

## WORK RELATED RISK FACTORS AND PREGNANCY OUTCOME BETWEEN WORKING WOMEN

By

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### Abstract:

**Introduction:** The employment rate of mothers has increased worldwide in recent years. So, there is concern about possible effects of work related risk factors and pregnancy outcome among working women. **Aim of Work:** To study the relation between work related risk factors and some adverse pregnancy outcome among a representative sample of pregnant women attending the antenatal care clinic at Beni-Suef university hospital in Egypt. **Materials and Methods:** 500 pregnant women who were visiting the antenatal care clinic at Beni-suef university hospital were our target group. They were interviewed using predesigned questionnaire including physical activity questionnaire, Job Stress Questionnaire, Workplace Stress Survey. Body mass index (BMI) is measured. Statistical analysis performed using SPSS version 21. **Results:** Among studied socio-demographic factors, age and educational level and body mass index were significantly associated with adverse pregnancy outcomes. Perinatal death was significantly higher among working women (odds ratio = 1.9, CI= 101-3.8). Among studied working conditions, working more than 40 hours/ week was significantly associated with high rate of preterm delivery and small gestational age (SGA) increase significantly with high work stress. **Conclusion:** Among the studied work conditions for working women, working more than 40 hours/ week and social stress index were found to be a significant risk factors for adverse pregnancy outcomes. Other factors as shift work, work categories, and physical activity score showed no significant association with pregnancy outcomes. Therefore, as long as the health of pregnant women permits her to continue work during pregnancy that is not stressful or overloading for her, no adverse effect on pregnancy outcomes is expected.

**Key words:** Pregnancy outcome, Shift work, Small for gestational age SGA, Perinatal death, Preterm.

## Introduction

The potential impact of employment on pregnancy is an important issue due to the increasing number of woman entering the labor force and continuing employment throughout pregnancy (Arafa and Abdel Fattah, 2007).

The majority of women remain well through their pregnancy. So, pregnancy should not be considered as either an illness, or a contraindication for work. However, a working pregnant woman may be exposed to particular hazards that might potentially cause adverse pregnancy outcome for her or her fetus (Royal College of physicians, 2009)

A meta-analysis has shown that physically demanding work that includes prolonged standing, shift and night work, and a high cumulative work fatigue score may be associated with adverse pregnancy outcomes such as spontaneous abortion, stillbirth, or low birth weight. Occupational exposures may also, interact with the fetal development, resulting in illhealth effects in the offspring, such as congenital malformations and neurobehavioral disorders in childhood (Mozurkewich et al.,2000).

The significant work factors directly correlated with adverse pregnancy outcomes included: fewer household helpers, standing at work for more than 7 hours per day, working in hot environments, commuting, walking, and carrying and lifting heavy weight (Banerjee , 2009)

Study of another systematic review reported that shift work, lifting an object at work, and prolonged standing might lead to pre-term delivery (Bonzini et al., 2007)

Physical exertion has been suggested as a risk factor for adverse pregnancy outcome due to the combined effects of vasoconstriction, myometrial contraction, reduced plasma volume, and diversion of blood flow away from the placental bed, diminution of uteroplacental blood flow with resultant fetal hypoxia. This, along with possible hormonal imbalance, may have deleterious effects on the fetus (Banerjee, 2009) .

Despite the probability that working women may have less favorable pregnancy outcomes, some studies of the health among working women provide conflicting results and leave the issue unresolved. Moreover, only few such studies have been conducted

in the developing countries (Arafa and Abdel Fattah, 2007), which necessitates further study to clarify these issues.

### **Aim of Work**

To study the relation between work related risk factors and some adverse pregnancy outcome among a representative sample of pregnant women attending the antenatal care clinic at Beni-Suef university hospital in Egypt.

### **Materials and Methods**

A prospective study involved 500 pregnant women who were visiting the antenatal care clinic at Beni-Suef University hospital, Egypt during the year 2013. The target group were enrolled in the study during their first antenatal care visit after taking their written consent to participate in the study. The purpose of study was explained to all of them and all were followed up until delivery.

### **Tools of study:**

#### **1. Predesigned questionnaire :**

All participants were interviewed by trained personnel using a predesigned questionnaire that included the following data:

I. Personal information: age at this first antenatal care visit, educational level, Special habits, contact information.

II. Obstetric history: duration of pregnancy at first antenatal care visit, expected date of delivery, history of present and past conceptions if any. Number of children, history of abortion , still birth or low birth weight

III. Occupational history: for working participants, work characteristics were included in details:-Type of work,number of working hours/ day, work pattern (daytime work or shift work), duration of work in years, working days/week, prolonged physical strain or fatigue, exposure to potential occupational hazards as radiation, chemical exposure, biological agents.

