International Journal of Community Medicine and Public Health
Hossain SMA et al. Int J Community Med Public Health. 2022 Dec;9(12):4304-4312
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040

DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20222995

Original Research Article

Impact of child nutrition training for mothers on the nutritional status of children: a propensity score matching approach

S. M. Ashraf Hossain[1,2]*, Md Elias Hossain[1]

[1]Department of Economics, University of Rajshahi, Bangladesh
[2]Department of Economics, Varendra University, Rajshahi, Bangladesh

Received: 22 October 2022
Revised: 06 November 2022
Accepted: 10 November 2022

***Correspondence:**
S. M. Ashraf Hossain,
E-mail: ashrafhossain29@gmail.com

ABSTRACT

Background: Since mothers are the primary caregivers of children under five, their nutritional status depends on their mothers' capacity to feed and nurture them properly. However, mothers' poor child-feeding practices can also lead to child malnutrition. Mothers' nutritional education and childcare habits can improve children's health through child nutrition training. This study examines how child nutrition training for mother affects children's nutritional status in the impoverished Northern Bangladesh.
Methods: In this cross-sectional study, total of 300 mothers have been interviewed and data on demographic, socioeconomic, and child-specific related issues are gathered using simple random sampling from the study areas. The data comprise both treatment and control groups. Propensity score matching (PSM) method is applied to examine impact of child nutrition training for mothers on nutritional status of children in terms of stunting, wasting, and underweight.
Results: Empirical results of PSM revealed that the children whose mothers have received trainings have lower prevalence of stunting (0.357 SD), wasting (0.646 SD), and underweight (0.935 SD) as suggested by the average treatment effect on the treated.
Conclusions: In summary, this study found positive impact of child nutrition training programs. Therefore, it suggests that the government and NGOs should formulate better and expanded programs focusing on training mothers for the betterment of children's nutritional status.

Keywords: Child nutrition training, PSM, Stunting, Wasting, Underweight

INTRODUCTION

Both economic and human development needs well-nourished children so that they can grow and develop properly as well as think sincerely about making a significant contribution to their communities. Hence, to a certain extent, the present and past health of a nation's children are reflected through its current health.[1] In general, child health, has been identified as a vital measure of economic advancement and is considered by many experts to reflect the development of a society. However, malnutrition in children is one of the problems that plague developing countries even at this time and age. It is interpreted as insufficient consumption or defective adaptation of food and micro-nutrient inadequacies. Children are usually malnourished if they are unable to make use of the food that they eat properly (under-nutrition) because the nutrients they take from their diet are inadequate for their growth or if they consume too many calories (over-nutrition). Approximately 149 million or 21.9% of children aged within 6-59 months were stunted (short for age) worldwide and wasted (small for height) was observed to be 49 million or 7.3% worldwide for the same age group.[2]

Malnutrition can lead to several harmful factors, such as reduced productivity of workers, higher rates of chronic disease, decreased quality of life, and greater proportions of fatality.[3] In addition of being a public health problem, malnutrition has long been considered as an economic problem due to its linkage to poverty.[4-5] Also, children who are experiencing poverty, malnourishment, illness, and lack of care, are simply not capable enough to acquire higher-order cognitive abilities.[6] Hence, it is a persistent issue in many developing countries. Proper nutrition during early adolescence is therefore critical to growth prospects of any child. Period from infancy to twenty-four months of age is widely acknowledged as a critical window for fostering child growth, cognitive development and overall survival.[7] Thus, in order to support natural development, organ creation, brain function, and immunity during early childhood, appropriate nutrition is required.[5-7] Furthermore, better nutrition is core component of survival, growth, and wellbeing for present, future generations. Well-nourished children perform better academically, grow into healthy individuals and provide children with better upbringing.

