Association of Maternal Work with Adverse Perinatal Outcome

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ABSTRACT

Objective: To investigate the relationship between maternal work and pregnancy outcome.

Methods: Over a 4-month period from October 2004 through February 2005, 2,419 women were interviewed shortly after delivery in the three main public and Health Insurance hospitals in Alexandria, Egypt. Of these, 730 (30.2%) were working and 1,689 (69.8%) were not working prior to delivery. A detailed description of working status was analyzed, along with a risk profile which was compared between the two groups.

Results: There was no significant association between different work characteristics and perinatal outcomes except for that between working posture, stress and delivery of small-for-gestational-age (SGA) babies. There was an excess rate of SGA and perinatal death among the non-working group, while preterm delivery was significantly increased among those who worked throughout the whole pregnancy. After adjusting for confounders, the risk of preterm delivery was no longer significant (OR = 1.2, 95% CI = 0.96-1.7). On the other hand, working status had a beneficial effect on SGA and perinatal death (OR = 0.41, 95% CI = 0.26-0.64 and OR = 0.26, 95% CI = 0.14-0.48, respectively).

Conclusion: These results cast doubt on the risk of adverse pregnancy outcome for women who work during pregnancy. Work per se does not constitute a health risk factor and may even have a positive social impact on pregnancy. Further research on this topic in our region is recommended.

MeSH terms: Maternal work; adverse pregnancy outcome; developing countries; strenuous work

La traduction du résumé se trouve à la fin de l'article.

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The potential impact of employment on pregnancy is an important issue that merits assessment, given the increasing numbers of women entering the labour force and continuing employment throughout pregnancy. Guidelines in some European countries and the United States suggest that pregnant women should avoid prolonged standing and heavy lifting in the workplace during the second and third trimesters of pregnancy.^{1,2} Much attention is paid by obstetricians to the diet and environment of the pregnant woman in prenatal care, but it is possible that her work also may affect pregnancy outcome. In the workplace, women may encounter specific hazards of radiation or chemicals. More widespread are the problems of fatigue and boredom, which need careful assessment in relation to the outcome of pregnancy. These factors should be measured more precisely, thus allowing the physician to advise pregnant women better about the safe duration of work.³ Physical exertion in the workplace during pregnancy may be predictive of adverse reproductive outcome. Many studies have suggested that strenuous physical activity, including in the workplace during pregnancy, is associated with reduced infant birthweight, shorter gestation period, intrauterine growth retardation, spontaneous abortion, and some congenital malformations.⁴⁻¹⁰ These types of associations, however, have not been observed in other studies.¹¹⁻¹⁴ Moreover, only a few such studies have been conducted in developing countries.¹⁵⁻¹⁸

As the Egyptian population grows, the size of the labour force grows even faster with an increased participation of women in the workforce. Much of women's work in Egypt remains unrecognized, as informal activities, unpaid work, and activities for domestic consumption are not included. In accordance to the Population Census, which captures female work in formal activities only, the participation rate of females in the total labour force increased from 10% in 1986 to 12.9% in 2000 and to 15.4% in 2001.^{19,20} To the authors' knowledge after review of the literature, this work was the first undertaken in Egypt to investigate the association between maternal work and adverse perinatal outcomes.

MATERIAL AND METHODS

The data for the current study were collected from three public hospitals in the

City of Alexandria, the second capital of Egypt: El-Shatby Maternity Hospital (the Main University Hospital) and Gamal Abdel-Nasser and Karmouz Hospitals (the Main Health Insurance Hospital). These hospitals provide services to the inhabitants of Alexandria and nearby governorates. The study approached all parturients who were delivering in the hospitals during the period October 2004 through February 2005. Women who agreed to participate were interviewed during their postpartum stay in the hospital. Those who left work during pregnancy (antenatal leave, $n=5$), were on child care leave ($n=13$) or had multiple births ($n=97$) were excluded. Only three women refused to participate in the study. All participants were interviewed by trained interviewers using a pre-coded questionnaire that included the following data: current age, age at marriage, education, antenatal care, history of present and past conceptions, medical history and any other circumstances that could lead to adverse perinatal outcome (i.e., vaginal bleeding, premature rupture of the membrane, etc.). Weight was recorded during the third trimester, but height was not taken as it is not routinely measured for pregnant women. For those participants in the working category, work characteristics were studied in detail, including: type of job, posture during work, duration of work in years, working hours and rest days/week. Those who work for more than 50 hours/week and/or who do not receive rest days were considered to be suffering from occupational fatigue.²¹ Stress at work was assessed via a psychological job demand questionnaire using a four-point scale: ≤ 3 not stressed, 4-6 mild stress, 7-9 moderate stress and 10-12 severe stress.²² Shortly after delivery, gestational age was assessed using the Ballard scoring system.²³

Perinatal outcome

Three main perinatal outcomes were assessed: premature birth (delivery before the 37th week of gestation), small for gestational age (SGA) (birthweight below the 10th percentile for weight for a given gestational age according to Egyptian standard weight for age distribution), and perinatal death.

