

Identifying Demographic and Socio-economic Factors of Influencing the Size of the child at Birth in Bangladesh

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ABSTRACT

Low birth weight is a predominant public health apprehension and one of the leading causes of early neonatal mortality in developing countries. The purpose of the study is to identify the demographic and socio-economic factors that influence the size of the child at birth in Bangladesh. This study utilized the child dataset from the Bangladesh Demographic and Health Survey (BDHS) 2014. A sample of size 4728 toddler who born inside 5 years of the survey was recorded from their mother. Univariate, bivariate and multivariate analysis are performed to show the prevalence of small-sized birth and its association with some socio-economic and demographic factors. About 20% of new-born child were reported as small size, 67% were average and 13% were large. Antenatal care visits, mothers' education level, division, place of residence, media exposure, mothers' age at birth, wealth index and fathers' education level, mothers' height and BMI, the gender of the child had a significant association with the birth size of Bangladeshi child. Mothers who were illiterate have greater chance to birth small-sized baby than literate mothers. Sylhet division is in poor condition compared to Chittagong and Dhaka division to have a small birth size. Female babies and multiple births have more risk than male babies and single birth to be smaller in size respectively. The authority can take necessary measures based on the outcomes of the study to increase the size of child at birth in Bangladesh.

Keywords

Size at birth, Low birth weight, Antenatal care, BDHS, Bangladesh

Introduction

The size of a new-born baby at birth has been identified as an important health indicator of the baby's health and intellectual growth and it is one of the most important indices in estimating the maturity of the new-born [1]. New-borns child birth weight depends on the mother's gestational age, pre-gestational BMI, and gestational weight and female new-borns' body fat mass is higher than male new-borns' fat mass [2]. Massive studies have done about long-run effects of low birth weight (LBW), adulthood diseases risk [3,4], health risk at ages 23 to 33 year [5], lower LBW rates of high-school students [6], health and IQ effect related to educational and earnings [7,8,9] and next-generation birth effect [10]. World Health Organization (WHO) defined LBW as child birth weight of fewer than 2,500 grams (5.5 pounds). Seen more in developing countries than in developed countries, birth weight contributes below 2,500 grams to an extent of impoverished health effects [11]. A survey from Nepal, 16.0% of children were small size at birth and 11.5% birth weight of infants had low birth weight (<2500 grams). The mothers who had no antenatal visits (OR = 1.315; 95% CI: 1.042-1.661) and lived in the Far-western development region (OR = 1.698; 95% CI: 1.228-2.349) were likely to have small size infants [12,13,14]. According to the Danish Longitudinal Survey of Children (DLSC) data, the consequence of a child low birth weight involves growing mental and physical growth at ages 6 months, 3, 7 and 11 years [15]. Weight during the birth of a child affects his subsequent physical growth and education [16]. The effects of child low birth weight are related to maternal education and low educated mothers are born low birth weight children [17]. Maternal education is closely linked to subsequent child care and upbringing [18,19]. Babies born to mothers in food-insecure families were 38 % smaller in size than food-safe families (adjusted OR = 1.38; 95% CI: 1.19- 1.59; P < 0.001) [20]. Child age

between 0-23 months Birth weight and length at birth, and maternal short stature were prevalent risks of stunting [21]. The medium-term education health effects associated with low birth weight in the family [22].

Despite being a developing country in South Asia, Bangladesh has the highest LBW infant in the world. According to BDHS data 2011, 17.2% of the new-born children were reported as very and less than average in size whereas 69% of children reported as average in size and the rest were very large and larger than average [23]. Child size at birth in Bangladesh is not yet a priority in the national health program. Parents and health providers are still less concerned about the causes and consequences of the small-sized child at birth. Thus, the aims of the study to identify the demographic and socio-economic factors associated with small size at birth and which factors influence the size of the child at birth based on the recent BDHS 2014.

