International Journal of Statistical Sciences *ISSN 1683-5603*
Vol. 21(1), 2021, pp 147-158

Factors Affecting Birth Weight of a Newborn – A Community Based Study in Gopalganj, Bangladesh

Md. Murad Hossain[1*], Syeda Nazmun Nahar[2] and Md. Minhajul Islam[3]

[1]Department of Statistics, Faculty of Science,
Bangabandhu Sheikh Mujibur Rahman Science and Technology University,
Gopalganj-8100, Bangladesh
Email: sadid.shimul@gmail.com

[2,3] Department of Statistics, M.Sc. student,
Bangabandhu Sheikh Mujibur Rahman Science and Technology University,
Gopalganj-8100, Bangladesh
Email: nazmunnahar68.stat@gmail.com, minhajstat9@gmail.com

[*]Correspondence should be addressed to Md. Murad Hossain
(Email: sadid.shimul@gmail.com)

[Received November. 10, 2020; Revised January 10, 2021; Accepted February 15, 2021]

Abstract

Birth weight is one of the indicators of newborn health. Most of the people do not have proper knowledge about birth weight. In this paper, we tried to know which factors are associated with the birth weight status of the newborn. This was a survey-based study from different places such as Government hospitals, private hospitals, and different areas. This information was collected from the mother by a pre-tested questionnaire. We collect 150 newborn weights at 0-6 month and all birth weights were measured within 24 hours of delivery. The variables age of pregnant women, pregnancy time, day time rest during pregnancy, antenatal care have been considered important factors for newborn birth weight. The dependent variable was chosen for birth weight. Bivariate analysis is used to assess the association between birth weight and a list of independent variables. The binary logistic model was applied to detect the impact of a factor the independent variable of the Pearson chi-square test. All statistical analysis become executed the usage of SPSS model 20 software program. A p-value <.05 was considered significant.

Keywords: Birth Weight, pregnancy time, rest during pregnancy, antenatal care.

AMS Classification: 91D20.

1. Introduction

Birth weight is the first weight of the new child received after beginning. The birth weight of less than 2.5 can be considered as low birth weight and greater than or equal to 2.5 can be considered normal birth weight. Birth weight is closely associated with the health and survival of infants in the developing world [3]. Birth weight depends on many factors some of them are antenatal care, nutritional status of the mothers during pregnancy, weight during pregnancy, age of pregnant women, etc. A better weight of babies was found among mothers who had received antenatal care, through their pregnancy period. The incidence of low birth weight babies was found much more among mothers who did not receive any antenatal care during their pregnancy period [6]. Antenatal care is the care that mothers had receive during pregnancy which included regular checkups from a specialist, take different types of tablets, TT injection, eat balanced food, etc. Maternal nutrition status during pregnancy has been considered an important prognostic indicator of birth outcome [9]. Women who have a poor nutritional status at conception are at higher risk of disease and death (World Health Organization (WHO) 2012). The age of pregnant women is one of the causes of baby birth weight. Mothers who are young (<20 years) or old (>35 years) are more likely to give birth to LBW infants than those aged 20-35 years (Eisner et al., 1979; Lee et al., 1988; Tin et al., 1994; Dhār et al., 2003)[11].

2. Literature Review

LBW (<2,500 g) is a major public health problem in Bangladesh. Over one-third of infants (36%) had LBW, a prevalence which is more than twice 15% threshold that indicates a public health problem. Less than 1% of infants were born with VLBW (<1,500 g) [11]. A survey on Incidence of and Risk Factors for Small Size Babies in Bangladesh. They studied 8,588 children born within five years of the survey among them 485 (17.2%) were reported as small in size at birth in Bangladesh. No ANC or inadequate ANC appeared as a significant predictor of small size babies. Mother's education, parity, pregnancy planning, and region of residence are the other significant determinants of having small size babies [4]The predictors of new born birth weight were maternal MUAC (maternal mid-arm circumference), parity and wealth index [1]. The significant determinants associated with the mothers who delivered LBW babies were as follows: age of the mother <20 years (57.1%), literacy rate (illiterate 56.3%), and weight gain

