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Association between maternal and child nutritional status in some selected rural and urban regions of West Bengal: A cross sectional study

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Abstract
Child malnutrition continues to be a serious problem throughout the developing countries including India. Maternal malnutrition is a major predisposing factor for morbidity and mortality among women in the developing countries. The consequences of poor maternal nutritional status are reflected in low weight gain during pregnancy, high rate of infant and maternal morbidity and mortality etc. Thus child's nutritional status is somehow influenced by the maternal nutritional status. As a result, one of the interesting field of nutritional research is to understand the relationship between maternal and child nutritional status. Hence the present study aims to evaluate the relationship between maternal and child nutritional status using anthropometry. A cross sectional study was conducted among 518 mother-child pairs from some rural and urban regions of West Bengal, India. The anthropometric measurements of height and weight were recorded following standard procedures. The results showed that the BMI of mothers were significantly associated with HAZ and WHZ of under-five children. Whereas for above-five children mother's BMI was found to be significantly associated with the BMIZ of children only. These are indicative of a strong relation between the maternal nutritional status and short term nutritional status of children. Again the long term nutritional status of under-five children was also found to be significantly influenced by the maternal nutritional status. Thus it can be concluded that improving maternal nutritional could have a significant role in the prevention of childhood malnutrition.

Keywords: maternal and child nutritional status

1. Introduction
'Health' and 'Nutrition' – are the two essential key factors for ensuring a healthy future for children. Good health and proper nutrition in infancy and childhood plays a key role in determining one's overall lifestyle throughout life. And for securing a healthy childhood, a quality care by mothers is utmost necessary. Again a good quality and high degree of child care is dependent on various maternal factors including maternal nutritional status itself. In recent years it has been estimated that the poor nutritional status of mother and her child is highly responsible for the one-third children disease burden and around 5 million deaths in a year [1]. This scenario of maternal and child under nutrition was found even more severe in low-income and middle-income countries. As a consequence, poor nutritional status of mother and child is considered to be responsible for advancement in overall disease burden and increasing mortality. Recent research evidence also emphasizes on the importance of maternal nutritional status, both for the health of the mother and for ensuring healthy growth and development of infants. [2, 3] Thus the protective role of maternal nutritional status in the context of child's nutritional status cannot be ignored. Previous studies in this field were mostly carried out on preschool children and their mothers. Negash *et al*. (2015) carried out a baseline survey in Hula, Ethiopia on 197 mothers of children aged between 6-23months. They concluded that having a mother with better nutritional status and salaried employment is a benefit for the nutritional status of the child [4]. Mendes *et al*. (2014) worked on 4,258 mothers and their children aged < 60 months in Brazil. They also observed a strong, positive association between maternal and child nutritional status [5]. Rahman *et al*. (1993) surveyed on 339 children aged between 3-36 months and their mothers and reported maternal nutritional status as a proximate determinant of child's nutritional status [6]. But how the maternal nutritional status is related to the child's nutritional status in late childhood is not very clear.

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Thus researches focusing the relationship between the maternal nutritional status and the child's nutritional status are scanty among older children (i.e. children aged > 5 years). Again, Indian studies on the association between maternal nutritional status and child nutritional status using anthropometry appear to be scarce in the existing literature. Moreover detailed work in this field from West Bengal is also lacking. Therefore, the present study was undertaken to determine the relationship between maternal and child nutritional status in some selected rural and urban regions of West Bengal.

2. Materials & Methods
2.1 Area under study: The present cross sectional study was conducted in some selected rural and urban areas from three districts (viz. North 24 Parganas, Howrah and South 24 Parganas) of West Bengal.

2.2 Sample Size: Total 518 mother-child pairs were participated in the study. Children aged between 0-12 years and their mothers constituted the study subjects of the present study. Cluster sampling was done for the purpose of data collection.

2.3 Ethical Clearance: Clearance from University Bio ethics committee for Animal and Human Research Studies, Calcutta University, was obtained. During the survey the mothers were briefed about the study and her consent was taken for the same.

2.4 Study Instrument: The study instrument was a pre-tested, self-structured, predesigned interview schedule. Information regarding various socio-demographic variables and socio-economic characteristics were gathered by interviewing the mothers.

