

A Community- Based Cohort Study for the Risk Factors of Low Birth Weights, in an Upper Egypt Governorate

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Abstract: The prevention of low birth weight (LBW) is a major challenge because it affects many babies, is not restricted to an easily identifiable group, and has multiple risk factors and much uncertainty about the underlying causal mechanisms. Furthermore, low birth weight involves many health care providers and is not amenable to one simple effective intervention. **Objective:** To detect risk factors affecting the pregnancy outcome; LBW in Sohag region. **Design:** A community-based, cohort study. **Subjects:** 1082 pregnant women; were interviewed 3 times; once while pregnant, then after labour –within a week- and again during 40 days after parturition. **Timing:** On the period of July 2007 till Jan. 2011. **Settings:** 5 rural and 4 urban locations; 2 were under-served in each location. **Methods:** A) During antenatal visit: women had been subjected to history taking, general examination and obstetrical evaluation, blood pressure, weight and height measuring, haemoglobin estimation and urine examination. B) During postnatal visits: women and neonates examined twice, during the first week postpartum and after a one month. **Results:** 1082 deliveries, of whom 1073 (98.8%) babies born alive, 56.6 % were males and 43.4 % were females, while 1.2% born dead, of whom one-third, 4 (0.4%) died intrapartum while 8 (0.8%) were stillbirths. Early neonatal deaths represented 11 (1.0 %) neonates and 3 (0.3 %) died in the late neonatal period and another 3 died before the end of the study. 1056 babies were surviving till the end of this study, comprising (97.2%) of the studied cases. There were 72 out of 1059 newborns being of LBW; 6.8 %. Risk factors affecting the LBW: Biologic and socioeconomic differentials, ANC utilization, mother's health status, exposure to smoking, past obstetric bad experience, current obstetric morbidity (risky pregnancy), mode of labour and morbidity arising during labour or in early neonatal period of major congenital anomalies or severe birth trauma were found to be risky for the LBW. **Conclusion:** Collaborative efforts from all who concerned are needed for the development, approval, implementation and revisal for clinical and classroom experiences to personnel concerned with LBW care provision and registry.

[Eman Abdel-Baset Mohamed. **A Community- Based Cohort Study for the Risk Factors of Low Birth Weights, in an Upper Egypt Governorate.** *Journal of American Science.* 2012; 8(6): 600-607].(ISSN: 1545-1003). <http://www.americanscience.org>. 74

Key words: Low Birth Weight- Risk Factors- Antenatal care- Obstetric morbidities.

1. Introduction

More than 20 million infants are born each year weighing less than 2,500 grams (5.5 pounds), accounting for 17 % of all births in the developing world – a rate more than double the level in industrialized countries (7 %)⁽¹⁾. LBW infants are at higher risk of dying during their early months and years. Those who survive are liable to have an impaired immune system and may suffer a higher incidence of such chronic illnesses as diabetes and heart disease in later life⁽²⁾. More than 96 % of low birth weight occurs in the developing world, reflecting the higher likelihood of these babies being born in poor socio-economic conditions, where women are more susceptible to poor diet and infection and more likely to undertake physically demanding work during pregnancy.⁽³⁾ It reflects, further, a generational cycle of under-nutrition, the consequences of which are passed along to children by mothers who are themselves in poor health or undernourished.^(4,5)

There is significant variation in the incidence of LBW across regions. South Asia has the highest

incidence, with 31 % of all infants with LBW, while East Asia/Pacific has the lowest, at 7 %. India is home to nearly 40 % of all LBW babies in the developing world. In sub-Saharan Africa 14 % and in the Middle East/North Africa 15 % of infants are born with low weight.^(6,7)

Reliable monitoring of this vital indicator is difficult, however, given that 58 % of all infants in the developing world are not weighed at birth. This proportion is highest in South Asia (74 %) and sub-Saharan Africa (65 %).^(2,3)

In developing countries, we need for an integrated LBW care system⁽¹⁾ of 4 levels. Level 0: concerning traditional birth attendants (TBAs); they can be key persons in provision of care to pregnant mothers and newborn babies; for health and nutrition education and for referral of high risk pregnancies to specialized centers⁽²⁾. Level 1: cares for uncomplicated pregnancy, delivery and the neonate, Level 2: cares for complicated cases and provides short-term intensive care. Level 3: deals with very high-risk mothers and infants and provides long term intensive care⁽⁸⁾.