The incidence of child malnutrition in Bangladesh has declined over the last few years as a result of specific developments in the healthcare sector between 2004 and 2007.[8] Consequently, throughout the last decade, Bangladesh has been one of the few developing countries to achieve a significant drop in the incidence of child malnutrition. The Bangladesh government, many development partners, non-profit organizations, and NGOs have all worked together to implement locally based nutrition and health initiatives, and this reduction in the rates of child malnutrition may be ascribed to their joint efforts. Despite the recent decreases in the incidence of children malnutrition, Bangladesh's rate of decline is substantially slower. This means the policymakers and experts must seek out more effective programs in order to preserve development and promote health growth. In addition, nutritional problems could be prevented through a wide range of cost-effective precautionary measures, such as the nutrition education program, the launch of community clinics and mass media nutrition campaigns, and the modification of existing nutrition policies.[9] A well-resourced, clearly aimed, and organized nutrition education training for mothers is supposed to improve their knowledge of child nutrition, health-care attitudes, and behavioral patterns. Training programs of such kind are very common in Bangladesh which are targeted for mothers, many of whom have received limited to no education. Subsequently, a number of international and national non-governmental organizations including Bangladesh integrated nutrition program, BRAC, Save the Children, Save Our Soul (SOS) Children's Village, Care Bangladesh, Children's Hope, and World Vision have been promoting appropriate childcare practices, such as suitable child-feeding procedures and management of childhood diseases like diarrhea. The training programs of these organizations usually include a variety of services, such as counseling mothers on children's general health and feeding practices, providing them basic family planning knowledge and contraception education, training them to identify and connect to local resources, supporting them for medicating extended family relationships, and teaching them about the importance of recreational activities, among others. All these services are intended to improve both children's nutrition and living conditions and mothers' abilities to acquire educational, social, health, and medical services for their children. However, there are insufficient studies on the impact of such nutritional education training in Bangladesh, predominantly of women who have received limited formal education. More particularly, it is not known whether this type of training program can lead to significant changes in the nutritional status of children when compared to those of other community(s) that weren't provided with services. The purpose of the study is to examine the impact of such a training program by comparing the nutritional status of the children whose mothers participated in such training programs with those whose mothers didn't participate.

METHODS

Study design

This study is based on an analytical cross-sectional household survey which includes mother-child pairs with training program participation and mother-child pairs without training program participation. Overall, the study covered a period of three months from January 2020 to April 2020 for the purposes of data collection and analysis.

Study area

Two unions in Bangladesh's Godagari Upazila, located in the Rajshahi District, were the sites of this cross-sectional study. The upazila has nine unions comprising 398 villages. Among these, Matikata Union and Gogram Union were selected as the specific study areas of this study. Matikata Union was purposively selected as the treatment group area because some NGOs started operating their maternal training programs there since 2016 whereas Gogram Union was selected as the control group area due to its socio-economic and geographical resemblance with Matikata Union. The study sites were purposively selected based on the criteria that both unions have impoverished households having at least one child under-5 years of age. The additional criteria for mothers in Matikata union is that they have received the training whereas the additional criteria for mothers in Gogram union is that they haven't received the training.

Data collection

Two NGOs such as SOS children' village and world vision operating in Rajshahi district were contacted and asked about their nutrition training program, who were the beneficiaries of the program, and in which villages, these programs were being implemented. Moreover, two comprehensive listings were created from the information

obtained from these NGOs. Then, both listings were put into Microsoft excel and consecutive numbers were assigned to each of the mothers of the two listings. The first list includes mothers who received child nutrition training in the Matikata Union. Out of this list of 90 mothers, by using the simple random sampling (SRS) technique, 70 mothers were selected as the treatment sample for this study. The sample size was determined by using the online sample survey calculator known as the "Survey System" considering a 5% error at a 95% confidence level and then a table of 70 random numbers was produced by using the online random number table generator known as "Stat Trek" to ensure that these numbers were randomly selected from within the range of 1 to 90 without any duplication. The second list includes mother-child pairs in the Gogram union who are potential claimants of receiving the training program in the future. Out of this list of 570 mothers who haven't been trained yet, 230 mothers were selected to form a control group according to the same criteria mentioned above. Two study areas were then visited to conduct interviews with the mothers. The questionnaire was carefully administered to 70 mothers in the Matikata Union and 230 mothers in the Union of Gogram. The selected samples have fulfilled the inclusion-exclusion criteria and written consent was obtained as well. This study was approved by the department of economics' ethics review board of University of Rajshahi.

Study instruments

At first, with an electronic scale and a stadiometer, the mothers' weight and height were observed and recorded respectively. Using a uni-scale, the children's weights were measured and recorded. For children who were able to stand, their weight was measured from a standing position and for those who weren't able to stand, their mothers' weight while carrying them was measured and subtracting it from the mothers' weight, their weight measurements were found. The heights of the children were observed and recorded by using a height board of 130 cm long. For children with a height less than 85 cm, their height was measured in a lying position. In addition, the survey's primary research technique was a structured questionnaire. In order to check the feasibility of the survey questionnaire and to assess the appropriateness of other research tools, a pilot study was carried out prior to the field survey.

Treatment variable

This is measured categorically whereby a value of 1 is assigned to mothers who participated in the child nutrition training program and a value of 0 to those who didn't participate.

