Child Nutrition and Mother Health Status of Landless, Marginal and Small Farmers' Community in Dinajpur, Bangladesh

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Abstract : *This study was undertaken to identify the association between child nutrition, mother health status with socio-demographic and economic factors as well as to determine the factors affecting child nutrition of the beneficiary families supported by a NGO working in Dinajpur, Bangladesh. The study was carried out on the families having under-5 children using simple random sampling method. The average height and weight of under-5 children were found 88.1 cm and 11.29 kg respectively. Graphical representation showed as age of children increases the mean height (cm) and mean weight (kg) of the children also increased parallel. The prevalence of underweight children (49%) was observed comparatively higher than stunted (36%) and wasted (34%) children among the very small farmers' families. Body Mass Index (BMI) of mothers indicated that about 53% were normal weight, about 37% mothers were underweight and 10% mothers were overweight and obese. Analyses revealed that age of children, sex of children and monthly family expenditure were found statistically significant for stunting status of children. The variables like age of father, education of mother and child breast feeding duration were found significant factors for underweighted children. Mothers' marital age was found significant for underweight to normal weight mother.*

Keywords - *Child nutrition, Z-scores, Mothers' BMI, Farmers' community, NGO*

I. Introduction

According to World Bank report, one third of all child deaths in low income country like Bangladesh are caused in by malnutrition [1].Malnutrition results from insufficient nutritious food consumption. In Bangladesh the per capita income is only $ 1,190 per month [2], where the child malnutrition is wide spread. The prevalence of underweight and stunting was "very high", and the prevalence of wasting was indicated as a "critical problem"[3].

The situation of malnutrition in Bangladesh is alarming for mothers and their children [4]. Malnutrition is a major public health problem. It is a serious obstacle to national and socio-economic development of this country. It results from causes of poverty, ignorance, illiteracy, population pressure [5] etc. compounded with natural and manmade calamities. Various studies suggest that lack of food and poverty are not only responsible but also lack of nutritional knowledge is a major cause of malnutrition [6]. The major nutritional problems are low birth weight; inappropriate breast feed, mothers' low height and weight, age gap of child with previous child etc. Low birth weight is a major public health problem in many developing countries [7]. The cause of low birth weight is maternal malnutrition, illness, taking less food during pregnancy etc. Practice of breast feeding, timely introduction of weaning food, proper nutritional education for mothers, timely and complete immunization, maternal education during pregnancy, family size, family income etc. also influence nutritional status of children. A previous study found that the prevalence of stunting, underweight and wasting of 6-59 months old children were 54%, 33% and 16%, respectively for rural indigenous children in Dinajpur, Bangladesh[8].

Overall nutritional status in Bangladesh of 60.4% women of age 15 to <49 years is normal, that is, they have normal BMI (18.5-24.99) while 24.8% women are suffering from chronic energy deficiency or thinness (BMI <18.5) and 14.9% women are overweight or obese (BMI ≥25). Women of both rural and urban areas are about two times more likely to be overweight or obese, about 16.5% and 27%, respectively than the men of both rural and urban areas, about 9.7% and 12.4%, respectively [9]. Limited access to safe drinking water and sanitation facilities and poor hygiene are associated with skin diseases, acute respiratory infections (ARIs), and diarrheal diseases, the leading preventable diseases in Bangladesh [10]. About 3% of households in Bangladesh

do not have a toilet facility. Overall 66.7% of households have their own latrine and 29.2% share latrine with others irrespective of type of latrine [9].

The NGOs are working in Bangladesh or eradicate poverty and improvement of child nutrition and mother health status for landless and small farmers' community. But general people still believe that so far development trends to these small and marginal farmers' families by these lots of NGOs are very much slow. The ActionAid Bangladesh (AAB) an NGO claimed that they have great impact in the nutrition of mothers and children, empowerment of women. The AAB has implemented a number of health, education and development programs in Bangladesh with the aim of the poverty alleviation and empowering the poor. Understanding the above literature of our country and with the general people's belief the proposed work aims at exploring the impact of development intervention by the beneficiaries of LRP 45 program, ActionAid Bangladesh working in Dinajpur on changes in child nutrition and mother health status of the small and marginal farmers' community.

II. Methodology

2.1 Location of the study
The study was carried out among the family members of the NGO beneficiaries from LRP-45 program of ActionAid Bangladesh working in Dinajpur district, the north-western district of Bangladesh.