Pre-conception factors and conditions arising during pregnancy, or parturition, may influence LBW mortality, the health of the newborn, or the ultimate development of the child. Improved care relevant to the LBW period can thus promote better health throughout the world⁽⁸⁻¹⁰⁾.

Female genital tract infection had been shown to be a risk factor for preterm labour, delivery of a low birth-weight infant, premature rupture of amniotic membranes, chorioamnionitis and postpartum endometritis⁽⁹⁾. These complications can be prevented by treatment of these infections before gestation or during antenatal care⁽¹⁰⁾.

Small-for-dates and pre-term babies, clinically malnourished at birth and with depleted glycogen stores, present the greatest single problem; they must be distinguished early from those who, though small-for-dates, present no clinical indication for intensive neonatal care⁽¹¹⁾.

Mortalities of LBW babies below the third percentile of birth weight may be up to 6 times higher than that of babies whose birth weight is average for the duration of pregnancy⁽¹⁰⁾. It is higher in males than in females and is also higher for those with poor temperature regulation and marked hypoglycemia after the first few hours of life, either asymptomatic or with neurological signs and higher for those with dehydration with or without a high serum sodium⁽¹¹⁻¹⁴⁾.

In developed countries, serious neonatal infections are comparatively rare with the exception of pulmonary infection. Meningitis sometimes develops, however, as a result of infection acquired during or after birth, and may lead to death or subsequent long-term sequelae⁽¹⁵⁾. Intrapartum and postpartum contamination of the fetus are common in developing countries, where infection is possibly the most important and most readily preventable health problem of the neonate. Neonatal tetanus is an outstanding example^(16,17).

Neonatal jaundice must never be regarded as physiological until all known pathological causes have been excluded. This applies particularly to jaundice within the first 36 hours, when it is most often due to rhesus or other blood group incompatibilities or to other causes of haemolysis⁽¹⁸⁾. Delayed feeding of low birth weight babies is an avoidable cause which, as with other causes of raised indirect bilirubin level, can lead to kernicterus⁽¹⁹⁾.

Congenital malformations are an important cause of LBW mortality and morbidity and may be found to account for a great percentage of LBW deaths, depending on the frequency of autopsy. Major neural tube malformations are more common among the lower socio-economic groups, at age and parity extremes, and in female fetus. Major chromosomal

aberrations constitute another group of congenital malformations that frequently lead to early death⁽²⁰⁾.

2. Subjects and Methods

The fieldwork was divided into two parts:

1- Antenatal care visits that were either:

A) Clinic-based part in the served areas for the target clients, or

B) Household visits for the underserved areas' residing eligible mothers.

2- Postnatal home visits of all the studied mothers in all chosen areas were done according to the detailed registered home residence.

Each woman was thus seen at least three times, one while she was pregnant, second at the first week after labour, and the third visit was after the first month of parturition within the puerperium.

According to the information center of Sohag, (21) the following 9 locations in Sohag governorate were selected to carry out the practical work of the study in Sohag and Akhmim districts, considering a time starting July 2007 till Jan. 2011 for the ANC visits and the postnatal home visits. They were Awlad azaz, Mazalwa, Demno, Gezeraa Mahrous, Gezeraa Shandaweel, both Sohag east and west wards, Nage El-Tal Elawsat and Ezbat El Arab; they chosen randomly to represent all geographical areas of the governorate

Sampling:

Sample size calculation: An Epi Info 6 computer program was used for determining the required number of participants (4000 was the total eligible women in the studied areas), at confidence level 95%. It was 984 (264 x 4 divisions urban and rural, served and under-served) that was increased to 1082 eligible pregnant mothers. A systematic method used to determine the sample of pregnant women drawn from Awlad Azzaz, El-Mazalwa, Demno G. Shandaweel, East and West Sohag faubourgs. Total coverage of G. Mahrous, Nage El-Tal and Ezbat El-arab were occurred for two months duration for each.

