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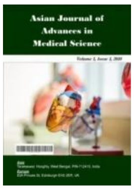

ASSESSMENT OF LOW BIRTH WEIGHT AND RESPONSIBLE FACTORS FOR NEWBORN INFANTS IN TEPI GENERAL HOSPITAL, SOUTH WESTERN ETHIOPIA

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AUTHOR'S CONTRIBUTION

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Background: Birth weight plays an important role in infant mortality and morbidity, child development, and future health of the child. This study assessed and identified the determinants of weight of newborn children at birth in Tepi General Hospital, South Western Ethiopia.

Methods: The data for this study was extracted by reviewing delivery registration medical record and card of the study subject. A total of 1838 newborn infants were considered. Chi- square test and Binary logistic regression model were used for data analysis in this study.

Results: According to this study, from the sampled newborn infants 616 (33.52%) of infants weight is below 2500grams and 1222 (66.48%) of newborn infants weight is 2500 grams and above. The prevalence of low birth weight of newborn infants is 33.52%. The estimated odds ratio (OR) of place of residence or maternal residence (rural) is equals to exp(0.243)= 1.275 (95% CI: 1.020, 1594), indicates that rural children are 1.275 times more likely to be low birth weight child at birth as compared to urban children holding all other variables constant.

Conclusion: Children from rural mothers, mothers who did not get more antenatal care visits, mothers who did not get more vaccination during pregnancy, are gives low birth weight at birth or they are not normal at birth. Birth order of children at birth and mothers' pregnancy problem are directly related in this study.

Keywords: Newborn infant; infant morbidity; infant mortality; binary logistic regression; odd ratio; weight of child at birth.

ABBREVIATIONS

CI : Credible Interval
Df : Degree of freedom
EDHS : Ethiopia Demographic and Health Survey
OR : Odd Ratio
LBW : Low Birth Weight
WHO : World Health Organization

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1. INTRODUCTION

The birth weight of an infant is the first weight recorded after birth, ideally measured inside the first hours after birth, earlier than substantial postnatal weight loss has occurred. Low birth weight (LBW) is described as a birth weight of much less than 2500 g (up to and which includes 2499 g [1–3], as per the World Health Organization (WHO). Birth weight is a strong predictor of neonatal and infant mortality [4], [5]. Because birth weight data are readily existing, researchers have frequently classified on birth weight when they measuring the effect of other risk factors [6,7].

The birth weight of an infant or a child is substantial indicator of the overall performance of the child's health, and it can point out to predict future child's survival status [8–11]. Some countries used growth chart [12,13] in recognizing child's nutrition status [13–16]. Weight of infants whom survival life will have a negative dead set against feature and accelerated hazards of the disease; lifetime, and suffered from the high frequency of cardiovascular disease ,cognitive disabilities ,and decrease intelligent quotient ,which influence their social overall performance, and job possibilities [17–20].

Many literatures overlook the association of birth weight of an infant growth with overall-related behaviors of children including a quality measurement and data amalgamation of confirmation are from human studies on the association of birth size or infant growth with afterward ,energy intake, eating behavior, and systolic blood pressure [15].

Infant birth weight has a strong role in determining short and long-term health, and reducing the prevalence of low birth weight should be given much importance [7]. There are many risk factors for birth weight including poor maternal nutrition, lifestyle factors, pregnancy complications such as hypertension, socio-economic conditions, maternal age, maternal body composition and birth order [21].

The low birth weight infant was high respectively in sub-Saharan, southern Asia and globally [22]. The study done in Iranian showed that the prevalence of low birth weight in 13 articles which were reviewed was shown as 2 to 10 percent [23]. In Nigeria DHS,2013, the proportion of low birth weight in this study was 7.3 percent [24]. In Northeast Brazil, the average birth weight of 23.80 percent [25]. In Northwest part of Ethiopia, from the study participants, this makes the prevalence to be 24.93 percent [26]. In East west Ethiopia, the mean birth weight of cases and controls were 2138.28 g ± 206.87 and 3145.16 g ± 414.99 [27]. In Dangla Primary Hospital, Amhara Regional State, Northwest Ethiopia, the magnitude of low birth weight was 10.3 percent [28]. The study done in Jimma Specialized Hospital, larger proportion (38.4 percent) of infants was reported as "average sized" followed by "very large" (20.6%) [19]. EDHS, 2011, out of the 1,390 newborns who had their birth weight determined, 203 (14.6%) were LBW (<2,500gm). Few infants (10.2%) were preterm (<37 weeks) [29]. The birth weight of infants in Ethiopia was 15 percent [30].