2.2 Sampling design and sample size
It is well known that like all NGO's working in Bangladesh, LRP-45 program of AAB has also working with invariant land size families (landless, marginal and small farmers) for their child nutrition and mother health improvement [11]. Therefore considering the homogeneity of land sizes of the population, simple random sampling technique was followed for selecting the sampled families from these beneficiary populations in Dinajpur. Among the total beneficiary families (4936), finally 165 randomly selected families were determined using appropriate sample size estimating formula (probability, p=0.05 and margin of error, m= 0.05) for this study.

2.3 Anthropometric measurements of children aged 6-59 months
The anthropometric approach is the most commonly used tool and it is non-invasive, less costly and easy to obtain compared to other techniques for measuring nutritional status of under-five children [12]. This is why we adopted this technique in the present study. For estimating nutritional status of under-five children, height and weight data were compared with the international reference standard, the National Center for Health Statistics (NCHS) developed by the United States as recommended by the World Health Organization (WHO) based on Z-score [13].

Height-for-age: Compared with a reference standard, height-for-age z-scores (HAZ) detects stunting status. The term "stunting" is used to describe a condition in which children fail to gain sufficient height, given their age. Stunting is often associated with long-term factors such as chronic malnutrition and frequent illness. It is therefore an indicator of past growth failure. Stunting is very sensitive to socio-economic and demographic factors.

Weight-for-age: Compared with a reference standard, weight-for-age z-scores (WAZ) detects underweight status. The term "underweight" is used to describe a situation where a child weighs less than expected, given his or her age. W/A reflects body mass relative to age. Unlike height, weight fluctuates over time and therefore reflects current and acute as well as chronic malnutrition. It is commonly used for monitoring growth and to assess changes in the magnitude of malnutrition over time.

Weight-for-Height: Compared with a reference standard, weight-for-height z-scores (WHZ) detects wasting status. The term "wasting" refers to a situation where a child has failed to achieve sufficient weight for height (W/H). Weight-for height is normally used as an indicator of current nutritional status. Wasting may be the consequence of starvation or severe disease. It can also be due to chronic conditions or a combination of both.

2.4 Mother health status using BMI
The BMI or weight/height ratio are frequently used for adults and are employed for epidemiological studies because measurements of weight and height are easy to collect, quick, relatively non-invasive, more precise and easy to measure the nutritional status of adults [14]. The BMI is highly correlated with weight and consistently independent of height, less biased by height and weight/height [15]. It has been shown that BMI correlates well with body fat [16] and shows highest correlation with independent measures of body fat [17].

2.5 Statistical Analysis
Tabular analysis includes preparation of simple tables of proportions describing the concentration of categorical variables and preparation of bivariate tables showing the relationship or association between two

categorical variables. Descriptive statistics includes computation of summary measures: means, variances, proportions, etc. Chi-square (χ2) test was used to test the significance of the associations between two categorical variables. Bivariate analysis finds the relationship of different socioeconomic, demographic and other family factors with nutritional status of children and mothers. Binary logistic regression was use to find the significant contributing factors that affects the stunting, underweight and wasting status of children. Multinomial logistic regression analysis also used to interpret the mothers' underweight, normal and overweighed status in respect of different causal variables.

III. Results and Discussion

The average height and weight of under-5 children were found 88.1 cm and 11.29 kg respectively. But the average height of male and female children was 86.3 cm and 90.0 cm. And the average weight of male and female children was 11.30 kg and 11.28 kg (Fig. 1).
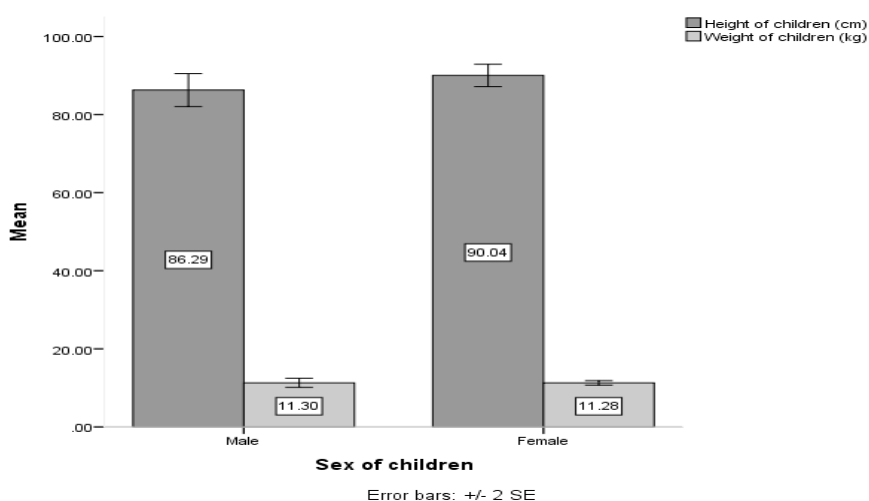

Fig. 1. Mean height (cm) and weight (kg) of under five children according to sex for the farmers' families in Dinajpur, Bangladesh.

