

Pathways of job style and preterm low birth weight

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Abstract

Introduction: Preterm and low birth weight tend to occur as a direct result of prenatal risky behaviors, diseases, as well as fetal exposure to harmful social and environmental factors. The present study aimed to investigate the relationship between job style and preterm low birth weight.

Methods: The present case-control study was conducted in the Kamali hospital, Teheran, Iran in 2014. Participants included 156 mothers having a gestational age of less than 37 weeks and infants weighing less than 2500 gm. Additionally, the control group consisted of 433 mothers with a gestational age of over 37 weeks and having infants weighing between 2500-4000 gm. The data were collected using the Mother's Lifestyle Scale (MLS) during pregnancy based on recognized social determinants of health and those developed by the researchers. The domain of the mother's job style was assessed using a questionnaire consisting of 18 items on topics such as working conditions, job satisfaction, and perceived employer empathy. Higher overall scores in this instrument indicate the mother's poorer job style. The data were analyzed using SPSS version 16 and Lisrel version 8.8 through a statistical path analysis.

Results: The model fit indices indicated that there was found to be high favorability, demonstrated that the model fit and that there were rational relationships (CFI=1, RMSEA=0.00), and showed that on the direct path that the mother's job style had the most adverse effect (B=-0.3) with weight gain during pregnancy showing the most positive effect (B=0.16) on PLBW. The mother's level of education was found to be the only variable that affected PLBW negatively in both the direct and indirect paths through the mother's job style and household income (B=-0.17).

Conclusion: According the path analysis model, job style has a direct influence on preterm low birth weight. Thus, special consideration should be placed on aspects surrounding a mother's job situation in order to prevent any adverse effects.

Keywords: Job style, Preterm birth weight, Pathways, Low birth weight

1. Introduction

Infants are one of the most vulnerable members of society and their health is an important measure of a society's health; infant mortality rates are, in fact, a good indicator of the well-being and development of society and its families (1). Despite the advances in the last two decades and increased infant survival rates, nine million infants still die from a variety of causes every year, two thirds of which occur in only 10 countries of the world with most cases being report in Asia. The reported causes of infant mortality include preterm birth and low birth weight as the

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third main cause (observed in 10.5% of the cases), diarrheal diseases are the second (15.9%) and respiratory diseases are the first (17.6%)(2). In Iran, the leading causes of infant mortality include preterm birth and low birth weight (44%) (3). Preterm Birth (PTB) is the birth of an infant before 37 weeks of pregnancy and Low Birth Weight (LBW) as having a birth weight of less than 2500 gm (4, 5). The infant's size at birth is indicative of the duration of pregnancy as well as healthy fetal development, and therefore, should be studied with respect to gestational age; otherwise, the infant's size, which increases with gestational age, can interfere with other indications of fetal development and growth. Infants born before the end of the 37th gestational week and who also weigh less than 2500 gm are referred to as Preterm Low Birth Weight (PLBW) (6). The prevalence of PTB and LBW are 9.6% and 15.5% worldwide and are 5.6%-13.4% and 6-9% respectively in Iran (6-11). These outcomes are responsible for 75% of the cases of prenatal death and half of the cases of long-term neurological disorders, these preterm issues lead to huge diagnostic and medical treatment costs and constitute a foreboding challenge in terms of time, energy, economic, and equipment expenditures for both families and the health care system. The serious complications of PTB and LBW often include Respiratory Distress Syndrome (RDS), Necrotizing Enterocolitis (NEC), Intra Ventricular Hemorrhage (IVH), Patent Ductus Arteriosus, sepsis, and the risk of severe and long-term disabilities that may include disorders of intellectual disability, childhood learning disorder, sensory and physical disabilities (hearing, visual and motor difficulties), low IQ, and cerebral palsy (12-17). PTB and LBW occur as a direct result of either personal risks or diseases as well as fetal exposure to harmful social and environmental factors. In addition to the impact of environmental factors, socioeconomic factors are always a significant local risk factor associated with these two negative outcomes (18). Generally, these outcomes are a function of social status and lifestyle forming two of the most influential factors across regions (19). The World Health Organization (WHO) defines a healthy lifestyle as one that is based on known behavioral patterns that are determined by the interaction between personal characteristics in addition to the social, economic, and environmental conditions in which an individual lives (20). Lifestyle incorporates various dimensions of life within its definition, including job style (21, 22), which is the focus of investigation for this study. Some researchers categorize job-related factors into an internal (stress, physical and ergonomic risks, and contact with chemicals) and an external (job security, income, flexible work hours, etc.) categories (23). Others define job style in terms of the type of occupation, the physical environment of the job, women's employment status, work hours, the level of fatigue experienced due to work conditions, etc. (24-26). Job conditions are linked to health inequity through a number of psychosocial, behavioral, and psychological mechanisms. The risk factors are divided into four main categories, including physical, chemical, ergonomic and psycho-social factors; for instance, physical risks, chemical risks, repetitive tasks, extended and heavy physical work, work shift, and the lack of control on the job (27). Therefore, a gender-specific pattern is developed for occupational health problems due to the biological, psychosocial, and social dissimilarities at play and the exposure to occupational hazards (28). The potential effects of occupational conditions and job position on adverse pregnancy outcomes remains a controversial issue. Most studies conducted on the effects of working conditions on pregnancy outcomes do not compare equal working conditions as a risk factor, and a number of research studies have not uncovered any relationship between working conditions and adverse pregnancy outcomes such as LBW. In contrast, several reviews and meta-analysis studies have reported that work hours, work shifts, and occupational stress to have significant effects on these outcomes (29 and 30). Given the differential findings derived from previous studies, the present study was conducted to identify and unify the factors affecting the incidence of PLBW.

