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Socio Demographic and Economic Factors Associated with Intrauterine Growth Retardation in Far Western Nepal

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ABSTRACT

Birth weight is determined by the duration of gestation and the intrauterine growth rate. Intrauterine growth retardation (IUGR) is an important public health problem causing low birth weight. This paper aims to describe the relationship between sociodemographic and economic factors and IUGR in far western Nepal. An institution-based nested case-control study was conducted in Seti and Mahakali provincial (then regional) hospitals. The cohort of pregnant mothers was followed for the possible result of producing either cases or controls. Altogether, 98 cases and 196 controls were identified after following the cohort of full-term pregnant mothers. Face-to-face interviews were done with mothers to collect the data using a structured questionnaire. One-to-one matching was done for the age and ethnicity of the mother and the sex of the newborn. The odds ratio was used to estimate the magnitude of the association between suspected risk factors and IUGR. The average weight gain during pregnancy was 5.6 kg among cases and 6.54 kg among the control group. The mean birth weight of newborns among cases was nearly 2218 grams, and that of the control was 2962 grams. In the bivariate analysis, age at marriage, illiteracy, housing condition, history of low birth weight (LBW), less than 4 antenatal care (ANC) visits, low iron consumption during pregnancy, lack of regular consumption of milk and milk products, vegetables and fruits, low food consumption, not getting financial support from family members, and feeling stress during pregnancy were found to be associated with IUGR. In multivariate conditional logistic analysis, a history of LBW, fewer than four ANC visits, and a lack of regular consumption of fruits during pregnancy were identified as independent risk factors for IUGR. Focused interventions for service utilization and care during pregnancy, both from health institutions and from the family, are the keys to controlling IUGR.

Key words: Pregnancy, Intra uterine growth, low birth weight and nested case control

INTRODUCTION

Birth weight depends on the duration of gestation and the rate of intrauterine growth. Low birth weight (LBW) is caused by either a short gestation period or retarded intrauterine growth (or a combination of both) (Kramel, 1987). The birth weight is referred to as low if the newborn is less than 2,500 grams at the time of birth (WHO, 2010). The condition of fetal growth being inhibited and the fetus not attaining its growth potential is intrauterine growth retardation (IUGR), and the newborn should have grown bigger if growth-inhibiting factors had not been operating in utero (Bakketeig, 1998).

LBW is closely associated with fetal and neonatal mortality and morbidity. It also retards growth and cognitive development, including the occurrence of chronic diseases later in life (Barker, 1992). LBW is considered the single most important predictor of neonatal mortality (Ryan et al., 2000). The prevalence of LBW in developing countries is about six times higher than that in developed countries (Imdad et al., 2011). About 30% of births have low birth weight in Southeast Asia, and among them, 60–80% of neonatal deaths occur (UNICEF, 2004). One hospital-based study conducted in Nepal found that 12% of newborn babies are LBW (Kayastha & Tuladhar, 2007). The majority of LBW infants were born at term, making IUGR a major factor for LBW in Nepal. Nearly 15% of births were reported as small in Nepal (MoHP, 2022). The aim of this paper is to describe the sociodemographic factors associated with IUGR in far western Nepal.

METHODS

An institution-based nested case-control prospective study was conducted in Seti and Mahakali provincial (then zonal) hospitals from August to November 2012**.** Initially, the cohort of full-term pregnant mothers admitted for delivery in the hospital was taken as a study group. The cohort was followed for the possible result of producing either cases (full-term LBW babies or IUGR) or controls (full-term normal birth weight babies). The weight of the newborn was taken before categorizing the mother, either in the case group or the control group. The sampling frame included all the full-term pregnant women admitted for delivery in the hospital within the study period.

A matched control, having a birth weight greater than 2500 grams, was selected for cases. The age of the mother (± 5 years), ethnicity, and sex of the child were matched for the selection of the controls. In case more than two suitable matched controls were available for a case, the researcher randomly selected two controls. Due to one-to-one matching, the period of data collection increased. The sample size for the study was 264 (88 cases and 176 controls), which was calculated through the stat calc of Epi Info (CDC, 2011) taking the following values: Two-sided confidence level = 95%, power (1-β) = 80%, ratio of controls to cases = 2, percent of controls exposed = 3.7, and odds ratio = 4.6 (Vettore M, et al. (2010)). The non-response rate was assumed to be 11%. Thus, the final size of the sample taken was 294 (98 cases and 196 controls). The live births during the study period were recorded from service registers (the health management information system). The term LBW was from live birth, and exclusion criteria were used to ensure singleton term LBW as a case. In the case of controls, matching

was done, and selection was done randomly. In this study, mothers who delivered preterm babies were excluded in both cases and controls. Similarly, mothers with singleton pregnancies, babies with congenital malformations, and stillbirths were also excluded. Mothers who were seriously ill and those with a known history of HIV, TORCH, renal diseases, or heart diseases were also excluded. The detailed procedure was as per the figure below:

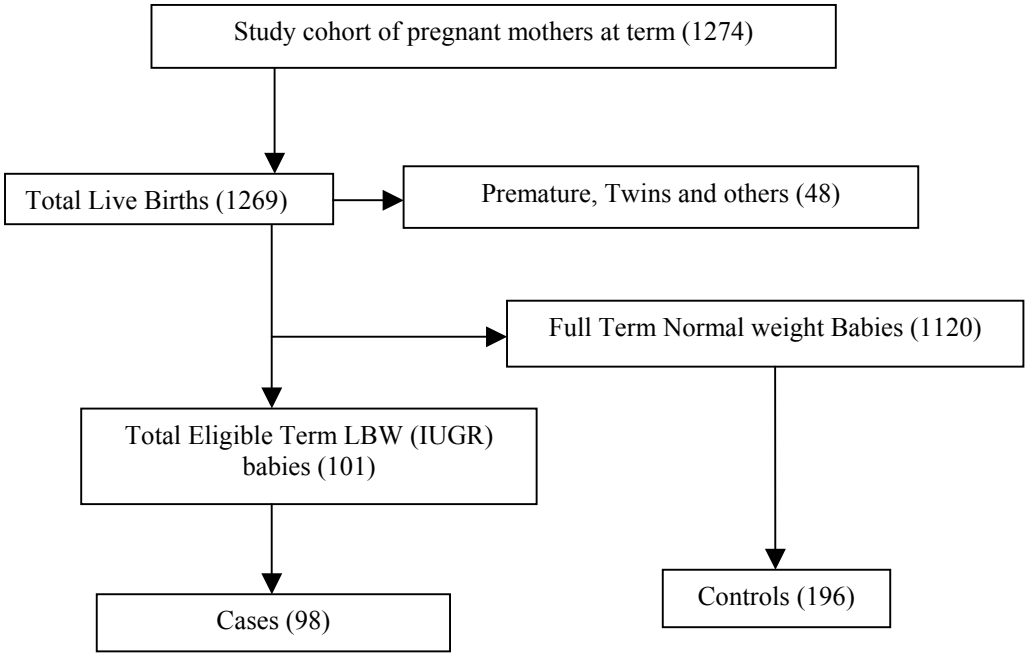

Figure 1: Sampling procedure

Face-to-face interviews were done using pretested questionnaires to collect data from cases and controls. Trained enumerators collected the data. Descriptive analysis was done in terms of simple frequency tables by splitting the cases and controls. A chi-square test was used to analyze the statistical significance of the difference in the amount of exposure in cases as compared to controls. The odds ratio was used to estimate the magnitude of the association between suspected risk factors and term LBW by considering the 95% CI and p-value less than 0.05. After bivariate analysis, binary multivariate analysis was used to analyze further to find out the relationship between exposure and the outcome. The equation for binary multivariate logistic regression used was $y=\beta 0 + \beta 1X1+ \beta 2X2+ \beta 3X3+ \beta 5X5 + \beta 6X6 +\ldots\ldots+ \beta iXi$ after testing its goodness of fit by Hosmer and Lemeshow, where y is the log of dependent variables and $\beta 0$ is constant (Hosmer, 1989).

RESULTS

Socio-Demographic Characteristics of Study Population

Ethnicity-wise distribution showed more than half of the respondents (51.4%) belonged to the upper caste, 35% were disadvantaged Janajati, nearly 12% belonged to Dalits, and only nearly two percent (1.7%) belonged to advantaged Janajati. Cases and controls among all ethnic groups were distributed proportionately in the ratio of approximately 1:2. Altogether, 51% were female births and 49% were male births.

Nearly one fifth (16.7%) belong to the age group less than 20 years of age, and only 2.4 percent of respondents belong to the age group older than 35 years. The maximum respondents belong to the 20-24-year-old group. The median age of the case group at the time of the study was 21 years, and that of the control group was 23 years. The median age at marriage in the case group was 19 years, and that of the control group was 20 years. More than one-third (35.40%) of respondents became pregnant for the first time before they reached 20 years. Regarding the educational status of mothers, 14.6% were found illiterate, and only 6.5% had completed their bachelor's degree or above. Nearly one-fourth of the respondents (23.1%) had only a primary level of education (Table 1).

