Research Article

Low birth weight and its associated factors among deliveries in Malawi city, Minia, Egypt

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Abstract
Background: low birth weight (LBW) is one of the major determinants of perinatal survival, infant morbidity, and mortality as well as the risk of developmental disabilities and illnesses in future. WHO estimates that 25 million LBW babies are born annually worldwide and 95% occur in developing countries. In Egypt, as in many other developing countries, most infant and childhood mortality has been also due to diarrhea, acute respiratory infections, other infectious diseases such as meningitis, neonatal infections and vaccine preventable diseases. These conditions are more critical among LBW children since they are more at risk of premature birth, fetal defects, neonatal complications, deficient immune system and greater exposure to infections. Global nutrition targets set at the World Health Assembly in 2012 include an ambitious 30% reduction in LBW prevalence between 2012 and 2025.
Aim of the study: To estimate percentage and risk factors of LBW among population in Mallawy city, Minia, Egypt. **Research methodology:** This study is prospective cohort study among pregnant females in 3rd trimester, included 346 participants, recruited from two health centers in Mallawy city. Face to face interview questionnaire was used in data collection. **Results:** LBW cases consisted 32.4% of all participants. By logistic regression analysis twin pregnancy, hypertension and preterm labor (PTB) were associated with the highest probability to LBW, with AOR= 3.88, 3.43 and 3.30 respectively. **Conclusion:** working status, passive smoking, short interpregnancy intervals, twin pregnancy, PTB, hypertension, and vaginal bleeding during pregnancy found to be risk factors for LBW. **Recommendations:** Increase the community awareness of risk factors of the problem. More research on larger populations is necessary for risk assessment and long term consequences of LBW.
Key words: LBW, prevalence, risk factors, Minia.

Introduction
LBW is defined by the World Health Organization (WHO) as birth weight of a live born infant of less than 2500 g regardless of gestational age (WHO & UNICEF, 2013). A large body of work shows links between LBW and all-cause mortality, developmental disabilities, and diminished respiratory functionning later in life in developing and developed countries (Schieve et al., 2016). Globally, more than 20 million infants, representing 15.5% of all births, are born with LBW; 95.6% of them lived in developing countries, accounting for 17% of all births in developing countries (Gebremedhin, 2015). The prevalence of low birth weight in the Middle East and North African region is estimated to be 11% which highlights the gravity of the situation (UNICEF, 2003). In Egypt, LBW babies represent about 13% of all births and this percent considered to be high (DHS, 2008).

Several risk factors have been found to be associated with LBW, including maternal age, ethnicity, lifestyle maternal characteristics such as smoking and alcohol consumption, education level, working conditions, access to obstetric observation, diabetes mellitus, mental stress and depression, body mass index (BMI) before pregnancy and additional weight-gain during pregnancy (Goldenberg et al., 2008).

Subjects and methods
Study design:
This is a center based prospective cohort study carried out in Mallawy city, Minia governorate. The study sample recruited from two medical health centers: Mallawy medical center and Mother and Child Health care center, which were selected randomly from mallawy city centers, where pregnant women were attending to get toxoid vaccine. In each vaccination set

females in 3rd trimester were recruited. In each set about 50 females were attending. There were two vaccination sets per week in each center.

The sample size of this study was calculated using EPI INFO program and according to the prevalence of LBW in Egypt, also according to the number of pregnant females attending the two health centers for vaccine. The study sample included 346 females, half of them recruited from Mallawy Medical Centre and the other half recruited from MCH Care Center.

Data collection:

Data collection tool:

The data were collected through face to face interview questionnaire with the participants. The questionnaire was prepared in English, to assess most probably causes that may lead to LBW also to measure the approximate number of cases of the condition. It contained: sociodemodemographic data, obstetric history, medical history, violence assessment screen, investigations and delivery outcome data.

Questions related to assessment of LBW, modified from a study conducted in Iraq to detect risk factors of LBW (Madiah & Shukir, 2017). While the part of questionnaire related to violence is modified from the abuse assessment screen used in a study made in an educational hospital in iran "Quality of life in women who were exposed to domestic violence during pregnancy" in 2016, (J. McFarlane et al., 1992).

Ethical consideration:

Approval of ethical medical committee of Faculty of Medicine, Minia University was taken. Also, approval of the managers of the two health centers was taken before starting. Consent was taken after explaining the nature, purpose and uses of the data from each participant.

