Egyptian Journal of Occupational Medicine, 2025; 49 (1) : 103 - 116

INCIDENCE OF LOW BIRTH WEIGHT AND/ OR PRETERM DELIVERIES AMONG WORKING PREGNANT WOMEN

By

El-Hadidy SS[1] , El-Gilany A[1], Elkhawaga GO[1], Kamal NN[2,3] and Fathi N[4]

[1]Department of Public Health and Community Medicine, Faculty of Medicine,Mansoura University, Egypt,[2]Department of Public Health, Faculty of Medicine, Minia University, Egypt,[3] Department of Medical Biotechnology, College of Biotechnology, Misr University for Science and Technology , Egypt,[4] Department of Women's Health and Obstetrics, Faculty of Nursing, Minia University, Egypt.

***Corresponding Author:** El-Hadidy SS. **E mail:** samah.elhadidy@mans.edu.eg*

***DOI:** 10.21608/ejom.2024.331963.1352*

***Submit date:** 2024-11-02 **Revise date:** 2024-12-09 **Accept date:** 2024-12-14*

***Authors' Contribution:** All authors contributed equally in this work.*

Abstract

Introduction: In Egypt, there is a rise in the percentage of working females. Working during pregnancy can significantly increase the risk of preterm deliveries (PTD) and/ or low birth weight (LBW). **Aim of Work:** To estimate the incidence of low birth weight and preterm deliveries among working pregnant women and explore their associated factors at Minia University Hospital, Egypt. **Materials and Methods:** A retrospective single cohort study was done in the Department of Obstetrics and Gynecology at Minia University Hospital. A total of 515 employed women admitted for delivery were subjected to face-to-face interview questionnaire to collect socio-demographic data, occupational, medical and obstetric history and also job stress Questionnaire was completed. **Results:** The incidence of mothers who delivered LBW and/or PTD was 39.2% .The significant independent obstetric and medical predictors of preterm deliveries and/ or low birth weight were personal or family history of LBW and/ or PTD, normal delivery and pregnant mothers not suffering from any medical condition : {AOR (95% CI): 3.6 (1.9-6.8), 8.1 (4.6-14.2), 3.3 (2.0-5.6) and 3.2 (1.9-5.4), respectively}. The occupational predictors of preterm deliveries and/ or low birth weight were employed women in jobs requiring mental effort, in both (private and governmental sectors) for ≤ 4 years : AOR (95% CI:1.9 (1.1-3.0) , 3.4 (1.6-7.3) and 1.8 (1.2-2.6), respectively. **Conclusion:** The incidence of preterm deliveries and/ or low birth weight was 39.2%. The significant independent predictors of LBW and/or PTD were personal or family history of LBW and/

or PTD , normal delivery, pregnant mothers not suffering from any medical condition and employed women in jobs requiring mental effort, in both (private and governmental)sectors for duration ≤ 4 years. **Recommendations:** Employed pregnant women should be covered by medical insurance system to receive adequate medical care during pregnancy.

Keywords: Preterm delivery, Unfavorable pregnancy outcome , Working woman , Low birth weight, Employment and pregnancy .

Introduction

In Egypt, there is an increase in the women participation in the workforce with a subsequent rise in the percentage of working pregnant females (El-Gilany et al., 2016). Different workplace exposures are linked to unfavorable pregnancy outcome including low birth weight (LBW)< 2500g and preterm deliveries (PTD) <37 week (Cai et al., 2020).Several studies in many countries including Egypt (Hassan et al., 2020), in the United states (Patil et al., 2020) and in France (Simoncic et al., 2022) found that employment of the pregnant mother increases the risk of unfavorable pregnancy outcomes as LBW and/or PTD. Job stress (non manual work) during pregnancy (Niedhammer et al., 2021) and physically demanding (manual) jobs (Cai et al., 2020 and Sejbæk et al., 2024), significantly increased the employed woman's risk of adverse outcome of pregnancy specially preterm deliveries and low birth weight that in turn call for modifying maternity sick leaves(Adane et al., 2023).Heavy physical workload showed a higher risk for preterm deliveriesin the form of working for long hours either during the first trimester (Suzumori et al., 2020)or late in pregnancy(Bonzini et al., 2007)and /or standing and /or lifting heavy weights(Woo, 1997). Manual employment related unfavorable outcome as LBW and/or PTD could be referred to that physical exertion causes shifting of blood to the skeletal muscles resulting in deprivation of the placenta and hence the fetus from nutrients and oxygen(Woo, 1997). Unfavorable pregnancy outcome as LBW and/or PTD due to exposure of pregnant women to work stress were could be attributed to immunological imbalances (Niedhammer et al., 2021).

