The Association of Maternal Nutritional Status, Socio-Demographic Variables and Birth Weight

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ABSTRACT

Objective: To determine the influence of socio-demographic and maternal nutritional status on birth weight.

Material and Methods:

The study was carried out in Basrah Maternity and Children Hospital. A total of 378 newly delivered newborns and their mothers were included in the study. Data collection was achieved through a structed interview for collection of socio-demographic informations and measurements of maternal anthropometry. Data were analysed using SPSS system, P value< 0.05 was regarded as significant.

Results:

The study has revealed that the mean birth weight was 3.164 and that low birth weight was dected in 18.8% of newborns. Maternal mid upper arm circumference, post partum weight hemoglobin level antenatal care, parity and maternal empolyment were signficant predictors of birth weight. In additon to that maternal anthropometry and hemoglobin level were positively correlated with low birth weight.

Conculsion:

Maternal nutritional status is the signle most important risk factor for low birth weight.

Key Words:

Maternal anthropometry, newborns, birth weight, socio-demographic variables.

INTRODUCTION

The health of newborn infant is, to a large extent, a function of the health of the mother.[1] Low birth weight (LBW) is the single best predictor of future growth and development.[1] Low birth weight is universely and in all population groups, the most important determinant of the chance of the newborn to survive and experience healthy growth and development.[2] LBW is defined as a weight at birth of less than 2500gm (i.e. upto and including 2499), irrespective of gestational age.[3-5] In addition to its avderse effects, on child survival and development, LBW is associated with an increased morbidity and long term disabilities, and it may even be an important risk factor for a number of adult diseases including non-insulin dependent diabetes mellitus and heart disease. [5-7] While it is recognized that the etiology of LBW . is multifactorial, emphasis is given to those factors that are believed to be of greatest importance in devloping countries and that might be amenable to change in the short term. These include poor maternal nutrition, certain infections, pre eclampsia, short birth intervals, short maternal stature, lack of antenatal care and teenage pregnancy.[5,7] Globally WHO has estimated that 17% (25 million) of all newborns have low birth weight, nearly 95% of them in devloping countries. Largely due to malnutrition and untreated infections in the mother.[1,5] The incidence of LBW does not only vary from country to country, but also from region to region within the same country. Investigations on birth weight have largely focused on setting standard norms for a region, determining the prevalence of LBW and its sequale and identifying factors

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Influencing fetal growth.[8] Reducing the incidence of LBW has been a major goal of various medical and governmental organizations. This needs understanding of the many risk factors associated with LBW which should be based on reginal data rather than universal data. Clearly there is a need for further research in some of these area.

The aim of the study was to determine the influecne of maternal nutritional status and socio-demographic variables on birth weight.

MATERIAL AND METHODS

This study was carried out in Basrah Maternity and Children Hospital from the period of October 1999 till June 2000. Basrah Maternity and Children Hospital is, the main Maternity Hospital in Basrah, which offers medical services to all areas of Basrah.

The study included newly delivered newborns (with gestational age ≥37 weeks) and their mothers. The assessment was restricted to singleton pregnancies of women who had no chronic illness. They were randomly selceted from the delivery room with 24 hours following delivery. Three hundred seventy eight newborns and their mother were included in the study. Data collection was achieved through a structured interview for collection of socio-demographic informations and measurement of maternal anthropometry.

Socio-demographic variables included maternal age, parity, educational level (illiterate, primary, intermediate, secondary or higher), residence, maternal employment, antenatal care in the index birth (no ANC <3 visits, poor, 3-6 visits or good ≥7 visits/pregnancy) interpregnancy interval and sex of the body.

Maternal anrthropometric measurements included post partum weight, height, mid upper arm cirumference (MUAC) and body mass index (BMI). BMI was estimated by dividing the maternal weight (in kilograms) over the height in square meters. Hemoglobin level was estimated for all mothers included in study. Anemia was defined as Hb level <11gm/dl; moderate anemia (Hb 7-10.9g/dl) and severe anemia (Hb 4 – 6.9gm/dl).[9]

All newborns were assessed for body weight and gestational age (from the date of the last menstrual period and assessment of gestatinal age using Dubowitz criteria), newborn with gestational age less than 37 weeks were excluded from the study.

