Multi-Knowledge Electronic Comprehensive Journal For Education And Science Publications (MECSJ)
ISSUE (30), March (2020)
ISSN: 2616-9185
www.mecsj.com

Does Maternal Household Work or Employment Result In Low Birth Weight?

Hatim T.O. Ali[1]*, Duria A. Ryes [2], Ahmed Mansor [3]
[1]Department of Obstetrics and Gynecology, Faculty of Medicine, King Khalid University, Abha, KSA.
[2]Department of Obstetrics and Gynecology, Faculty of Medicine, Khartoum University, Khartoum, Sudan.
[3]Department of Obstetrics and Gynecology, Faculty of Medicine, Sennar University, Sennar, Sudan.
*Corresponding author E-mail: hatimtag@gmail.com

Abstract:

Low Birth Weight LBW (fetal birth weight less than 2.5 kg), which can be a result of preterm delivery or small for gestational age newborns, is known to be associated with an increased incidence of neonatal morbidity and mortality. Working women form a substantial proportion of the workforce in Sudan; many of these women do their household duties in addition to their occupation workload. Moreover, they continue to work during pregnancy. This study aimed to find out the effect of different maternal working conditions (standing vs. sitting position at work, night-shift work vs. day time work and working hours during the week) on the fetal birth weight.

A total of 237 pregnant women and their Neonates in Omdurman Maternity Hospital in Khartoum State in Sudan were enrolled in this study, all of them do their household work, 54 (23%) of them are employed, and 183 (77%) are not.

The study showed a 24 (53.3%) of employed women gave birth to LBW babies compared to 46 (25.1%) of a non-employed group. When studying working posture, 16 out of 30 (53%) who work in a standing position more than 3 hours have LBW neonates compared to 8 out of 24 (33.3%) who work in sitting position. Concerning working time during the day, 20 out of 46 (43.5%) day worker women have LBW compared to 3 out of 8 (37.5%) who were night-shift working women, but the result was not statistically significant.

Multi-Knowledge Electronic Comprehensive Journal For Education And Science Publications (MECSJ)
ISSUE (30), March (2020)
ISSN: 2616-9185
www.mecsj.com

A 21out of 28 (75%) women who worked more than 40 hours per week have LBW neonates in comparison to 3 of 26 (11.5%) women who worked less than or equal to 40 hours a week.

LBW rate was increased in the working group compared to the household workers, ranging from equivalent effect in both working schedules, doubling the risk in those who work in standing posture compared to sitting one during work to 7 folds increase in whom they work more than 40 hours per week.

Keywords: Low Birth Weight, Household, Employment, Shift Work, Working Hours.

الملخص :

الوزن المنخفض عند الولادة LBW (وزن ولادة الجنين أقل من 2.5 كجم) ، والذي يمكن أن يكون نتيجة للولادة المبكرة أو صغيرًا مقارنة بمدة حمله ، من المعروف أنه مرتبط بزيادة تعرضه لحدوث الامراض والوفيات الوليدية. تشكل النساء العاملات نسبة كبيرة من القوى العاملة في السودان. يقوم العديد من هؤلاء النساء بواجباتهن المنزلية بالإضافة إلى عبء عملهن المهني. علاوة على ذلك ، يستمرون في العمل أثناء الحمل. هدفت هذه الدراسة إلى معرفة تأثير ظروف عمل الأمهات المختلفة (الوقوف مقابل وضعية الجلوس في العمل ، والعمل بالمناوبات الليلية مقابل العمل بالنهار و عدد ساعات العمل خلال الأسبوع) على وزن الجنين.

تم تسجيل ما مجموعه 237 من النساء الحوامل وولدانهن في مستشفى أم درمان للولادة بولاية الخرطوم في هذه الدراسة ، وجميعهن يعملن في المنزل ، و 54 (23٪) منهن لديهم وظائف أو أعمال خارج المنزل ، أما 183 (77٪) منهن ليس لديهم اعمال اخري.

وأظهرت الدراسة أن 24 (53.3٪) من النساء العاملات أنجبن أطفال وزنهم منخفض مقارنة بـ 46 (25.1٪) من المجموعة الغير عاملة. و عند دراسة الوضعية اثناء العمل ، فإن 16 من أصل 30 (53٪) الذين يعملون في وضعية الوقوف لأكثر من 3 ساعات انجبن حديثي الولادة وزنهم منخفض مقارنة بـ 8 من 24 (33.3٪) الذين يعملون في وضعية الجلوس. فيما يتعلق بوقت العمل خلال النهار ، فإن 20 من أصل 46 (43.5٪) من العاملات النهاريات لديهن وزن منخفض مقارنة بـ 3 من أصل 8 (37.5٪) من النساء العاملات في نوبات ليلية ، ولكن النتيجة لم تكن ذات دلالة إحصائية. 21 من 28 (75٪) من النساء اللواتي عملن أكثر من 40 ساعة في الأسبوع لديهن حديثي الولادة وزنهم منخفض بالمقارنة مع 3 من 26 (11.5٪) من النساء اللواتي عملن أقل من أو يساوي 40 ساعة في الأسبوع.