Matching variable

Based on previous literature, certain background variables were controlled for this study including variables related to mothers' characteristics such as age, education, employment, marital status, children's characteristics such as age, gender, certain dietary factors of child i.e., breastfeeding status, complementary feeding, child's health care as indicated by vaccinations received, and also environmental factors like accesses to safe water and sanitation.[6,10-12] A brief summary of these variables is provided in Table 1.

Nutrition outcome variable

Children's nutritional status is assessed using systematic indicators such as height-for-age (HAZ), weight-for-age (WAZ), and weight-for-height (WHZ), all of which are standardized into Z scores. Low height-for-age, low weight-for-age, and low weight-for-height are used to highlight different elements of child malnutrition, namely stunting, underweight, and wasting, respectively. In this study, HAZ, WAZ and WHZ are taken as the outcome variables to imply the children's nutritional status.[6,10,12]

While standardizing into Z scores, all three indicators HAZ, WAZ, and WHZ follow the basic formula below:

$$HAZ, WAZ \ \& \ WHZ = \frac{A - M}{1 * \sigma}$$

Where A is the observed individual height or weight of a child of a given sex/age group, M is the median height or weight in the reference population children of that same-sex/age group, and σ is the standard deviation (SD) of either height or weight measurement for that reference population.

All three outcome variables HAZ, WAZ and WHZ are continuous variables, normally distributed and range between -6 SD to 6 SD. If any of the stated Z scores has a mean of negative value throughout a population, it means that the population's nutritional status is worse on average than the WHO growth standard population. Therefore, in this study, those children who were found to be greater than -2 SD than the reference population's median in terms of low HAZ, low WAZ, and low WHZ have been identified as stunted, underweight, and wasted respectively. In order to derive standardized Z scores for height-for-age, weight-for-age, and weight-for-height, WHO Anthro software from WHO was used.

Estimation model; PSM model

The purpose of this study is to see how child nutrition training for mother affects children's nutritional status. Hence, this study is an impact evaluation study which is utilized to identify how much of a change in outcome may be attributed to a certain intervention. Comparing what might happen if an intervention being implemented, the factual, to what might happen without the implementation of the intervention, the counterfactual, is one way to assess that intervention's credibility. However, the counterfactual can't be evaluated with complete certainty because it is impossible for the same respondents to participate in the intervention and not to

participate in it simultaneously. Hence, for an impact evaluation, two prerequisites which are the availability of non-participant control group and resolving the problem of selection bias must be addressed.[13] The potential endogeneity and measurement error caused by self-selection bias, a phenomenon frequently observed in household survey analyses, complicate the empirical analysis of maternal child nutrition training in the context of children's nutritional outcomes. The self-selection bias arises because of both self-selection of participants in the program and determined levelling of programs to specific people. This makes the treatment group and the control group to be fundamentally different from one another even before the implementation of the program.[14] Because of potential omitted variables, using ordinary least squares (OLS) frequently yields impractical results. The instrumental variable approach is often used as a solution for overcoming this endogeneity issue. However, finding effective instruments in the framework of health and nutrition is sometimes challenging, if not impossible. Hence, PSM model estimation is carried out to examine intervention impact in this study and to improve causal interpretation of the results by offsetting possible endogeneity problems like omitted variable problem and selection bias. The rationale behind PSM is to use it to evaluate intervention impacts when a traditional randomized control trial becomes infeasible.[15,16]

PSM has been explained as a model based on the probability of participating in the intervention utilizing the observed characteristics to compose a statistical comparison group. Consequently, the mothers who participated in the program will form the treatment group and those who didn't participate will be referred as the control group and these two groups will be compared based on observed characteristics that would match participants and non-participants through an estimated probability (propensity score) of program participation.

The estimated propensity score $p(x_i)$, for subject i, (i=1,…, N) is the conditional probability of being assigned to a particular treatment given a vector of observed covariates X_i : $p(X_i) = Pr(D_i = 1|X_i) = E(D_i|X_i)$

Where, $p(x_i)$ is the propensity score; D_i= 1, if the mother is a participant; 0, otherwise; X_i= A vector of matching variables that have been observed for the i-th mother-child pair; E (.) is the expectation operator.