Study tools:

Various variables needed for the study were collected using the questionnaire form for the eligible women.

A pilot study had been carried out in a similar community to test the validity of the questionnaire; the necessary corrections were carried out. Then the final questionnaire had been developed and used in the structured interviews with the studied women who fulfill the selection criteria. Households of the studied deprived villages had been numbered and recorded and eligible women had been identified and listed.

The study started with 1082, during the cohort, a drop out of 11 mothers occurred because they delivered in a residence other than that where they first recruited. 12 mothers aborted while 1059 followed up until the end of puerperium.

3. Results

Results of this study can be portrayed as follows:

1- Biologic factors affecting the LBW outcome; (table 1) were the mothers' age at marriage ($p = 0.002$), whereas marriage before 16 years represented 10.5 % of cases, of whom 44.7 % had adverse perinate by death or disease. Teenage pregnancy constituted 8.5 % and significantly affected the LBW outcome ($p < 0.001$) and so do parity > 5 ($p < 0.001$), positive past abortions ($p < 0.001$) (in more than 1/4th of mothers) and too frequent current pregnancy before 1 year (in more than 20% of mothers).

2- Sociodemographic differentials affecting LBW; (tables 2,3): Illiteracy predominated among 60.7 % of the studied mothers while 16% completed basic education. 18.6 % mothers attained twelve years of education (secondary school level). Those who cached high education were only 4.6 % mothers. Mothers' education had a positive; though weak correlation ($r = 0.3$) and significant impacts upon LBW outcome ($p = 0.03$) as shown in tables (2) and (3).

Table (2) shows also that residence ($p < 0.001$), mother working (0.038), family monthly income and housing construction ($p = 0.003$), Flooring ($p = 0.001$), affected significantly the LBW outcome. Absence of husband abroad also affected significantly the LBW outcome.

In table (3), the educational level of the mothers showed statistically significant differences ($P = 0.03$), being highest (10 %) in the university or higher levels and lowest (5.6 %) among the illiterate mothers.

3- Antenatal (ANC), natal and postnatal Care and LBW: Table (4) shows that current ANC utilization, current ANC attendance, frequency and starting time, also spacing, current OBS problems, current twins, Intrapartum complication, mode of delivery and hypertensive disorders of pregnancy ($p < 0.001$ for each) affected significantly the LBW outcome.

While tables (5), (6) and (7) show the familial and maternal; obstetrical and in labour morbidities that affected the LBW outcome as follows:

A) Morbidity during pregnancy:

Table (4) shows that bleeding at early pregnancy affected 3.3 % mothers, antepartum hemorrhage affected 1.4 %, hyperemesis gravidarum occurred in 2.2 %, all significantly affected the LBW

outcome. Polyhydramnios affected 1.3% mothers while oligohydramnios occurred in 0.9%.

Table (5) shows also that anaemia ($Hb < 11\text{gm}\%$) occurred in 287 out of 500 tested mothers (57.4 %), hypertension was in 7.6 % (5.3 % were new cases), diabetes mellitus in 2.2 %, heart diseases in 3.2% (0.5 % were new cases) and all significantly affected the LBW outcome. Gynecological infection was in 11.6 % and urinary tract infection in 8.4 %. Chest and upper respiratory tract infection occurred in 5.3 % and teeth adversely affected in 1.2 % women. Neurological and psychiatric conditions were in 3.8%. New cases of toxoplasma infection were in 7.2 % of mothers. Surgical conditions e.g. stone ureter and obstructed cholecystitis occurred in 2 cases (0.2 %).