Efforts towards investigation of work related LBW and/or PTD among working women in Egypt are deficient and incomplete. This study aims to estimate the incidence of low birth weight and/or preterm deliveries

among working pregnant women and explore their associated factors at Minia University Hospital, Egypt.

Aim of Work

To estimate the incidence and the predictors of low birth weight and/or preterm deliveries among working pregnant women delivering at Minia University Hospital, Egypt.

Materials and Methods

Study design: This is retrospective single cohort study

Place and duration of the study: The study was done in the Department of Obstetrics and Gynecology at Minia University Hospital from April 2023 to August 2024.

Study sample: Employed pregnant women admitted to the Department of Obstetrics and Gynecology for delivery at **Minia** University Hospital .

Inclusion criteria: The pregnant women aged from 18 to 40 years, worked at least 1 year before pregnancy and continued working during pregnancy and naturally conceived singleton pregnancy. **Exclusion criteria:** Pregnant women who refused to participate in the study.

The sample size was calculated using Medcalc 15.8 (https://www.medcalc.org/). A previous study (El-Gilany et al, 2016) found that the incidence of PTD was 24.3%. With alpha error of 5%, study power of 80% and 5% precision, the calculated sample size is 515.

Study Methods:

The following data was collected through an Arabic **face-to-face interview questionnaire** as well as **review of mother/infant record** to collect:

(A) Personal data, educational level and socio-demographic data.(B) Medical history (hypertension, diabetes, cardiac, renal). (C) Obstetric history: parity, gravidity, inter-pregnancy spacing, personal and family history of PTD (pregnancy duration >20 and <37 weeks) (WHO, 2015) and LBW (weight <2500grams) (WHO, 2014), pregnancy morbidity diseases (eclampsia, hypertension, cord prolapsed, placenta previa).(D) Occupational history (during this pregnancy) include: job title, work duration, working hours/day, shift work, physically demanding work (prolonged standing more than 3 hours / day, heavy lifting, physical exertion, (Makowiec-Dabrowska et al., 2003)). (E) To assess the exposure to job stress during pregnancy using the validated (95%) and reliable (0.92) Arabic version of job stress questionnaire (Hussein , 2013) . It includes 27-items

and the responses are scored using 5-point Likert scale : Totally agree=5, Quite agree=4, Agree=3, Not agree=2, Totally not agree=1). Overall scores will fall within the range: 27 to 135. Scores ≥ 67 or above would suggest an unusual high amount of job stress and score < 67 suggest low stress.

Studies found that LBW and PTD are related (birth weight is affected by the duration of pregnancy) and both share similar risk factors (Jańczewska et al., 2023).Also studies at Minia, Egypt, detected that LBW was more related to PTD (Hassan et al., 2020),so the authors preferred to combine both LBW and PTD in this study as unfavorable pregnancy outcome.

- **Definition of mental and physical workers**: We classified employed mothers recruited in the study according to the type of work tasks into manual physically demanding workers (with prolonged work hours, prolonged standing more than 3 hours / day, heavy lifting, physical exertion, (Makowiec-Dabrowska et al., 2003)) , mental demanding workers (non manual work , not demanding physical effort) and both (jobs requiring both physical and mental efforts).

Consent

Informed consent was obtained from each participant sharing in the study after assuring confidentiality.

Ethical Approval

Ethical approval was obtained from the Ethical Committee at the Faculty of Medicine, Minia University, with approval number MUFMIRB (1185.06.24), and followed ethical guidelines.