2. Material and Methods

2.1. Design and sampling

The present case-control study was conducted in Kamali Hospital (Reference Hospital of Obstetrics and Gynecology) in Karaj, Iran in 2014. This review of literature showed that, taking into account the study variables (N= 22) and the key concepts, three to ten samples are required per each variable (N= 31). Assuming that six samples are used for each variable, the minimum sample size required was 132 for the case group and three times higher (i.e. 396) for the control group. To account for a minimum sample loss of 10%, the final sample size was raised to 156 in the case group and to 433 in the control group. This study's participants consisted of Iranian pregnant women aged 15-45 who were admitted to the Kamali Hospital for labor and delivery between the dates of November 2013 and March 2014.

2.2. Inclusion and exclusion criteria

The inclusion criteria that were employed for this study were: 1) Having a gestational age of less than 37 weeks in the case group and greater than 37 full weeks in the control group as calculated from the first day of the Last Menstrual Period (LMP) or as according to the ultrasound results, 2) Having no detected medical conditions such as

multiple pregnancy, cardiovascular diseases, diabetes, kidney diseases, thyroid diseases, pulmonary diseases, autoimmune diseases, preeclampsia, placental abruption, early rupture of the amniotic sac during or before pregnancy, hepatitis, HIV or TORCH syndrome, as well as not using any medications that might affect birth weight during the gestation, 3) Live birth to a baby weighing less than 2500 gm in the case group and 2500-4000 gm in the control group. The exclusion criteria were: 1) Having any prior medical conditions that could influence outcomes, 2) Lack of consent to participate, or 3) Failure to complete the form.

2.3. Data and Measures

The data and measurements were collected using the Mother's Lifestyle Scale (MLS) during pregnancy based on the social determinants of health derived from the literature and developed by the researchers in a study entitled "the design of an assessment tool and a model linking the mother's lifestyle during pregnancy to LBW in Tehran" using both deductive and inductive methods, which underwent a psychometric assessment of its face value, content items, criteria, and construct validities (i.e. an exploratory factor analysis). The MLS contains 132 items within 10 domains; three of the domains address the participants' general details, pregnancy history and recorded test results, and seven of them address the participants' physical activities, occupation, nutrition, stress control, self-care, social relationships, and poor health behaviors. This questionnaire is scored based on a 5-point Likert scale and using the MET (Metabolic Equivalent of Task for measuring physical activity). Validity was established through confirmation of the internal consistency of the questionnaire, which was reported as high as evidenced by a Cronbach's alpha of 0.76 (32). The domain of the mother's job style was assessed using 18 items on topics such as work hours, work shifts, work position (sitting, standing or squatting), work environment in relation to lighting, noise, and ergonomic conditions, job satisfaction, and perceived employer empathy. Higher overall scores in this domain would indicate the mother's less advantageous job style.

