Paediatric and Perinatal Epidemiology
Affiliated to the Society for Pediatric and Perinatal Epidemiologic Research

doi: 10.1111/j.1365-3016.2010.01177.x

Psychosocial work stress during pregnancy and birthweight

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Summary

Lee B-E, Ha M, Park H, Kim Y, Hong Y-C, Kim YJ, Ha E-H. Psychosocial work stress during pregnancy and birthweight. *Paediatric and Perinatal Epidemiology* 2011; **25**: 246–254.

Although there is a growing interest in the health effects of psychosocial work stress, studies on the relationships between job stress and adverse reproductive outcome are limited. We, therefore, investigated the associations between prenatal maternal occupational stress and birthweight using 310 mother–infant pairs included in the Mothers and Children's Environmental Health (MOCEH) study. Information on job stress was collected by interviewing women at enrolment during the first trimester of pregnancy using standardised questionnaires, namely, the Job Content Questionnaire (JCQ) of job strain and effort–reward imbalance (ERI) questionnaires. Regression analyses were carried out.

Decision latitude scores of the JCQ were found to be positively related to birthweight, while ERI ratios determined using the ERI model were found to be inversely related to gestational age. In addition, a passive job as defined by the job strain model was found to be associated with a lower birthweight, compared with a relaxed job. These results suggest that work-related psychosocial stress in pregnant women appears to affect birth outcomes, such as birthweight and gestational age.

Keywords: *work stress*, *pregnancy*, *birthweight*, *gestational age*.

Introduction

Nowadays, the birth rate in the Republic of Korea is at an unprecedented low, and thus has become a social issue. The total fertility rate in 2008 was 1.19.[1] In addition, researchers predict that the proportion of women giving birth for the first time after age 30 will increase, as the proportion of first births after age 30 was 43.1% in 2008.[1] Therefore, the public has been paying more attention than ever to ensuring that newborns are healthy. Low birthweights (LBWs) and preterm deliveries correlate closely with neonatal mortality and increases in infant and child morbidity rates.[2,3]

Accumulated evidence demonstrates that prenatal maternal stress affects the developing fetus and causes adverse effects in infants and children.[4–6] Previous studies have demonstrated that chronically elevated stress levels during pregnancy are related to a poor pregnancy outcome. Some authors have reported that anxiety and depression are associated with a lower birthweight and a smaller head size,[7] and others that stressful experiences during pregnancy increased the risk of preterm birth for several decades.[8,9] When women are exposed to harmful stress during pregnancy, they may increase their use of alcohol, tobacco and/or caffeine.[10] Psychosocial stress is also important from the perspective of public health because it can be mitigated by intervention.[11]

Social factors, such as stress resulting from a life change or job strain, and maternal and obstetric factors can impair fetal growth.[12] The importance of maternal work as a potentially modifiable risk factor for preterm delivery and intrauterine growth retardation has been pointed out by a number of authors.[13–15] Over the past 50 years, the economy in South Korea has expanded rapidly, and overall employment has increased.[16] In particular, the number of working women has increased; the employment rate among women over the age of 15 was 48.7% in 2008.[17] Furthermore, a substantial proportion of women continue to work during pregnancy until perhaps just a few days before giving birth. However, although there is a growing interest in the health effects of psychological job stress, few studies have been conducted on the relationship between job stress and adverse reproductive outcome, and the studies performed have produced inconsistent results. Research on pregnant women in the US showed that high-strain jobs were associated with lower birthweights[18] and high strain on the job increased the risk of giving birth to a small for gestational age (SGA) infant.[12] A case–control study in the US found working at a full-time, high-strain job past the 30th week of pregnancy correlated with a modest increase in a woman's risk of preterm delivery.[19] Meyer *et al*. also found that lowest-tertile control scores were associated with preterm birth.[20] On the other hand, a study in Taiwan showed high psychological demands on the mother only correlated with SGA, not LBW or preterm birth.[21] Another study found that a high-strain maternal job was associated with an increased risk of preterm delivery and LBW only among women who did not wish to continue working.[22] Still another study found that, compared with women with relaxed jobs (high control and low demands), women with passive jobs (low control and low demands) had a higher risk of both SGA and preterm delivery, although these associations were not statistically significant.[23]

Previous studies on job stress during pregnancy and birth outcomes have largely focused on the demand–control model. This model identifies stressful work using job task profiles that are characterised by high quantitative demands in combination with low control over work. On the other hand, the effort–reward imbalance (ERI) model maintains that effort at work is expended as part of a contract based on a notion of social reciprocity for 'rewards', such as money, esteem and career opportunities including job security. In the present study, we investigated whether maternal work-related stress during pregnancy influenced birth outcomes such as birthweight and gestational age (GA) using two complementary job stress models, namely, the job strain and the ERI models.