Statistical analysis

The analysis of the data was carried out using the IBM SPSS 20.0 statistical package software. Chi- square test, Fisher's exact and Z (test of proportions) tests were used to compare between proportions. Student t-test was used to compare two means. Multiple regression analysis was used to see the combined effect of different independent variables on the target (dependent variable). The probability of less than 0.05 was used as a cut off point for all significant tests.

Results

The age of the participants ranged from 18 to 43 years old. 17.3% of the participants lived in rural areas; the majority of females 61.1% had basic education. Only 15.9% of the participants were working mothers. 54.3% reported history of passive smoking during pregnancy.

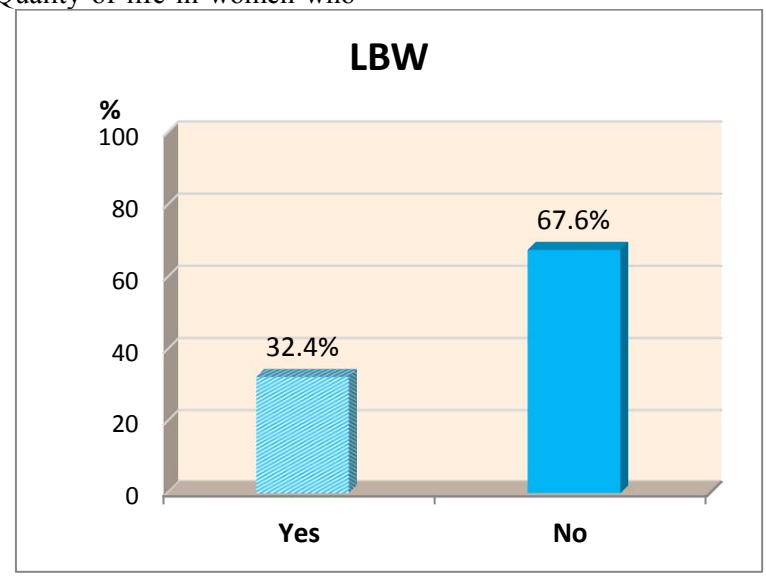

Figure (1): The incidence of LBW among the study sample in Mallawy city, 2019:

Showed that 32.4% of babies weighed less than 2500 gm. at delivery and considered to be LBW babies.

Table (1): Birth weight and sociodemographic data of mothers, Mallawy city, 2019:

	Total (n=346)	LBW (n=112)	control (n=234)	Test statistic (DF)	p value
Age at pregnancy					
Less than 20	28 (8.1%)	8 (7.1)	20 (8.5)	Fisher's (DF) 5.025 (3)	0.14
20 to <30	253 (73.1%)	77 (68.8)	176 (75.2)		
30 to < 40	61 (7.6%)	24 (21.4)	37 (15.8)		
40 to < 50	4 (1.2%)	3 (2.7)	1 (0.4)		
Residence					
Urban	286 (82.7%)	90 (80.4)	196 (83.8)	χ^2 (DF) 0.612 (1)	0.43
Rural	60 (17.3%)	22 (19.6)	38 (16.2)		
Working status					
Housewives	291 (84.1%)	84 (75)	207 (88.5)	χ^2 (DF) 10.267 (1)	**0.001***
Working	55 (15.9%)	28 (25)	27 (11.5)		
Smoking					
No	156 (45.1%)	37 (33)	119 (50.9)	Fisher's (DF) 10.242 (2)	**0.003***
Passive	188 (54.3%)	74 (66.1)	114 (48.7)		
Active	2 (0.6%)	1 (0.9)	1 (0.4)		

*significant

Table 1: shows no significant difference between the two groups regarding neither age nor residence of mothers. While there was significant difference between them regarding working and passive smoking, 75% of LBW babies born to working mothers and 66.1 to mothers with passive smoking history.