Data Management

The data obtained was statistically analyzed by mean of SPSS (23) under windows for estimation of important statistical parameters then presented in suitable tables. Qualitative variables were presented as number and percent, while quantitative variables were tested for normality distribution. Appropriate descriptive and analytic statistics were applied to compare between groups. Logistic regression was done to find out the independent predictors of LBW and PTD with calculation of AOR & 95% CI. The statistical significance level was set at ≤ 0.05.

Results

The overall incidence of isolated LBW was 5.0% (26/515), isolated PTD was 3.5% (18/515) and combined LBW and PTD was 30.7% (158/515) with overall incidence of LBW and/ or PTD was 39.2% (202/515) , (data not shown in tables).

Table 1:Socio-demographic and obstetric history of participating mothers .

Characteristics	Mothers without LBW and/or PTD No. (%)	Mothers with LBW and/or PTD No. (%)	Significance test	COR (95% CI)
Overall	**313 (59.8)**	**202(39.2)**		
Age(years):				
≤28 (r)	142 (63.1%)	83 (36.9)	$\chi2 = 0.9$	1
> 28	171 (59%)	119 (41.0)	P = 0.3	1.2 (0.8-1.7)
Education:				
Below Secondary	100 (54.1%)	85 (45.9)	$\chi2 = 5.5$	1.6(1.1-2.2)
Secondary/above (r)	213 (64.5%)	117 (35.5)	**P = 0.02***	1
Residence:				
Urban (r)	141 (61.8%)	87 (38.2)	$\chi2 = 0.2$	1
Rural	172 (59.9%)	115 (40.1)	P = 0.7	1.08 (0.8-1.5)
Marriage duration(years):				
≤5	165 (51.6%)	155 (48.4)	$\chi2 = 30.1$	2.96 (1.9-4.4)
> 5 (r)	148 (75.9%)	47 (24.1)	**P <0.001***	1
Number of children				
≤ 2(r)	169 (61%)	108 (39.0)	$\chi2 = 0.01$	1
> 2	144 (60.5%)	94 (39.5)	P =0.9	1.02 (0.7-1.5)
Number of pregnancies				
≤3	184 (56.4%)	142 (43.6)	$\chi2 = 7.0$	1.7 (1.1-2.4)
> 3 (r)	129 (68.3%)	60 (31.7)	**P = 0.008***	1
Number of abortions				
1	231 (57.9%)	168 (42.1)	$\chi2 = 6.2$	1.8 (1.1-2.7)
>1(r)	82 (70.7%)	34 (29.3)	**P = 0.013***	1
Personal history of unfavorable outcome:				
Yes	30 (31.9%)	64 (68.1)	$\chi2 = 40.2$	4.4 (2.7-7.1)
NO (r)	283 (67.2%)	138 (32.8)	**P <0.001***	1
Family history of unfavorable outcome:				
Yes	31 (25.4%)	91 (74.6)	$\chi2 = 83.9$	7.5 (4.7-11.8)
NO (r)	282 (71.8%)	111 (28.2)	**P <0.001***	1

Type of labor: Normal Cesarean(r)	174 (53.2%) 139 (73.9%)	153 (46.8) 49 (26.1)	$\chi 2 = 21.5$ **P <0.001***	2.5 (1.7-3.7) 1
Problems in this pregnancy†: Yes(r) NO	90 (65.2%) 223 (59.2%)	48 (34.8) 154 (40.8)	$\chi 2 = 1.6$ P = 0.2	1 1.3 (0.9-1.9)
Suffering from any chronic medical condition$: Yes (r) NO	132 (72.9%) 181 (54.2%)	49 (27.1) 153 (45.8)	$\chi 2 = 17.3$ **P <0.001***	1 2.3 (1.5-3.4)

† **:**Eclampsia, hypertension, cord prolapsed, placenta previa ,

$: hypertension, diabetes, cardiac, renal, *: Significant p value ≤ 0.05

Table 1 showed that the incidence of mothers who delivered LBW and/or PTD was 39.2% .It was statistically significantly higher among mothers educated below secondary, married for ≤5 years , got pregnant ≤3 times and had at least one abortion:{COR (95% CI) = 1.6(1.1-2.2), 2.96 (1.9-4.4), 1.7 (1.1-2.4) and 1.8 (1.1-2.7), respectively}.Also this incidence was statistically significantly higher among mothers with personal or family history of LBW and/or PTD and among pregnant mothers not suffering from any medical condition : {COR (95% CI) =4.4 (2.7-7.1), 7.5 (4.7-11.8) and 2.3 (1.5-3.4), respectively}.