Analysis

The first part of the analysis was restricted to working women and looked at the

TABLE I

General Characteristics of Working and Non-working Women

	Non-working Women (n=1689)		Working Women (n=730)		χ^2	P
	No.	%	No.	%		
Age (years)						
<20	119	7.0	12	1.6	94.19	0.000
20-35	1422	84.2	563	77.1		
>35	148	8.8	155	21.3		
Education					688.1	0.000
Illiterate	900	53.3	81	11.1		
Primary & preparatory	341	20.2	80	11.0		
Secondary	409	24.2	365	50.0		
University	39	2.3	204	27.9		
Weight						
≤ 60 kg	214	12.7	61	8.4	9.41	0.02
>60 kg	1475	87.3	669	91.6		
History of abortion	282	16.7	154	21.1	6.67	0.01
Previous perinatal death (yes)	95	5.6	52	7.1	2.0	0.157
Previous preterm/LBW (yes)	105	6.2	58	7.9	2.42	0.11
Bleeding in the current pregnancy (yes)	138	8.2	74	10.1	2.46	0.11
Parity						
1	686	40.6	297	40.7	10.44	0.005
2	417	24.7	220	30.1		
≥ 3	586	34.7	213	29.2		
Antenatal care						
Yes	1237	73.2	671	91.9	106.7	0.00
No	452	26.8	59	8.1		

nature of their employment and its association to perinatal outcomes. The three outcomes were then compared to non-working women (housewives). A series of logistic regression analyses were performed to adjust for potential confounders; three models were created, one for each perinatal outcome. The dependent variables were the adverse outcome versus the outcome of normal births. Mother's working status was introduced first as a single independent predictor to evaluate its crude association with the outcomes, then all other factors that could result in adverse perinatal outcome were added in the model to adjust for their effect using forward stepwise method. Though cigarette smoking is an important confounding variable, it was not added in the model as there were only three women in the sample who smoked. In our culture, it is unusual to see women smoking in this social class.

RESULTS

Altogether, 2,534 women were approached in the study. After exclusion of those who did not meet the sample criteria and those who did not agree to participate, 2,419 women remained in the study and supplied complete data. Of these, 730 (30.2%) were classified as working and 1,689 (69.8%) as non-working. Most (82%) were of middle social class. Table I illustrates the general characteristics (socio-demographic and obstetric) of both

groups. Working mothers were older and had a higher level of education. The table also shows that rates for history of abortion, previous perinatal death, previous preterm or LBW delivery, and early bleeding in the current pregnancy were higher for working compared to non-working women, however history of abortion was the only significant variable. Housewives were more often found to be multiparous (≥ 3). A significantly higher percentage of working women sought antenatal care compared to non-working women. The sample comprised different categories of employment: the lowest figure was unskilled labour (8.4%), nearly one third of the sample was professionals (31.1%), while clerical staff, paramedical staff, and skilled workers represented 25.5%, 18.2%, and 16.7%, respectively.

Of the sample of working women, 42.6% performed their work mostly in the sitting position, 39.5% stood, and 13.2% alternated between sitting and standing. Risky categories like squatting and carrying heavy objects each represented 0.5% of the sample, and the remaining percentages were in all combined categories. Of the different work characteristics, only stress and posture were found to be significantly associated with delivery of small babies ($\chi^2 = 18.95$, $p = 0.002$ and $\chi^2 = 9.68$, $p = 0.007$, respectively). There was an excess rate of adverse outcomes delivery among working women with fixed day-time work and no reported fatigue.

TABLE II
Distribution of Adverse Outcomes According to Some Work Characteristics

Work Characteristics	Preterm					SGA					Perinatal Death				
	Yes (n=129) No.	%	No (n=601) No.	%	χ^2	Yes (n=29) No.	%	No (n=701) No.	%	χ^2	Yes (n=16) No.	%	No (n=714) No.	%	χ^2
Work stress															
Not stressed	25	19.4	127	21.1	2.43 p=0.48	8	27.6	145	20.7	18.95 p=0.002	5	31.25	150	21.01	1.24 p=0.74
Mild	76	58.9	312	51.9		5	17.2	378	53.9		8	50	379	53.1	
Moderate	27	20.9	152	25.3		16	55.2	168	23.96		3	18.75	175	24.5	
Severe	1	0.8	10	1.7		0	0	10	1.4		0	0	10	1.4	
Fatigue															
Yes	12	9.3	36	5.99	1.9 p=0.168	5	17.2	44	6.3	3.74 p=0.053	2	12.5	47	6.6	FET=0.292
No	117	90.7	565	94.0		24	82.8	657	93.7		14	87.5	667	93.4	
Working schedule															
Morning	106	82.2	504	83.9	0.22 p=0.63	21	72.4	587	83.7	2.75 p=0.10	13	81.25	597	83.6	FET= 0.504
Shifts	23	17.8	97	16.1		8	27.6	114	16.3		3	18.75	117	16.4	
Posture															
Sitting	55	42.6	256	42.6	0.02 p=0.99	18	62.1	296	42.2	9.68 p=0.007	10	62.5	302	42.3	4.96 p=0.08
Standing	52	40.3	236	39.3		3	10.3	281	40.1		2	12.5	286	40.1	
Alternating	16	12.4	75	12.5		5	17.2	92	13.1		3	18.75	94	13.2	

