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Work Environment and Maternal Health Status during Pregnancy: A Cross-Sectional Study

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ABSTRACT

Objective(s): To establish the association between the work environment including physical and psychosocial occupational factors and maternal health during pregnancy.

Methods: A cross-sectional study was conducted among 150 pregnant employees in Baghdad- Al-Rasafa Sector. Data were collected using the PROMIS-29 Profile v2.1, Workplace Exclusion Scale, and Pregnancy Risk Assessment Form. Descriptive and inferential statistics were used, including frequency, percentage, mean, standard deviation, and chi-square tests.

Results: Statistical analysis revealed that psychosocial work environment factors were significantly associated with anxiety, fatigue, sleep disturbances, impaired physical function, and pain intensity. Similarly, depression demonstrated significant correlations with fatigue, physical function, and pain intensity. Regarding workplace exclusion, significant associations were identified with fatigue, physical risk factors, and psychosocial hazards. Furthermore, maternal health outcomes were significantly influenced by several sociodemographic and occupational variables, including maternal age, parity, gestational age, daily working hours, years of service, employment status, and family income ($p < 0.05$). Additionally, the data indicated a high prevalence of exposure to biological hazards, characterized predominantly by risks related to toxoplasmosis (71.3%) and rubella (72.0%).

Conclusion: The working environment exerts a profound influence on maternal health outcomes during pregnancy. Adverse physical environmental factors such as noise, vibration, prolonged standing, and ergonomic deficiencies were critically linked to heigh pain severity and impaired physical work capacity.

Recommendation: This study encourage for mandating workplace risk assessments, developing safe work policies, providing personal protective equipment, and supporting pregnant worker inclusive workplace.

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بيئة العمل والحالة الصحية للأم خلال الحمل: دراسة مقطعية

المستخلص

الهدف: للكشف عن العلاقة الارتباطية بين بيئة العمل، متضمنةً العوامل المهنية الفيزيائية والنفسية والاجتماعية، وصحة الأم خلال فترة الحمل

المنهجية: أُجريت دراسة مقطعية كمية في المدة من ٢٠ تشرين الأول ٢٠٢٥ إلى ٢٠ كانون الثاني ٢٠٢٦، شملت عينة مكونة من ١٥٠ موظفة حامل في قطاع الرصافة بالعاصمة بغداد. جُمعت البيانات باستخدام استمارة الخصائص اجتماعية ديموغرافية، وملف تقييم الصحة PROMIS-29(الإصدار ٢,١)، ومقياس الاستبعاد في مكان العمل، ونموذج تقييم مخاطر الحمل. واستُخدمت الأساليب الإحصائية الوصفية والاستدلالية لتحليل البيانات، وتضمنت التكرارات، والنسب المئوية، والمتوسط الحسابي، والانحراف المعياري، واختبار مربع كاي، وتحليل التباين أحادي الاتجاه (ANOVA) .

النتائج: كشف التحليل الإحصائي عن وجود ارتباط دال إحصائياً بين عوامل بيئة العمل النفسية والاجتماعية وكل من: القلق، والإعياء، واضطرابات النوم، وضعف الوظائف البدنية، وشدة الألم. وبالمثل، أظهر الاكتئاب ارتباطات جوهرية بكل من الإعياء، والوظائف البدنية، وشدة الألم. وفيما يتعلق بالاستبعاد في مكان العمل، رُصدت ارتباطات دالة إحصائياً مع الإعياء، وعوامل الخطر الفيزيائية، والمخاطر النفسية والاجتماعية. علاوة على ذلك، تبين أن المخرجات الصحية للأم تتأثر بشكل كبير بعدة متغيرات ديموغرافية واجتماعية ومهنية، شملت: عمر الأم، وعدد الولادات السابقة، والعمر الحملي، وساعات العمل اليومية، وسنوات الخدمة، والوضع الوظيفي، ودخل الأسرة .($p < 0.05$) كما أشارت البيانات إلى ارتفاع معدل انتشار التعرض للمخاطر البيولوجية، وتمثلت بشكل أساسي في المخاطر المرتبطة بداء المقوسات بنسبة ٧١,٣٪ والحصبة الألمانية بنسبة ٧٢,٠%

الاستنتاجات: تؤثر بيئة العمل تأثيراً عميقاً وجوهرياً في المخرجات الصحية للأمهات الحوامل؛ حيث ترتبط العوامل البيئية الفيزيائية السلبية مثل الضوضاء، والاهتزازات، والوقوف لفترات طويلة، والقصور في التصميم المريح لأماكن العمل ارتباطاً حرجاً بزيادة شدة الألم وضعف القدرة على الأداء البدني والعملي.