Table 2 : Socio-demographic and obstetric predictors of LBW and/or PTD.

Socioeconomic and obstetric predictors	B	AOR (95%CI)	P value
Marriage duration ≤5 > 5 (r)	1.811	6.1 (3.7-10.2) 1	**<0.001***
Personal history of LBW and/or PTD Yes NO (r)	1.293	3.6 (1.9-6.8) 1	**<0.001***
Family history of LBW and/or PTD Yes NO (r)	2.087	8.1 (4.6-14.2) 1	**<0.001***
Type of labor: Normal Cesarean(r)	1.208	3.3 (2.0-5.6) 1	**<0.001***
Suffering from any chronic medical condition: Yes (r) NO	1.166	1 3.2 (1.9-5.4)	**<0.001***
Constant % predicted Model c^2	23.546 75.1% 191.844		

(r): The reference group , *: Significant p value ≤ 0.05

Table 2 showed that the significant independent socio-demographic predictors of LBW and/or PTD were marriage ≤5 years {AOR (95% CI): 6.1 (3.7-10.2)}.

The significant independent obstetric and medical predictors of LBW and/or PTD were personal or family history of LBW and/or PTD , normal delivery and pregnant mothers not suffering from any medical condition : {AOR (95% CI): 3.6 (1.9-6.8), 8.1 (4.6-14.2), 3.3 (2.0-5.6) and 3.2 (1.9-5.4), respectively} .

Table 3 : Occupational history of mothers with LBW and/or PTD

Characteristics	Mothers without LBW and/or PTD No. (%)	Mothers with LBW and/or PTD No. (%)	Significance test	COR (95% CI)
Overall	**313 (59.8)**	**39.2))202**		
Type of work :				
Governmental(r)	134 (67%)	66 (33.0)	$\chi2$ =2.5, P = 0.1	1
Private	166 (59.9%)	111 (40.1)	$\chi2$=14.5, **P <0.001***	1.4 (0.9-1.9)
Both	13 (43.2%)	25 (65.8)		3.9 (1.9-8.1)
Job requirement:				
Mental	76 (48.1%)	82 (51.9%)	$\chi2$=13. 6, **P<0.001***	2.9 (1.6-5.3)
Physical	111 (64.9%)	60 (35.1%)	$\chi2$ =0.3, P =0.6	1.3 (0.6-2.8)
Both(r)	126 (67.7%)	60 (32.3%)		1
Standing >3hours /day:				
Yes (r)	196 (61.8%)	124 (38.8)	$\chi2$ = 0.08	1
NO	117 (60.0%)	78 (40.0)	P =0.8	1.1 (0.7-1.5)
Carrying heavy objects at work:				
Yes	131 (58.2%)	94 (41.8)	$\chi2$ = 1.1	1.2 (0.8-1.7)
NO (r)	182 (62.8%)	108 (37.2)	P = 0.3	1
Job duration/ years				
		158 (53.7%)		
> 4(r)		155 (70.1%)		2.02 (1.4-2.9)
		136 (46.3)		1
		66 (29.9)		
		$\chi2$ = 14.2		
		P **<0.001***		
Working hours/day				
≤8 (r)	255 (63.0%)	150 (37.0)	$\chi2$ = 3.8	1
>8	58 (52.7%)	52 (47.3)	P =0.06	1.5 (0.9-2.3)
Working days/week				
≤5	188 (55.3%)	152 (44.7)	$\chi2$ = 12.6	2.02 (1.4-2.9)
> 5(r)	125 (71.4%)	50 (28.6)	P **<0.001***	1
Night shift :				
Yes	70 (56.5%)	54 (43.5)	$\chi2$ = 1.3	1.3 (0.8-1.9)
NO (r)	243 (62.1%)	148 (37.9)	P = 0.3	1
Job stress#:				
Low	2 (33.3%)	4 (66.7)	FET	3.1 (0.6-17.3)
High(r)	311 (61.1%)	198 (38.9)	P =0.22	1