Nausea, vomiting, heartburn, morning sickness, headache, and drowsiness, although being trivial, yet affected a big number, 446 mothers (41.2%) during present gestation.

B) Complication of current labour:

Table (6) shows that most of the current deliveries, 853 (80.5%) out of 1059 passed safely. Complications of current deliveries were including: obstructed labour in 101 cases (9.5%), uterine inertia in 43 (4.1 %), precipitate labour in 19 (1.8%), perineal tearing in 37 (3.4%), while cervical tearing in 3 (0.3%), premature rupture of membranes in 9 cases (0.8%), rupture of uterus occurred in 1 case (0.1%). On the other hand, unknown difficulty was mentioned by 9 (0.8%) mothers.

C) Neonatal conditions:

Table (8) shows that birth trauma affected 144 out of 1073 (13.4 %) of the cases (it was in the form of: 45 cases of hypoxia, cephalhematoma, limb injury and avulsion of the cord, of whom 31 were severely affected. Bruising and caput represented 68.7% of the traumatized cases in 99 live-born).

Twenty out of 1073 live births, (1.9 %) suffered congenital anomalies in the form of: one case for each of hydrocephalus with spina bifida, anencephaly and cord abnormalities. Mongolism was noticed in 2 cases and cleft palate with harelip in 4 cases. Talibus occurred in 2 cases, polydactyly in 5, excess ear in 4 and cavernous hemangioma in 3 cases. Both major congenital anomalies and severe birth trauma were adversely affected the LBW outcome as shown in table (7).

The umbilical stump was infected in (0.3%) only of the cases. Jaundice developed in (25.2%) neonate. Neonatal infection occurred in (26.0%) of the cases including upper respiratory tract, chest infection, gastroenteritis, eye infection, skin infection and urinary tract infection. Mixed infections affected most of the cases.

The weight at birth was affected by the same factors affecting the LBW outcome ($P < 0.001$ for each factor). Growth velocity of the neonates in one

month -fortunately- was positive for all LBE infants studied.

Table (1): Biological factors affecting LBW

Maternal Parameters	Mothers n = 1082; 100%		Normal W. n = 1010; 93.3%		LBW n = 72; 6.7%		χ^2	P value
	No.	C%	No.	R%	No.	R%		
Age at marriage:								
< 16 year	114	10.5	63	55.3	51	44.7	42.41	0.002
\geq 16 year	968	89.5	947	97.8	21	2.2		
Age at this gestation:								
< 20 year	92	8.5	87	94.6	5	5.4	127.6	< 0.001
\geq 20 year	954	91.5	887	93.0	67	7.0		
Parity:								
< 5	866	80.0	812	93.7	54	6.3	400.5	< 0.001
\geq 5	216	20.0	198	90.7	18	8.3		
Abortion:								
Yes	290	26.8	25.8	89.0	32	11.0	132.4	< 0.001
No	792	73.2	752	94.9	40	5.1		
Spacing:*								
\leq 1 year	817	100	760	92.7	57	7.3	340.6	< 0.001
\leq 1 year	169	20.7	144	84.2	25	14.8		
> 1 year	648	79.3	616	95.1	32	4.9		
FP past practice:								
Yes	271	25.0	258	95.2	13	4.8	7.45	NS [#]
No	811	75.0	752	92.7	59	7.3		

* There were 252 primigravida in addition to the studied mothers for spacing.