Materials and Methods

The study data exploited from BDHS 2014 for the analysis. This survey was implemented through a collaborative effort of the National Institute of Population Research and Training (NIPORT), of the Ministry of health and family welfare. The survey is based on a two-stage stratified sample of households. In the first stage, 600 EA's (Enumeration Area) were selected with probability proportional to the EA size, with 207 EAs in urban areas and 393 in rural areas. A complete household listing operation was then carried out in all the selected EAs to provide a sampling frame for the second-stage selection of households. In the second stage of sampling, a systematic sample of 30 households on average was selected per EA to provide statistically reliable estimates of key demographic and health variables for the country, for urban and rural areas separately, and for each of the seven divisions. With this design, the survey selected 18,000 residential households, which were expected to result in completed interviews with about 18,000 ever married women [24]

Variables

In BDHS 2014 data set, size of child at birth recalled by mother had five categories such as very large, larger than average, average, smaller than average and very small and in this paper, we converted the categories smaller than average and very small as "small" and converted the categories very large, larger than average, average as "not small". On the other hand, there was no mothers' age at birth. Mothers' age at birth was calculated from mothers' current age minus date of child's birth and was categorized as less than 20 years, 20–29 years, 30–34 years and 35 years and above. Parent educational level had four categories as "no education", "primary education", "secondary education" and "higher education". The division represents seven administrative divisions such as Dhaka, Chittagong, Khulna, Rajshahi, Sylhet, Barisal and Rangpur. Place of residence categorized into urban and rural. In the BDHS data set, the wealth index had five categories Poorest, poorer, Middle, Richer and Richest but in this study we converted into poorer and poorest as 'poor' and the categories Middle as 'Middle' and the categories richer and richest as 'rich'. For media exposure variable, asked the respondents if they listened to the radio, watched television, or read newspapers or magazines at least once a week then adding these three variables: Frequency of reading newspaper or magazine ("yes = 1", "no = 0"), Frequency of listening to the radio ("yes = 1", "no = 0"), Frequency of watching television ("yes = 1", "no = 0"), make "media exposure" variable with coded as "0" for no access to media

and “1” for having access to any media. Employment Status of mother has two categories: Unemployed and Employed. According to WHO, we categorized adults’ body mass index (BMI) by below 18.5 as “underweight”, 18.5-24.9 as “normal weight” and above 25 as “overweight”. However, Mothers who visited antenatal care during maternity often known and accepted a medical procedure provider and categorize antenatal visit as “no visit”, “1-3 visits” and “4 or more visits”. Based on WHO definition, mothers’ height measures as “<145 centimetres” and “145 centimetres or more”. Wanted pregnancy variable was defined as whether the mother was wanted this child or not then mother answered for this question as "then" and "later", "no more". In BDHS 2014 mothers were asked about their health complications during pregnancy and then answered this question as "yes" or "no". Birth order of the child was categorized as "1st birth", “2nd or 3rd birth”, “4th or more birth”. Birth interval is categorized as “less than 24 months” and “24 months or more”. In the data set child is twin has 6 categories: single birth, 1st of multiple, 2nd of multiple, 3rd of multiple, 4th of multiple, 5th of multiple and converted these categories into two categories whether child is twin or not: “Yes” or “No”. Gender of the child categorized as “Male” or “Female”.

Results

Table 1 represents the percentage of the pregnant mother made this list according to the weight of her baby at the time of birth of her living baby. The result showed that the average-sized newborn baby was highest (3184) of 4728 children where the rests were in large or small categories. This also revealed that 6.5% of children were born very small size from the mother womb, 13.2% as smaller than average in size and 80.3% were perceived as greater than or equal average in size.

Table-1: The frequency distribution of the birth of all living children by mother.

Perceived size of child	Frequency	Percentage (%)
Very large	104	2.2
Larger than average	512	10.8
Average	3184	67.3
Smaller than average	621	13.2
Very small	307	6.5
Total	4728	100

Table 2 represents the outcomes of the bivariate analysis for birth size with all independent variables. The results indicated significant association of maternal age at birth, mothers’ education, fathers’ education, ANC visits, height of mothers, BMI of mothers, birth order of the child, gender of the child, mothers’ employment status, twin baby, division, place of residence and wealth index with the size of the baby at birth. Out of all independent variables, four appears insignificant as the p-value is greater than 0.05. These variables are mothers’ employment status, Intention of pregnancy, pregnancy complications and birth interval.