TABLE III
Distribution of Adverse Perinatal Outcomes with Working Status

Perinatal Outcome	Non-working Women (n=1689)		Working Women (n=730)		Significance	
	No.	%	No.	%	χ^2	P
Preterm	233	13.8	129	17.7	6.01	0.01
SGA	209	12.4	29	4.0	40.55	0.00
Prenatal death	82	4.9	16	2.2	9.32	0.02

TABLE IV
Crude and Adjusted OR for Working Status with Regard to the Three Outcomes

Model 1	Crude OR (95% CI)
Preterm	1.4 (1.06-1.69)
SGA	0.29 (0.19-0.43)
Perinatal death	0.43 (0.25-0.75)
Model 2	Adjusted OR (95% CI)
Preterm	1.2 (0.96-1.7)
SGA	0.41 (0.26-0.64)
Perinatal death	0.26 (0.14-0.48)

Variables added in the second model were: age, educational level, parity, previous perinatal death, previous abortion, previous preterm, and history of present conception (antenatal care, toxemia of pregnancy, anemia, uterine bleeding, and premature rupture of the membrane).

Preterm delivery and perinatal death were encountered more often in women with mild work stress and who work in a sitting position, however the difference was not significant (Table II). It can be concluded from Table III that the percentages of SGA and perinatal death were significantly lower for working women (4.0% and 2.2% in working mothers vs. 12.4% and 4.9% in non-working mothers, respectively), in contrast to preterm delivery where the risk was higher. The crude association between working status and the three outcomes (first model) was significantly higher for SGA and perinatal death especially. There was an increased risk of prematurity (OR = 1.4, 95% CI = 1.06-1.69) in contrast to SGA and perinatal death where the risk was significantly decreased (OR = 0.29 and 0.43, 95% CI = 0.19-0.43 and 0.25-0.75, respectively). The significant association between working status and

prematurity was lost after taking into consideration the effect of other predisposing variables which were added to the second model (OR = 1.2, 95% CI = 0.96-1.7). On the other hand, the risk of working status on SGA and perinatal death remains significantly decreased in the second model (OR = 0.41 and 0.26, 95% CI = 0.26-0.64 and 0.14-0.48, respectively) (Table IV).

DISCUSSION

One of the most dramatic structural changes in Egypt is the increased participation of women in the paid labour force. Pregnant women in the developing world are increasingly involved in paid employment in addition to their household responsibilities. The resulting heavy workload might have an effect on the woman and her unborn child.

Several studies have examined the association between working characteristics and pregnancy outcome and indicated that long hours or irregular job hours, shift work, long periods of standing, high-stress work and certain postures were associated with adverse pregnancy outcomes.^{17,24-31} Mozurkewich et al.³² conducted a meta analysis to evaluate the association between working condition and adverse pregnancy outcomes, and concluded that specific working conditions may significantly increase a woman's risk of adverse pregnancy outcomes. However, none of these studies was conducted in a developing country like Egypt. Moreover, such associations have not been determined to be risk factors in other studies.³³⁻³⁵ The results of the current study indicated that only posture and stressed work had a significant association with delivery of small-for-date babies. Neither work fatigue (long working hours) nor shifts were significantly associated with increased risk of adverse pregnancy outcomes. The recent study conducted by Sydsjo et al. concluded that the continuous increase in infants' birthweight among working pregnant women did not correlate with increased rest periods.³⁶

Most of the women in the present study were unable to determine the exact periods of standing and sitting while doing their work. In Egypt, in many workplaces and different work categories, working pregnant women – especially during the third trimester – are exempted from much workload and their periods of rest during work are increased. This in turn tends to diminish physical exertion during work. In addition, they are performing their work mostly sitting or alternating sitting with standing position, especially in the professional

categories like teachers and clerical staff. Another limitation of the study is that we could not measure directly the physical exertion at work and depended mainly on evaluating the number of working hours. Furthermore, not all physical strain is equal; it is highly probable that housewives are as physically active as women who work, particularly women working in office jobs.