- **Age Assessment-** Age of the children was verified by checking their birth records.
- **Anthropometric Assessment-** Height (up to nearest 1 mm) and weight (up to nearest 100g) of both the mothers and children were measured using standard anthropometric equipment and procedures. The nutritional status of children was assessed according to Standard Deviation (SD) classification using WHO growth standards. [7]
- Anthropometric indices used for assessing nutritional status for under-five children (i.e. ≤ 5 years age) were Weight for Height (WHZ) and Height for Age (HAZ); whereas for above-five children (i.e., > 5 years age) Height for Age (HAZ) and Body Mass Index (BMIZ) were used. Standard Deviation classification as recommended by WHO was used in the study [7]. For mothers BMI was used as the anthropometric index representing their nutritional status.

2.5 Statistical Analysis: The collected data was numerically coded and entered into Microsoft Excel 2007 and then transferred to SPSS version 20. Added data was analyzed with appropriate test like Chi Square test to see the association among various parameters, at a minimum significance level of 0.05.

3. Results
The study population consists of 67.3% under-five (≤ 5 years age) and 32.6% above-five (> 5 years age) children and the population equally distributed between rural and urban

regions. Most of the families surveyed were nuclear type (68.5%). Most of the families were from Socio Economic Status (SES) class IV and V (i.e, monthly family income per capita is less than Rs.1883, as per updated B.G. Prasad's socioeconomic scale, May 2016) [8]. Most of the mothers were educated up to secondary level of school. (Table 1) Most of the families resided in either pucca (49%) or semi-pucca (49.4%) type of house with separate kitchen provision (74.7%). Only 14.9% households did not have any sanitary facility. Majority of households (56.2%) consumed drinking water either boiled or filtered. (Table 1)

Table 1: Socio demographic and household characteristics of the study population

Demographic Variables	No (%)
1. Location:	
Rural	259 (50.0)
Urban	259 (50.0)
2. Age	
Under-Five	349 (67.3)
Above-five	169 (32.6)
3. Gender	
Male	264 (51.0)
Female	254 (49.0)
4. Religion	
Hindu	476 (91.9)
Muslim	42 (8.1)
5. Caste	
Gen	234 (45.2)
SC	135 (26.1)
ST	72 (13.9)
OBC	77 (14.9)
6. Family Type	
Nuclear	355 (68.5)
Joint	163 (31.5)
7. Socio economic status (as per Monthly Family Income /capita)	
SES I & II (≥ Rs. 3139)	123 (23.7)
SES III (Rs. 1883-3138)	84 (16.2)
SES IV & V (≤ Rs.1882)	311 (60.2)
8. Maternal Literacy Status	59 (11.3)
Iliterate	
Primary	94 (18.1)
Secondary	236 (45.5)
Higher Secondary	59 (11.3)
Graduate/ Post Graduate	70 (13.5)
9. House Type	
Kaccha	8 (1.5)
Semi-pucca	256 (49.4)
Pucca	254 (49.0)
10. Separate Kitchen Provision	
Yes	387 (74.7)
No	131 (25.3)
11. Sanitary Facility	
No facility	77 (14.9)
Shared/ Common latrine	103 (19.9)
Separate latrine	338 (65.3)
12. Cooking Fuel Used	
Gas	220 (42.5)
Kerosene, coal or others	298 (57.5)
13. Drinking Water consumed as	
Non-filtered	227 (43.8)
Boiled or filtered	291 (56.2)

As depicted in the following table (i.e., Table 2) it was found that the association between short terms (indicated by WHZ) as well as long term (HAZ) well-being of under-five and nutritional status of their mothers was highly significant. Also

the prevalence of stunting among under-five children (viz. 13.4% severely stunted and 50.7% moderately stunted) was found to be higher in case of undernourished mothers (Figure1). Similarly the overall percentage of wasting among under-five children was also found to be higher among undernourished mothers (Figure 2).