NS = Not significant. C%= column % & R%= row %

Table (2): Socioeconomic factors affecting LBW

	Mothers n = 1082; 100%		Normal W. n = 1010; 93.3%		LBW n = 72; 6.7%		χ^2	P value
	No.	C%	No.	R%	No.	R%		
Residence:								
Rural	639	59	604	94.1	38	5.9	450.7	< 0.001
Urban	443	41	409	92.3	34	7.7		
Education:	900*		828		72			
Illiterate or < Basic	657	66.7	611	93.0	46	7.0	101.27	0.03
\geq Basic education	243	33.3	217	89.3	26	10.7		
Mother occupation:								
House wives	867	80.1	808	93.9	59	6.8	38.87	0.038
Working mothers	215	19.9	202	94.0	13	6.0		
Monthly income *:								
\leq 200 LE	712	100.0	652	91.6	60	8.4	400.61	< 0.001
\leq 200 LE	377	53.0	349	92.3	28	7.7		
> 200 LE	335	47.0	303	90.5	32	9.5		
Housing:								
Muddy	279	25.8	254	91.6	25	9.4	18.22	0.003
Red bricks	803	74.2	756	94.1	47	5.9		
Husband availability:								
Not available	3	0.3	000	0.0	3	100	98.90	< 0.001
Available	1079	99.7	1010	93.6	69	6.4		

** 712 mothers only knew the family monthly income & only 900 accepted to define their educational status.

Table (3): Maternal educational levels, impact upon LBW

Educational Level	Mothers n = 1082; 100%		Normal W. n = 1010; 93.3%		LBW n = 72; 6.7%	
	No.	C%	No.	R%	No.	R%
Illiterate	657	60.7	620	94.4	37	5.6
Basic Education	173	16.0	158	91.3	15	8.7
Secondary School Level	202	18.6	187	92.5	15	7.5
> University Level	50	4.7	45	90.0	5	10.0

*p = 0.03, McNemar test was applied

Table (4): Current obstetric morbidity, impact upon LBW

Current Obstetric Morbidity	Mothers		Pregnancy outcome %		P
	No.	%	Normal W.	LBW	
Nil	226	20.9	95.5	4.5	< 0.05
Maternity Morbidity					
Direct obstetric morbidity:					
Bleeding at early preg.	36	3.3	30.1	69.9	< 0.05
Antepartum hemorrhage	15	1.4	20	80	< 0.05
Hyperemesis gravidarum	23	2.2	78.3	21.7	< 0.05
Poly & oligohydramnios	24	2.2	57.1	42.9	NS
Indirect obstetric morbidity:					
Anaemia, 500 tested	287	57.4	38.4	61.6	< 0.05
Hypertensive disorders	82	7.6	23.5	76.5	< 0.05
DM; 558 tested	12	2.2	27.3	72.7	< 0.05
Heart conditions	35	3.2	35.3	64.7	< 0.05
Gynecological infection	126	11.6	51.6	48.4	NS
Urinary TI; 558 tested	47	8.4	57.5	42.5	NS
Chest & U.R.T. infection	57	5.3	52.6	47.4	NS
Toxoplasmosis; 83 tested	6	7.2	49	51	NS
Neurologic & psychiatric	41	3.8	43.9	56.1	NS
Surgical conditions	2	0.2	50	50	NS
Teeth affections	13	1.2	50.7	49.3	NS
Anorexia and vomiting	446	41.2	43.2	56.8	NS
Rh -ve risk in 182	16	8.8	43.8	56.2	NS
Fetal morbidity					
Mal presentation/ lie	10	0.8	88.9	11.1	< 0.05
miscarriage	23	2.3	0	100	< 0.001
Pre-term	12	1.1	0	100	< 0.001
Post-term	5	0.5	20	80	0.001
Materl. & fetal morbidity	6	0.6	0	100	< 0.001

1.9 % out of 1082 mothers were old diabetics. **1.3% (14 out of 1082 mothers) had Ig G for toxoplasmosis. Sometimes more than one complication occurred in the same mother.