One of the assumptions of the PSM model is the balancing and conditional assumption which states that matching variables must be balanced on a given propensity score.[15,17] It can be denoted as $D_i \perp X_i \mid p(X_i)$. The conditional independence assumption (CIA) is the second assumption. It asserts that covariates that can influence both treatment (participating in the training program) and potential outcomes (height-for-age, weight-for-age, etc.) concurrently have to be observed by the researchers implying that potential treatment has no effect on the potential result.[16] Mathematically, it can be stated as $Y_1, Y_0 \perp D_i|p(X_i)$. And the final assumption is known as overlap or common support assumption. According to this assumption, mothers with the same characteristics, X, are considered to have same chance of being assigned to either the treatment or the control group.[17] It is expressed as $0<p(D_i=1/X_i)<1$.

In this study, the propensity scores are computed using the logit model. This approach for estimating propensity scores is most frequently applied.[18] This model is used to predict the probability that the mother participated in the program. Mathematically,

$$ln\frac{p(X_i)}{1-p(X_i)} = ln\frac{Pr(D_i = 1/X_i)}{1-Pr(D_i = 1/X_i)} = \beta_1 + \sum\beta_i X_i$$

Where $p(X_i) = Pr(D_i = 1/X_i)$ = the probability that the mother participated in the training program, $1-p(X_i) = 1-Pr(D_i = 1/X_i)$ = the probability that the mother did not participate in the training program, β_1 is the intercept term, $\beta_i$is the regression coefficient, $X_i$is the vector of matching variables that have been observed. In logit model, the outcome variable is binary where D_i=1 is the value for the treatment and the value for the control is D_i=0.

Nearest neighbor matching, radius caliper matching, and Kernel Matching were used as matching algorithms. And, due to its superiority over alternative treatment effects, the average treatment effect on the treated (ATT) was chosen to examine the program impact.[15] Mathematically, ATT can be denoted as $ATT = E[(Y_1 - Y_0)/X, D = 1] = E[Y_1/D = 1, X] - E[Y_0/D = 1, X]$. But since a mother can't be simultaneously a program participant and a non-participant, the study of Rosenbaum and Robin (1983) can become helpful in determining ATT, that is,

$$E[Y_1 - Y_0/D = 1, p(X)] = E[Y_1/D = 1, p(X)] - E[Y_0/D = 0, p(X)]$$

Where $p(X)$ is the propensity score.

Stata 13 was used for data management purposes, all descriptive and statistical analyses including for estimating the stated empirical model. In particular, the psmatch2 program was used to run the PSM model.

RESULTS

Table 2 shows the demographic characterizes of mothers and children for both groups. For treated samples the percentages of mothers from age groups 21-25 and 25-30 years are 35.71% and 38.57% whereas 42.61% and 32.61% are accounted for control samples of mothers respectively. In case of treated mothers, 28.57% had passed primary level, 61.43% had passed secondary and 10% had passed higher secondary level of education.

By contrast, 31.74%, 60.87% and 7.39% are accounted as primary, secondary and higher secondary level of education in case of control mothers. The majority of both the treated and the control mothers are housewives. Above table depicts that the major portion of both the treated children and control children are from age group 49-59 months. Moreover, 52.86% of the treated children are male and 58.26% of the control children are female. The summary statistics of the matching variables used in the study is given in Table 3.

As the prerequisites to rightfully consider the results of PSM, both balancing property and the common support conditions must be checked. Figure 1 which shows standardized mean differences in histograms, adds to the evidence of the balancing property that there are fewer imbalances between the treatment and control groups in terms of matching variables after applying PSM. In case of an unmatched sample, standardized % biases across covariates range from -40% to 42%. After matching, as shown in the figure, standardized % biases across covariates are reduced ranging from -7% to 8%. Figure 2 shows treated mother-child pairs in red and untreated mother-child pairs in blue and because there are enough observations in the common support area, the common support condition is satisfied. The cut-off treated mother-child pairs that do not fall into the common support area are illustrated in green.