#: Low< 67, high ≥67, (r): The reference group, *: Significant p value ≤ 0.05

Table 3 showed that incidence of LBW and/or PTD was statistically significantly higher among those mothers working in both governmental and private sectors , in mental requiring jobs , for ≤4 years and for ≤5 days /week {COR (95% CI) = 3.9 (1.9-8.1), 2.9 (1.6-5.3, 2.02 (1.4-2.9) and 2.02 (1.4-2.9), respectively)

Table 4 : Occupational predictors of unfavorable outcome of pregnancy(LBW and/or PTD).

Occupational Predictors	**B**	**AOR (95%CI)**	**P value**
Type of work :			
Governmental(r)		1	
Private	0.308	1.4 (0.9-2.1)	0.164
Both	1.231	3.4 (1.6-7.3)	**0.001***
Job requirement:			
Mental	0.622	1.9 (1.1-3.0)	**0.012***
Physical	-0.019	1 (0.6-1.7)	0.943
Both(r)		1	
Job duration			
≤4 years	0.566	1.8 (1.2-2.6)	**0.005***
> 4 years(r)		1	
Constant	23.546		
% predicted	65.4%		
Model χ^2	36.473		

*: Significant p value ≤ 0.05

Table 4 showed that the occupational predictors of LBW and/or PTD were employed women in jobs requiring mental effort, in both (private and governmental sectors) for duration ≤ 4 years : AOR (95% CI:1.9 (1.1-3.0) , 3.4 (1.6-7.3)and 1.8 (1.2-2.6), respectively.

Discussion

Work conditions and exposures not only affect the working women's health but can also impact their pregnancy outcome (Reda et al., 2024). LBW and/or PTD are considered unfavorable pregnancy outcomes because of the high morbidity and mortality of newborns (Alberman, 1994).Maternal health, determining obstetric characteristics ,and different occupational exposures are the main risk factors related to LBW and/or PTD (Niedhammer et al., 2009).

The current study detected that the incidence of LBW and/or PTD among working females was 39.2% (Table 1) and this can be attributed to the high incidence of LBW among working female at Minia (Hassan et al., 2020). Slightly lower incidences (24.8% and 17.5%) were detected among working women in Iran (Mahmoodi et al., 2015) and Egypt (Mohamed et al., 2022), respectively. Much lower incidence of LBW and/or PTD (7.3%) was reported among working Irish women (Niedhammer et al., 2009).

The studied mothers with a history of unfavorable outcome (LBW and/or PTD) before the last pregnancy were 3.6 times more at risk of this unfavorable outcome(LBW and/or PTD) ,(Table 2),which can be explained by ignoring investigations and existence of the same factors causing this problem before. Similarly, studies in Brazil and Norway found that previous unfavorable outcomes (LBW and/or PTD) increased its risk in the next pregnancies (Defilipoet al., 2022 and Tingleff et al., 2022, respectively).

Normal delivery among the studied pregnant female was associated with increased risk of unfavorable outcome(LBW and/or PTD) by about 8.1 times (Table 2) which could be explained bythat this study was carried out in a university hospital where normal delivery is the first choice while cesarean section in Egypt was more frequent in the private sector (Al Rifai, 2017).In agreement with this finding, a study done in Ethiopia detected that normal delivery increased the risk of unfavorable outcome (Hailu and Kebede, 2018).

In contrast, other studies in Ethiopia, Ghana and Brazil detected that cesarean section increased the risk of unfavorable outcome (LBW and/or PTD) (G/Mariam et al., 2021, Axame et al., 2022 and Defilipo et al., 2022 , respectively)

The present study (Table 2) detected that the risk of unfavorable outcome was 3.2 times higher among

those mothers not suffering from any chronic medical condition which could be attributed sometimes to negligence of antenatal visits and subsequently difficulty in access to health information. This finding was correlated with studies in UK (Panaitescu et al.,2017).However, this result was in contrast to the findings of studies in Sub-Saharan Africa , Morocco and Sweden(Olusanya and Ofovwe , 2010 ; Al Khalaf et al., 2022 , respectively).