Table (2): obstetric history and birth weight among study sample in Mallawy city, 2019:

	Total (n=346)	LBW (n=112)	control (n=234)	Test statistic (DF)	p value
Gravidity					
Prim gravida	108 (31.2%)	38 (33.9)	70 (29.9	χ^2 (DF) 0.568 (1)	0.45
Multigravida	238 (68.8%)	74 (66.1)	164 (70.1)		
Last delivery#					
Normal	63 (27.9%)	21 (30.9)	42 (26.6)	χ^2 (DF) 0.437 (1)	0.51
CS	163 (72.1%)	47 (69.1)	116 (73.4)		
Last inter-pregnancy interval #					
< 3 years	115 (50/9%)	44 (64.7)	71 (44.9)	χ^2 (DF) 7.434 (1)	**0.006***
≥ 3 years	111 (49.1%)	24 (35.3)	87 (55.1)		
History of LBW					
Yes	24 (6.9%)	12 (10.7)	12 (5.1)	χ^2 (DF) 3.661 (1)	0.06
No	322 (93.1%)	100 (89.3)	222 (94.9)		
Preterm					
Yes	95 (27.5%)	57 (50.9)	38 (16.2)	χ^2 (DF) 45.668 (1)	**<0.001***
No	251 (72.5%)	55 (49.1)	196 (83.8)		
Twin pregnancy					
Yes	44 (12.7%)	28 (25)	16 (6.8)	χ^2 (DF) 22.511 (1)	**<0.001***
No	302 (87.3%)	84 (75)	218 (93.2)		
Sex of newborn					
Male	175 (50.6%)	56 (50)	119 (50.9)	χ^2 (DF) 0.022 (1)	0.88
Female	171 (49.4%)	56 (50)	115(49.1)		

*significant #no.=226

Table 2: shows that LBW cases were more among females with IPI less than 3 years, PTB and with twin pregnancy. The statistical difference between the two groups as regard these points was significant. While no difference was found regarding history of LBW, sex of baby, gravidity and type of delivery.

Table (3): medical history of mothers in Mallawy city in relation to baby weight, 2019:

		Total (n=346)	LBW (n=112)	control (n=234)	Test statistic (DF)	p value
Hb	Range Mean±SD	(9-13) 10.8±0.7	(9-13) 10.6±0.8	(9-13) 10.9±0.7	t (DF) -3.384 (344)	**0.001***
Gestational diabetes						
Yes		18 (5.2%)	3 (2.7)	15 (6.4)	Fisher's (DF) 2.162 (1)	0.2
No		328 (94.8%)	109 (97.3)	219 (93.6)		
Hypertension						
Yes		63 (18.2%)	39 (34.8)	24 (10.3)	χ^2 (DF) 30.691 (1)	**<0.001***
No		283 (81.8%)	73 (65.2)	210 (89.7)		
Vaginal bleeding						
Yes		36 (10.4%)	20 (17.9)	16 (6.8)	χ^2 (DF) 9.867 (1)	**0.002***
No		310 (89.6%)	92 (82.1)	218 (93.2)		
Emotionally abused						
No		299 (86.4%)	98 (87.5)	201 (85.9)	Fisher's (DF) 0.874 (2)	0.65
Husband		45 (13%)	13 (11.6)	32 (13.7)		
Family member		2 (0.6%)	1 (0.9)	1 (0.4)		

*significant

Table 3: revealed that 34.8% of LBW cases had mothers with hypertensive disorders and 17.9% of had vaginal bleeding during pregnancy with significant difference between the two groups. No significant difference was found regarding diabetes and emotional violence.

Table (4): Multiple logistic regressions of predictors of LBW in Mallawy city, 2019:

		LBW			
		Crude OR (95% CI)	P-value	Adjusted OR (95% CI)	P-value
Twin pregnancy		4.54 (2.34-8.82)	**<0.001***	3.88 (1.48-10.19)	**0.006***
Hypertension		4.68 (2.63-8.30)	**<0.001***	3.43 (1.08-10.91)	**0.037***
PTB		5.35 (3.22-8.88)	**<0.001***	3.30 (1.32-8.23)	**0.011***
Vaginal bleeding		2.96 (1.47-5.97)	**0.002***	2.16 (0.54-8.58)	0.275
Smoking	No	1.00 (reference)		1.00 (reference)	
	Passive	2.09 (1.30-3.34)	**0.002***	2.01 (0.97-4.14)	0.059
	Active	3.22 (0.20-52.69)	0.413	0	1.000
Working status	Housewife	1.00 (reference)		1.00 (reference)	
	Working	2.56 (1.42-4.59)	**0.002***	1.90 (0.73-4.97)	0.190
Last inter-pregnancy interval (yr)					
≥ 3 yr		1.00 (reference)		1.00 (reference)	
< 3 yr		2.25 (1.25-4.04)	**0.007***	1.87 (0.92-3.78)	0.084
Taking medications		2.47 (1.53-3.99)	**<0.001***	0.53 (0.17-1.64)	0.270
History of PTB		2.83 (1.03-7.82)	**0.044***	1.43 (0.39-5.30)	0.593
Hb		0.91 (0.86-0.96)	**<0.001***	0.96 (0.58-1.59)	0.879