التوصيات: استناداً إلى هذه النتائج، تتأثر صحة الأم أثناء الحمل بالتفاعل متعدد الأبعاد بين التعرضات الجسدية في مكان العمل، والظروف النفسية والاجتماعية، وعوامل الخطر المهنية. وقد تبين أن الألم هو المحصلة الصحية الأكثر ارتباطاً مباشراً بعوامل بيئة العمل الفيزيائية، في حين أظهر القلق، والإعياء، واضطرابات النوم، وضعف المشاركة الاجتماعية ترابطاً وثيقاً وتداخلاً متبادلاً فيما بينها.

الكلمات المفتاحية: صحة الأم؛ بيئة العمل؛ المخاطر المهنية؛ القلق؛ الإرهاق؛ اضطراب النوم؛ الاستبعاد من مكان العمل.

Introduction

Over the past several decades, the global surge in women remaining in the workforce throughout pregnancy has intensified the need to understand how occupational conditions impact maternal health [(1)]. Gestation triggers profound physiological, physical, and psychological adaptations that can transform routine workplace exposures into significant clinical risks [(2,3)]. Biomechanical and environmental stressors such as prolonged standing, heavy lifting, excessive workloads, vibration, and noise alongside chemical and psychosocial pressures, have all been heavily implicated in adverse maternal and perinatal outcomes [(4,5)].

The workplace serves as a critical vector for health exposures. Severe physical demands can compromise placental perfusion and precipitate preterm birth, while acute psychosocial strain often triggers catecholamine release, potentially undermining maternal-fetal well-being [(1)]. Consequently, identifying biological, ergonomic, and organizational hazards is paramount, particularly within healthcare and formal employment sectors where pregnant individuals routinely encounter compounding risk factors [(6)].

Previous literature has linked long working hours and shift work to unfavorable pregnancy outcomes, although evidence remains mixed [(5,6)]. Occupational stress and poor workplace support have also been associated with anxiety, depressive symptoms, fatigue, and sickness absence among pregnant workers [(7–12)]. At the same time, inadequate workplace accommodation and pregnancy-related discrimination may worsen maternal psychological well-being and reduce workplace participation [(11,12)].

Despite this expanding body of international research, a critical geographic gap remains: no published Iraqi study has yet quantified how the localized workplace environment influences maternal health

during gestation [3,13]. To address this empirical oversight, this study investigates the impact of the work environment on maternal health among pregnant employees in Baghdad, examining the complex interrelationships between physical, psychosocial, and occupational factors and overall maternal functioning and well-being.

Methods

Study Design and Setting

A quantitative, cross-sectional design was used to determine the association between work environment conditions on pregnant women's health for the period between October 20th, 2025 to January 20th, 2026. The research was conducted in the Baghdad-Al Al-Rasafa sector district in the teaching hospitals. One hundred and fifty pregnant employees were included.

Study Sample and Sampling

Convenience sampling was used to select the participants, who were then interviewed with pregnant women at their respective workplaces. To ensure adequate statistical power and representativeness for this cross-sectional study, the minimum required sample size was determined based on standard statistical criteria using Cochran's sample size determination method, assuming a 95% confidence interval, a 5% margin of error, and a 50% response distribution. Inclusion and exclusion criteria involved pregnant employees aged 18-45 years who attended work. Employees with chronic illnesses that might have an independent effect on maternal health, those on long-term leave.