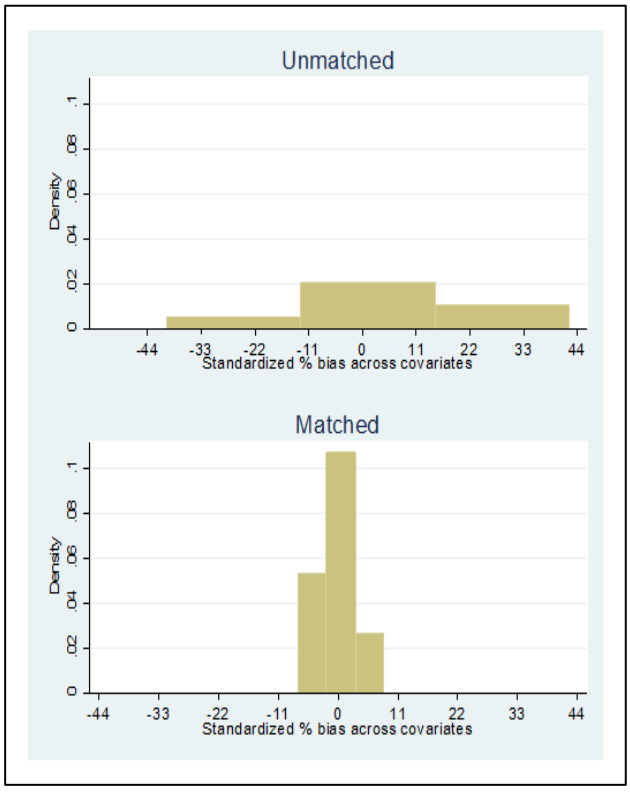

Figure 1: Distribution of standardized mean differences

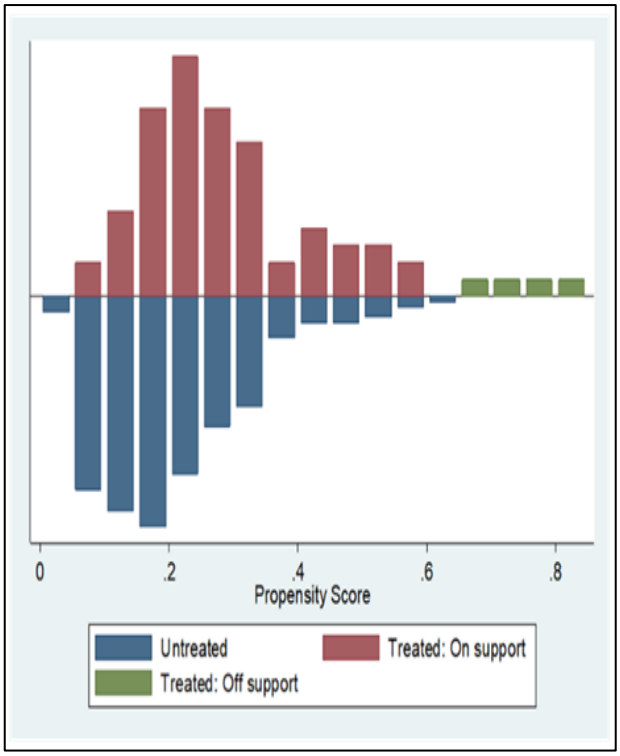

Figure 2: Common support.

The estimated average treatment effects of child nutrition training on children's height-for-age Z scores (HAZ), weight-for-height Z scores (WHZ), and weight-for-age Z scores (WAZ) are shown in Table 4-6 respectively. Standard errors are also reported in all estimations. The outcome dependent variables are HAZ, WHZ, and WAZ which reflect stunting, wasting, and underweight status of the children respectively.

The children whose mothers have received child nutrition training have lower prevalence of stunting than those in the control group. Using nearest neighbor matching, radius caliper matching, and kernel matching, shown in Table 4, the mean HAZ scores of children in the treatment group are increased by 0.3536, 0.3561, and 0.3569 SD scores respectively when compared to the children in the control group. Further results of the empirical estimation of the impact of child nutrition training, shown in Table 5, also indicate lower degree of wasting status by increases in the mean WHZ scores for the children in the treatment group than those in the control group. These increases are accounted as 0.6438, 0.6457, and 0.6459 SD scores according to the respective matching algorithms. Finally, child nutrition training for mothers improves the underweight status of the children as well, as shown in Table 6, the mean WAZ scores of the children in the treatment group when compared to the children in the control group are increased by 0.9340, 0.9354, and 0.9349 SD scores according to the nearest neighbor, radius caliper and kernel matching respectively.

Table 1: Description of matching variables used in PSM model.

Matching covariates	Type	Measurement
Mother's age (years)	Continuous	Mother's current age measured in years
Mother's education level	Continuous	Refers the educational attainment of mothers measured in years of schooling completed
Mother's employment status	Dummy	Refers to whether mother is employed or not: '1' for employed and '0' for unemployed
Marital status of mother	Dummy	Refers whether the mother is currently married or not: '1' for married and '0' for divorced or separated
Child's age (years)	Continuous	Measured in months
Child's gender	Dummy	'1' for female and '0' for male
Initiation of breastfeeding	Dummy	Refers to the initiating time of breastfeeding: '0' for ≥24 hours after birth and '1' for soon after birth
Duration of breastfeeding	Continuous	Refers to the total months of breastfeeding received by child since birth: measured in months
Colostrum received	Dummy	Refers to whether the child was provided with colostrum: '1' for given and '0' for not given
Initiation of supplementary feeding	Dummy	The age at which the child received supplementary food: '0' for age< 6 months and '1' for age ≥ 6 months
Immunization	Dummy	Refers to child receiving all necessary vaccinations: '1' for all vaccines covered and '0' for some vaccines missed
Total number of children	Continuous	Number of children in the household
Toilet	Dummy	Refers to the type of toilet facility used: '1' for sanitary and '0' for others
Access to safe drinking water	Dummy	Indicates the accessibility to safe water: '1' for safe and '0' for not safe