Methods

Population and data collection

Study subjects were drawn from the Mothers and Children's Environmental Health (MOCEH) study – a multi-centre prospective cohort study. The study population and the methods used have been described in detail previously.[24] The study protocol was approved by the institutional review boards of Ewha Womans University (Seoul), Dankook University Hospital (Cheonan) and Ulsan University Hospital (Ulsan), all located in the Republic of Korea. We enrolled only women who were more than 18 years of age, and in the first trimester of pregnancy, and resident in the targeted study sites (Seoul, Cheonan and Ulsan) at the time of enrolment. Women who planned to move out of the targeted study site within 1 year of the date of enrolment or were cognitively impaired were excluded. All study participants provided written informed consent before being enrolled in the study.

When the present study was performed, 1558 pregnant women were enrolled in the MOCEH study and the pregnancy outcomes of 1088 women were being followed up. The following subjects were excluded: 25 with multiple births, 15 with congenital anomalies and 3 stillbirths. We restricted study subjects to pregnant women with a job during pregnancy ($n = 332$). After excluding those candidates with data missing for items related to job stress, the data of 310 mother–infant pairs were finally included in the analysis.

Job Content Questionnaire

To obtain information on the women's job stress, we used standardised questionnaires, administered at 20 or fewer weeks of pregnancy. Job strain was measured using the Karasek demand–control questionnaire. Psychological job demands (job demand) were defined[25] in terms of psychological stressors associated with work load, unexpected assignments and interpersonal conflicts. The job decision latitude (job control) was defined as the ability of a worker to control his/her activities and skill usage. Five items addressed psychological demands and nine decision latitude. Physical exertion was measured by one item. Responses to each question, which were scored on a four-point Likert scale ranging from 'strongly disagree' to 'strongly agree', were weighted and summed to produce total job demand and total job control scores. We used the

Korean version of the Job Content Questionnaire (JCQ), which has been validated by Eum *et al*.[26]

Job demand and control scores were dichotomised at the median values and combined into four categories. High-strain jobs were defined as those with high job demands but low control over work. Other categories were defined as: relaxed jobs – low demand and high control, active jobs – high demand and high control, and passive jobs – low demand and low control. In addition, the question on physical exertion was dichotomised at the median value into high and low groups.

Effort–reward imbalance

An alternative theoretical model, the ERI model involved the application of a standardised questionnaire. Only 10 items that measured occupational effort and reward were selected from the original items, because this provided a useful proxy measure of the extrinsic model component. The extrinsic or situational component was composed of effort (time, pressure, interruptions and disturbances, and the demand at work) and reward (salary, esteem, and security/promotion). The effort and reward scales were constructed by summing scores of each item and the ERI ratio was calculated. The ERI ratio reflects the degree of imbalance between high efforts and low rewards at work.[27] We used the Korean version of the ERI questionnaire, as validated by Eum *et al*.[28]

Birth outcomes and information on possible confounding factors

Information on birthweight and GA was obtained from delivery records. Gestational age was determined based on the onset of the last menstrual period or the first ultrasound estimate for women with unreliable dates.

We obtained information on possible confounders of the association between psychosocial work stress during pregnancy and fetal growth using a questionnaire at enrolment. We also obtained infant gender and maternal parity from the delivery records. Pre-pregnancy body mass index (BMI) was calculated using recorded weights and heights. Using the questionnaire, we asked the women to indicate the extent of their physical activities during their pregnancies, by choosing one item out of a four-category list: light, moderate, intense, or very intense activity. This represented a summation of each woman's work-related physical activity, recreation/exercise and housework. Covariates were defined as follows: maternal age (20 to <30, 30 to <35 and ≥35 years), pre-pregnancy BMI (<18.5, 18.5 to <23, ≥23 kg/m^2), maternal educational level (high school or above), income per month (<2000, 2000 to <4000, ≥4000 dollars), physical activity during pregnancy (light or moderate, hard), exposure to environmental tobacco smoke (no, yes), infant sex (male, female) and parity (0, 1, ≥2).