The incidence of LBW and/ or PTD among the studied females was statistically significantly higher among those mothers working in both governmental and private sectors at same time, in mental requiring jobs, for ≤4 years and for ≤5 days /week (Table 3). Tuntiseranee et al.,(1998) agreed with our findings that mental work is associated with increased incidence of LBW and/or PTD, however (Hickey et al., 1995) found in their study that no significant relationship was detected between LBW and/or PTD and work duration ,hours/week or work type.

The risk of unfavorable outcome of pregnancy(LBW and/or PTD) increased with employment in jobs requiring mental effort (AOR :1.9) (Table 4).Similarly, a previous study in Thailand detected the association between mental job requirement and LBW(Tuntiseranee et al.,1998). However, studies in Cyprus reported that unfavorable outcome (LBW and/ or PTD) were more frequently among women practicing manual labour (Stylianou-Riga et al.,2018).

Also the increased risk of unfavorable outcome of pregnancy (LBW and/or PTD) among those working for ≤ 4 years (Table 4) which can be explained by lack of the necessary job coping experiences in addition to a limited number of sick leave days, the increase in employment years ensures entitlement to more sick leave days (Khojasteh et al., 2016).

The Egyptian labor law No. 12 of 2003, as amended by Law No. 180 of 2008, provides specific protections and benefits for working females, particularly to ensure equality and safeguard their rights in the workplace. It is prohibited by this law to assign tasks to pregnant women that are hazardous, physically demanding, or otherwise unsuitable during pregnancy. However although the Egyptian labor law protects this vulnerable group but most of mothers recruited in this study (> 60%) worked in the private sector (either alone or has dual private and governmental work) which make it

unfeasible to obtain the benefits of the Egyptian law, in addition to that most of their jobs (e.g servants, nurses, farmers…etc) depend mainly on physical activity .

Conclusion

The incidence of employed mothers who delivered unfavorable outcome (LBW and/or PTD babies), at Minia University Hospital, was 39.2%. This risk increased among those with positive personal or family history of unfavorable outcome, normal delivery and those not suffering from any medical condition. The work related risk factors of unfavorable outcome were being employed in jobs requiring mental effort, in both (private and governmental sectors) and for duration ≤ 4 years.

Recommendations

Periodic medical examination should be encouraged and carried out to all employed women to early manage any diagnosed medical disorder. Furthermore, employed pregnant women should be covered by medical insurance system to receive adequate medical care during prenatal period with close monitoring of those with previous personal or family history of LBW and/or PTD. The occupational health team should assist pregnant employees by providing accessible health information and facilitating adjustments to their work conditions.

Study limitation: Being hospital-based and single center study limits the external validity of study results.

Funding

All authors didn't receive any fund or research grants.

Conflict of interest

None.

Acknowledgement

The authors would like to acknowledge Minia University Hospital and Department of Obstetrics and Gynecology for their help and support. Also we thank the pregnant women delivering in Minia University Hospital for their participation in the study.

References

1. Adane HA, Iles R, Boyle JA and Collie A (2023): Maternal occupational risk factors and preterm birth: Protocol for a systematic review and meta-analysis. Plos one; 18(7): e0283752.
2. Al Khalaf S, Bodunde E, Maher GM, O'Reilly ÉJ, McCarthy FP, et al.(2022): Chronic kidney disease and adverse pregnancy outcomes: a systematic review and meta-analysis. Am J Obstet Gynecol; 226:656–70. DOI:10.1016/j.ajog.2021.10.037
3. Al Rifai RH (2017): Trend of caesarean deliveries in Egypt and its associated factors: evidence from national surveys, 2005–2014. BMC Pregnancy and Childbirth; 17: 1-14.
4. Alberman E (1994): Low birth weight and prematurity. In: Pless IB, ed. The epidemiology of childhood disorders. New York, Oxford

University Press; 49–65.