during pregnancy <6.5 kg (92.9%), day time rest during pregnancy <2 h (66.7%), birth interval <2 years (73.3%), and hemoglobin level of the mother at the time of delivery <11 g/dL (64.9%) [2].The Predictor variables Maternal diseases, nutation, physical work, past obstetric comphcatlons, compactions of pregnancy and utllizatiohot ANC services and find out the predictors those are significantly associated with maternal complication of current pregnancy, past obstetric history, maternal diseases, ANC status, dietary intake and nature of work dung pregnancy. This predictors are also causes of low birth weight [5]. The maternal factors like education, nutritional status, knowledge regarding maternal nutrition, hemoglobin status, multigravida, spacing, weight gain during pregnancy has got significant association in determining the birth weight of the baby [7].The most important factor influencing the birth weight of new born is the socioeconomic environment that has the direct influence on maternal nutrition, height, and weight and Hb% [8].The best predictor of birth weight as a continuous variable was maternal weight at registration [9]. Many countries have programs offering special assistance to women thought to be at risk for giving birth to a low birth weight infant. Programs providing emotional support, practical assistance, and advice have been offered in addition to usual care [10].

In our study we categorize the new born birth weight in two category (less than or equal to 2.5 & greater than 2.5).The previous report most of them work about low birth weight. But in our study we work both normal birth weight and low birth weight. The objectives of the study is to find the association between maternal factor and birth weight, examine the effect of antenatal care on birth outcome and increase concern about the importance of birth weight. The main objective is to find out which factors are associated with the new born baby birth weight.

3. Materials & Methods

This is a cross sectional study, where data were collected through face to face interview, using a pre-tested questionnaire. Questionnaire were found to get information from an individual mother of the new born baby about their (mother) age, education status, occupation, husband occupation, rest time during pregnancy, amount of taken during pregnancy, antenatal care during pregnancy, complication at different time, iron tablets and its sources, practice during pregnancy, perception of the mother and baby after birth, birth weight of the new

born etc. We use the simple random sampling procedure for collecting the sample. We collect 150 samples randomly from different Government, non-government health care institutes and different household in Gopalganj from the time period of June to July, 2018. Frequency tables, bivariate tables and graphs have been used in study for analysis. Here we use several procedure such as Chi-square test, Binary logistic regression, Odds Ratio. All statistical analysis was performed using SPSS version 20 software.

3.1. Chi-square statistic

The chi square statistic is defined as

$\chi^2 = \sum_i \frac{(O_i - E_i)^2}{E_i}$, Where O_i the observed number of cases in category i, andE_i is the expected number of cases in category i.

3.2. Odds and Odds Ratio

Odds are the ratio of probability of an event will occur divided by the probability of it will not occur. Mathematically

Odds= $\frac{P(Success)}{P(Failure)} = \frac{P}{1-P}$ where p is the probability of success

Odds always have values greater than zero and if odds value is larger than one it means that success will occur more likely than failure. Odds ratio, as the name indicates, is the ratio of two Odds. Mathematically Odds ratio = $\frac{\frac{P_1}{1-P_1}}{\frac{P_2}{1-P_2}}$

Here, P_1 and P_2 refer to the probability of success in group 1 and group 2 respectively.

3.3. Logistic Regression Model

Logistic regression model looks familiar especially to someone who is familiar with linear regression, like standard regression it used a regression equation with coefficients for all regressed variables but Logistic regression regress against the logit of dependent variable, not the dependent variable itself. Additionally, binary logistic regression is a type of regression analysis where the dependent variable is

a dummy variable. The logistic regression model use logit transform and formula represented as

$\ln\frac{P_i}{1-P_i}=\beta_0+\beta_1x_{1i}+\beta_2x_{2i}+\ \ldots\ldots\ldots\ldots\ldots\ \ldots\ldots+\beta_kx_{ki}$

Where p_i= P (Y_i =1) =1- P (Y_i =0), (Y_i =1), (Y_i =0) is the probability of success and failure of an observation i respectively.