Table 2: Distribution of the size of the child at birth as perceived by mothers according to background characteristics, BDHS 2014.

Variable	Frequency	Percentage	Size of the child at	χ^2	df	P-
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		(%)	birth				value
			Not Small (%)	Small (%)			
Mothers' Age at Birth of Child (n=7886)							
< 20	2537	32.2	83.2	16.8	26.789	3	0.000
20-29	4118	52.2	80.7	19.3			
30-34	867	11.0	75.6	24.4			
35+	364	4.6	71.8	28.2			
Mothers' Educational Level (n=7886)							
No education	1233	15.6	72.6	27.4	45.807	3	0.000
primary	2206	28.0	78.5	21.5			
Secondary	3621	45.9	82.3	17.7			
Higher	826	10.5	86.5	13.5			
Fathers' Educational Level (n=7884)							
No education	2008	25.5	74.7	25.3	43.488	3	0.000
primary	2377	30.1	79.2	20.8			
Secondary	2360	29.9	83.2	16.8			
Higher	1139	14.4	85.6	14.4			
Division (n=7886)							
Barisal	906	11.5	83.6	16.4	48.191	6	0.000
Chittagong	1517	19.2	79.1	20.9			
Dhaka	1378	17.5	78.3	21.7			
Khulna	862	10.9	82.2	17.8			
Rajshahi	959	12.2	85.2	14.8			
Rangpur	958	12.1	85.0	15.0			
Sylhet	1306	16.6	73.2	2.6			
Place of Residence (n=7886)							
Urban	2488	31.5	82.4	17.6	5.854	1	0.016
Rural	5398	68.5	79.4	20.6			
Wealth Index (n=7886)							
Poor	3240	41.1	77.5	22.5	21.831	2	0.000
Middle	1516	19.2	79.8	20.2			
Rich	3130	39.7	83.5	16.5			
Mothers' Mass Media Exposure (n=7873)							
No	3053	38.8	77.3	22.7	17.862	1	0.000
Yes	4820	61.2	82.3	17.7			
Mothers' Employment Status (n=7884)							
No	5905	74.9	80.5	19.5	0.061	1	0.805*
Yes	1979	25.1	80.1	19.9			
Mothers' Body Mass Index (n=7825)							
< 18.5	1767	22.6	75.5	24.5	26.349	2	0.00
18.5-24.99	4565	58.3	81.3	18.7			
≥ 25.0	1493	19.1	84.3	15.7			
Mothers' Height (n=7883)							

< 145	986	12.5	76.1	23.9	8.067	1	0.005
≥ 145	6897	87.5	81.0	19.0			
Antenatal Care (ANC) Visit (n= 4494)							
0	964	21.5	75.5	24.5	21.198	2	0.000
1-3	2089	46.5	81.3	18.7			
4+	1441	32.1	82.9	17.1			
Intention of Pregnancy (n= 4727)							
Then	3564	75.4	80.3	19.7	0.167	2	0.920*
Later	693	14.7	80.2	19.8			
No More	470	9.9	81.1	18.9			
Pregnancy Complicacy (n= 3525)							
No	1860	52.8	81.6	18.4	0.266	1	0.606*
Yes	1665	47.2	82.3	17.7			
Birth Order (n=7886)							
1	3094	39.2	79.4	20.6	13.107	2	0.001
2-3	3578	45.4	82.5	17.5			
4+	1214	14.4	76.6	23.4			
Birth Interval (n=982)							
< 24	359	36.6	83.0	17.0	1.117	1	0.290*
≥ 24	623	63.4	76.8	23.2			
Child in Twin (n= 7886)							
No	7768	98.5	80.8	19.2	40.742	1	0.000
Yes	118	1.5	48.4	51.6			
Gender of Child (n= 7886)							
Male	4061	51.5	81.6	18.4	5.002	1	0.025
Female	3825	48.5	79.0	21.0			

Note that: i. (*) indicates the insignificant at a 5% level of significance. ii. The number of missing values may vary for each variable. The percentages presented are valid percentages.