2. METHODS

2.1 Study Area

The study was conducted in Tepi General Hospital found in Sheka zone, South Nation Nationalities Peoples of Region, and Southwestern Ethiopia. Tepi General Hospital is located in Sheka Zone 565 Kms from the capital city of Ethiopia, Addis Ababa. The Hospital gives medical services for people living in Sheka zone.

2.2 Data Source

The data for this study was extracted by reviewing delivery registration medical record and card of the study subject. All singleton live birth babies in the study period were included. To maintain the quality of data, training was given for data collectors. Regular and continues follow up was made by the principal investigator to monitor quality of the data collection process and every filled checklist was checked on daily basis and feedbacks were given to data collectors.

2.3 Variables Considered in the Study

The outcome variable is the Birth weight of newborn infants. The independent factors selected from the birth registers were those associated with birth weights according to previous study [31-34]. Based on registration medical records the factors included maternal age, marital status, gender of infant, arm circumference of infant, family income, birth order of child, vaccination during pregnancy and antenatal visit care.

2.4 Method of Data Analysis

Chi-Square test used to determine an association between dependent and independent variables [35]. The chi-square statistics is a measure of how far the observed counts are from the expected counts. The test statistic is $\chi^2 = \frac{\sum (O_{ij}-E_{ij})^2}{E_{ij}}$. Where O_{ij} is the observed value in the i^{th} row and the j^{th} column, E_{ij} is the expected value in the i^{th} row and the j^{th} column.

Binary logistic regression is the form of regression, which used when the dependent variable is dichotomous and the independent variables are any type. A binary variable has only two possible values, such as presence or absence of a particular event, in this study (Status of birth weight means that low birth weight or normal birth weight).

$$Model: \ ln(P_i / 1 - P_i) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots\dots.. \beta_k X_{ki}.$$

$P_i / 1 - P_i = exp(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots\dots.. \beta_k X_{ki}$. Where P_i is the probability of success, $1 - P_i$ is the Probability of failure, β_0 is constant term, β regression coefficients and X_i are independent variables.

3. RESULTS

The socio-demographic characteristics and the associations between infant's weights in gram of sampled children's were summarized in Table 1. There are 1838 newborn children were participated in the study. Among the newborn children 616 were have less than 2500 gram of weight, and 1222 have equal or more 2500 grams of weight. Of the total newborn children, males accounting, 244 (29.2%) and females accounting, 372(37.3 %) have less than 2500 gram of weight whereas 596 (70.8%) of males and 626 (62.7%) of females have equal or more 2500 grams of weight. Table 1 also shows that the distribution of maternal age on infant's birth weights. The majority of the maternal age group is within 20 to 34 years old.

Regarding maternal residence out of the total mothers more than half 1145 (62.29%) of them live in rural area while 693 (37.71%) live in the urban setting and the prevalence of low birth weight was higher among the newborn delivered to rural mothers 34.3%. Gender of newborn child, maternal residence, family income, antenatal care visit and maternal age were found to be significantly associated with birth weight of the newborn infants at 5% significant level.

Table 1. Distribution of infants birth weight status with socio-demographic characteristics of the study participants (n= 1838)