Statistical analysis

The characteristics of the study subjects are expressed as numbers (%) or as means ± SDs. χ^2 and *t* tests were used to compare the differences in proportions and mean values respectively.

The relationships between JCQ and ERI scores and birthweight were examined using a regression model. To identify covariates for inclusion in the multivariable models, we first identified risk factors previously associated with level of job stress or birthweight in the literature. Risk factors were considered potential confounders if they showed associations with job stress or birthweight at the $P < 0.20$ level by univariable analyses. Accordingly, the covariates included in this study were: maternal age, pre-pregnancy BMI, education, income, physical activity during pregnancy, environmental tobacco smoke, infant sex and parity.

In addition, regression analyses were performed to assess the associations between job strain and birthweight and GA. All statistical analyses were carried out using SAS software version 8.2 (SAS Institute, Cary, NC.)

Results

Table 1 shows the characteristics of study subjects. Of the 310 women 52.9% were more than 30 years old and 17.1% had an education level of less than high school. During their pregnancies, 12.9% performed hard physical activity. The newborns' mean ± SD birthweight was 3284 ± 415 g.

The distribution of study variables according to job stress status as measured using the JCQ and ERI models is presented in Table 2. The JCQ model showed that women with low family incomes had higher proportions of low control. Hard physical activity during pregnancy, which included not only housework but also physical activity at work, also correlated with

Table 1. Characteristics of the study subjects

	n (%)		n (%) or Mean ± SD
		Physical activity during pregnancy	
Maternal age (years)		Light or moderate	268 (86.5)
20 to <30	146 (47.1)	Hard	40 (12.9)
30 to <35	121 (39.0)	Unknown	2 (0.6)
≥35	43 (13.9)	Environmental tobacco smoke	
Pre-pregnancy body mass index (kg/m^2)		Unexposed	100 (32.3)
<18.5	41 (13.2)	Exposed	179 (57.7)
18.5 to <23	190 (61.3)	Unknown	31 (10.0)
≥23	75 (25.2)	Parity	
Unknown	1 (0.3)	0	199 (64.2)
Maternal education (years)		1	83 (26.8)
<12	57 (17.1)	≥2	21 (6.8)
≥12	252 (81.3)	Unknown	7 (2.2)
Unknown	5 (1.6)	Gender of infant	
Income per month (USD)		Male	170 (54.8)
<2000	43 (13.9)	Female	140 (45.2)
2000 to <4000	146 (47.1)		
≥4000	119 (38.4)	Birthweight (g)	3284 ± 415
Unknown	2 (0.6)	Gestational age at birth (week)	39.4 ± 1.5

higher proportions of low control. The maternal age of those in the low control group was significantly lower than in the high control group. Less educated and high physical activity mothers tended to have high physical demands. In the case of the ERI model, no covariates were found to be associated with level of work effort or reward.

Table 3 displays the relationships between GA, birthweight and JCQ and ERI scores. As reward scores increased, GA significantly increased ($b = 0.047$, $P = 0.01$). In addition, we also found an inverse relationship between ERI ratio and GA ($b = -0.429$, $P = 0.03$). However, components of JCQ were not found to be associated with GA. On the other hand, birthweight significantly increased with increasing decision latitude scores ($b = 4.79$, $P = 0.05$ in model 1). Neither psychological demand nor physical demand scores were found to be related to birthweight.

Relationships between job strain and GA and birthweight are shown in Table 4. Women with passive jobs (low demand with low control) had newborns with birthweights 150 g lower than those born to mothers in relaxed jobs (low demand with high control). A similar pattern was found after adjusting for GA as well as covariates of model 1 ($b = -129.39$, $P = 0.02$). Compared to participants with relaxed jobs (low demand with high control), participants with high strain jobs (high demand with low control) tended to have newborns with lower birthweights. Although model 1 showed active jobs (high demand with high control) were associated with a minimally increased infant birthweight compared with relaxed jobs, this became negatively associated after the additional adjustment for GA in model 2. On the other hand, levels of job strain were not found to be associated with GA.