5. Axame WK, Binka FN and Kweku M (2022): Prevalence and factors associated with low birth weight and preterm delivery in the Ho municipality of Ghana. Advances in Public Health ; (1): 3955869.
6. Bonzini M, Coggon D and Palmer KT (2007): Risk of prematurity, low birth weight and pre-eclampsia in relation to working hours and physical activities: a systematic review. J Occup Environ Med; 64(4): 228-43.
7. Cai C, Vandermeer B, Khurana R, Nerenberg K, Featherstone R, et al., (2020): The impact of occupational activities during pregnancy on pregnancy outcomes: a systematic review and meta-analysis. Am J Obstet Gynecol; 222(3): 224-38.
8. Defilipo ÉC, Chagas PSC, Drumond CM and RibeiroLC(2022): Factors associated with premature birth: a case-control study. Revistapaulista de pediatria :orgaooficial da Sociedade de Pediatria de Sao Paulo, 40, e2020486. https://doi.org/10.1590/1984-0462/2022/40/2020486IN
9. El-Gilany AH, El-Khawaga G and Ghanem A (2016): Incidence and occupational risk factors of preterm delivery among working mothers: a single center study in Egypt. TAF Prev Med Bull; 15(3): 199.
10. G/Mariam, B, Tilahun T, Merdassa E and Tesema D (2021): Indications, Outcome and risk factors of cesarean delivery among pregnant women utilizing delivery services at selected Public Health Institutions, Oromia Region, South West Ethiopia. Patient Related Outcome Measures: 227-236.
11. Hailu LD and Kebede DL (2018):Determinants of low birth weight among deliveries at a referral Hospital in Northern Ethiopia. BioMed Research International; (1):8169615.
12. Hassan EE, Ismail MH, Mosallem FA and Refeai SA (2020): Low birth weight and its associated factors among deliveries in Malawi city, Minia, Egypt. Minia J Med Res ;31(1):122-8. Available at: http ://www.who.int/ reproductivehealth/ publications/maternal_perinatal_health/ preterm-birth-guideline
13. Hickey CA, Cliver SP, Mulvihill FX, McNeal SF, Hoffman HJ, et al.,(1995): Employment-related stress and preterm delivery: a contextual examination. Public Health Rep; 110(4):410-8. PMID: 7638328; PMCID: PMC1382150.
14. Hussein S (2013): Measuring the impact of work stress on the level of job performance, an exploratory and analytical study of the performance of employees in the Technical Education Authority, Baghdad College. J Eco Sci Univ Issue; (36): 208- 27.
15. Jańczewska I, Wierzba J, Jańczewska A, Szczurek-Gierczak M and Domżalska-Popadiuk I (2023): Prematurity and Low Birth Weight and Their Impact on Childhood Growth Patterns and the Risk of Long-Term Cardiovascular Sequelae. Children (Basel, Switzerland); 10(10): 1599. https://doi.org/10.3390/children10101599
16. Khojasteh F, Arbabisarjou A, Boryri T, Safarzadeh A and Pourkahkhaei M (2016): The Relationship between Maternal Employment Status and Pregnancy Outcomes. J Glob Health Sci; 8(9): 53533. https://doi.org/10.5539/gjhs.v8n9p37
17. Mahmoodi Z, Karimlou M, Sajjadi H, Dejman M, Vameghi M, et al.,(2015): Association of Maternal Working Condition with Low Birth Weight: The Social Determinants of Health Approach. Ann Med HealthSci Res; 5(6): 385–91. https://doi.org/10.4103/2141-9248.177982
18. Makowiec-Dabrowska T, Hanke W, Radwan-Włodarczyk Z, Koszada-Włodarczyk Wand Sobala W (2003): W jakich warunkach pracują kobiety będące w ciąży? Zakres odstępstw od przepisów o pracach szczególnie uciążliwych lub szkodliwych dla kobiet [Working condition of pregnant women. Departures from regulation on occupations especially noxious or hazardous to women]. Med Pr;54(1):33-43. Polish. PMID: 12731403.
19. Mohamed H, Mesabah M, Haroun H and Mousa S (2022): Evaluation of the Incidence, Possible Risk Factors and Maternal & Neonatal Morbidity & Mortality in Cases of Preterm