		Infants' Birth Weight in grams		Chi-square Test	
Variables	**Categories'**	**< 2500**	**>= 2500**	**Df**	**Sign**
Gender of child	Male	244 (29.2%)	596 (70.8%)	1	0.000
	Female	372 (37.3%)	626 (62.7%)		
Residence of Mothers	Urban	221 (32.1%)	472 (67.9%)	1	
	Rural	395 (34.3%)	750 (65.7%)		
Birth order of child	First	51 (24.9%)	154 (75.1%)	2	0.001
	2nd	133 (29.5%)	318 (70.5%)		
	3 and above	432 (36.5%)	750 (63.5%)		
Family income	< 500 birr	500 (36.5%)	870 (63.5%)	1	0.000
	>= 500 birr	116 (24.8%)	352 (75.2%)		
Vaccination during pregnancy	Not vaccine	249 (32.3%)	521 (67.7%)	1	0.364
	Vaccine	367 (34.4%)	701 (65.6%)		
Antenatal visit	4 and above	469 (34.0%)	909 (66.0%)	1	0.014
	Below 4	147 (32.0%)	313 (68.0%)		
Family size	<=3 members	188(36.7%)	324 (63.3%)	2	0.049
	4 and below	286(31.9%)	610 (68.1%)		
	Above four	142 (33.0%)	288 (67.0%)		
Marital Status	Married	570 (33.1 %)	1151(66.9%)	3	0.196
	Single	26 (38.8%)	41 (61.2%)		
	Divorced	11(32.4%)	23 (67.6%)		
	Windowed	9(56.2%)	7 (43.8%)		
Mothers' age	15 - 19	92 (33.3%)	184 (66.7%)	6	0.046
	20 - 24	172(32.8%)	352 (67.2%)		
	25 - 29	134 (32.3%)	281(67.7%)		
	30 - 34	109 (34.7%)	205 (65.3%)		
	35 - 39	82 (35.2%)	151 (64.8%)		
	40 - 44	23 (37.7%)	38 (62.3%)		
	45 - 49	4 (26.7%)	11 (73.3%)		

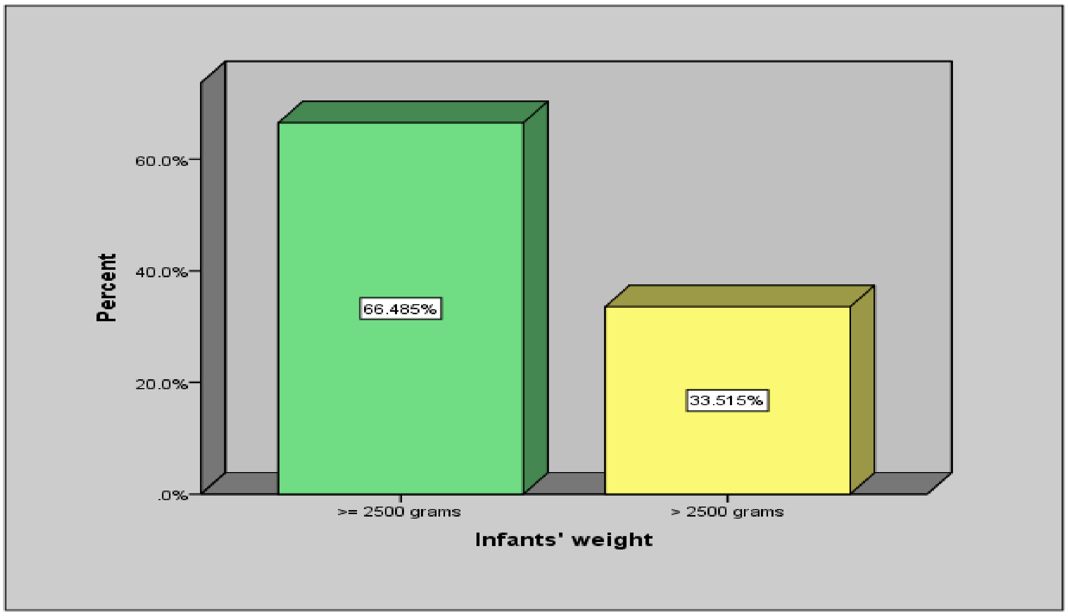

Fig. 1. Birth weight status of newborn infants

Table 2. Parameter estimates of related covariates in the Binary logistic regression model using backward selection method