Table 2: Relation between maternal nutritional status and nutritional status of under-five children

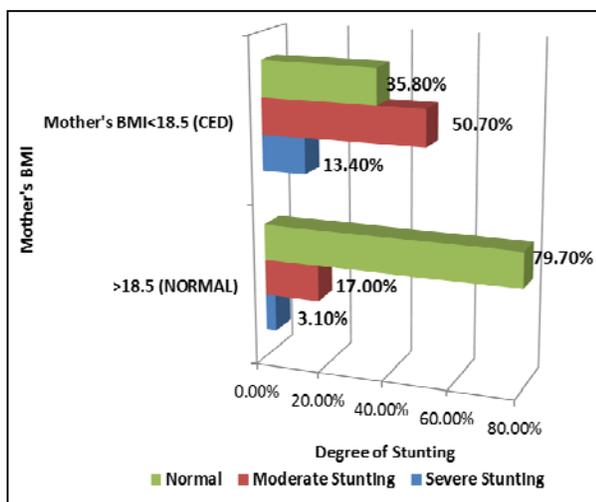| Maternal Nutritional Status BMI (kg/m^2)	Under Five children (N=349) Weight For Height (WHZ)						Under Five children (N=349) Height For Age (HAZ)					
	Severe Wasting	Moderate Wasting	Normal	Total	χ^2	p-value	Severe Stunting	Moderate Stunting	Normal	Total	χ^2	p-value
> 18.5 (Normal)	18	40	224	282	17.283	0.0001	9	48	225	282	51.884	<0.0001
Row%	6.3	14.1	79.484.5	100			3.1	17.0	79.7	100		
Col%	90.0	62.5		80.8			50.0	58.5	90.3	28.6		
< 18.5 (CED)	02	24	41	67			9	34	24	67		
Row%	2.9	35.8	61.1	100			13.4	50.7	35.8	100		
Col%	10.0	37.5	15.4	19.1			50.0	41.4	9.6	19.1		
Total	20	64	265	349			18	82	249	349		
Row%	5.7	18.3	75.9	100			5.1	23.4	71.3	100		
Col%	100	100	100	100			100	100	100	100		

Fig 1: Distribution (%) of Stunting among Under-Five Children according to Maternal Nutritional Status
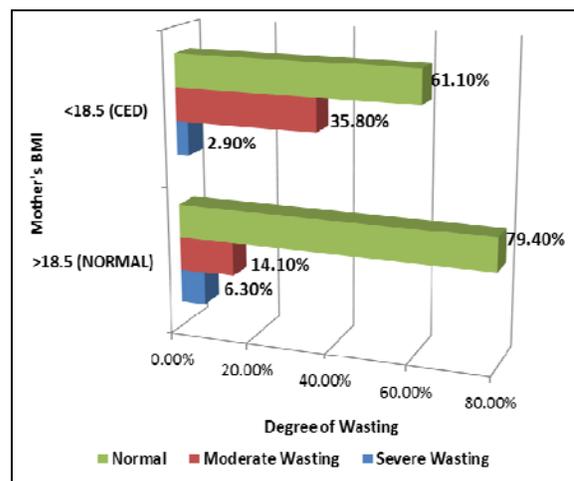*CED stands for Chronic Energy Deficiency

Fig 2: Distribution (%) of Wasting among Under-Five Children according to Maternal Nutritional Status
*CED stands for Chronic Energy Deficiency

Table 3: Relation between maternal nutritional status and nutritional status of above-five children

Maternal Nutritional Status BMI (kg/m^2)	Above Five children (N=169) Body Mass Index (BMIZ)							Above Five children (N=169) Height For Age (HAZ)					
	Severe Thinness	Thinness	Normal	Overweight	Total	χ^2	p-value	Severe Stunting	Moderate Stunting	Normal	Total	χ^2	p-value
> 18.5 (Normal)	18	29	102	9	158	17.924	0.0004	2	17	139	158	4.326	0.114
Row%	11.3	18.3	64.5	5.6	100			1.2	10.7	87.9	100		
Col%	94.7	87.8	98.0	69.2	93.4			66.6	89.4	94.5	93.4		
< 18.5 (CED)	1	4	2	4	11			1	2	8	11		
Row%	9.0	36.3	18.1	36.3	100			9.0	18.1	72.7	100		
Col%	5.2	12.1	1.9	30.7	6.5			33.3	10.5	5.4	6.5		
Total	19	33	104	13	169			3	19	147	169		
Row%	11.2	19.5	61.5	7.6	100			1.7	11.2	86.9	100		
Col%	100	100	100	100	100			100	100	100	100		