Table 1: Socio-Demographic Characteristics of Study Population

Variables	Study Group		Total % (n=294)
	Case % (n=98)	Control % (n=196)	
Ethnicity			
Dalit	10.20	12.80	11.90
Disadvantaged Janajaties	36.70	34.20	35.00
Relatively Advantaged Janajaties	2.00	1.50	1.70
Upper Caste	51.00	51.50	51.40
Religion			
Hindu	100.00	100.00	100.00
Sex of the child			
Male	45.90	50.50	49.00
Female	45.90	49.50	51.00
Age of mother			
≤19 years	18.40	15.80	16.70
20-24 years	61.20	54.60	56.80
25-29 years	16.30	26.50	23.10
30-34 years	3.10	2.00	2.40
≥35 years	1.00	1.00	1.00

Median age (Years)	21.00	23.00	22.00
Median age when married	19.00	20.00	19 .00
Median age when got pregnant (first time)	20.00	21.00	20.00
Age of mother when got pregnant first time			
≤19 years	39.80	33.20	35.40
20-24 years	55.10	56.10	55.80
25-29 years	5.10	10.70	8.80
Education of mother			
Illiterate	21.40	11.20	14.60
Primary	16.30	26.50	23.10
Lower Secondary	17.30	17.30	17.30
Secondary	19.40	22.40	21.40
Higher Secondary	19.40	15.80	17.00
Bachelor and Masters	6.10	6.60	6.50

Source: Field Survey, 2013

Relation of Socio Demographic Factors with Intra Uterine Growth Retardation

The association of IUGR with the age of the mother when she got pregnant for the first time was not statistically significant. However, mothers who got married before 20 years were 1.83 times more likely to give birth than mothers who married after 20 years (OR 1.83). Similarly, mothers who were illiterate in comparison to those who were literate are 2.157 times more likely to give birth to IUGR (OR = 2.157, CI: 1.12-4.154) (Table 2).

Table 2: Relation of Socio demographic factors with IUGR

Exposure variables	Case (%)	Control (%)	Crude OR	P-Value	95% CI
Age at marriage					
< 20 years	61 (62.20)	93 (47.40)	1.83	0.017	1.11-2.99
≥20 years	37(37.80)	103(52.60)	1		
Age when got pregnant first time					
< 20 years	78(79.60)	136(69.40)	1.721	0.064	0.96-3.06
≥20 years	20(20.40)	60 (30.60)	1		
Literacy					
Illiterate	21(21.40)	22(11.20)	2.157	0.02	1.12-4.154
Educated	77(78.60)	174(88.80)	1		

Association of socio-demographic variables with Intra Uterine Growth Retardation

The multivariate logistic regression of all the socio-demographic and economic factors that have shown some association in bivariate analysis showed that there was a strong association between IUGR and housing conditions. It showed that those who had inadequate housing conditions were 2.073 times more likely to give birth to an IUGR baby (Table 3).

Table 3: Association of Intra Uterine Growth Retardation with Socio demographic and economic factors

Exposure variables	Case (%)	Control (%)	Crude OR	P-Value	Adjusted OR	95% CI	p-value
Age of mother when got married							
<20 years	61 (62.20)	93 (47.40)	1.83	0.017	1.586	0.92-2.74	0.24
≥20 years	37(37.80)	103(52.60)	1				
Age when got pregnant first time							
<20 years	78(79.6)	136(69.4)	1.721	0.06	1.054	0.46-2.43	0.9
≥20 years	20(20.40)	60 (30.60)	1		1		
Literacy							
Illiterate	21(21.4)	22(11.2)	2.16	0.02	1.9	0.95-3.81	0.071
Educated	77(78.6)	174(88.8)	1		1		
Housing condition							
Inadequate	58(66.70)	81(46.00)	2.346	0.002	2.073	1.20-3.59	0.009
Adequate	29(33.30)	95(54.0)	1		1		

Risk factors of Intra Uterine Growth Retardation

In the final model, among the exposure variables, three variables (history of LBW, ANC visits less than four times, and not consuming fruits regularly during pregnancy) were found to be the independent risk factors for IUGR after controlling for other variables (Table 4).