Source: Author's Own Calculation.

Table 2: Demographic characteristics of the study participants.

Mothers	Treated, n (%)	Controls, n (%)
Age (years)		
15-20	2 (2.86)	25 (10.87)
21-25	25 (35.71)	98 (42.61)
25-30	27 (38.57)	75 (32.61)
31-35	12 (17.14)	24 (10.43)
36 and over	4 (5.71)	8 (3.48)
Educational level		
Primary	20 (28.57)	73 (31.74)
Secondary	43 (61.43)	140 (60.87)
Higher secondary and above	7 (10)	17 (7.39)
Occupation		
Housewife	49 (70)	143 (62.17)
Small business	16 (22.86)	48 (20.87)
Agriculture	5 (7.14)	30 (13.04)
Others	0 (0)	9 (3.91)
Children		
Age (months)		
6-12	12 (17.14)	27 (11.74)
13-24	8 (11.43)	37 (16.09)
25-36	12 (17.14)	57 (24.78)
37-48	10 (14.29)	29 (12.61)
49-59	28 (40)	80 (34.78)
Gender		
Male	37 (52.86)	134 (58.26)
Female	33 (47.14)	96 (41.74)

Source: Author's calculation from field survey.

Table 3: Summary statistics of the matching variables.

Variables	Mean	Std. deviation	Minimum	Maximum
Continuous variable				
Child's age (Years/ months)	36.44	17.94	6	59
Mother's age (Years)	26.54	4.86	18	40
Mother's education level	7.13	2.94	1	12
Total number of children	2	0.866	1	5
Duration of breastfeeding	18.98	9.29	6	36
Categorical variables	**Percentage**			
Child's gender	1=43		0=57	
Mother's employment status	1=36		0=64	
Marital status of mothers	1=91.33		0=8.67	
Initiation of breastfeeding	1=68		0=32	
Colostrum received	1=70		0=30	
Supplementary-feeding initiation	1=74		0=26	
Toilet	1=51		0=49	
Access to safe drinking water	1=52		0=48	
Immunization	1=59		0=41	

Source: Author's calculation from field survey.

Table 4: Impact on height-for-age Z scores of children (Stunting status).

Matching method	Sample	Treated	Controls	Difference	SE	T stat
Nearest neighbor	Unmatched	-2.7252	-3.1155	0.3902	0.1728	2.26
	ATT	-2.7252	-3.0789	0.3536	0.1821	1.94
Radius caliper	Unmatched	-2.7252	-3.1155	0.3902	0.1728	2.26
	ATT	-2.7810	-3.1371	0.3561	0.1756	2.03
Kernel matching	Unmatched	-2.7252	-3.1155	0.3902	0.1728	2.26
	ATT	-2.7810	-3.1380	0.3569	0.1745	2.05

Source: Author's calculation from field survey.

Table 5: Impact on weight-for-height Z scores of children (Wasting status).

Matching method	Sample	Treated	Controls	Difference	SE	T stat
Nearest neighbor	Unmatched	-1.9152	-2.6029	0.6876	0.1715	4.01
	ATT	-1.9152	-2.5591	0.6438	0.1820	3.54
Radius caliper	Unmatched	-1.9152	-2.6029	0.6876	0.1715	4.01
	ATT	-1.9734	-2.6192	0.6457	0.1754	3.68
Kernel matching	Unmatched	-1.9152	-2.6029	0.6876	0.1715	4.01
	ATT	-1.9734	-2.6194	0.6459	0.1743	3.71

Source: Author's calculation from field survey.

Table 6: Impact on weight-for-age Z scores of children (Underweight status).