Multi-Knowledge Electronic Comprehensive Journal For Education And Science Publications (MECSJ)
ISSUE (30), March (2020)
ISSN: 2616-9185
www.mecsj.com

أظهرت الدراسه زيادة في معدل انجاب اطفال وزنهم منخفض في مجموعة الامهات العاملات مقارنة بربات المنازل ، بدءًا من التأثير المكافئ في كل من جدولي العمل الليلي والنهاري،الى مضاعفة المخاطر لدى أولئك الذين يعملون في وضع الوقوف مقارنة بالجلوس أثناء العمل انتهاء"بسبعة أضعاف زيادة في نسبة حديثي الولادة ذو الوزن المنخفض عند الامهات اللاتي يعملن أكثر من 40 ساعات في الأسبوع.

الكلمات المفتاحية: انخفاض الوزن عند الولادة ، ربة المنزل ، العمل ، العمل بنظام المناوبة ، ساعات العمل.

1. Introduction:

LBW (Low Birth Weight) can be defined as a neonatal birth weight less than 2.5kg. The LBW pregnancy-related complications are significant contributors to perinatal mortality and morbidity, so identification of modifiable risk factors such as working conditions is an essential priority in maternity care.

Three Centuries ago, labour was thought to become more comfortable with the increase in maternal physical activity (PA), Kerr & Johnstone (1954). The association between maternal employment and low birth weight newborns was exposed to several studies, but they yielded different results, (Saurel-Cubizolles et al. 2004).

The effect of moderate maternal PA (moderate PA' was defined as a daily walk of at least 2–6 miles) in the form employment and household work on neonatal birth weight was studied for the first time on the late 19th and early 20th Centuries when they consider them a risk for delivering newborns with lower birth weight, (Briend RG 1980) .

The majority of women remain well throughout their pregnancy. Pregnancy should not be regarded either as an illness or, generally, as a contraindication to work. Indeed, there is some evidence of a beneficial effect of work on pregnancy. It has been suggested that the ‘reproductive experience’ of women who work is better than those who do not. Some studies show that women who are employed have a lower risk of preterm delivery than those who are not. However, a pregnant woman may be exposed, while at work, to particular hazards that might potentially cause adverse outcomes for mother or fetus.

Therefore, where possible, steps should be taken to minimize exposure where there is sufficient evidence that the risk of maternal or fetal harm outweighs any benefit to health, (Kerr & Johnstone 1954).

2. Epidemiology of adverse pregnancy outcomes:

2.1 Fetal outcomes

The adverse outcomes that are measurable immediately after the end of pregnancy include spontaneous miscarriage, preterm delivery, stillbirth, and low birth weight. In 1998, in England and Wales, 7.48% of live births were of low birth weight, and the rate of stillbirths per 1,000 total births was 3.9. The United Kingdome has the highest rate of preterm delivery in Europe, (Macfarlane AJ & Mugford M 2000)

These adverse birth outcomes are clinically significant. They have recognized risk factors for poor health in the perinatal period, childhood, and even later in life. Low birth weight is related to neonatal mortality, a significant determinant of post-neonatal mortality and infant and childhood morbidity. Moreover, there is considerable evidence that low birth weight predicts poor growth and development and increases the risk of chronic diseases in adulthood, including coronary heart disease and stroke, hypertension, non-insulin-dependent diabetes, obstructive lung disease, and neurological and cognitive impairment. (Coghlan M & Owens J 2006; Haram K et al. 2003; Lesley Vickers & Susan Paterson 2009).

3. Possible biological mechanisms

It is not entirely understood how workplace exposure could result in adverse pregnancy outcomes. Several biological/physiological mechanisms have been hypothesized, although there is little direct evidence to support them. Plausible explanations for and against a causal pathway for the adverse outcomes of interest are summarized below:

3.1 Prolonged standing

It is well established that prolonged standing leads to accumulation of the blood in the lower limb veins due to the effect of gravity in addition to the compression exerted by the pregnant uterus, especially on the third trimester, which leads to a reduction in systemic blood pressure and subsequent reduction in uterine blood flow. This mechanism may potentially cause a reduction in the rate of fetal growth velocity leading to intrauterine growth restriction (Lesley Vickers & Susan Paterson 2009; Ha E et al. 2002).