Work categories: Type and nature of work was then categorized into 5 main groups (Clerical workers, Elementary occupations, Health Professionals, Teaching Professionals, Technicians) according to (International Standard Classification of Occupations (ISCO), 2008).

**IV. Medical history:** history of Diabetes Mellitus, cardiac diseases, medications---etc. which may affect the outcome of pregnancy were excluded from the study.

**V. Adverse pregnant outcomes:-**The main outcomes assessed during follow up included :

- i. Perinatal death (abortion, still birth or early neonatal deaths),
- ii. Preterm delivery (delivery of the fetus before 37 completed week of gestation),
- iii. Small for gestational age (SGA) :- (birth weight below the 10th for a given gestational age) (Lawrence, 2006).

Pregnancy outcome was assessed during follow up of participating women in the sequential antenatal care visits (via ultrasound and other investigations) and after delivery. For women delivering outside the hospital, the outcome was obtained by contact information.

## **2. Physical activity questionnaire:-**

General Practice Physical Activity Questionnaire (GPPAQ) was used as a validated short measure of physical activity based on type and amount of

physical activity involved during work. It generates a simple - 4-level Physical Activity Index (PAI) - categorizing subjects as: Active, Moderately Active, Moderately Inactive, and Inactive) The General Practice Physical Activity Questionnaire (GPPAQ), 2006).

## **3. The Job Stress Questionnaire:-**

Load of stress encountered during work measured using (Workplace Stress Survey of The American Institute Of Stress (AIS), 2011).

## **4. Workplace Stress Survey :**

AIS has created a job stress survey that can help reveal employee stress levels. Survey participants are asked to assign a number from one to 10 statements that describe amount of work stress and work satisfaction.

According to this questionnaire, three levels of work stress were identified:-

- Mild stress (A score of 10-30)
- Moderate stress (A score of 40-60)
- Severe stress (A score of 70-100)

**5. Body Mass Index (BMI)** was calculated from the formula: pre-pregnant weight in kilos/(height in

meter)<sup>2</sup>, then according to (WHO, 2012) classification of BMI the women classified into 4 Categories underweight (BMI= 15-18.5), Normal weight (BMI= 18.5- 24.9), Overweight (BMI= 25-29.9), Obese(BMI=  $\geq$  30).

**Consent:** an informed consent was taken from all the participants.

### Ethical approval

To ensure privacy, dignity and

integrity, names of the participant were kept confidential.

### Data analysis:-

Data was tabulated and statistically analyzed using SPSS version 21 , chi square test and Odds ratio were used to study the association between work related risk factors and studied pregnancy outcomes. P value <0.05 was considered significant.

## Results

**Table 1:- Socio-demographic characteristics of the studied participants**

Socio-demographic characteristics	Non-working women N= 326		Working women N= 174		P value
	No.	%	No.	%	
<b>Age categories:-</b>					
< 20 years	55	16.9	4	2.3	0.0001*
20 - 35 Years	242	74.2	152	87.4	0.02*
>35 Years	29	8.9	18	10.3	0.8
<b>Residence</b>					
Rural	258	79.1	78	44.8	0.000*
Urban	68	20.9	96	55.2	
<b>Educational level</b>					
Illiterate/ basic	180	55.2	36	20.7	0.000*
Secondary and higher	146	44.8	138	79.3	
<b>BMI</b>					
Underweight	26	7.9	12	6.9	0.7
Normal	178	54.6	92	52.9	0.7
Overweight / Obese	122	36.5	70	40.2	0.6

\*: Significant

Comparison of the socio-demographic characteristics showed a significant difference between working women aged 20-35 years, residing in urban areas with high education level (secondary to university) compared to non-working ones.

Table 2:- Relationship between working status and different pregnancy outcomes

Pregnancy outcome	Non-working women N= 326 No.	%	Working women N= 174 No.	%	Odds ratio	95%confidence interval	P value
Perinatal death	20	6.1	20	11.5	1.9	1.1-3.8	0.035*
Preterm delivery	42	12.9	24	13.8	0.9	0.5- 1.6	0.7
Small for gestational age (SGA)	26	7.9	18	10.3	1.3	0.7-2.5	0.4

\*: Significant

Working status was associated with a significant higher percent of perinatal death compared to non-working ones.