β_0 = log-odds when all x_{ji} are 0

β_j= increase in log-odds when x_{ji} is increased by one unit, j=1, …,k

e^{β_j} = increase in odds when x_{ji} is increased by one unit, j=1,… k

4. Result and Statistical Analysis

In this study 150 new born birth weight was concerned. From the survey we found that 64% of the new born baby are boy and 42.7% are girl. The age of the 24% mothers of new born baby is in the interval 15-19, the age of the 30.7% mothers is in the interval 20-24, the age of the 28% mothers is in the interval 25-29, the age of the 17.3% mothers is in the interval >=30. The occupation of the new born father were found 24.67% are farmer,24.67% are Business man, 14.67% are Govt. worker ,12% are Driver/electrician,18.66% are Non govt. Job, 2.67% are Foreigner and 2.67% are others in the study. The income –expenditure status of the 24% households are surplus, 34% are equal, 29% are sometimes deficit and 13% are always deficit in our study. Here 5% women taken more than normal food during pregnancy, 38% taken same as usual and 57% taken less than normal. The rest time during pregnancy time were found that 37% take less time rest during pregnancy, 45% take proper or medium rest and 18% take good rest during pregnancy. It was found that 45.3% face Complication after 6 months of pregnancy up to the time of delivery and 42.7% who do not face this, 29.3% have complication at time of this delivery and 54.3% not and 57.3% have problem within 2 weeks of delivery and 70.7% not in our study. The 20% mothers went to govt. hospital for treatment during pregnancy time , 37% went private clinic, 11% went to family Planning, 3% went Village doctor, 9% went to NGO clinic and 20% are did not take any treatment. The 23.3% women do not take iron tablets during pregnancy, 11.3% take less than one month, 8% take 1-2 months, 32% take

2-3 months and 25.3% take 3-4 months or above. All of the birth weight 18% new born weight is <2.5 and 82% new born weight is >=2.5 in our study.

Table 4.1: Graphical representation of some Univariate analysis

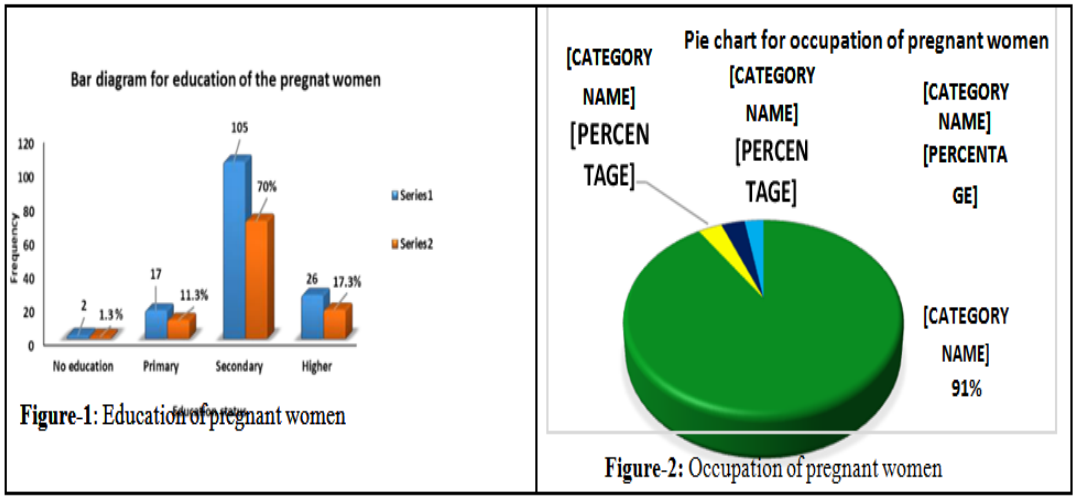

Figure-1: Education of pregnant women

Figure-2: Occupation of pregnant women

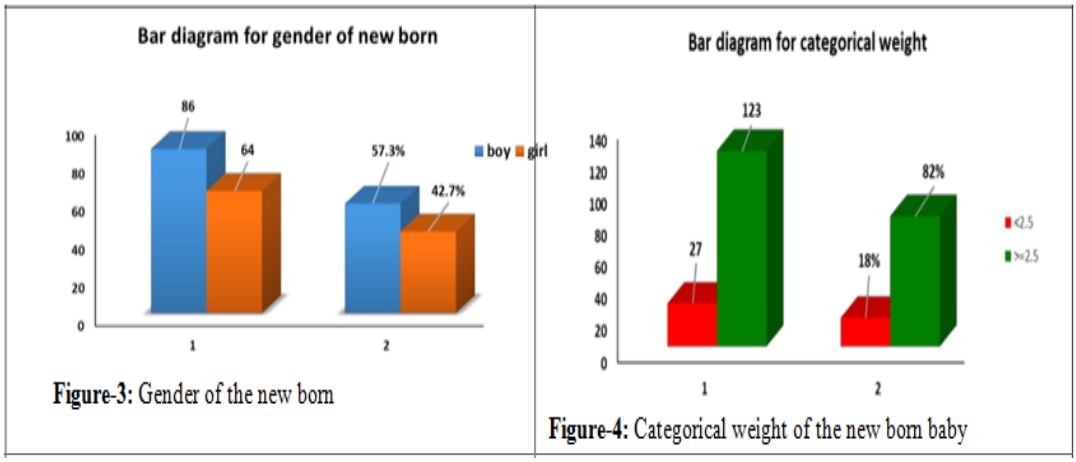

Figure-3: Gender of the new born

Figure-4: Categorical weight of the new born baby

In figure-1, the educational status of the mothers were found 1.33% are not educated, 11.33% have primary education, 70% have secondary education & 17.33% mothers are higher educated. In figure-2, the occupation of the mothers were found 90.67% are housewife, 3.33% are Govt.job, and 3.33% occupation is