3.2 Hard physical work

Altered body posture and heavy physical exercise or strain might reduce maternal blood pressure and blood flow from the uterus to the placenta, which can result in restricted fetal growth and impaired survival. There may also be increased substrate utilization by muscles with increased maternal energy requirements. Theoretically, this might use up calories needed by the fetus, resulting in nutritional deficits, (Haram K et al. 2003; Simpson JL 1993; Naeye RL, Peters EC 1982)

3.3 Shift work

It has been postulated that shift work might influence reproductive function in humans through hormonal disturbances. Both direct (through changes in a circadian rhythm) and indirect (through psychosocial stresses and disturbed sleep) mechanisms have been proposed, (Zhu JL et al. 2004).

3.4 Working hours

Different exposure criteria were used in various studies, but in general, studies considered working longer than around 40 hours a week, compared to 40 or less. Two studies assessed low birth weight, IUGR (Intra-Uterine Growth Restriction), or SGA (Small for Gestational Age) in relation to long working hours. Both showed a positive relationship, with risk estimates 1.34 and 2.4. A high-quality systematic review identified a further six papers, five of which were of high quality. The largest study found an increased risk (odds ratio 1.7),

but the other five were all negative, with relative risks close to unity, (Knutsson A 2003; Palmer KT et al. 2013).

This study was designed to provide provisional information regarding the adverse effect, if any, of household duties or occupation on the fetal outcomes in the form of low birth weight, in order to guide the administrative personnel in the ministry of labor to give especially considerations for women who continue to work during pregnancy.

4. Material and Methods

4.1 *Study Area, Study Population, and Sample collection:*

This study was a descriptive analytical, cross-sectional study conducted in Omdurman Maternity Hospital in Khartoum State, Sudan. During the period between Jaune 2014 and July 2015. The study populations were pregnant ladies and their neonates who have no known risk factors for IUGR or SGA or preterm labour (to reduce the effect of confounders), which were amounted (237) pregnant women. Patients were divided into two groups, the employed group (study group) and the non-employed (control group). All pregnant ladies were interviewed directly by the researcher using a structured, valid and reviewed questionnaire and measure their neonatal birth weight.

4.2 *Data Analysis:*

The data analyzed by a statistical package for social science (SPSS) software programme version17. Chi-square test was used for correlating between maternal work and neonatal birth weight, a P-value of <0.05 was considered significant.

4.3 Ethical Clearance:

- Patient Informed consent.
- Permission from Omdurman Maternity hospital administration.

Multi-Knowledge Electronic Comprehensive Journal For Education And Science Publications (MECSJ)
ISSUE (30), March (2020)
ISSN: 2616-9185
www.mecsj.com

5. Result

Out of 237 pregnant women, 54 (23%) of them were employed, and 183 (77%) were housewives, but both groups did their household duties. A significant effect of maternal employment during pregnancy on neonatal birth weight was identified, 44% of employed women had LBW compared with 25% in only household workers group (P-value = 0.018), as it is shown in table 1.

The study yielded no significant correlation between different working schedules and LBW, which is shown in table 2, where 43.5% of day time workers gave birth to LBW neonates in comparison to 37% of night-shift workers with P-value = 0.34.

Table 3 shows that 53% of pregnant women worked in a standing posture more than 3 hours a day have LBW babies, which are significantly higher than in whom worked in sitting position which was 33%, with P-value =0.05.

A significant effect (P-value =0.001) of working more than 40 hours a week on birth weight is detected, where 75% of women worked more than 40 hours a week compared to 11% in women who worked 40 hours or less per week which is shown in table 4.

Table (1) The effect of maternal employment on birth weight of the baby (P-value = 0.018)

Employed	Baby Birth weight			Total
	<2.5 kg	2.5-4 kg	>4 kg	
No	46	134	3	183
Yes	24	30	0	54
Total	70	164	3	237

Multi-Knowledge Electronic Comprehensive Journal For Education And Science Publications (MECSJ)
ISSUE (30), March (2020)
ISSN: 2616-9185
www.mecsj.com

Table (2) The correlation between different working schedules and baby birth weight (P-value = 0.34)

Work schedule	Baby Birth weight			Total
	<2.5 kg	2.5-4 kg	>4 kg	
Night-time	3	5	0	8
Day time	20	26	0	46
Total	24	30	0	54

Table (3) The correlation between working posture and baby birth weight (P-value =0.05)

Posture at work	Baby birth weight			Total
	<2.5 kg	2.5-4 kg	>4 kg	
Sitting	8	16	0	24
Standing	16	14	0	30
Total	24	30	0	54

Table (4) The correlation between women working hours per week and LBW baby (P-value =0.001)

Workings hours per week	Baby Birth weight			Total
	<2.5 kg	2.5-4 kg	>4 kg	
< 40 hours	3	23	0	26
> 40 hours	21	7	0	28
Total	24	30	0	54

6. Discussion

This study explored that there is no adverse effect of household work on the birth weight of the baby, and it may be protective with an odds ratio (75%) (0.64). By contrast to the study finding of Xiping Xu et al. (1994), who concluded, women with children and no household help were at increased risk for small for gestational age (SGA) births compared with women with household help. This difference in results can be attributed to the difficulty of categorizing household workload, including the degree of assistance received.