Graphical representation showed that as age of children increases the mean height (cm) and mean weight (kg) of the children also increased parallely (Fig. 2).
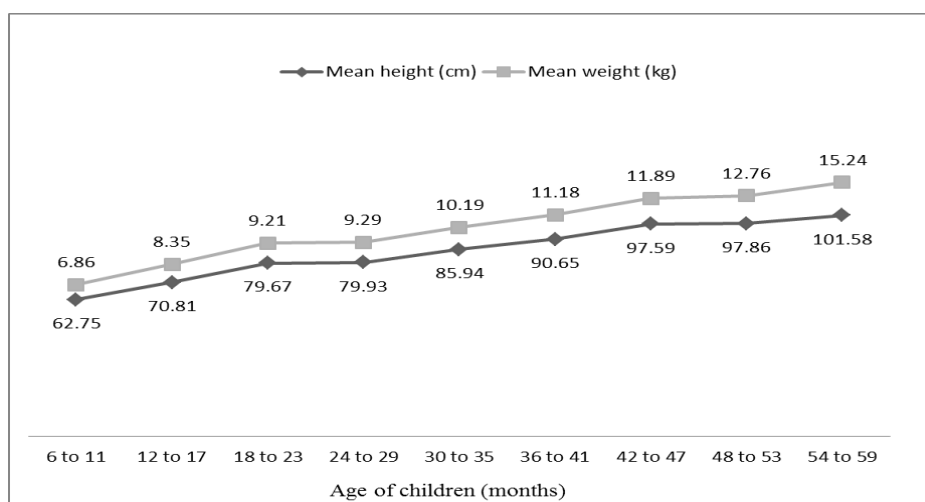

Fig. 2. Mean height (cm) and weight (kg) of under five children according to age for the farmers' families in Dinajpur, Bangladesh.

Nutritional status of children found that about 35.8% were stunted (64.2% are normal) among them 20.0% were moderately stunted and 15.8% were severely stunted. About 49.1% were found underweight (50.9% are normal) children among which 32.7% were moderately underweight and 16.4% were severely underweight

(This prevalence rate of stunting and underweight was found similar for Bangladeshi children in a previous research conducted by Banu et al [18]. Regarding wasting status, about 33.9% were found wasted (66.1% are normal) including 24.8% were moderately wasted and 9.1% were severely wasted (Fig. 3).
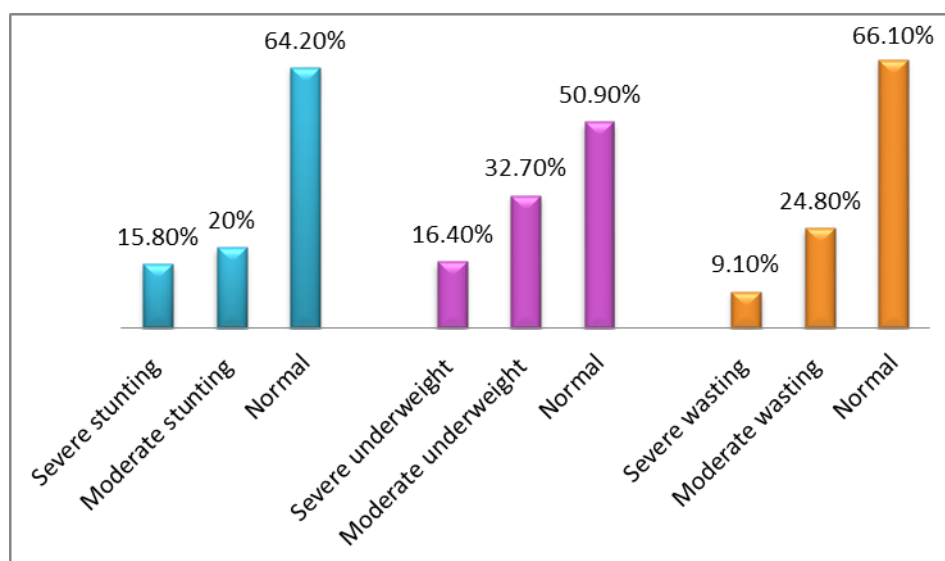

Fig. 3. Nutritional status of under five children for the farmer's families in Dinajpur, Bangladesh.