Data Collection and Study Instruments

Data were gathered through structured, face-to-face interviews conducted at the participants' workplaces. The study was conducted across teaching hospitals within the Al-Rasafa health sector of Baghdad, Iraq. Data collection was carried out over a six-month period.

The assessment integrated the following instruments: socio-Demographic and Obstetric Profile: include baseline characteristics such maternal age, parity, gestational age, daily working hours, total years of service, employment status, and monthly family income. Additionally, PROMIS-29 Profile v2.1: A multi-domain psychometric tool used to assess seven core parameters of health-related quality of life: physical function, anxiety, depression, fatigue, sleep disturbance, social roles/activities, and pain interference (Internal consistency in this study: α= 0.93). Workplace Exclusion Scale (WES): Evaluated subjective perceptions of professional isolation, marginalization, and psychological exclusion within the workplace setting (Internal consistency in this study: α= 0.94). Pregnancy Risk Assessment Form: A specialized checklist designed to systematically screen for environmental and occupational hazards, categorized into physical, biological, ergonomic, chemical, psychosocial, shift/night work, and welfare-related risks (Internal consistency in this study: α= 0.87).

Ethical Considerations

This study was executed in strict accordance with institutional and international ethical standards. Prior to initiation, formal ethical clearance was granted by the Ethics Committee of the University of Baghdad, College of Nursing (Approval No. 44, dated November 25, 2025), alongside institutional permission from the Clinical Research Ethics Committee at the Ministry of Health and the respective administrative boards of the participating teaching hospitals.

All prospective participants were fully briefed on the study's scope, objectives, and data management procedures. Written informed consent was voluntarily obtained from each participant before commencing data collection. Participants were expressly informed of their right to withdraw from the study at any stage without penalty. To protect participant confidentiality, all data were thoroughly anonymized, and personal identifiers were omitted from all analytical databases and subsequent publications.

Statistical analysis

The information was obtained through face-to-face interviews, which were conducted at the interviewees' workplaces. Descriptive statistics consisted of frequency, percentage, mean, and standard deviation. One-way ANOVA and chi-square analysis were the inferential tests. The level of statistical significance was $p \leq 0.05$.

Results

Table 1. Demographic, obstetric, and occupational characteristics of the study sample (n = 150).

Variable	Category	n	%
Age	22–27 years	47	31.3
	28–33 years	42	28.0
	34–39 years	49	32.7
	40–45 years	12	8.0
Residence	Urban	144	96.0
	Rural	6	4.0
Education	Bachelor's degree	93	62.0
No. of pregnancies	3–4	68	45.3
Parity	2	51	34.0
Miscarriages	None	82	54.7
Gestational age	32 to <37 weeks	77	51.3
Daily working hours	2–4 h	81	54.0
Work system	Morning	123	82.0
Main job type	Teacher	57	38.0
Years of service	1–5 years	60	40.0
Employment status	Permanent	117	78.0
Physical effort	Requires little effort	49	32.7
Monthly family income	Sufficient	60	40.0

Note. The dominant categories are shown for each variable.

Table 1 shows that the prevailing work profile was morning-shift work (82.0%), teaching (38.0%), permanent job (78.0%), and short working days of 2–4 h (54.0%). They also indicated that they had enough family income per month (40.0%).

Table 2. Significant interrelationships among major maternal health domains.

Relationship	χ^2	p-value
Physical function vs. fatigue	301.692	< 0.001
Physical function vs. sleep disorder	252.734	< 0.001
Physical function vs. social roles	310.378	< 0.001
Anxiety vs. fatigue	348.246	< 0.001
Anxiety vs. sleep disorder	206.414	0.026
Anxiety vs. social roles	272.665	< 0.001
Depression vs. fatigue	367.793	< 0.001
Depression vs. sleep disorder	217.120	0.001
Depression vs. social roles	209.956	< 0.001

Note. All reported relationships were statistically significant ($p \leq 0.05$). χ^2 = chi-square statistic.