2.4. Procedures

The present control-case study was conducted at Kamali Hospital in Karaj, Iran between 2013 and 2014. The necessary permissions to conduct the study were obtained from the chancellor of Alborz University of Medical Sciences, the hospital director, and the maternity ward manager. Eligible mothers were identified for both groups by the researchers or the interviewers in the delivery room of the hospital and monitored until childbirth. Either the researchers or the interviewers were present in the delivery room doing observations during the process of childbirth and monitored the conditions. Infants who are born with no known medical problems such as congenital disorders, cardiopulmonary diseases, etc., who weighed less than 2500 grams on the delivery room's scale, and who were born with less than 37 weeks of gestational age were assigned to the case group and those weighing 2500-4000 grams and born with a gestational age of more than 37 weeks were assigned to the control group. The researchers verified the accuracy of the delivery room scales in person; the scale was calibrated and its reliability was controlled by the researcher by weighing 10 samples and comparing them against a verified scale (the control scale: 100 gram). After transferring each mother to the postnatal ward, the study objectives were explained to her if her conditions allowed and an informed consent was obtained from her if she was willing to participate. The researchers then populated the data on the questionnaire that included items on the mother's medical records, such as laboratory test results and ultrasound results, and interviewed the mother in order to gather the demographic and lifestyle portion of the questionnaire. Due to time constraints, the researchers visited Kamali Hospital over three work days each week to collect the data. The sampling for all of the deliveries performed during the set days (constituting a total of 1600 deliveries) took of total of 15 months to complete; the mothers who were unwilling to participate in the study (due to fatigue, spouse's discontent, personal preferences, etc.) and those who submitted incomplete questionnaires were excluded from the study. Sampling was terminated when the sample size reached 589. The researchers also collected data pertaining to the mothers' personal, economic and social factors (mother's age, increased weight during pregnancy, household income, level of education, household size, husband's job, husband's job loss) and included them in the results. A path analysis was employed to assess the fitness with the theoretical model determining the concurrent relationships among the mother's personal, social factors, and job style with PLBW. The data were analyzed in SPSS and Lisrel using logistic regression and path analysis. This study was approved by the Ethics Committee of Alborz University of Medical Sciences on 31st August, 2013.

3. Results

The case group (156 mothers with a gestational age of less than 37 weeks and infants weighing less than 2500 gm) and the control group (433 mothers with a gestational age of over 37 weeks and infants weighing 2500-4000 gm) were matched in terms of the mothers' mean age, weight before pregnancy, birth spacing and occupied land area, but showed significant differences in their mean pregnancy weight gain and years of education as part of the

personal and social factors that were assessed ($p < 0.001$; Table 1). In order to perform the path analysis, the correlation between the variables was determined using Bivariate Analyses. As shown in Table 2, PLBW demonstrated that the highest direct correlation among the factors of pregnancy weight gain and the highest inverse correlation with the mother's job style. The path analysis assessed the effects of personal, economic and social variables including husband's job, husband's job loss, household size, mother's level of education, household income, mother's age, mother's weight gain during pregnancy, and job style on PLBW. According to the path analysis diagram (Figure 1), among the variables on the direct path, the mother's job style had the most adverse effect ($B = -0.3$) while mother's weight gain during pregnancy showed the most positive effect ($B = 0.16$) on PLBW. The model indicated that mothers with unfavorable job conditions are more likely to deliver PLBW infants, while mothers with the recommended pregnancy weight gain tend to deliver infants with a higher birth weight and at a later gestational age. The mother's level of education was the only variable that affected PLBW negatively and this finding was present in both the direct and indirect paths through the mother's job style and household income ($B = -0.17$). Birth weight and gestational age at birth were affected positively by income ($B = 0.08$) and negatively by the husband's job and job loss ($B = -0.2$ and $B = -0.08$) both through the direct path (Table 3). The model fitness indices indicated a high favorability and fitness with the model and the rational relationships set between the variables based on the conceptual model employed by the researchers of this study, for which no significant differences were found to exist between the variables that met fitness and the conceptual model ($GFI = 1$, $CFI = 1$, $RMSEA = 0.00$).