There were no significant differences found in nutritional status between the children of landless, marginal and small farmers' family categories (Table 1). The prevalence of underweight children (about 49%) was comparatively higher than stunted (about 36%) and wasted (about 34%) children.

Table 1: Percentage distribution of children (aged 6-59 months old) nutritional status using Z-scores in Dinajpur, Bangladesh.

Variables	Categories	Farmers category		
		Landless (118)	Marginal and small (47)	All (165)
Stunting (p= 0.20)	Severe stunting (HAZ =< -3.00 SD)	18.6	8.5	15.8
	Moderate stunting (-2.99 =< HAZ =< -2.00 SD)	17.8	25.5	20.0
	Normal (HAZ > -2.00 SD)	63.6	66.0	64.2
Underweight (p=0.55)	Severe underweight (WAZ =< -3.00 SD)	21.3	14.4	16.4
	Moderate underweight (-2.99 =<WAZ =< -2.00 SD)	33.9	29.8	32.7
	Normal (WAZ > -2.00 SD)	51.7	48.9	50.9
Wasting (p=0.36)	Severe wasting (WHZ =< -3.00 SD)	10.2	6.4	9.1
	Moderate wasting (-2.99 =<WHZ =< -2.00 SD)	22.0	31.9	24.8
	Normal (WHZ > -2.00 SD)	67.8	61.7	66.1

Chi square test revealed that age of children, sex of children, duration of child breast feeding and monthly family expenditure were associated significantly with stunting status of children. But the age of children (months), child breast feeding periods and education of mother were associated significantly with wasting status of children (Table 2).

Table 2: Percentage distribution of children according to nutritional status by background characteristics in Dinajpur, Bangladesh.

Variables	Categories	Stunting status of children		Underweight status of children		Wasting status of children	
		Normal	Stunted	Normal	Underweight	Normal	Wasted
Age of children (months)	< 2 years	19.8	37.3	29.8	22.2	33.9	10.7
	2-4 years	47.2	42.4	39.3	51.9	40.4	55.4
	> 4 years	33.0	20.3	31.0	25.9	25.7	33.9
χ^2 Value		6.774[*]		2.698[NS]		10.371[**]	
Sex of children	Male	44.3	39	47.6	56.8	54.1	48.2

	Females	55.7	20	52.4	43.2	45.9	51.8
χ^2 Value		7.193**		1.390^{NS}		0.519^{NS}	
Duration of child breast feeding (months)	≤6 months	13.2	10.2	13.1	11.1	13.7	9.0
	7-24	40.6	59.3	42.9	51.9	53.2	35.7
	25-48	46.2	30.5	44.0	37.0	33.0	55.4
χ^2 Value		7.406*		1.642^{NS}		9.909**	
Birth weight of children (Kg)	<2.5	4.7	8.5	6.0	6.2	7.3	3.6
	2.5-2.75	33.0	42.4	36.9	35.8	35.8	37.5
	> 2.75	62.3	49.2	57.1	58.0	56.9	58.9
χ^2 Value		2.927^{NS}		0.023^{NS}		0.924^{NS}	
Age of mother (years)	16-20	20.8	18.6	22.6	17.3	21.1	17.9
	21-25	33.0	44.1	32.1	42.0	35.8	39.3
	26-30	29.2	20.3	26.2	25.9	26.6	25.0
	30 +	17.0	16.9	19.0	14.8	16.5	17.9
χ^2 Value		2.490^{NS}		2.102^{NS}		0.394^{NS}	
Education of mother	Illiterate	35.8	28.8	26.2	40.7	27.5	44.6
	Primary	19.8	28.8	23.8	22.2	24.8	19.6
	School and above	44.3	42.4	50.0	37.0	47.7	35.7
χ^2 Value		1.930^{NS}		4.252^{NS}		4.894***	
Age of mother at the time of child born (Year)	12-16	39.6	52.5	38.1	50.6	43.1	46.4
	17-18	34.9	23.7	35.7	25.9	31.2	30.4
	19 +	25.5	23.7	26.2	23.5	25.7	23.2
χ^2 Value		3.008^{NS}		2.864^{NS}		0.191^{NS}	
Monthly income of household (BDT)	≤4500	31.1	35.6	31.0	34.6	33.0	32.1
	4501 to 6500	30.2	33.9	34.5	28.4	33.0	28.6
	≥6501	38.7	30.5	34.5	37.0	33.9	39.3
χ^2 Value		1.104^{NS}		0.729^{NS}		0.537^{NS}	
Monthly expenditure of households (BDT)	<3000	38.7	25.4	34.5	33.3	32.1	37.5
	3000-4500	34.9	50.8	34.5	46.9	38.5	44.6
	> 4500	26.4	23.7	31.0	19.8	29.4	17.9
χ^2 Valuec		4.442***		3.608^{NS}		2.579^{NS}	
Note: Level of significance: *P<0.05, **P<0.01, ***P<0.10, NS= Not Significant.							