It was revealed from Table 3 that mothers who belong to Dhaka division (OR=1.635; 99%CI=1.208-2.213) had 1.635 times, 1.439 times for Chittagong division (OR=1.439; 99%CI=1.109-2.010) and 1.734 times for Sylhet division (OR=1.734; 99%CI=1.734-2.347) likely to have a small child at birth than mother who belongs to Barisal division. Female babies (OR=1.228; 99%CI=1.054-1.432) are found to have about 23% higher risk of being smaller birth than a male counterpart. Mother's having greater or equal 145cm height (OR=0.762; 95%CI=0.611-0.951) were 0.762 times risk of giving small-sized child compared to outcomes of mother's height less than 145cm. Mothers have about 23%, 21% and 34% less chance to procreate small-sized child at birth for primary education (OR=0.769; 95%CI=0.599-0.987), secondary education (OR=0.790; 90%CI=0.603-1.035) and higher education (OR=0.665; 90%CI=0.438-1.009) of mothers respectively compare to mothers who have no education. Wealth index is very much important and has a significant effect on the birth size of the child at a 10% level of significance (OR=0.792; 90%CI=0.619-1.011). Child of a rich family has 0.792 times less likely to born in a small size than a child who belongs to a poor family. Children who born in 2nd or 3rd order, have 0.775 times less chances to be the small size (OR=0.775; 99%CI=0.651-0.923) than the birth of 1st order. Comparing with 1st birth, 4th or more ordered child (OR=0.801;

90%CI=0.62-1.036) are 0.801 times less likely to be small at birth. The twin babies are about 4.00 times more likely to be small in size compare a singleton.

Table 3: Regression parameter estimates, standard errors, odds ratio and corresponding p-values obtained by the binary logistic regression model.

Variable	β	S.E.	P-value	Odds Ratio	95% C.I. for Odds ratio	
					Lower	Upper
Division						
Barisal ^(R)				1		
Chittagong	0.401	0.152	0.008***	1.493	1.109	2.01
Dhaka	0.492	0.155	0.001***	1.635	1.208	2.213
Khulna	0.221	0.171	0.196	1.247	0.893	1.742
Rajshahi	-0.12	0.177	0.497	0.887	0.627	1.254
Rangpur	-0.101	0.174	0.562	0.904	0.643	1.272
Sylhet	0.551	0.154	0.000***	1.734	1.282	2.347
Place of Residence						
Urban ^(R)				1		
Rural	0.021	0.098	0.827	1.022	0.843	1.238
Mothers Education						
No education ^(R)				1		
Primary	-0.263	0.128	0.039**	0.769	0.599	0.987
Secondary	-0.236	0.138	0.087*	0.790	0.603	1.035
Higher	-0.408	0.213	0.055*	0.665	0.438	1.009
Fathers Education level						
No education ^(R)				1		
primary	-0.085	0.11	0.438	0.918	0.741	1.139
Secondary	-0.178	0.127	0.161	0.837	0.652	1.073
Higher	-0.162	0.181	0.37	0.85	0.597	1.212
Sex of Child						
Male ^(R)				1		
Female	0.206	0.078	0.009***	1.228	1.054	1.432
Mass Media Exposure						
No ^(R)				1		
Yes	0.027	0.101	0.79	1.027	0.843	1.253
Wealth Index						
Poor ^(R)				1		
Middle	-0.027	0.116	0.817	0.974	0.776	1.221
Rich	-0.234	0.125	0.061*	0.792	0.619	1.011
Mothers Height						
< 145cm ^(R)				1		
≥ 145 cm	-0.272	0.113	0.016**	0.762	0.611	0.951
Mothers Body Mass Index						

< 18.5 ^(R)				1		
18.5-24.99	-0.139	0.143	0.33	0.87	0.657	1.151
≥ 25	-0.167	0.211	0.43	0.847	0.56	1.281
Antenatal Care Visit						
0				1		
1-3	-0.161	0.103	0.117	0.851	0.696	1.041
4+ ^(R)	-0.104	0.121	0.392	0.901	0.711	1.143
Birth Order						
1 ^(R)				1		
2-3	-0.255	0.089	0.004***	0.775	0.651	0.923
4+	-0.221	0.131	0.091*	0.801	0.62	1.036
Child in Twin						
No ^(R)				1		
Yes	1.393	0.395	0.00***	4.026	1.856	8.734
Mother's Age at Birth of Child						
< 20 ^(R)				1		
20-29	-0.006	0.13	0.96	0.994	0.77	1.282
30-34	0.126	0.211	0.55	1.135	0.75	1.716
35+	0.231	0.249	0.355	1.259	0.772	2.053
Note that: (*) indicates the significant at 10% level of significance. (**) indicates the significant at a 5% level of significance. (***) indicates the significant at a 1% level of significance.						