Table 2 show that all tested interdomain relationships were statistically significant. The strongest associations were observed between depression and fatigue ($\chi^2 = 367.793$, $p < 0.001$), anxiety and fatigue ($\chi^2 = 348.246$, $p < 0.001$), and physical function and social roles ($\chi^2 = 310.378$,

$p < 0.001$), confirming strong interdependence across physical, psychological, sleep, and social health domains.

Table 3. Maternal and occupational factors associated with maternal health outcomes.

Variable	p-value	Interpretation
Maternal age	**0.001**	**Significant**
Number of pregnancies	0.718	Not significant
Parity	**0.019**	**Significant**
Number of miscarriages	0.584	Not significant
Gestational age	**< 0.001**	**Significant**
Daily working hours	**0.027**	**Significant**
Work system	0.369	Not significant
Working type	0.145	Not significant
Working title	0.120	Not significant
Years of service	**0.001**	**Significant**
Employment status	**0.046**	**Significant**
Type of work	0.756	Not significant
Monthly family income	**0.001**	**Significant**

Note. p-values are obtained from ANOVA or chi-square tests as applicable. Significant variables are shown in bold.

Table 3 indicates that maternal health outcomes were significantly linked to factors such as maternal age ($p = 0.001$), parity ($p = 0.019$), gestational age ($p = 0.001$), daily working hours ($p = 0.027$), years of service ($p = 0.001$), employment status ($p = 0.046$), and monthly family income ($p = 0.001$). However, the number of pregnancies, miscarriages, work system, job type, job title, and type of work did not show significant associations.

Discussion

This study demonstrates that maternal health outcomes, both pre-pregnancy and gestational, are deeply structural and intrinsically linked to the physical work environment, psychosocial occupational conditions, and specific workplace exposures. These findings align with an established body of literature indicating that suboptimal working conditions adversely affect both maternal physical and psychological well-being [1-5]. However, this perspective is not without debate in the literature; some longitudinal studies argue that the observed well-being of employed pregnant women may be confounded by the "Healthy Worker Effect" [6,7]. This theory suggests that women who remain in the workforce during pregnancy often possess a more robust baseline of physical and psychological health before conception, which may mask or mitigate the potential negative impacts of adverse workplace exposures. From our perspective, while the Healthy Worker Effect may explain the baseline resilience of some pregnant employees, it should not be used to dismiss the active role that workplace stressors play in eroding their health over time. Our findings strongly indicate that even among inherently healthier working cohorts, adverse environmental and psychosocial factors trigger distinct clinical and psychological strains, suggesting that reliance on pre-pregnancy selection effects underestimates the true burden of occupational hazards during gestation.

Notably, within the current cohort, sleep disturbances emerged as the most prevalent health issue, followed sequentially by fatigue, anxiety, pain, and diminished physical function. This hierarchy is consistent with previous research documenting a high prevalence of sleep disorders and fatigue among employed pregnant women, particularly when subjected to occupational stress, intensive physical labor, or inadequate recovery periods [8-10]. Furthermore, the strong correlations observed among physical

function, anxiety, depression, fatigue, sleep disorders, and social roles underscore the multidimensionality of maternal health, suggesting that impairment in one health domain concurrently exacerbates disturbances in others.

Conversely, alternative epidemiological evidence suggests that such gestational symptoms particularly sleep disturbances and fatigue are primarily driven by intrinsic physiological and hormonal shifts characteristic of the second and third trimesters, rather than being purely occupational products [11,12]. These counter-studies emphasize that non-work confounding factors, such as pre-existing clinical history and the quality of home-based social support, often act as stronger predictors of maternal distress and sleep fragmentation. We argue that maternal health domains should not be evaluated through a binary lens of either purely biological or purely occupational causes. Instead, our study shows a highly interconnected multidimensionality where work-induced stress and lack of recovery act as accelerators that exacerbate natural, pregnancy-induced physiological shifts, creating a compounding effect that significantly degrades the mother's quality of life.