Binary logistic regression analysis (Table 3) showed that the variables like age of children, sex of children and monthly expenditure of families were statistically significant with stunting status of children. Children of less than 2 years were found 2.8 times higher risk of being stunted than children of aged greater than 4 years. Among all children, female children were found 0.60 times lower risk of being stunted than male children of the farmers' community. The family had monthly expenditure less than 3000 (BDT) was 1.93 times higher risk of being stunted than families had monthly family expenditure more than 4500 (BDT). The risk of stunting reduced for the children with the increase of their age and their family's monthly income.

The risk variables like age of father, education of mother and duration of child breast feeding periods were found significant factors with underweighted children. Children of father's age group 20-29 years and 30-39 years were respectively 2.96 and 2.94 times higher risk of being underweighted than the children whose father age was 40+ years. Children of illiterate mothers faced 3.11 times higher risk of being underweight than the children had mothers' education high school and above. Children had breast feeding period up to 6 months been 1.69 times higher risk of being underweight than the children had feeding period between 25-48 months. The risk of underweighted children increases with the increase of their father's age, mother's education and children's breast feeding period.

The risk factors such as age of the children and total earning family members were statistically significant factors for identifying wasting of children. Children of age group less than 2 years were 0.25 times lower risk of being wasted children than the children of age 4+ years. Families having total earning members one person was 1.93 times higher risk of being wasting children than families having total earning members 2+ persons. The risk of wasting increases for children with the increase of their age and the risk of wasting decreases among children with the increase of earning members in families.

Table 3: Results of binary logistic regression analysis of significant studied variables for stunting, underweight and wasting among selected farmers' children in Dinajpur, Bangladesh.

Stunting						
Variables	Level			P value	Odds Ratio (OR)	95% C.I. for OR	
		B	S.E.			Lower	Upper
Age of children (months)	< 2 years	1.05	0.47	0.02	2.85*	1.12	7.28
	2-4 years	0.29	0.42	0.49	1.33	0.57	3.09
	> 4 years (*RC*)	-	-	-	1.00	-	-
Sex of children	Male (*RC*)	-	-	-	1.00	-	-
	Female	-0.50	0.25	0.04	0.60*	0.36	0.99
Monthly expenditure of households (TK.)	< 3000	0.66	0.43	0.05	1.93*	0.82	4.54
	3000-4500	0.15	0.36	0.23	1.17	0.57	2.39
	> 4500 (*RC*)	-	-	-	1.00	-	-
Underweight						
Age of father (year)	20-29	1.08	0.45	0.01	2.96**	1.20	7.27
	30-39	1.08	0.51	0.03	2.94*	1.08	8.04
	≥40 (*RC*)	-	-	-	1.00	-	-
Education of mother	Illiterate	1.13	0.41	0.01	3.11**	1.38	6.98
	Primary	0.38	0.41	0.35	1.46	0.64	3.29
	School + (*RC*)	-	-	-	1.00	-	-
Duration of child breast feeding (months)	≤6 month	0.53	0.35	0.04	1.69*	0.84	3.38
	7-24	0.27	0.53	0.32	1.31	0.46	3.70
	25-48 (*RC*)	-	-	-	1.00	-	-
Wasting						
Age of children	< 2 years	-1.41	0.53	0.01	0.25**	0.09	0.70
	2-4 years	0.09	0.38	0.81	1.10	0.52	2.32
	> 4 years (*RC*)	-	-	-	1.00	-	-
Total earning family members	One person	0.66	0.44	0.03	1.93*	1.77	2.11
	2 + person (*RC*)	-	-	-	1.00	-	-
Note: RC-Reference category; Level of significance: *P<0.05, **P<0.01.						