company job and 2.67% doing other work. In figure-3 showed that 64% of the new born baby are boy and 42.7% are girl and in figure-4,we see that 18% new born weight is <2.5 and 82% new born weight is >=2.5 in our study.

Table 4.2: Bivariate analysis for different characteristics

Variables and their Categories	Weight		df	Pearson	P value
	<2.5	>=2.5			
Age of the pregnant women					
15-19	12	21	3	10.231	0.017
20-24	5	42			
25-29	5	36			
<=30	5	24			
Income-Expenditure					
Surplus	5	32	3	8.702	.034
Equal	7	44			
Sometimes deficit	7	36			
Always deficit	8	11			
Weight of the pregnant women					
40-45	5	5	4	17.008	.002
45-50	5	47			
50-55	5	47			
55-60	6	22			
>60	6	2			
Pregnancy time					
<8 month	9	12	2	10.896	.004
8-9 month	11	55			
>9month	7	56			
Amount of food taken during pregnancy					
More than normal	5	7	2	7.073	.029
Same as usual	6	52			
Less than normal	16	64			
Antenatal care					
Yes	11	94	1	14.299	.001
No	16	29			

Variables and their Categories	Weight		df	Pearson	P value
	<2.5	>=2.5			
Treatment					
Government Hospital	5	40	5	18.334	.040
NGO	6	50			
Private Clinic	6	10			
Pharmacy	7	5			
Village doctor	8	11			
Do not Know	10	12			
Perception of the pregnant women health after born of the baby					
Good	14	91	2	7.871	.020
Average	5	6			
Bad	8	26			
Perception of the baby health after birth					
Good	7	86	2	9.916	.003
Average	8	2			
Bad	12	35			

Bivariate analysis suggested that a considerable involvement between age of the pregnant women and dichotomous dependent variable of birth weight and we observed that the calculated value of the chi-square and the p value at the chosen level of significance. Therefore, we may conclude that there is association between weight of the new born and age of the pregnant women because the p value is less the level of significance under consideration. Pregnancy time is very important variable significantly impact on this dichotomous dependent variable. In bivariate analysis the other variables amount of food taken during pregnancy, antenatal care, treatment, perception of the pregnant women health after born of the baby and perception of the baby health after birth appeared to be influential impact of birth weight because having large chi-square standards and $p<.05$ for every case.

Table 4.3: Binary Logistic Regression Model with Selecting Independent Variables and Binary Categorized Birth Weight

Predictors	P value	Odds ratio
Age of the pregnant women		
15-19(Ref)	0.00	
20-24	0.002	0.04
25-29	0.049	1.175
<=30	0.058	0.05
Income-Expenditure		
Surplus(Ref)	0.017	
Equal	0.007	6.545
Sometimes deficit	0.007	5.143
Always deficit	0.019	4.208
Pregnancy time		
<8 month(Ref)	0.008	
8-9 month	0.003	0.167
>9month	0.036	0.625
Antenatal care		
Yes (Ref)	0.029	
No	0.00	7.829
Treatment		
Government Hospital(Ref)	0.00	
NGO	0.009	24.23
Private Clinic	0.00	19.5
Pharmacy	0.012	6.5
Village doctor	0.009	24.23
Do not Know	0.014	8.25
Perception of the baby health after birth		
Good(Ref)	0.00	
Average	0.00	7.02
Bad	0.05	0.23