Statistical analysis:

Data were analyused using SPSS system. Step wise multiple regression analysis was used to identify variables predicting birth weight. Logistic regression analysis was used to identify independent contribution of each of these variables to LBW. Determinant coefficient (R2) and P value were measured (P value < 0.05 was considered to be significant), and a 95% confident interval was caluclated to estimate the significance of odd ratios.

RESULTS

Three hundred seventy eight newborns and their mothers were included in this study. The mean birth weight was 3.164kg (Table 1), LBW was present in 71 newborns (18.8%), 44 newborns (11.6%) were large for gestational age and the rest had normal birth weight. Table 1 also illustrates the characteristics of births, the mean maternal age was 27.5 years and parity was 2.5, while the mean gestational age was 38.4 weeks. Sixty two women (16.4%) were illiterate. Other important findings are that about 46% of women had no or poor antenatal ease and 92.6% of them were unemployed. Anemia was present in 155 women (41%), anemia was moderate in all cases. Distribution of women in relation to anthropometric measurements is also presented in Table 1.

The step wise multiple regression analysis showed that the most important variable predicting birth weight is mid upper arm circumference (MUAC) (P<0.0001), Table 2. Other significant variables predicting birth weight in order of frequency were hemoglobin level, maternal post partum weight, antenatal care, parity and maternal empolyment (r^2 for these variables was 0.880. Other factors including maternal age, education, interpregnancy interval, maternal height, BMI, sex of the baby and residence were non significant variables (r^2 0.102, P Value >0.05).

Seventy one newborns (18/8%) were born with a birth weight of <2.5 kg. Logistic regression analysis reveals that LBW was signficantly associated with (in order of frequency) MUAC (r^2 0.251), OR 2.392), maternal height r^2 0.222, OR 2.392) BMI (r^2 0.186, OR 0. 561), maternal post partum weight (r^2 0.154, OR 1.225) and hemoglobin level (r^2 0.129, OR 1.793), (Table 3). The best cut-off points for LBW were MUAC <23cm, maternal post partum weight <55kg, and BMI <23.

DISCUSSION

Low birth weight (LBW) is a global problem of great improtance.[10] The determinant and consequences of low infant birth weight have been the subject of numerous clinical and epidemiological studies which review the clinical evidence.[11] It is generally recognized that LBW can be caued by many factors, because many questions remain, however, about which factors exert independent causal effects, as well as the magnitude of these effects.[7]

The average birth weight was 3.164, which is comparable to that estimated in Saudi Arabia (3.24-3.31kg), [8] but higher than that estimated in India (2.7kg).[12] The frequency of LBW in our study was 18.8%. A recent report shows that the incidence of LBW is highest in Asia (21%) and lowest in Europe (6%).[13] The frequency of LBW in our study is higher than that estimated in neighboring countries like Saudi Arabia where the incidence of LBW ranges from 4-14%, [14] but comparable to that reported in India and Bangladesh where the estimated incidences of LBW are 20% and 21% respectively.[12, 15]

The influence of maternal nutritional status on birth weight has gained special interest in the view of possible nutritional interventions.

LBW was positively correlated with maternal anthropometric measurements (mainly MUAC, which is also the main predictor of birth weight), followed by maternal height, BMI and maternal post partum weight. This is in agreement with other studies which have studied the effect of maternal nutritional status on birth weight.[12,14-18] Although more of the studies had used pre-pregnancy weight, few studies had measured the post partum weight with comparable results. [14,15] In this study all anthropometric measurements were postively correlated with LBW. However, step wise multiple regression analysis reveals that only MUAC and post partum weight are significant factors prediciting birth weight.