Table 3 :- Relationship among different pregnancy outcomes and socio-demographic characteristics among working women

Variable	Perinatal death N=20		P	Pregnancy outcome				P
	No.	%		Preterm delivery N=24		SGA N=18		
				No.	%	No.	%	
<b>Age categories:-</b>								
<20 years	6	30	0.1	2	8.3	0	0	0.4
20 - 35 Years	2	10	0.5	5	20.8	14	77.8	0.3
>35 Years	12	60	0.0001*	17	70.8	4	22.2	0.1
<b>Residence</b>								
Rural	8	40		14	58.3	10	55.6	0.3
Urban	12	60	0.6	10	41.7	8	44.4	
<b>Educational level</b>								
Illiterate/ basic	6	30	0.4	8	33.3	10	55.6	0.02*
Secondary /higher	14	70		16	66.7	8	44.4	
<b>BMI</b>								
Underweight	6	30	0.9	2	8.3	2	11.2	0.7
Normal	4	20	0.7	6	25	8	44.4	0.6
Overweight / Obese	10	50	0.3	16	66.7	8	44.4	0.3

\*: Significant

Table 3 shows: 1-Significant association between perinatal death, preterm delivery in one side and age category &gt; 35 years on other side.

2- SGA was significantly more prevalent among illiterate/ basic education group.

3- Preterm delivery was significantly more prevalent among overweight and obese women.

Table 3 :- Relationship among different pregnancy outcomes and socio-demographic characteristics among working women

Variable	Perinatal death N=20		P	Pregnancy outcome				P
	No.	%		Preterm delivery N=24		SGA N=18		
			No.	%	No.	%	No.	%
<b>Age categories:-</b>								
<20 years	6	30	0.1	2	8.3	0	0	0.4
20 - 35 Years	2	10	0.5	5	20.8	14	77.8	0.3
>35 Years	12	60	0.0001*	17	70.8	4	22.2	0.1
<b>Residence</b>								
Rural	8	40		14	58.3	10	55.6	0.3
Urban	12	60	0.6	10	41.7	8	44.4	
<b>Educational level</b>								
Illiterate/ basic	6	30	0.4	8	33.3	10	55.6	0.02*
Secondary /higher	14	70		16	66.7	8	44.4	
<b>BMI</b>								
Underweight	6	30	0.9	2	8.3	2	11.2	0.7
Normal	4	20	0.7	6	25	8	44.4	0.6
Overweight / Obese	10	50	0.3	16	66.7	8	44.4	0.3

\*: Significant

Table 3 shows: 1-Significant association between perinatal death, preterm delivery in one side and age category &gt; 35 years on other side.

2- SGA was significantly more prevalent among illiterate/ basic education group.

3- Preterm delivery was significantly more prevalent among overweight and obese women.

**Table 4:- Relationship between some work characteristics and different pregnancy outcomes among working women**

Pregnancy outcome	Work Shift				Odds ratio	95% confidence interval	P	No. of working hours/ week				Odds ratio	95% confidence interval	P		
	Yes		No					<40 hours/ week N= 127	≥ 40 hours/ week N= 47	P	Odds ratio				95% confidence interval	P
	No.	%	No.	%												
<b>Perinatal death</b>	4	16.7	16	10.7	1.9	0.5- 6.2	0.2	16	12.6	4	8.5	1.5	0.4- 4.8	0.6		
<b>Preterm delivery</b>	5	20.8	19	12.7	1.8	0.6- 5.4	0.3	8	6.3	16	34.1	0.13	0.05- 0.3	0.0001*		
<b>Small for gestational age (SGA)</b>	4	16.7	18	12	2.2	0.7- 7.3	0.2	12	9.4	6	12.8	0.7	0.25- 2.1	0.7		

\*: Significant

Preterm delivery was significantly high in women working more than 40 hours/ week.

Table 5:- Relationship between type of job and different pregnancy outcomes among working women

Pregnancy outcome	Type of job					P
	Clerical worker N= 40 No. %	Elementary occupations N= 40 No. %	Health Professionals N= 74 No. %	Teaching Professionals N= 14 No. %	Technicians N= 6 No. %	
Perinatal death	4 10	2 5	10 13.5	2 14.3	2 33.3	0.29
Preterm delivery	4 10	4 10	12 16.2	2 14.3	2 33.3	0.5
Small for gestational age (SGA)	4 10	6 15	8 10.8	0 0	0 0	0.5

No significant difference in the outcome of pregnancy in relation to the 5 job categories.

Table 6:- Relationship between both physical activity score and work stress index and different pregnancy outcomes among working women

Pregnancy outcome	Physical activity score		P	Work stress index			P
	Active** N= 108 No. %	Inactive*** N= 66 No. %		Mild N= 34 No. %	Moderate N= 109 No. %	Severe N= 31 No. %	
Perinatal death	16 14.8	4 6.1	0.18	3 8.8	16 14.7	1 3.2	0.18
Preterm delivery	14 12.9	10 15.2	0.5	31 91.2	91 83.5	28 90.3	0.4
Small for gestational age (SGA)	10 9.3	8 12.1	0.4	28 82.4	91 83.5	29 93.5	0.03*

\*. Significant

The prevalence of SGA was significantly higher among those with severe work stress.