Table 4: Risk factors of IUGR

Exposure variables	Case (%)	Control (%)	Crude OR	P-Value	Adjusted OR	95% CI	P-value
Age of mother when got married							
<20 years	61 (62.2)	93 (47.40)	1.83	0.017	1.586	0.92-2.74	0.24
≥20 years	37(37.80)	103(52.60)	1				
BMI of mother							
<18.5 kg/m2	39(40.6)	32(16.70)	3.421	0.001	3.764	0.95-14.9	0.059
≥18.5 kg/m2	57 (59.4)	160(83.30)	1		1		
Height of mother							
<150 cm	74(75.50)	123(62.80)	1.83	0.028	2.625	0.42-16.4	0.301
≥150cm	24(24.50)	73 (37.20)	1		1		
Weight of mother (At first ANC:3-4 months)							
≤ 43 kg	47 (49.0)	40 (20.70)	3.669	0.001	0.539	0.05-5.54	0.603
> 43kg	49(51.0)	153(79.30)	1		1		
Literacy							
Illiterate	21(21.4)	22(11.20)	2.16	0.02	1.9	0.95-3.81	0.071
Educated	77(78.6)	174(88.8)	1		1		
Housing condition							
Inadequate	58(66.7)	81(46.00)	2.346	0.002	0.329	0.06-1.65	0.177
Adequate	29(33.3)	95(54.00)	1		1		

Source: Field Survey, 2013

DISCUSSION

This study has identified several risk factors for IUGR related to sociodemographic and economic conditions. Conditional logistic regression analysis was done to eliminate the effects of potential confounders and identify the independent effects of various risk factors.

The prevalence of IUGR (term LBW) in this study was 7.9% (male: 7.5% and female: 8.4%), which is comparatively less than that found in the previous studies (UNICEF, 2000). The higher figure found in the previous studies might be due to the inclusion of preterm LBW and term LBW as LBW or IUGR. Age of mother less than 20 years when she got married, education status of mother, and housing conditions were found to be the risk factors for IUGR in binary logistic regression, but housing condition was also found to be an independent risk factor for IUGR in multiple conditional logistic regression among the socioeconomic variables. Previous studies (Rafati, S., et al. (2005); Yasmeen, M., et al. (2005); Vettore, M., et al. (2010)) had also shown similar results. However, the age of the mother when she got her first pregnancy, the socioeconomic status of the mother, the occupation of the mother, and the working hours in a day were not found to be associated with IUGR in this study. Previous studies showed poverty (Yasmeen, M. et al., 2005), low socioeconomic status (Mumbare, S.S. et al., 2012), and the age of the mother (Mondal, B. 2000) were found to be associated with LBW. Maternal education was not found to be associated with LBW in a similar study done in the past (Mumbare, S.S. et al., 2012). The three important variables, namely history of previous LBW, number of ANC, and regular consumption of fruits during pregnancy, were found to be important predictors for IUGR.

Interventions to reduce IUGR should be specific to the targeted population and directed at the quantitatively important modifiable determinants of intrauterine growth. Comprehensive approaches, which include a combination of interventions to improve the overall health of women, are needed. Such approaches are likely to be most effective in reducing the IUGR problem in Nepal. A prospective study with a larger sample is needed to identify the risk factors among pregnant mothers with different exposures for a more accurate association, like health problems that are associated with IUGR during pregnancy. Further, an experimental study is needed to identify the types of foods that are protective factors for IUGR during pregnancy. Focused interventions for service utilisation and care during pregnancy are the keys to controlling IUGR. Care during the window of opportunity (the first 1000 golden days) is the key to avoiding the IUGR due to maternal anthropometry. Similarly, the age of marriage after 20 years, female education, and adequate housing conditions should be ensured to minimize the risk of IUGR.

LIMITATIONS

Hospitals were selected purposively for this study. The study relied on hospital data for certain variables, like height and weight. Due to the time factor and nature of the study, the study cohort was followed up for a short period, and very few cases might be left unmatched, though most of the cases were matched based on the principles of one-to-one matching. The findings might have limited scope in other socioeconomic and cultural contexts.

ETHICAL CLEARANCE

The national ethical guidelines developed by the Nepal Health Research Council were followed to respect ethical issues in research. Informed written consent was obtained from the participants before data collection. Approval was taken from the Thesis Committee of the

Department of Community Medicine and Public Health, Institute of Medicine, Tribhuvan University, Kathmandu, Nepal.

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