Variables		B	S.E.	Wald	df	P value	Exp(B)	95% C.I. for EXP(B)	
								Lower	Upper
Place of residence	Rural	0.243	0.114	4.560	1	0.033	1.275	1.020	1.594
	urban (ref)	---							
Family size	4 and below	0.683	0.133	26.487	1	0.050	1.981	1.527	2.570
	Above 4 (ref)	---							
Vaccination during pregnancy	Not vaccinated	0.779	0.254	9.374	1	0.002	2.179	1.323	3.586
	Vaccinated (ref)								
Birth order of the child	1st	-0.743	0.208	9.061	1	0.003	0.476	0.293	0.772
	2nd	-0.564	0.247	5.205	1	0.023	0.569	0.350	0.923
	3 and above	----							
Antenatal care visit	4 and above	-0.130	0.111	1.373	1	0.046	0.878	0.347	1.291
	Below 4 (ref)	---							
Infant arm circumference(in cm)		- 0.878	.059	221.900	1	0.000	0.415	0.370	0.466

The figure shows out of the total newborn infants 616 (33.52%) of infants weight is below 2500grams and 1222 (66.48%) of newborn infants weight is 2500 grams and above. This indicated that according to this study the prevalence of low birth weight of newborn infants is 33.52%.

The results from multivariable analysis revealed that maternal residence, family size, vaccination during pregnancy, antenatal care visit, birth order and infant arm were factors associated with birth weight of newborn infants statistically significant at P value < 0.05 (Table 2).

4. DISCUSSIONS

When the Binary logistic regression model is used in the analysis of the data, the odds ratio of the coefficients of the explanatory variables in the model are interpreted. This means that estimates of this odds ratio, and corresponding confidence intervals can be easily found from the fitted model. The discussion and interpretation of the parameters corresponding to the variables, which are found significant in the binary logistic regression model as shown in table 2 are described in the following section.

The result indicates that place of residence is a significant covariate. The estimated odds ratio (OR) of place of residence or maternal residence (urban) equals to exp(0.243)= 1.275 (95% CI: 1.020, 1594), indicates that rural children are 1.275 times more likely to be low birth weight child at birth as compared to urban children holding all other variables constant. The study is consistent with Tadese et al. (2016) that birth weights are lower in rural than in urban areas [19].

The estimated odds ratio of vaccination during pregnancy (Not vaccinated) equals to exp(0.779)= 2.179 (95% CI: 1.323, 3.586), indicates that children not vaccinated during pregnancy are 2.179 times more likely to be low birth weight child at birth as compared to vaccinated children during pregnancy holding all other variables constant.

From Table 2, it can also be observed that birth order is significantly related with the birth weight of child at birth. As compared to 3 and above order children, the first order child is 0.476 times less likely and second order child is 0.569 times less likely to be low birth weight at birth keeping all variables constant. The result is inconsistent with Magadi et al. [36] who state that birth or1der is an important factor influencing birth weight and first order births are on average more likely to be low birth weight babies than higher order births.

In this study, antenatal visit care (Number of times pregnant women get antenatal care) was found a statistically significant variable associated with birth weight of child at birth. The odds ratio for pregnant women who get antenatal visit care 4 and above times is OR=0.878. Which implies that children from mothers who get antenatal visit care 4 and above times during pregnancy period are 0.878 times less likely to be low birth weight at birth as compared to child from mothers who get below four antenatal visit care keeping all other covariates constant. Mothers who get complete antenatal visit care can give normal birth weight child. The study is consistent with Kitchen and drow (1987) and Teresa et al. (2002) that mothers received 4 or more antenatal care during pregnancy gave birth to higher birth weight babies in comparison to mothers who received less than 4 antenatal care visits [8,16,9]. The finding is also consistent with Tail et al. [28] that early antenatal care initiation also associated with magnitude of birth weights.

5. CONCLUSION

According to this study, place of residence, family size, vaccination during pregnancy, antenatal visit care, birth order and infant arm all important in reducing the incidence of low birth weight of infants at birth. Children from rural mothers, mothers who did not get more antenatal care visits, mothers who did not get more vaccination during pregnancy, are gives low birth weight at birth or they are not normal at birth. Birth order of children at birth and mothers' pregnancy problem are directly related in this study. The prevalence of LBW in this study is relatively higher than the reported current estimate of LBW in Ethiopia.

ETHICS APPROVAL AND CONSENT

Ethical approval was obtained from Mizan- Tepi University College of Natural and computational Science with reference number MTU/CNCS/198/20 before starting the actual research data collection. A letter of consent was written to Tepi General Hospital medical director and hospital administration offices to have the desired cooperation and participation of the study participants. Participants was assured about the confidentiality of the information.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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