In binary Logistic Regression, odds ratio for the retained in the selected model with age of the mother of new born, pregnancy time, antenatal care, where the mother of new born going for treatment, antenatal care and perception of the new born baby health after birth of the respondents proving to be particularly significant in predicting new born baby birth weight of the new born .The binary logistic regression showed that among age group 20-24, 25-29 and >=30 the odds of new born baby birth weight are 1.175 higher and.04,.05 lower than the odds of new born baby birth weight in group 15-19. The household income-expenditure status such as surplus, equal, sometimes deficit and always deficit the odds of new born baby birth weight are 6.545, 5.143 and 4.208 higher than the odds of birth weight in group surplus. The mother whose odd ratio of the pregnancy time <8 month and 8-9 are0.167 and 0.625 lower than the odds in group >9 month. The pregnant women who take antenatal care have 7.829 times more than baby birth weight than the women who did not take antenatal care. Those mother who take treatment in the NGO clinic, private clinic, pharmacy and village doctor having the odds ratio 24.23, 19.5, 6.5.24.23 and 8.24 times more than the odds of group government hospital. The odds of new born perception status average and bad are 1.23 and 17.2 greater than of the group whose perception is bad of the new born birth weight.

5. Conclusion

Inside the cutting-edge age, we are inside the stage of fast development in all components of existence however we are getting undeserving physiologically day by day likely because of less caring for our health. It is far very crucial to care about the health of women for the duration of being pregnant length. Because most of the infant weight is related to their maternal health care during the pregnancy duration. Within the bivariate evaluation, we determined the association among exclusive independent variables and the dependent variable. Respondent's antenatal care and quantity of meals the pregnant women took throughout pregnancy changed into a very critical variable notably impacted on beginning weight. Inside the binary logistic regression, we were considered six variables, specifically age of the pregnant girls, income-expenditure of the family, being pregnant time, antenatal care, where the pregnant girls going for treatment, and notion of the new child fitness after birth and we perform the odds ratio among those variables. We endorse that the pregnant mother need to receive

antenatal care blanketed ordinary check-U.S.A. from a specialist, take different kinds of capsules, TT injection, eat balanced food, etc. The pregnant mom ought to be acutely aware of nutrition repute because maternal nutrition fame throughout being pregnant has been taken into consideration a crucial prognostic indicator of delivery outcome. The authorities and other focused government have to take proper steps to conscious the people about the significance of start weight. Exclusive press media (Newspaper and mass media) can play a critical function in this situation.

References

[1] Goshu, H., Teshome, M. S., and Abate, K. H. (2018). Maternal dietary and nutritional characteristics as predictor of newborn birth weight in Jimma Town, Southwest Ethiopia, 2017. Journal of Public Health and Epidemiology, 10(5), 155-164.

[2] Rajashree, K., Prashanth, H. L., and Revathy, R. (2015). Study on the factors associated with low birth weight among newborns delivered in a tertiary-care hospital, Shimoga, Karnataka. IntJMedSci Public Health, 4(9), 1287-90.

[3] Christian, P., Khatry, S. K., Katz, J., Pradhan, E. K., Le Clerq, S. C., Shrestha, S. R., ... and Keith, P. W. (2003). Effects of alternative maternal micronutrient supplements on low birth weight in rural Nepal: double blind randomised community trial. Bmj, 326(7389), 571.

[4] Islam, M. M., and Khan, M. H. R. (2016). Incidence of and risk factors for small size babies in Bangladesh. International Journal of Community and Family Medicine, 1, 123.

[5] Idris, M. Z., Gupta, A., Mohan, U., Srivastava, A. K., and Das, V. (2000). Maternal health and low birth weight among institutional deliveries. Cardiovascular disorders, 8(3), 37-35.

[6] Kadapatti, M. G., and Vijayalaxmi, A. H. M. (2012). Antenatal Care the Essence of New Born Weight and Infant Development. International Journal of Scientific and Research Publication, 2,3.

[7] Malik, S., Ghidiyal, R. G., Udani, R., and Waingankar, P. (1997). Maternal biosocial factors affecting low birth weight. The Indian Journal of Pediatrics, 64(3), 373-377.

[8] HM, V. K., Kumar, G. V., Cheluvegowda, G. K., and Mahesh, S. H. (2014). Maternal and neonatal factors among low birth weight babies: A tertiary care hospital based study. Current Pediatric Research, 18(2).

[9] Nahar, S., Mascie-Taylor, C. G. N., and Begum, H. A. (2007). Maternal anthropometry as a predictor of birth weight. Public Health Nutrition, 10(9), 965-970.

[10] Hodnett, E. D., and Fredericks, S. (2003). Support during pregnancy for women at increased risk of low birthweight babies. Cochrane database of systematic reviews, (3).

[11] STATISTICS, B. B. O. (2005). National Low Birth Weight Survey of Bangladesh, 2003-2004.