Labour at El Minya Maternity University Hospital. Minia J Med Res: 33(4): 49-58. DOI: 10.21608/mjmr.2022.258231

20. Niedhammer I, Bertrais S and Witt K (2021): Psychosocial work exposures and health outcomes: a meta-review of 72 literature reviews with meta-analysis. SJWEH; 47(7):489.
21. Niedhammer I, O'Mahony D, Daly S, Morrison JJ, Kelleher CC et al.,(2009): Cross-Generation Cohort Study Steering Group, Occupational predictors of pregnancy outcomes in Irish working women in the Lifeways cohort. BJOG; 116(7): 943-52.
22. Olusanya BO and Ofovwe GE (2010): Predictors of Preterm Births and Low Birth weight in an Inner-City Hospital in Sub-Saharan Africa. Matern Child Health J ;14: 978–86. https://doi.org/10.1007/s10995-009-0528-4).
23. Panaitescu AM, Syngelaki A, Prodan N, Akolekar R and Nicolaides KH (2017): Chronic hypertension and adverse pregnancy outcome: a cohort study. Ultrasound Obstet Gynecol ; 50: 228-35
24. Patil D, Enquobahrie DA, Peckham T, Seixas N and Hajat A (2020): Retrospective cohort study of the association between maternal employment precarity and infant low birth weight in women in the USA. BMJ open; 10(1): e029584.
25. Reda A, Rasha AM, Ashraf A and Shams-Eldin N (2024): Relation between Employment Workload and Pregnancy Outcome A Prospective Clinical Study. Med J Cairo Univ; 91(12): 1567-74.
26. Sejbæk CS, Flachs EM, Frankel H, Mehlum IS, Tøttenborg SS, et al.,(2024): O-325 Physical work demands during pregnancy and the risk of preterm birth-Findings from a Danish register-based cohort study. Occup Med; 74(Suppl 1): 23590.
27. Simoncic V, Deguen S, Enaux C, Vandentorren S and Kihal-Talantikite W (2022): A comprehensive review on social inequalities and pregnancy outcome—identification of relevant pathways and mechanisms. Int J Environ Res Public Health; 19(24):16592
28. Stylianou-Riga P, Kouis P, Kinni P, Rigas A, Papadouri T , et al., (2018): Maternal socioeconomic factors and the risk of premature birth and low birth weight in Cyprus: a case–control study. Reprod Health ;15: 157. https://doi.org/10.1186/s12978-018-0603-7)
29. Suzumori N, Ebara T, Matsuki T, Yamada Y, Kato S, et al.,(2020): Effects of long working hours and shift work during pregnancy on obstetric and perinatal outcomes: A large prospective cohort study -Japan Environment and Children's Study. Birth; 47 (1): 67-79.
30. Tingleff T, Vikanes Å, Räisänen S, Sandvik L, Murzakanova G, et al., (2022): Risk of preterm birth in relation to history of preterm birth: a population-based registry study of 213 335 women in Norway. BJOG;129(6): 900-7.
31. Tuntiseranee P, Geater A, Chongsuvivatwong V and Kor-anantakul O (1998): The effect of heavy maternal workload on fetal growth retardation and preterm delivery: a study among southern Thai women. J Occup Environ Med; 40(11): 1013-21.
32. Woo GM (1997): Daily demands during pregnancy, gestational age, and birth weight: reviewing physical and psychological demands in employment and non-employment contexts. Ann Behav Med; 19(4): 385-98.
33. World Health Organization (WHO) (2014): Global nutrition targets 2025: low birth weight policy brief [Internet]. Geneva: WHO; 2014 [cited 2018 Feb 6]. Available at: http://apps.who.int/iris/bitstream/10665/149020/2/WHO_NMH_NHD_14.5_eng.pdf?ua=1
34. World Health Organization (WHO), (2015): Recommendations on interventions to improve preterm birth outcomes. Available at: https://apps.who.int/iris/bitstream/handle/10665/183037/?sequence=1.