Mothers health status determined by Body Mass Index (BMI) of studied farmers' families in Dinajpur. Results indicated that 52.5% mothers were normal BMI, about 28.5% mothers were moderate underweight, 8.5% mothers were severely underweight and 1.8% mothers were obese. Overall results indicated that about 10.3% mothers were overweight, 52.7% mothers were normal and 36.9% were underweighted (Fig. 4). That means about half of total (about 53%) mothers were normal BMI, around one third of total mothers were underweighted and rests mothers were over weighted.
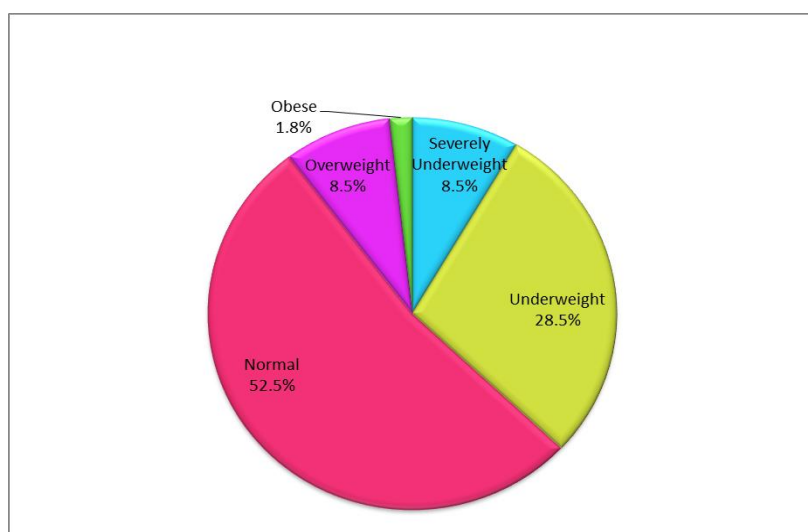

Fig. 4. Nutritional status of mothers for the farmer's families in Dinajpur, Bangladesh.

The results of Table 4 described that there was a significant relationship between nutritional status of mothers' and underweight status of children. Maximum normal mothers had normal children. Whereas from underweight mothers' about 43.21% children were underweight, 38.98% children were stunted and 42.86% children were wasted. Also from overweight mothers' about 4.94% children were underweight, 5.08% children were stunted and 7.14% children were wasted.

Table 4: Nutritional status of mothers (using BMI) according to nutritional status of children of the farmers' families in Dinajpur, Bangladesh.

		Underweight status of children		Stunting status of children		Wasting status of children	
		Normal (%)	Underweight (%)	Normal (%)	Stunted (%)	Normal (%)	Wasted (%)
Nutritional category	Underweight	30.95	43.21	35.85	38.98	33.94	42.86
	Normal	53.57	51.85	50.94	55.93	54.13	50.00
	Overweight	15.48	4.94	13.21	5.08	11.93	7.14
Chi-square		6.144*		2.707^{NS}		1.736^{NS}	
Note: Level of significance: *P<0.05, NS = Not Significance.							

Multinomial logistic regression analysis (Table 5) revealed that only mothers' marital age was found significant for underweight to normal weight. If mothers' age at marriage was increase by one year, the multinomial log-odds showed that underweight mothers' decrease to normal weight by 0.039 unit while all other variables in the model constant. In another case age of children, monthly expenditure on food of families, families last year income from loan, families last year income from salary, total monthly income of families and monthly expenditure of families were found significant for overweight to normal weight. If one month increases in age of children, the multinomial log-odds of nutritional status of mothers for overweight to normal would be expected to increase by 0.051 unit while holding all other variables in the model constant. If monthly expenditure on food of families was increase by one BDT, the multinomial log-odds showed that overweight mothers' decrease to normal weight by 0.002 unit while all other variables in the model constant. If one BDT increases in families last year income from loan, the multinomial log-odds of nutritional status of mothers for overweight to normal would be expected to increase by 0.000 unit while holding all other variables in the model constant. If one BDT increases in families last year income from salary, the multinomial log-odds of nutritional status of mothers for overweight to normal would be expected to increase by 0.000 unit while holding all other variables in the model constant. If total monthly income of families was increase by one BDT, the multinomial log-odds showed that overweight mothers' decrease to normal weight by 0.001 unit while all other variables in the model constant. If one BDT increases in monthly expenditure of families, the multinomial log-odds of nutritional status of mothers for overweight to normal would be expected to increase by 0.001 unit while holding all other variables in the model constant.

