of interest** *The authors declare that they have no conflict of interest.*

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## Tables

Table 1: Proportion of mother - child pairs among the study sample households (n = 130)

Nutritional status of mother - child pairs	n	%
Normal Mother vs Normal Child (NM/NC)	33	25.38
Overweight Mother vs Stunted Child (OM/SC)	16	12.31
Underweight Mother vs Normal Child (UM/NC)	15	11.54
Overweight Mother vs Normal Child (OM/NC)	37	28.46
Underweight Mother vs Stunted Child (UM/SC)	10	7.69
Normal Mother vs Stunted Child (NM/SC)	19	14.62
<b>Total</b>	<b>130</b>	<b>100.00</b>

Table 2: Mean and SD of Anthropometric Characteristics and age of mother-child Pairs

Variables	Overweight Mother vs Stunted Child (OM/SC) (n=16)	Normal Mother vs Normal Child (NM/NC) (n=33)
Mother		
Age (years)	27.42±4.79	27.02±4.81
Wight (kg)**	55.31±7.07	46.24±4.54
Height (cm)*	144.77±4.19	150.40±5.56
BMI (kg/m <sup>2</sup> )**	26.34±2.82	20.42±1.41
Minimum Waist Cir (cm)	83.75±8.11	72.75±4.93
Child		
Age (years)	6.06±3.48	6.07±2.79
Wight (kg)	15.56±7.31	16.27±5.22
Height (cm)	101.19±20.02	109.46±14.29
Height for age (z score)**	-2.68±0.96	-0.87±0.92
MUAC (cm)	15.77±2.31	16.59±1.97

Significant difference between the two groups by t-test, \*P < 0.05; \*\*P < 0.01 MUAC – Mid Upper Arm Circumference



Table 3: Socio-demographic Characteristics of the sampled households as per OM/SC and NM/NC

Variable	(OM/SC) (n=16)		(NM/NC) (n=33)		Total (n = 49)	
Educational status of the HHD						
Illiterate	11	68.8	25	75.8	36	73.5
Literate	05	31.2	08	24.2	13	26.5
Educational status of the Mother						
Illiterate	06	37.5	09	27.3	15	30.6
Literate	10	62.5	24	72.7	34	69.4
Mother's earning type						
Non-earner	12	75.0	27	81.8	39	79.6
Earners	04	25.0	06	18.2	10	20.4
Per capita monthly family income (Rs)						
≤ 1666.0	05	31.2	17	51.5	22	44.9
>1666.0	11	68.8	16	48.5	27	55.1
Per capita monthly family Expenditure (Rs)*						
≤ 1200.0	05	31.2	20	60.6	25	51.0
>1200.0	11	68.8	13	39.4	24	49.0
No. of living room						
≤ 2	11	68.8	27	81.8	38	77.6
≥ 3	05	31.2	06	18.2	11	22.4
Household Size (No.)						
≤ 5	09	56.2	22	66.7	31	63.3
≥ 6	07	43.8	11	33.3	18	36.7
No. of Children						
≤ 2	13	81.2	29	87.9	42	85.7
≥ 3	03	18.8	04	12.1	07	14.3
Mother's age group (years)						
≤ 30	11	68.8	23	69.7	34	69.4
≥ 31	05	31.2	10	30.3	15	30.6

Significant difference between the two groups by chi-square test, \* $P < 0.05$

Overweight Mother vs Stunted Child (OM/SC)

Normal Mother vs Normal Child (NM/NC)

Household Head (HHD)