Although the bivariate analysis in Table 2 showed significant association between maternal perceived small size at birth of babies and age of mothers at birth of babies, fathers' education, mothers' BMI, place of residence, fathers' education, ANC visit and media exposure but these factors showed no significant independent effect on size at birth after controlling the effects of other factors in multivariate analysis. This is possible reason behind the outcomes that effect of these factors may be confounded with the effects of other factors. For example, mothers' education and fathers' education may be confounded with wealth index, maternal age is confounded with birth order and BMI is likely to be confounded with height of mothers.

Discussions

This study was conducted to explore some important factors that influence the size of the child. The result indicated that about 20% of new-born babies were assigned as small size at birth in Bangladesh. The rest 80% of babies were either average or larger in size. From this study, one in every five infants in Bangladesh was small at birth. This percentage of small sized children at birth is slightly greater than the percentage (17%) from the study [23] based on the data BDHS2011[28]. This result can be compared with the socio-economic and population of our neighbouring countries India and Nepal. The proportion of small-sized babies were 20.5% (2007) in India and 17% (2011) in Nepal [12]. From bivariate analysis, the variables mothers' age at birth, mothers' education, fathers' education, ANC visits, height of mothers, BMI of mothers, birth order of the child, gender of the child, mothers' employment status, twin baby, birth interval, division, place of residence and wealth index have significant association with size of child at birth. This result is consistent with other study [23]. Mother's education level showed

negative association with the small sized child at birth. This finding is fully supported by previous studies [12,23]. Educational level of mother affects the size of the babies at birth by increasing the mother's knowledge about healthy lifestyles and healthcare processes and greater use of healthcare services by mothers. This study also found the divisional variations regarding birth size in Bangladesh. The highest prevalence of small-sized baby was found in Dhaka and Chittagong and lowest prevalence was in the Sylhet. But Infants from Dhaka and Sylhet region had relatively higher risk of being smaller. Sylhet is the eastern division and Dhaka is an overpopulated division of Bangladesh where poor access to health care services and utilization and low social status of women [24]. The wealth index has a significant negative association with the size of the child at birth both in bivariate and multivariate analysis but some other studies [12,23,25] had no such significant relationship. With increasing the level of wealth index from poor to rich, the likelihood of bearing small sized child is decreasing. The birth order of children showed significantly independent effects on child size at birth. Our findings agree with other studies [25,26]. The observed higher risk of small sized baby among first time or lower order births may be associated with mothers' young or advanced age and unplanned pregnancy. The odds of small-sized child at birth are higher among female child as compared to male counterpart. This finding is in line with studies conducted in Nepal [12]. The important significant determinant of child size at birth in several studies, ANC visit [12,23] was not significantly associated with the size of child at birth in logistic regression (significant in bivariate analysis) of this study. The possible reasons could be the awareness of women and opportunity to get medical facilities in online.

Conclusion

The present study revealed one in five infants born had small sized as perceived by the mothers. The size of child at birth had a significant association with some socioeconomic and demographic variables such as maternal age at birth, mothers' education, fathers' education, ANC visits, height of mothers, BMI of mothers, birth order of the child, gender of the child, mothers' employment status, twin baby, division, place of residence and wealth index. The findings of higher prevalence of small sized babies as perceived by mothers in Dhaka and Sylhet divisions underscore the requirement to develop policies specific to these regions. It is necessary to find out why these regions have higher incidence of small size baby and build up specific solutions for these regions. Ensure education to make women aware of the causes and consequences of small sized babies at birth.

Conflict of interest

All authors declare that there is no conflict of interest.

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