Table 5: Results of multinomial logistic regression analysis of selected variables for mothers' nutritional status of farmers' families in Dinajpur, Bangladesh.

Background characteristics		B	S. E.	P value	Odds Ratio (OR)	95% C. I. for OR	
						Lower	Upper
Underweight	Intercept	-0.314	2.758	0.909	-	-	-
	Age of mother (year)	-0.042	0.063	0.499	0.959	0.848	1.084
	Age of children (months)	0.000	0.014	0.993	1.000	0.973	1.028
	Age gap of children with previous child (years)	-0.005	0.080	0.950	0.995	0.850	1.164
	Monthly expenditure on food of households (BDT)	0.000	0.001	0.808	1.000	0.998	1.002
	Age of mother at the time of marriage (years)	-0.220	0.122	0.072	.803***	0.632	1.020
	Total land of households (decimals)	-0.007	0.006	0.254	0.993	0.981	1.005
	HHs last year income from loan (BDT)	0.000	0.000	0.467	1.000	1.000	1.000
	Total family member of HHs	0.314	0.227	0.167	1.369	0.877	2.137
	Age of father (year)	0.035	0.044	0.424	1.036	0.950	1.129
	Total earning family members in HH	0.432	0.659	0.512	1.540	0.423	5.604
	HHs last year income from salary (BDT)	0.000	0.000	0.584	1.000	1.000	1.000
	Birth weight of children (kg)	0.194	0.704	0.783	1.214	0.305	4.821
	Total monthly income of HH	0.000	0.000	0.462	1.000	1.000	1.001
	Monthly expenditure on education purpose (BDT)	0.001	0.001	0.382	1.001	0.999	1.003
	Monthly expenditure of households (BDT)	-0.001	0.001	0.413	0.999	0.997	1.001
Overweight	Intercept	-7.412	5.123	0.148	-	-	-
	Age of mother (year)	-0.073	0.139	0.601	0.930	0.709	1.221
	Age of children (months)	0.051	0.026	0.051	1.052*	1.000	1.107
	Age gap of children with previous child (years)	0.118	0.152	0.436	1.125	0.836	1.514
	Monthly expenditure on food of households	-0.002	0.001	0.047	.998*	0.997	1.000

	(BDT)						
	Total land of households (decimals)	0.005	0.005	0.295	1.005	0.996	1.014
	HHs last year income from loan (BDT)	0.000	0.000	0.020	1.000*	1.000	1.000
	Total family member of HHs	0.228	0.365	0.532	1.256	0.614	2.566
	Total earning family members in HH	-0.429	1.302	0.742	0.651	0.051	8.360
	HHs last year income from salary (BDT)	0.000	0.000	0.026	1.000*	1.000	1.000
	HHs last year income from cultivated land (BDT)	0.000	0.000	0.089	1.000	1.000	1.000
	Birth weight of children (Kg)	1.807	1.304	0.166	6.092	0.473	78.435
	Total monthly income of HH	-0.001	0.000	0.027	0.999*	0.999	1.000
	Monthly expenditure on education purpose (BDT)	-0.001	0.001	0.090	0.999	0.997	1.000
	Monthly expenditure of households (BDT)	0.001	0.001	0.054	1.001*	1.000	1.003
Note: Reference category is normal; Level of significance: *P<0.05, **P<0.01.							

IV. Conclusion

The mean heights of female children were found to be higher than the male children, but the mean weights were almost the same. Binary logistic regression analysis showed the significant determinant factors for being stunted children were found as age of children, sex of children and monthly expenditure of households. Age of father, education of mother and breast feeding periods for children were found the significant factors for being underweighted children. The factors such as age of the children and total earning family members were significant factors to identifying wasted children. Around one third of total mothers were underweighted and rests mothers were over weighted. There was a significant relationship between nutritional status of mothers' and underweight status of children. Multinomial logistic regression analysis revealed that only mothers' marital age was found significant for underweight to normal weight.

Acknowledgements

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