Matching method	Sample	Treated	Controls	Difference	SE	T stat
Nearest neighbor	Unmatched	-2.2552	-3.2403	0.9851	0.1723	5.72
	ATT	-2.2552	-3.1892	0.9340	0.1839	5.08
Radius caliper	Unmatched	-2.2552	-3.2403	0.9851	0.1723	5.72
	ATT	-2.3159	-3.2513	0.9354	0.1773	5.27
Kernel	Unmatched	-2.2552	-3.2403	0.9851	0.1723	5.72
	ATT	-2.3159	-3.2509	0.9349	0.1761	5.31

Source: Author's calculation from field survey.

DISCUSSION

In Bangladesh, the child health situation is a major source of concern. Several organizations have attempted to the resolve this issue by developing different family development programs in which mothers are given child nutrition training. The objective of this study was to see how these nutrition training program for mothers affects

the nutritional status of under-five children in Godagari Upazila, Rajshahi district. Training programs of such kind have long been thought to be a useful instrument for improving maternal knowledge of child nutrition and childcare practices. However, there is limited evidence available on a comprehensive assessment of the impact of such training programs in Bangladesh. Moreover, evaluating a program in a cross-sectional analysis in the context of selection bias is problematic. Hence, the current study attempted to evaluate the impact of child nutrition training obtained by mothers on children's nutritional status by applying the PSM method.

According to several studies, maternal nutrition training is linked to the reduction of childhood malnutrition as well as improved childcare practices,[19-22] whereas very few studies have found such training to be ineffective in its role of improving children's nutritional status.[23-24] According to the findings of this study, nutrition training programs affect positively on improving child nutrition in rural Bangladesh. More specifically, the models after matching showed positive significant impact of child nutrition training on the nutritional status of children in the study areas. One possible explanation for the favorable relationship between child nutrition training and children's nutritional status is that as mothers receive proper nutrition training, they become more aware of optimal nutritional food and childcare practices. Similar improvements in nutritional status and childcare practices due to the nutritional knowledge training received by mothers have been reported.[25-26] In addition, a study conducted in a relocated Delhi slum discovered that maternal education on childcare practices can help children in resource-poor situations in improving their nutritional status.[27] Overall, the study found that the prevalence of stunting, wasting, and underweight were significantly lower among the children whose mothers had received the training than among the children in the control group. Hence, child nutrition training for mothers improves both short term and long-term nutritional status of the children.

Despite the positive results found, this study suggests some policy recommendations that could further improve training programs of such kind. Firstly, training programs should involve both educating mothers with nutrition knowledge and providing them with access to microcredit so that they can earn income to feed their children appropriately. Secondly, the government needs to put in place a robust health surveillance system so that particular care can be provided to the most disadvantaged groups, such as the impoverished and most severely malnourished children, and rapid intervention may be carried out when necessary. Finally, in addition to face-to-face training, audio-visual clips can be shown about the merits of exclusive breastfeeding, sanitation, proper waste disposing, immunization, safe drinking water, etc. as parts of an improved intervention.

CONCLUSION

It has been observed from this study that most of the nutritional behaviors and activities needed in order to improve children's nutritional status need little economic investment to succeed but still, malnutrition continues to be a severe burden for Bangladesh. The results of this study indicates that mothers living in adverse conditions or low socio-economic status can still improve their children's nutritional status if they receive appropriate nutrition training.

ACKNOWLEDGEMENTS

Author would like to thanks to the respondents of this study. Also like to thank SOS children's village and world vision for their support by providing relevant information useful to this study.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Black RE, Victora CG, Walker SP, Bhutta ZA, Christian P, De Onis M. Maternal and Child Nutrition Study Group. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet. 2013;382(9890):427-51.
2. UNICEF D. Levels and trends in child malnutrition. Key findings of 2019 edition. New York: UNICEF. 2019.
3. Welch RM, Graham RD. A new paradigm for world agriculture: meeting human needs: productive, sustainable, nutritious. Field Crops Res. 1999;60(1-2):1-10.
4. Monte C. Malnutrition: a secular challenge to child nutrition. J Pediatr (Rio J). 2000;76(3):S285-97.
5. Müller O, Krawinkel M. Malnutrition and health in developing countries. CMAJ. 2005;173(3):279-86.
6. Donegan S, Maluccio JA, Myers CK, Menon P, Ruel MT, Habicht JP. Two food-assisted maternal and child health nutrition programs helped mitigate the impact of economic hardship on child stunting in Haiti. J Nutr. 2010;140(6):1139-45.
7. Muss C. Impact of prenatal nutrition on the cerebral development of the infant. J Nursing, Social Studies, Public Heal Rehabilitation. 2011;3(4):139-54.
8. Jesmin A, Yamamoto SS, Malik AA, Haque MA. Prevalence and determinants of chronic malnutrition among preschool children: a cross-sectional study in Dhaka City, Bangladesh. J Heal Population Nutrit. 2011;29(5):494.
9. Ahmed T, Mahfuz M, Ireen S, Ahmed AS, Rahman S, Islam MM, Cravioto A. Nutrition of children and women in Bangladesh: trends and directions for the future. J Heal Population Nutr. 2012;30(1):1.