The study showed a significant increase in the rate of LBW in employed women (44%) compared to household workers (25%); moreover, the rate of LBW increased in whom they work in standing position >3hours per day (half of them) compared to sitting position (one third), which can be explained by pooling of blood in the lower limb and decrease cardiac output and hence placental blood flow.

Reversely, Ha et al. (2002) found a slight difference between working posture and LBW, but he advised if employees stand for >3 hours/day, employers should consider reducing this or provide alternative work for that period, to reduce hours of standing to the minimum possible.

Working more than 40 hours /week increases the LBW rate by seven-folds, and the result is statistically significant (p= 0.001), which can be explained by increased nutritional demand of the mother and the psychological stress of work. Launer et al. (1990) reported regardless of the period of exposure, no elevations in small for gestational age birth were observed among women exposed to any of the three types of employment exertion.

In this study, there is no significant increase in the rate of LBW in association with a night-shift work compared to a day time work, which can be due to a small sample size or difference in work demands between the two groups. Hickey et al. (1995) reported significant effect of shift work on baby birth weight when textile mills workers in Anhui, China, were surveyed.

7. Conclusion:

Household duties do not affect the birth weight of babies. In contrast, maternal employment may increase the rate of LBW newborns, especially if it stands more than three hours a day during the work or working more than 40 hours per week. Working during a night shift or a day time shift does not add an adverse effect on the newborn birth weight.

8. Recommendation:

Further studies are needed to find out:

- At which trimester, the effect of employment is marked on birth weight.
- Is work leave during pregnancy may reduce the effect of employment on birth weight.

9. Conflicts Of Interest:

The authors declare no conflict of interest.

References

1. Briend RG. (1980). Maternal physical activity, birth weight, and perinatal mortality. Medical Hypotheses. 6(11):1157–1170.
2. Coghlan M, Owens J, (2006). Developmental origins of cardiovascular disease, Type 2 diabetes, and obesity in humans. *AMJ Obstetric Gynecology*; 36-38.
3. Ha E, Cho SI, Park H, Chen D. (2002). Does standing at work during pregnancy result in reduced infant birth weight? *J Occup Environ Med*. 44(9):815–21.
4. Haram K, Mortensen JH, Wollen AL. (2003). Preterm delivery: an overview. *Acta Obstet Gynecol Scand.* ;82(8):687–704
5. Hickey CA, Cliver SP, Mulvihill FX. (1995). Employment-related stress and preterm delivery: a contextual examination. *Public Health Report*; 110:410-18.
6. Kerr, Johnstone, Phillips. (1954) Historical review of British obstetrics and gynaecology. *British Journal of Obstetrics and Gynaecology*.; 54-55
7. Knutsson A. (2003). Health disorders of shift workers. *Occupational Med*; 53(2):103–8.

8. Launer, L J Villar, J Kestler, E Onis. M de (1990). Prevention Research Program, National Institute of Child Health and Human Development, *British Journal of Obstetrics and Gynecology* 02; 97(1):62-70
9. Lesley Vickers, Susan Paterson. (2009). Royal College of Physicians. Physical and shift work in pregnancy: occupational aspects of management. A national guideline. London: RCP.
10. Macfarlane AJ, Mugford M. (2000). Birth Counts – statistics of pregnancy and childbirth, 2nd edition. London, 308-310.
11. Naeye RL, Peters EC. (1982). Working during pregnancy: effects on the fetus. Paediatrics. 69(6): 724–7.
12. Palmer KT. Bonzini M, Harris EC, Linaker C, Bonde JP. (2013). Work activities and risk of prematurity, low birth weight, and pre-eclampsia. *Occupational Environment Medicine*. 70(4):213-22.
13. Saurel-Cubizolles MJ, Zeitlin J, Lelong N, Papiernik E. (2004) Employment, working conditions, and preterm birth: results from the Europop case-control survey. *J Epidemiology Community Health*; 58(5):395–401.
14. Simpson JL. (1993). Are physical activity and employment related to preterm birth and low birth weight? Am J Obstetric Gynecology; 168(4):1231–8.
15. Xiping Xu, Min Ding, Baoluo Li, David C Christiani. (1994). Occupational and Environmental Medicine; 51:470-474
16. Zhu JL, Hjollund NH, Andersen AM, Olsen J. (2004). Shift work, job stress, and late fetal loss: The National Birth Cohort in Denmark. *J Occup Environ Med*; 46(11).