Comparing working and non-working status in relation to pregnancy outcomes revealed that working women had significantly lower rates of SGA and perinatal death than non-working women. There was an increased risk of preterm delivery for working women, which lost its significance after adjusting for other potential confounders. On the other hand, the risk of SGA and perinatal death was significantly decreased for the working group in its crude and adjusted association. In agreement with the findings in the current study, Saurel-Cubizolles et al.³⁷ and Henriksen et al.³⁸ found no evidence that work per se had any detrimental or beneficial effect on the risk of preterm delivery. Earlier studies^{39,40} indicated that working to term in the absence of contraindications did not impose any added risk to mother or infant. In the context of our findings, other researchers^{41,42} reached the conclusion that no significant difference between employed women and housewives was observed in their physical health or pregnancy outcome, and virtually all the indices of outcomes were slightly more favourable for the housewives.

In conclusion, the relationship between working status and pregnancy outcome could not be explained only by the women's demographic, social or personal characteristics; employment in itself places the woman within an integrated social network, allowing her to receive substantial support, which is beneficial during pregnancy. In addition, working women have more access to insured antenatal care, which increases their chances of better quality care and early detection of risk. An important issue that should be addressed in future research is whether there are any specific occupational groups that are at increased risk, for instance women who are facing very stressful jobs, both physically and psychologically, without social support and self-esteem. The present work is con-

sidered a first step to understanding the main effects of work during pregnancy. The findings suggest that work per se has no serious effect on the woman or on her fetus and that healthy women without an adverse obstetric or medical history can safely continue in employment during pregnancy.

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RÉSUMÉ

Objectif : Étudier la relation entre le travail pendant la grossesse et les résultats périnataux.

Méthode : Nous avons interviewé 2 419 femmes peu de temps après leur accouchement dans les trois principaux hôpitaux publics et privés d'Alexandrie, en Égypte, sur une période de quatre mois. Parmi ces femmes parturientes, 730 (30,2 %) avaient travaillé et 1 689 (69,8 %) n'avaient pas travaillé pendant leur grossesse. Nous avons analysé des descriptions détaillées du travail effectué et comparé le profil de risques des deux groupes.

Résultats : Nous n'avons observé aucune association significative entre les diverses caractéristiques du travail et les résultats périnataux, exception faite d'un lien entre la posture au travail, la tension et l'accouchement d'un bébé petit pour son âge gestationnel (PAG). Les taux de PAG et de décès périnatal étaient plus élevés chez les femmes qui ne travaillaient pas, tandis que le taux d'accouchement prématuré augmentait considérablement chez les femmes ayant travaillé pendant toute la période de grossesse. En ajustant les taux pour tenir compte des facteurs de confusion, le risque d'accouchement prématuré n'était plus considérable (RC=1,2, IC de 95 % = 0,96-1,7). D'autre part, le fait de travailler avait un effet bénéfique sur les taux de PAG et de décès périnatal (RC=0,41, IC de 95 % = 0,26-0,64 et RC=0,26, IC de 95 % = 0,14-0,48, respectivement).

Conclusion : Ces résultats mettent en doute l'élément hasardeux du travail pendant la grossesse puisque le travail en soi ne constitue pas un facteur de risque pour la santé, mais peut même avoir un impact social positif sur la grossesse, ce qui suggère qu'il faudrait pousser les recherches sur ce sujet dans notre région.

The Canadian Public Health Association (CPHA) and the Pandemic Health Alert Network are informing Canadians about the basic public health steps we can all take to help prevent the spread of infection, prepare to cope in an emergency, and protect our health during a flu pandemic.

Around the world, governments are gearing up for the next flu pandemic. Websites, fact sheets and checklists abound. However, the language they use and level of information they provide can be overwhelming and technical. To address this, CPHA and the Pandemic Health Alert Network have created a toolkit of practical, evidence-based information that is communicated in plain language.

This simple and practical toolkit provides Canadians with the information they need to protect themselves in a flu pandemic. The tools are easy to use, with common sense measures Canadians can put into practice in their daily lives.

These simple public health steps fall into three action areas:

1. **PREVENT** – basic public health habits that reduce the chance of catching and spreading the flu, such as proper hand washing;
2. **PREPARE** – easy-to-follow instructions on how to be prepared for a flu pandemic, or other emergency situation; and
3. **PROTECT** – crucial information on self-care during a flu pandemic.

The toolkit is designed to stimulate Canadians' interest to learn more and put that knowledge into action with simple measures that could stem the force of the next flu pandemic. The hope is that these steps will strengthen public resilience. That way we'll all be better prepared to cope in a flu pandemic, or other public health emergency.

The toolkit is available in English and French, online at www.pandemic.cpha.ca.