Table 1. Comparing some personal-social factors of research units in the two groups of normal weight and preterm low birth weight infants 2014-2015

Variables		Normal weight infants	PLBW ¹	p-value
		Mean ± SD	Mean ± SD	
Mothers	Age (years)	27.72 ± 9.02	29.404 ± 9.02	p=0.052
	Weight before pregnancy (kg)	64.43 ± 13.7	73.53 ± 12.1	p=0.17
	Weight gain (kg)	13.57 ± 6.43	11.35 ± 5.1	P<0.001
	BMI (kg/m ²)	56.57 ± 4.14	31.40 ± 4.08	p=0.001
	Interval of pregnancy (month)	5.47 ± 1.17	1.39 ± 5.22	p=0.06
	Residential density per unit	26.9 ± 12.65	28.03 ± 12.99	p=0.25
	Mother Education	9.71 ± 3.53	10.99 ± 3.36	p<0.001
	Job, n (%)			p<0.001
	Employed	32 (7.4)	36 (23.07)	
	Housekeeper	401 (92.6)	120 (76.92)	
Husbands' job, n (%)	Unemployed	35 (8.1)	45 (28.8)	p<0.001
	Employed	398 (91.9)	111 (71.2)	

¹PLBW: Preterm low birth weight infants

Table 2. Correlations among job style, socioeconomic factors and preterm low birth weight

Variables	Preterm Birth weight	Age of mother	Mother's Weight gain	Mother's Education	Family size	Household jobless	Husband job	Household Income	Job style
Preterm Low Birth Weight	1	-0.26	0.181*	-0.130*	0.091*	-0.146*	-0.235*	0.078	-0.332*
Age of mother		1	-0.107	0.043	0.173*	0.015	0.018	0.169	0.105*
Mother's Weight gain			1	0.059	-0.103*	0.045	0.096*	0.051	0.007
Mother's Education				1	-0.267*	0.006	-0.118*	0.163	0.199*
Family size					1	0.042	0.074	0.016	-0.058
Husband jobless						1	0.176*	-0.046	0.055
Husband job							1	-0.65	0.48
household Income								1	0.047
Job style									1

* Correlation is significant at the 0.01 level

Table 3. Path Coefficients for working condition .social-economic-demographic factors on birth weight

Predictor variables	Effect			Model coefficients	t-value	R ²	Errorvar
	Direct	Indirect	Total				
Mother's Education	-0.12	-0.0502	-0.1702	-0.025	3.04	0.21	0.44
Age of mother	-	-	-	-	0.51		
Mother's Weight gain	0.16	-	0.16	0.02	4.26		
Husband job	-0.20	-	-0.20	-0.44	5.26		
Husband jobless	-0.08	-	-0.08	-0.14	2.22		
Household income	0.08	-	0.08	0.002	2.23		
Job style	-0.30	-	-0.30	-0.01	7.98		