N.B. Dependent variable LBW, OR odds ratio, CI confidence interval R^2= 0.334 *significant

Table (4): shows that twins and preterm babies were approximately 3 times in risk for being LBW more than other group. LBW had higher odds of being born to working mothers, hypertensive mothers and mothers with history of vaginal bleeding and passive smoking during pregnancy. Hypertensive mothers were 3 times more risky for having LBW babies. In the multivariate model these associations lost their statistical significance except for twin pregnancy, hypertension and PTB.

Discussion

The current study stated that the incidence of LBW was 32.4% which is much higher than estimated by Egypt Demographic Health Survey (DHS, 2008) that estimated it to be 13%.

This difference may be attributed to the difference in the study population and subjective mother's estimate of birth weight for babies who were delivered outside the health unit. Our result was nearly similar to study done in Central India with a prevalence of 33% (Kumar, 2010). No association was found between mother's age and the weight of the neonates. This result with a study carried out in Gujarat which found that maternal age was not a risk factor for LBW (Mumbare, et al., 2009).

Maternal working status was found to be related to LBW. Our results agreed with the results a study in Iran, which stated that Neonatal birth weight in employed women is less than non-employed women (Rafatie et al., 2017). LBW was also found to be related to passive smoking, mothers who exposed to passive smoking were 2 times more liable to have LBW babies (AOR 2.1). A study conducted by Banderali et al. found the same result as ours, exposure to parental tobacco smoking have several negative birth outcomes such as LBW (Banderali et al., 2015).

As regard interpregnancy interval (IPI), our results revealed that 64.75% of LBW cases were born to mothers who had IPI of less than 3 years; this result was similar to result of the study that was conducted in two urban primary health care (PHC) centers in Fayoum district, which found that LBW was significantly related to short IPI (Mahfouz et al., 2018).

Our study stated that twin pregnancies as well as PTB were considered to be strong risk factors for LBW (OR=3.88) and (OR=3.30) respectively. These results were in line with the results of the study conducted in Molago Hospital which showed that PTB and multiple pregnancies were significantly associated with LBW (Louis et al., 2016).

Regarding hypertension, our study stated that 34.8% of preterm cases reported positive history of hypertension in pregnancy, odds of LBW was 3 times higher with hypertensive disorders. Similar finding was also reported from the study done in India which revealed that mothers with pregnancy induced hypertension (PIH) were more likely to delivery LBW as compared with those women without PIH (AOR= 3.32) (Mumbare et al., 2011). We found no relation between diabetes and LBW. Our result was similar to what came in a study by Lema and Deresse which stated that babies born to mothers having history of chronic diabetes mellitus were less likely to be born with LBW when compared to those born to mothers with no history of chronic diabetes mellitus. (Lema & Deresse, 2017).

As regard to gestational weight gain (GWG), our study found that low GWG was associated with 58.9% of LBW cases, with significant difference between the two groups. This result agreed with that of the study made by R. Zhao et al., which stated that women with low GWG were more likely to have LBW (Zhao et al., 2017).

Conclusion

The incidence of LBW was found to be 32.4%. The current study showed that maternal working status, passive smoking, short IPI, history of preterm, twin pregnancy and PTB were risk factors for LBW. In addition, low Hb level, hypertension, antepartum hemorrhage and low GWG found to be risk factors for LBW, also. On the other hand, the results showed that LBW not related to age of mother, gravidity, sex of baby, DM, history of previous LBW and emotional violence. Twin pregnancy, hypertension and PTB had the higher probability (AOR=3.88), (AOR=3.43) and (AOR=3.30) respectively.

Recommendations:

There is a need to encourage the use of family planning methods that could be an effective measure to solve the of problem of short IPI. Mothers should be motivated to seek adequate level of antenatal care to help early detection of clinical health problems that may lead to LBW as hypertention and low Hb level of mothers. Increase community awareness of benefits of avoidance of exposure to tobacco smoke. More research on larger populations is necessary for risk assessment and long term consequences of LBW.