The prevalence of anemia in women indicated that about half of the pregnancy and a third of non-pregnant women in the world suffer from anemia.[9] Our study revealed that anemic women had a higher risk of having LBW and that maternal hemoglobin level is the second most signficant variable predicting birth weight. The positive association between anemia and LBW was observed in other studies. [12,17]

The role of antenatal care was investigated by many investigators. Our study illustrates that antenatal care is an important factor prediciting birth weight, although logistic regression analysis didn't reveal a significant association between ANC and LBW. The results of other studies showed an conflicting results, some of them failed to report any association between ANC and birth weight,[8] while others had reported an important association.[12,19]

The effect of parity showed a significant linear distribution of birth weight ($P<0.01$) but parity was not a significant variables contributing to LBW, this is in agreement with a study done in Saudi Arabia which didn't demonstrate a signficant correlation between parity and LBW,[14] but in contrast to other study which have found that parity had a significant association with LBW. [10,12]

Our study had identified that maternal empolyment is a significant variable predicting birth weight, this can be attributed to the increased exposure to psychological stress and increased caloric expenditure by working mothers.[7,14] Apart from maternal employment none of the other socio-demographic variable show a signficant correlation with LBW or can predict birth weight. Other studies had revealed conflicting results regarding the influence of socio-demographic factors (including sex of baby, maternal age, education, residence and interpregnancy interval) on birth weight.[7-10, 12, 14]

From this study, we conclude that maternal nutritional status is the single most important risk factor for LBW. Among other things, the role of antenatal care, nutritional anemia and maternal exposure to psycho-social stress, on fetal growth merits attention.

Perinatal health, together with maternal health and safe motherhood will be one of the major challenges for this decade.

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Table 1. Characteristics of the cases studies

Characteristic	No.	Mean (SD)
Birth weight	378	3.164(0.854)
Maternal age	378	27.45(5.60)
Parity	378	2.5(.27)
Gestational age	378	38.4(1.3)
	No.	**%**
Sex		
- Male	174	46
- Female	204	54
Maternal education		
-Illiterate	62	16.4
- Primary, Intermediate, and secondary	278	73.5
- Higher	38	10
Housewives (unempolyed)	350	92.6
ANC		
- No	35	9.2
- Poor	139	36.8
- Good	204	54
Interpregnancy Inteval		
- <12 m	66	17.5
- ≥ 12 m	223	59
Maternal Post partum Weight		
- <40	5	1.3
- 40-49	21	5.6
- ≥50	353	93.4
Height		
- <40	-	
- 140-150	16	4.2
- ≥150	362	95.8
BMI		
- <20	42	11.1
- 20-22.5	75	19.8
> 22.5	261	69
MUAC		
- <20	10	2.6
- 20-22.5	31	8.2
> 22.5	33.7	89.2
Anemia		
- Moderate	155	41%
- Severe	-	-

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Table 2. Predictors of birth weight (step wise multiple regression analysis)

Variables	Association (contribution) Coefficients β	P-Value
MUAC*	0.044	<0.0001
Hb%*	0.106	<0.0001
Post partum weight*	0.014	<0.001
ANC*	0.120	0.002
Parity*	0.026	0.01
Maternal employment*	0.206	0.008
Other variables	-	>0.05

* r^2 for these variables is 0.880 → significant

ĩ r^2 for other variables (maternal age, education, interpregnancy interval, maternal height, BMI, sex of the baby and residence) is 0.120.

Table 3. Predictors of birth weight (step wise multiple regression analysis)

Variables	R2	Contribution	P-Value	OR	CI
MUAC	0.251	0.872	0.0000	2.0392	1.79-3.193
Height	0.222	0.128	0.0000	0.879	0.868-0.922
BMI	0.186	0.603	0.0000	0.561	0.420-0.711
Maternal Weight	0.154	0.202	0.0001	1.225	1.103-1.360
Hb%	0.128	0.583	0.01	1.793	1.263-2.544
Other Variables ĩ	0.042	-	>0.05		

* Variables are illustrated in order of frequency

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