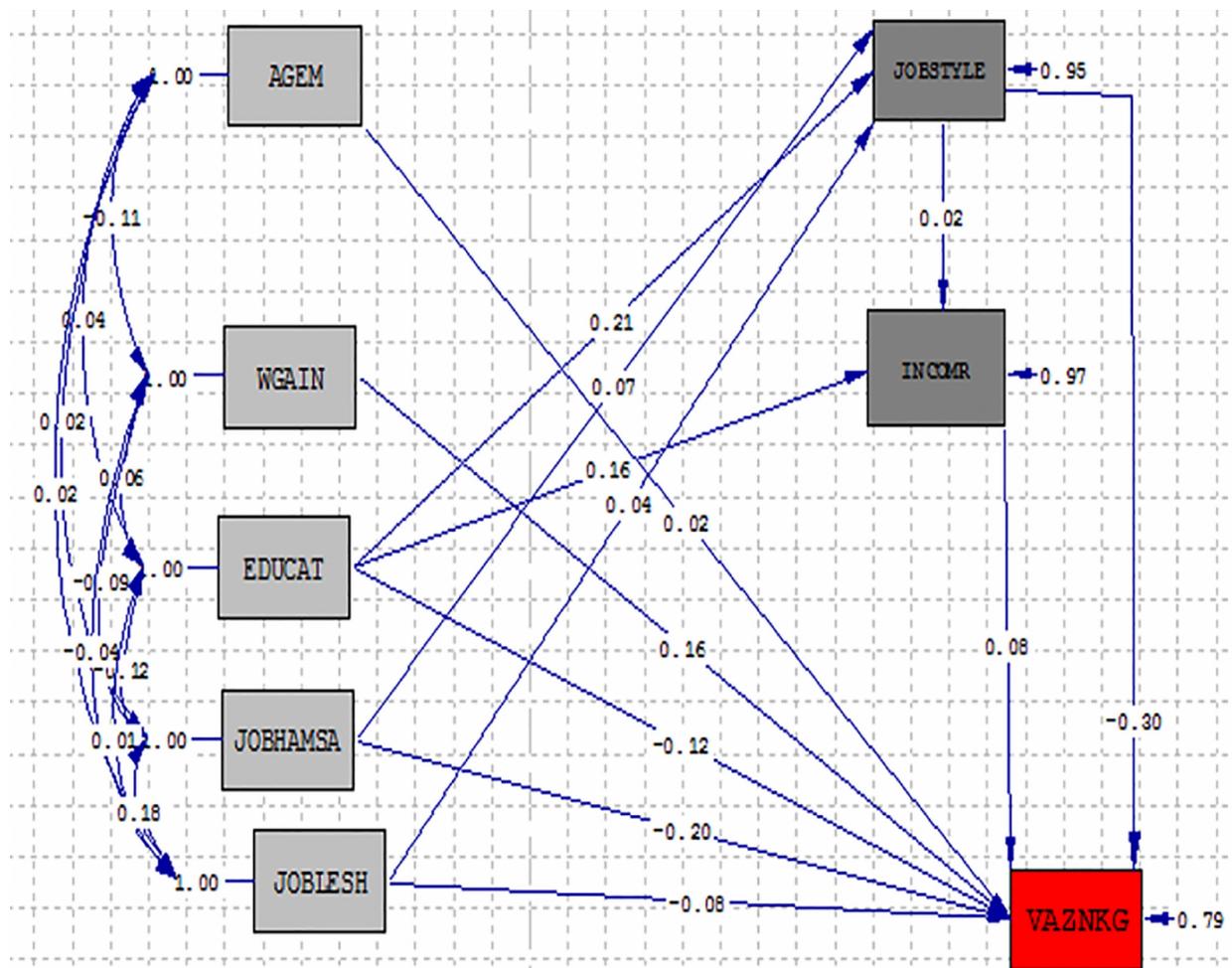


Figure 1. The Empirical Path Model for Effects of job style, socio-economic Predictors on Preterm Birth weight. JOBHAMSA: Husband job, JOBLESH: Husband jobless, EDUCAT: Mother's Educate, WGAIN: Mother's Weight gain, AGEM: Age of mother, INCOMR: household Income (I.R. Rial), VAZNKG: Preterm Low Birth Weight

4. Discussion

Public and professional perspectives on health have broadened in the modern day and the non-medical determinants of health are being more appreciated in research. Each of these determinants may affect the status of an individual's health dramatically in and by itself or by exerting mutual effects on the other previously substantiated determinants and thus have some impact on health inequalities. The mother's health conditions during pregnancy form the foundation of the baby's wellness throughout his/her life extending even into adulthood (33). By affecting the mother's level of wellness during pregnancy, these determinants play a major role in the early stages of conception, pregnancy, infancy and post-infancy, and the late stages of infant's growth and development (34). As one of the