An unexpected finding in this investigation was that physical work environment factors were exclusively associated with pain severity ($p = 0.010$). This implies that pain may manifest as the most immediate and acute clinical outcome of adverse physical workplace exposure. Given the high prevalence of noise, vibration, prolonged stationary posture (standing or sitting), and ergonomic constraints observed in this sample, this association is clinically significant. Moreover, it corroborates prior studies linking ergonomic and biomechanical stressors to musculoskeletal disorders during pregnancy [3,5,10,13]. Key evidence, however, from parallel systematic reviews has failed to establish a definitive causal link between routine physical workplace stressors (such as prolonged standing or mild ergonomic constraints) and severe obstetric or neonatal complications in low-risk pregnancies [14,15].

This body of research often distinguishes transient, pregnancy-induced musculoskeletal discomfort from severe clinical pathology, viewing physical work demands as manageable discomforts rather than direct hazards to gestational safety.

This study emphasize that although physical workplace demands may not directly lead to severe or fatal obstetric pathologies, dismissing daily severe pain as a "transient discomfort" overlooks its profound impact on maternal physical function and mental well-being. The statistically significant association ($p = 0.010$) found in our sample underscores the urgent clinical need for preventive ergonomic interventions to improve the daily life and comfort of pregnant workers, regardless of long-term obstetric risks.

Conversely, psychosocial variables demonstrated broader, more systemic associations. Specifically, anxiety was significantly correlated with fatigue, sleep disturbances, physical function, and pain intensity, while depression exhibited significant links to fatigue, physical function, and pain intensity. Additionally, workplace marginalization was associated with fatigue and specific occupational risk domains. These interconnected results support the premise that adverse psychosocial working conditions heighten psychological distress and compromise maternal adaptation capacities [16-21]. On the other hand, a substantial body of occupational health literature posits that remaining employed during pregnancy can serve as a powerful protective factor [22-28].

Our interpretation reconciles these conflicting findings by highlighting that employment is a double-edged sword: the workplace possesses a powerful dual potential to either protect or damage maternal mental health. While employment can offer financial stability and a supportive social network, our evidence shows that when the environment turns toxic, marked by workplace marginalization and poor psychosocial conditions, the protective value of work is completely lost, leaving the pregnant mother highly vulnerable to systemic psychological distress.

Regarding sociodemographic and occupational determinants, variables such as

parity, gestational age, daily working hours, tenure, employment status, and family income significantly influenced maternal well-being. In contrast, the organizational work system, job sector, and specific job titles yielded no significant effects. This discrepancy implies that the objective, day-to-day working environment and its inherent hazards are far more critical to maternal health than nominal job titles alone.

Finally, the assessment of occupational hazards highlighted several critical vulnerabilities. Biological hazards represented a primary concern, evidenced by high exposure risks to toxoplasmosis and rubella. Regarding physical exposures, ambient noise and vibration were highly prevalent. Crucially, the systemic absence of workplace ergonomic evaluations and dedicated rest facilities represents a severe structural deficiency in maternal occupational health protection within these settings. Collectively, these findings underscore the critical need for proactive workplace risk assessments, immediate environmental modifications, and formalized occupational counseling tailored specifically for pregnant employees.

Conclusion

The working environment has a considerable influence on pregnant maternal health in many aspects. Adverse physical microclimates characterized by high noise, vibration, and prolonged stationary standing are directly tied to increased somatic pain severity. Negative psychosocial factors including chronic job strain, and a deficit in institutional social support correlate with systemic psychological distress, specifically anxiety, depression, fatigue, and sleep disturbances. Objective occupational and socioeconomic factors such as daily working hours, years of service, employment status, and family income serve as powerful indicators of gestational well-being.

Recommendations

A reduction in workload, as well as flexible working hours are recommended during pregnancy. Antenatal care should include screening for common mental disorders, including anxiety, depression, and sleep disturbance. Employers should make suitable rest accommodation at the place of work and provide health education on occupational risks and on methods of home care. Policy and administrative recommendations include mandating workplace risk assessments, developing pregnant worker safe work policies, providing personal protective equipment, and supporting pregnant worker inclusive workplace policies.

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Conflict of interest

None to declare.

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Data availability

The data supporting the findings of this study are not publicly available due to ethical and privacy considerations but may be made available from the corresponding author upon reasonable request and with appropriate approval.

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