\*\*Active = Work with physical effort (vigorous), use of tools and handling heavy objects.

\*\*\*Inactive = Work require sitting most of time (such as in an office), standing or walking not requiring much intense physical effort.

## Discussion

This prospective study involved 500 pregnant women who attended the antenatal care clinic at Beni-Suef university hospital, Egypt during the year 2013. Of which, 174 women were working full time during pregnancy. Most of the working women (87%) were in the age categories between 20-35 years with educational level ranging between secondary and university education (42% & 37%; respectively) (table 1).

There was a significant difference for the age categories, residence, and educational level between working and non-working women, showing a higher percentage of non-working women < 20 years of age, compared to higher percent of 20-35 years age category for working women. For residency, most of non-working women resided in rural areas (80%) compared to 45% for working subjects. Most working women (79%) have secondary / higher education compared to 45% amongst the non-working ones; a finding which is consistent with the reported high percentages of educational level for working women (Arafa and Abdel Fattah, 2007) and (Niedhammer et al., 2009).

Peri-natal death was reported in 11.5% vs. 6% for working compared to non-working subjects ( $p=0.035$ ) (Table 2). This finding is consistent with that of (Banerjee , 2009) who found an increase in the perinatal mortality rate among employed women with reported significant work factors that correlated with miscarriage and/or perinatal death included: fewer household helpers, standing, working in hot environment, walking, carrying, and lifting heavy weight at work (Banerjee , 2009). No significant difference was observed in preterm delivery and SGA between working and non-working women (Table 2); a finding which is similar to that reported (Arafa and Abdel Fattah, 2007) indicating that working to term in absence of contraindications did not impose any added risk to the mother or infant.

The risk of preterm delivery and perinatal death was significantly higher among the age group more than 35 years of age (table3), a finding that coincides with the study of (Louise et al ., 2013) who reported that older mothers are at increased risk of adverse pregnancy outcome compared to their younger counterparts.

Moreover among working women, it was observed that the prevalence of SGA was significantly higher among women with low education (illiterate/basic) (Table 3).

Relation between educational level and outcomes of pregnancy has been described many decades ago with inverse relation between pregnancy outcomes and maternal education. Higher education not only presumes higher economic standing but suggests a more informed approach to both self-care and the use of the health care system. Better knowledge of health-related behaviors is also likely to be reflected by the woman's education level (Morrison et al., 1989).

In this study the preterm delivery was significantly high among obese and overweight women, in agreement to that reported by (Sebire et al., 2001) and (Cedergren, 2004) who found that maternal obesity carried significant risk for the mother and fetus.

Studying working characteristics in relation to pregnancy outcomes, there was significant high prevalence of preterm delivery in women working more than 40 hours/ week during pregnancy. This is similar to finding of other European studies that detect a

moderate excess risk of preterm birth and small-for-gestational-age for pregnant women employed as manual workers and for those working > 40 hrs/ week, or standing for long period (Cubizolles et al., 2004), (Niedhammer et al., 2009), (Mozurkewich et al., 2000), (Nurminen, 1998), (Pompeii et al., 2005), (Zhu et al., 2004), (Croteau et al., 2007) and (Tuntiseranee et al., 1998)

There was no significant difference in pregnancy outcome in relation to shift work, or different job categories (table 4, table 5), which is in agreement with reported data from (Cubizolles et al., 2004) and (Henriksen et al., 1994) indicating that work would not have a detrimental effect on pregnancy outcomes so long as pregnant women are in good health.

Small for gestational age is significantly high with severe work stress index (table 6); and this finding supported by (Lee et al., 2011). A possible biological mechanism linking maternal stress and birth outcomes indicates that stress triggers the production of placental corticotrophin releasing hormone (CRH), which in turn results in reduced gestational age and low birth weight (Hobel and Culhane, 2003) and (Lockwood, 1999).

## Conclusion

This prospective study was planned to demonstrate the relationship between different work characteristics and three of pregnancy outcomes including perinatal death, preterm delivery, and small for gestational age. A Significant relationship was detected between working status and prenatal death. Socio-demographic factors found to affect pregnancy outcomes including older maternal age and low educational level, and high body mass index. Among the studied working conditions, working more than 40 hours/ week and work stress index were significantly associated with high rate of SGA.

## Conflict of interest:

Authors have declared that no conflict of interests exists.

## No financial support

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