References

1. Banderali G., A. Martelli, M. Landi, F. Moretti, F. Betti, G. Radaelli, C. Lassandro, and E. Verduci, 2015: Short and long term health effects of parental tobacco smoking during pregnancy and lactation: a descriptive review. J Transl Med, page:327, vol.13. DOI 10.1186/s12967-015-0690-y.
2. Demographic health survey, 2008: low birth weight data, UNICEF, 2008. Re-analyzed by UNICEF HQ, June 2009. . Last updated October, 2014. Accessed on 19/4/2019.
3. Eman M. Mahfouz, Naglaa A. El-Sherbiny, Wafaa Y. Abdel Wahed, and Nashwa S. Hamed, 2018: Effect of inter-pregnancy interval on pregnancy outcome: a prospe-ctive study at Fayoum, Egypt International Journal of Medicine in Developing Countries 2018;2(2):38–44. https://doi.org/10.24911/IJMDC.51-1520268317.
4. Goldenberg RL, Culhane JF, Iams JD, et al., 2008: Epidemiology and causes of preterm birth. Lancet.371:75–84. [PubMed: 18177778].
5. Lema Desalegn Hailu and Deresse Legesse Kebede, 2018 : Determinants of Low Birth Weight among Deliveries at a Referral Hospital in Northern Ethiopia. Hindawi, BioMed Research International Volume 2018, Article ID 8169615, 8 pages. https://doi.org/10.1155/2018/8169615.
6. Louis B., Buyungo Steven, Nakiwala Margret, et al., 2016: Prevalence and Factors Associated with Low Birth Weight among Teenage Mothers in New Mulago Hospital: A Cross Sectional StudyJ Health Sci (El Monte). 2016; 4: 192–199. doi:10.17265/2328-7136/2016.04.003.
7. Madiah M. Abass and Shukir S. Hasan, 2017: Maternal risk factors associated with low birth weight at maternity teaching hospital in Erbil city: A case control study. The Malaysian journal of nursing. Page: 45-52.Vol. 8 (4).
8. McFarlane J., Barbara barker, Karen Soeken and linda Bullock, 1992: Abuse assessment screen. American medical association. Journal of American medical association, 267, 3176-78.
9. M. Gebremedhin, F. Ambaw, E. Admassu and H. Berhane, 2015: Maternal associated factors of low birth weight: a hospital based cross-sectional mixed study in Tigray, Northern Ethiopia," BMC Pregnancy and Childbirth, vol.15 (1), article no.222.
10. Mumbare S., G.Maindarkar, R.Darade, S.Yengl, M.K. Tolani and K. Patole, 2009: "Maternal risk factors associated with term low birth weight neonates: a matched-pair case control study," Indian Pediatrics, vol. 49, no. 1, pp. 25–28.
11. Rafatie S., Maryam Rabiee, Shabnam Golmohammadie, and Shahrzad Hadavand, 2018: To Compare the Effects of Maternal Occupational Activities on Birth Weight: A Cross Sectional Study. Published online 2017 December 10. Women Health Bulletin. 2018 January; 5(1):e13772. doi: 10.5812/whb.13772.
12. Salmasi G, Grady R, Jones J and McDonald SD., 2010: Environmental tobacco smoke exposure and perinatal outcomes: a systematic review and meta-analyses. Acta obstet Gynecol Scand. 89(4):423-441.
13. Schieve L, Tian L, Rankin K, Kogan M, Yeargin-Allsopp M, Visser S, et al., 2016: Population impact of preterm birth and low birth weight on developmental disabilities in US children. Ann Epidemiol 2016; 26 (4):267e74.
14. UNICEF, 2003: State of the World's Children Report. United Nations Children's Fund(2003)UNICEF,NewYork,2003.ISBN 92-806-3784-5. Available:https://www.unicef.org/sowc/archive/ENGLISH/The%20State%20of%20the%20World%27s%20Children%202003.pdf.Accessed on 20/9/2019.
15. V. Kumar, 2010: Magnitude and correlates of low birth weight at term in rural wardha.

Online Journal of Health and Allied Sciences, vol. 15, no. 1, pp. 237–278.

16. World Health Organization and UNICEF, 2013: Low birth weight: country, regional and global estimates, New York. Geneva: WHO; 2013. Available at: unicef.org/publications/files/low_birthweight_from_EY.pdf. Accessed on 19/4/2019.
17. Zhao R., Xu L., Wu M.L., Huang S.H., Cao X.J., 2017: Maternal pre-pregnancy body mass index, gestational weight gain influence birth weight. PMID: 28716548. DOI: 10.1016/j.wombi.2017.06.003.