leading determinants of health and mortality (35, 36), socioeconomic status (SES) is often used as a factor for describing social inequalities, and some sources suggest that SES comprises a complex of indicators that represent a combination of contributing indicators including education, occupation and income. According to the path analysis regression, the mother's job style demonstrated the highest negative as well as the most direct effect on birth weight, indicating that the greater likelihood of PLBW was found when the mother experienced worse job conditions. The mother's job type is important, both with respect to the job itself (in terms of job difficulty, ergonomic conditions, etc.) and because of the mother's chance coming into contact with potentially harmful substances at work. The type of job the mother has or the conditions in which she works depends on the socioeconomic status of her family in addition to her skills, standing and social class, as the less educated or less skilled mothers and those from lower social classes are more often exposed to unfavorable working conditions such as physical pressure, low job control, noise, air pollution, work shift, fatigue, etc. Moreover, their earnings are less than men or women with jobs with more favorable working conditions (27). This finding concurs with the findings of other similar studies, including the study conducted by the same researchers in Tehran in 2012 that only examined birth weight, in which the mother's job type and working conditions were also found to affect birth weight (30 and 36-39). Various mechanisms have been proposed in the literature for how occupational factors affect pregnancy outcomes; for instance, working while standing in an upright position causes the accumulation of blood in the leg veins, leading to venous return, cardiac output, arterial pressure, and ultimately reduced fetal placental blood flow, especially during the third trimester of pregnancy, which causes intrauterine growth retardation, LBW, etc. Nighttime work shifts also increase estrogen levels through disrupting the hormonal balance and suppressing nocturnal melatonin, which is generally caused by the presence of light at night, which could lead to an adverse pregnancy outcome such as miscarriage or LBW (41). Heavy jobs can also lead to unfavorable pregnancy outcomes by changing the mother's nutritional status due to the additional calories consumed due to the physical nature of the job (42). Income is a major job-related determinant of physical and psychological health. According to the results that were generated in this study, household income has a direct positive influence on PLBW. Various interpretations have been proposed for the mechanism by which income and health inequalities are related; for instance, at the personal, material, structural levels, as well as certain behavioral factors and lifestyle may be at play. Another interpretation involves malnutrition and the subsequent infectious diseases that can result from them, both leading to increased maternal, neonatal or infant mortality rates (43). The mother's level of education also affected PLBW directly and indirectly by means of her income and job style. Several studies on preterm childbirth have investigated the effect of various social and structural determinants such as socioeconomic status, social class, and factors including education, occupation and income on adverse pregnancy outcomes (including preterm childbirth). Women with a low (SES), especially if they also have a lower level of education, are twice as likely to suffer from PLBW compared to women with a higher (SES). Educational inequalities affect preterm childbirth through the unfavorable combination of certain pregnancy characteristics, psycho-social factors, and lifestyle habits exhibited in less educated women (44). Other factors investigated in this present study include the husband's job and job loss, which can have a direct negative effect on this particular pregnancy outcome. Many adverse pregnancy outcomes such as LBW diminish when the husband better understands his obligations toward the mother and child and physically, psychologically, and financially supports the mother. This support is physical, psychological and financial at the same time and helps preclude adverse pregnancy outcomes through reducing the mother's stress levels and her disadvantageous health behaviors and ensuring that she gets early pregnancy care (45, 46). However, when the father is under unfavorable conditions of stress and financial hardship due to job loss or unemployment, not only can he no longer perform his otherwise typical obligations toward the mother, but his occupational situation also places the mother under these similar unfavorable conditions, which can then affect both the mother's health and the health of the fetus (47, 48). A point of strength for the present study was that the two groups were matched in terms of confounding factors such as age before pregnancy, birth spacing, etc.

5. Limitations of study

Since the study was conducted on mothers who had a normal vaginal delivery, the brief duration in hospital required the data collection to be carried out over a very short period lasting just during the process of childbirth and afterwards in the postpartum ward; so, the mother's fatigue and the passage of time may have therefore affected her recollection of the issues under investigation and her responses.

6. Conclusions

Infants are the most vulnerable members of the society; so, it is important to identify the factors that influence healthy outcomes. According to the path analysis model, job style directly influences preterm low birth weight. Thus, special attention needs to be placed on the mother's job.

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Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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