10. Umapathi N. Maternal education, child-care and nutritional status: Lessons from a nutritional program. Job Market Paper, Institute for Fiscal Studies and Centre for Microdata Methods and Practice, University College London. 2008.
11. White H, Masset E. Assessing interventions to improve child nutrition: a theory-based impact evaluation of the Bangladesh Integrated Nutrition Project. Journal of International Development. J Develop Studies Asso. 2007;19(5):627-52.
12. Manda J, Gardebroek C, Khonje MG, Alene AD, Mutenje M, Kassie M. Determinants of child nutritional status in the eastern province of Zambia: the role of improved maize varieties. Food Security. 2016;8(1):239-53.
13. Waddington H, White H, Snilstveit B, Hombrados JG, Vojtkova M, Davies P et al. How to do a good systematic review of effects in international development: a tool kit. J Develop Effectiveness. 2012;4(3):359-87.
14. Khandker SR, Koolwal GB, Samad HA. Handbook on impact evaluation: quantitative methods and practices. World Bank Publications. 2009.
15. Becker SO, Ichino A. Estimation of average treatment effects based on propensity scores. Stata J. 2002;2(4):358-77.
16. Rosenbaum PR, Rubin DB. The central role of the propensity score in observational studies for causal effects. Biometrika. 1983;70(1):41-55.
17. Caliendo M, Kopeinig S. Some practical guidance for the implementation of propensity score matching. J Economic Surv. 2008;22(1):31-72.
18. Thavaneswaran A, Lix L. Propensity Score Matching in Observational Studies. Manitoba Centre for Health Policy. University of Manitoba, Canada. 2008.
19. Ickes SB, Baguma C, Brahe CA, Myhre JA, Adair LS, Bentley ME et al. Maternal participation in a nutrition education program in Uganda is associated with improved infant and young child feeding practices and feeding knowledge: a post-program comparison study. BMC Nutr. 2017;3(1):1-10.
20. Reinsma K, Nkuoh G, Nshom E. The potential effectiveness of the nutrition improvement program on infant and young child feeding and nutritional status in the northwest and southwest regions of Cameroon, Central Africa. BMC Heal Serv Res. 2016;16:1-9.
21. Kalimbira AA, MacDonald C, Simpson JR. The impact of an integrated community-based micronutrient and health programme on stunting in Malawian preschool children. Pub Heal Nutr. 2010;13(5):720-29.
22. Remans R, Pronyk PM, Fanzo JC, Chen J, Palm CA, Nemser B et al. Multisector intervention to accelerate reductions in child stunting: an observational study from 9 sub-Saharan African countries. Am J Clin Nutr. 2011;94(6):1632-42.
23. Dewey KG. Reducing stunting by improving maternal, infant and young child nutrition in regions such as South Asia: evidence, challenges and opportunities. Maternal Child Nutrit. 2016;12:27-38.
24. Nikièma L, Huybregts L, Martin-Prevel Y, Donnen P, Lanou H, Grosemans J et al. Effectiveness of facility-based personalized maternal nutrition counseling in improving child growth and morbidity up to 18 months: A cluster-randomized controlled trial in rural Burkina Faso. PloS one. 2017;12(5):e0177839.
25. Berisha M, Ramadani N, Hoxha R, Gashi S, Zhjeqi V, Zajmi D et al. Knowledge, attitudes and practices of mothers in kosova about complementary feeding for infant and children 6-24 months. Med Arch. 2017;71(1):37.
26. Jemide JO, Ene-Obong HN, Edet EE, Udoh EE. Association of maternal nutrition knowledge and child feeding practices with nutritional status of children in Calabar South Local Government Area, Cross River State. Nigeria. Int J Home Sci. 2016;2(1):293-8.
27. Sethi V, Kashyap S, Seth V. Effect of nutrition education of mothers on infant feeding practices. Ind J Pediatr. 2003;70(6):463-6.

Cite this article as: Hossain SMA, Hossain ME. Impact of child nutrition training for mothers on the nutritional status of children: a propensity score matching approach. Int J Community Med Public Health 2022;9:4304-12.