But for above-five children, only the BMIZ indicator (that represents short term nutritional status) shows a significant association with maternal nutritional status. Here the association between HAZ indicator of children and maternal nutritional status was found to be non-significant. (Table 3) Here also the prevalence of stunting among above-five children (viz. 9% severely stunted and 18.1% moderately stunted) was found to be higher in case of undernourished mothers (Figure 3). Similarly the overall percentage of wasting among under-five children was also found to be higher among undernourished mothers (Figure 4). Higher percentage of overweight/obese children was found among mothers possessing BMI < 18.5 (Figure 4). Again percentage of overweight or obese children was comparatively lower in case of mothers possessing normal BMI.
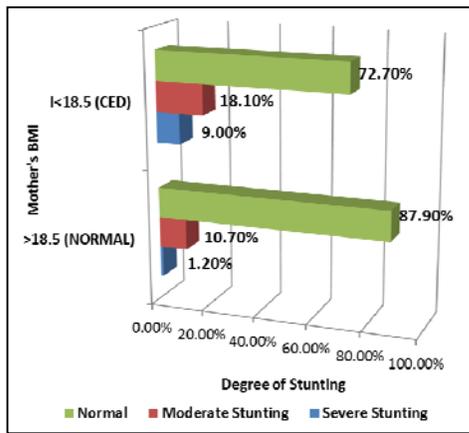
Fig 3: Distribution (%) of Stunting among Above-Five Children
according to Maternal Nutritional Status
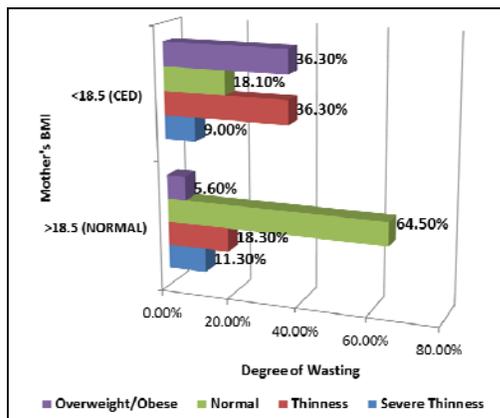*CED stands for Chronic Energy Deficiency

Fig 4: Distribution (%) of Wasting among Above-Five Children
according to Maternal Nutritional Status
*CED stands for Chronic Energy Deficiency

4. Discussion

Present data analysis revealed that mother's nutritional status was significantly associated with the degree of wasting and stunting of under-five children. This indicates that both the short term and long term nutritional status of under-five children get significantly influenced by the mothers' nutritional status. This finding for under-five children was supported by the previous findings by Negash *et al*. (2015) [4] and Mendes *et al*. (2014) [5]. They reported a significant and positive correlation between maternal and child nutritional status. Mock *et al*. (1993) conducted a similar type of study in rural Guinea and reported that maternal and child anthropometric indices were significantly correlated [9]. significant impact of maternal nutritional status was found to be continued on the degree of wasting in older children also. Kulsum *et al*. (2013) also found a similar result and concluded that a positive association between weight/age and weight/height ratios with that of maternal nutritional status [10]. However the non-significant association between mothers' BMI and HAZ indicator for above-five children indicates that the long term nutritional status of older children (> 5 years) was not at all significantly influenced by maternal nutritional status. Thus maternal nutritional status can be considered as an important factor for determining the nutritional status of preschool as well as school children.

5. Conclusion

The results of the present study indicate a significant association between maternal nutritional status and short term nutritional status of both under-five and above-five children. However maternal nutritional status was found to be significantly associated with the long term nutritional status of under-five children only. All these indicate that maternal nutritional status plays an important role in determining the nutritional status of 0-12 years aged children. Again the results showed that moderate under nutrition was more prevalent than severe under nutrition among children. Thus intervention programmes are needed which should focus on improving the nutritional status of both mothers and children along with regular health monitoring so as to achieve their optimal good health.

6. Acknowledgement

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