Table (5): Current labour complications, impact upon LBW

Labour Complications	Mothers n = 1059*		Pregnancy outcome (%)		P value
	No.	%	Normal W.	LBW	
Nil	853	80.5	97.7	2.3	<0.001
Obstructed L/disproportionate	101	9.5	39.6	60.4	0.05
Premature rupture of membranes	9	0.8	44.4	55.6	NS
Precipitate labour	19	1.8	52.6	47.4	NS
Cervical / perineal tear	40	3.7	65	35	NS
Rupture of uterus	1	0.1	0	100	<0.001
Uterine inertia	43	4.1	53.5	46.5	NS
Unknown morbidity	9	0.8	55.6	44.4	NS

* 1059 were followed till labour

Table (6): Maternity care utilization effect on LBW

	Mothers n = 1082; 100%		Normal W. n = 1010; 93.3%		LBW n = 72; 6.7%		χ^2
	No.	C%	No.	R%	No.	R%	
Current ANC attendance:							
No	457	42.2	438	95.8	21	4.2	47.1
Yes	625	57.8	574	91.8	51	8.2	
ANC frequency:	625	100	553		72		401.3
Irregular (< 4)	459	37.4	438	95.4	21	4.6	
Regular (≥ 4)	166	26.6	115	69.3	51	30.7	
ANC starting time:	625	100.0	574	91.8	51	8.2	118.4
1st trimester	283	45.3	260	91.9	23	8.1	
2 nd , 3 rd trimester	342	54.7	314	93.3	28	6.7	
Mode of delivery:	1059	100	987	93.2	72	6.8	90.9
Spontaneous vaginal	696	65.7	661	95.0	35	5.0	
Assisted*	363	34.3	326	89.8	37	10.2	

* P value was < 0.001 for each parameter. *Assisted delivery included induced, augmented, instrumental or surgically assisted by episiotomy or even cesarean section.

Table (7): Morbidity factors and risks affecting LBW in Sohag

	Mothers n = 1082; 100%		Normal W. n = 1010; 93.3%		LBW n = 72; 6.7%		χ^2	P value
	No.	C%	No.	R%	No.	R%		
Current OBS risks							547.54	< 0.001
Nil	230	21.2	215	93.5	15	6.5		
Present	852	78.8	795	93.3	57	6.7		
Twin index pregnancy	1059	100.0	987	93.2	72	6.8	246.57	< 0.001
No	1033	97.5	970	93.9	63	6.1		
Yes	26	2.5	17	65.4	9	34.6		
Intrapartum risk	1059	100.0	987	93.2	72	6.8	397.14	< 0.001
Nil	733	70.3	716	95.1	37	4.9		
Present	306	29.7	271	89.2	35	11.4		
Hypertensive disorders							293.14	< 0.001
No	1000	92.4	984	98.4	16	1.6		
Yes	82	7.6	26	31.6	56	68.4		
Reported ds of mothers							10.20	NS
Negative	743	68.7	684	92.1	59	7.9		
Positive	339	31.3	326	96.2	13	3.8		
Family history of dses.							6.06	NS
Negative	861	79.6	815	94.7	46	5.3		
Positive	221	20.4	195	79.2	26	11.8		

Table (7) shows that the current obstetric and intrapartum problems and risks whether maternal or fetal, as well as multiple current pregnancy and hypertension that affected the mother during gestation, all affected significantly the LBW outcome.

Table (8): Congenital anomalies and birth trauma effect on LBW in Sohag

Parameter	Normal W. n = 987; 93.2%		LBW n = 72; 6.8%		χ^2	P value
	No.	R%	No.	R%		
Major Cong. Anomaly:					2.09	0.007
- Absent	987	94.2	52	5.8		
- Present	00	0.00	11	100.0		
Major Birth trauma:					15.89	0.001
- Absent	987	96.0	52	4.0		
- Present	00	0.0	11	100		

Both major congenital anomalies and disabling birth trauma affected the LBW outcome at high significant levels (p = 0.007 and 0.001)

Table (9): Smoking effect on LBW in Sohag

Maternal exposure to smoking	Mothers n = 1082	Normal W. n = 1010; 93.3 %	LBW n = 72; 6.7 %
Not exposed	344 (31.8 %)	318 (92.4 %)	26 (7.6 %)
Exposed	738 (68.2 %)	692 (93.8 %)	46 (6.2 %)

Uncorrected $\chi^2 = 0.66$; P was NS; 0.41 - Relative Risk = 0.99 at 95% confidence limits of [0.95-1.02]

Maternal exposure to smoking (whether passively because of husband smoking or actively) was effective in producing adverse outcome as the relative risk approximate 1.

Table (10): Stepwise regression analysis for the factors affecting the LBW in Sohag

Variable	Beta	T-value	p-value
Biologic differentials	7.922	15.532	0.0001
Socioeconomic	4.987	8.998	0.02
ANC seeking	4.021	8.542	0.029
Maternal health	3.657	7.894	0.031
Bad Obs history	3.124	7.432	0.038
Current Obs problem	2.869	7.123	0.043
Assisted labour	2.475	6.801	0.049
Anomalies or birth trauma	2.222	6.454	0.05

Biologic and socioeconomic differentials, ANC utilization, mother's health status, exposure to smoking, past obstetric bad experience, current obstetric morbidity (risky pregnancy), mode of labour and morbidity arising during labour or in early neonatal period of major congenital anomalies or severe birth trauma were detected as being risk factors for LBW.

4. Discussion

LBW outcome is adversely affected in the current study as well as in 1-9 studies. There are similarities of SB rate and intrapartum death rate of the current study and that of Meagher study in Royal P.A. Hospital. In ARCCOP Australia, 1996 (20), the LBW mortality rate was much lower than current study, 7.1 per 1000 live births compared to 22 for our study which in turn is greatly lower than Bhutta, Z.A. and Rehman, S., in Pakistan 1997 (22), 60-90/1000 live-births). Stillbirths comprised 65% in Australia, almost 50% in Pakistan and 36.4% in current study of LBW deaths. Early NNM rate is almost equal in current study and Pakistan, about 45.5% of LBW deaths being much higher than that registered by IC, Sohag-MOH, Sep. 2010 (21) due to under-registration. On the other hand post neonatal deaths are the same in Eichenwald of American Academy of Pediatrics (13) and our study, about 0.3 % for both.

The current study is lower than Lowry L.W. et al., 1998, ARCCOP, Australia, 1996 and Wilkinson D, 1997 studies (18,19,24) as regard the congenital anomalies incidence as well as for birth trauma and for increasing neonatal jaundice nowadays, possibly because of increasing awareness. Neonatal infections were very high in the current study, mostly because of rural residence, low level of education and environmental pollution.

Weight, length, mid- arm circumference, head and chest circumference were lower than Harvard, Tanner or WHO figures.

Biologic and socioeconomic differentials, , mother's health status, exposure to smoking, past obstetric bad experience, current obstetric morbidity (risky pregnancy), mode of labour and morbidity arising during labour or in early neonatal period of major congenital anomalies or severe birth trauma were found to be risky for the LBW in the current study.

Current ANC utilization, attendance, frequency and starting time, also spacing impact on the LBW

outcome, were found to in agreement with 3-9 studies as it agree in the study design mostly and all had a sample size approximately equal. In addition current OBS problems, current twins gestations, intrapartum complications, mode of delivery and hypertensive disorders of pregnancy ($p < 0.001$ for each) affected significantly the LBW outcome as was the case in 9-20 studies; mostly because the similarity in; not only the study design but also the samples studied were nearly the same.

Recommendations:

Reimbursement for maternity care and case management service to 100% for all pregnant women, even through outreach service (care in situ); not only medical but also nutritional, psychosocial and resource needs with referral system reinforcement.

Modeling the prognostic association between prenatal care and LBW risk markers by using Home Based Maternal Cards (HBMC) for even non-educated women by means of shapes and pictures.

Improvements in the health and socioeconomic status of women, including improving female education and combating illiteracy, include maternal health education in preparatory school curriculum.

Further researches about LBW morbidity and mortality via both: hospital-based and community-based studies. Repeating the studies on regular basis (every 5-10 years).

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