Discussion

In the present study, it was found that birthweight was significantly lower by about 129 g in the passive group in the job strain model than in the relaxed group. In particular, among JCQ components, decision latitude rather than psychological or physical demand was found to be marginally associated with birthweight. According to the ERI model, reward rather than effort was found to be positively associated with GA.

Most studies have demonstrated a relationship between birthweight and job strain, but have not assessed job control as a separate variable. Vrijkotte *et al.*, using the Amsterdam Born Children and Their Development dataset, demonstrated that high maternal job strain coupled with a long working week was associated with a newborn birthweight reduction of 150 g.[12] In a study conducted in the US, infants born to mothers with high job strain were found to have mean birthweights 190 g lower than those bornto mothers with

Table 2. Distribution of study variables according to job stress measured using the JCQ and ERI models

	JCQ						ERI ratio			
	Psychological job demands[a]		Decision latitude[a]		Physical job demands[a]		Effort[b]		Reward[b]	
	Low	High	Low	High	Low	High	Low	High	Low	High
Maternal age (years)	30.4 ± 3.7	30.3 ± 3.7	29.7 ± 3.3	31.1 ± 4.0	30.5 ± 3.7	30.2 ± 3.6	30.3 ± 3.7	30.4 ± 3.7	30.2 ± 3.7	30.6 ± 3.6
P	0.95		0.0009		0.48		0.80		0.29	
Pre-pregnancy body mass index (kg/m^2)	21.2 ± 2.9	21.8 ± 3.2	21.4 ± 3.0	21.5 ± 3.2	21.5 ± 3.1	21.4 ± 3.0	21.4 ± 0.9	21.4 ± 0.9	21.5 ± 3.1	21.3 ± 3.1
P	0.10		0.64		0.88		0.90		0.54	
Maternal education (years)										
<12	33 (62.3)	20 (37.7)	33 (62.3)	20 (37.7)	26 (49.1)	27 (50.9)	35 (66.0)	18 (34.0)	28 (52.8)	25 (47.2)
≥12	146 (57.9)	106 (42.1)	134 (53.2)	118 (46.8)	165 (65.5)	87 (34.5)	141 (56.0)	111 (44.0)	146 (57.9)	106 (42.1)
P	0.56		0.23		0.02		0.18		0.49	
Income per month ($)										
<2000	25 (58.1)	18 (41.9)	24 (55.8)	19 (44.2)	24 (55.8)	19 (44.2)	26 (60.5)	17 (39.5)	26 (60.5)	17 (39.5)
2000 to <4000	87 (59.6)	59 (40.4)	95 (65.1)	51 (34.9)	96 (65.8)	50 (34.2)	87 (59.6)	59 (40.4)	83 (56.9)	63 (43.1)
≥4000	68 (57.1)	51 (42.9)	49 (41.2)	70 (58.8)	73 (61.3)	46 (38.7)	65 (54.6)	54 (45.4)	67 (56.3)	52 (43.7)
P	0.92		0.0005		0.46		0.67		0.89	
Physical activity during pregnancy										
Light or moderate	171 (63.8)	97 (36.2)	141 (52.6)	127 (47.4)	188 (70.2)	80 (29.8)	159 (59.3)	109 (40.7)	151 (56.3)	117 (43.7)
Hard	9 (22.5)	31 (77.5)	28 (70.0)	12 (30.0)	4 (10.0)	36 (90.0)	19 (47.5)	21 (52.5)	25 (62.5)	15 (37.5)
P	<0.0001		0.04		<0.0001		0.16		0.46	
Environmental tobacco smoke										
Exposed	64 (64.0)	36 (36.0)	52 (52.0)	48 (48.0)	66 (66.0)	34 (34.0)	59 (59.0)	41 (41.0)	53 (53.0)	47 (47.0)
Unexposed	102 (57.0)	77 (43.0)	105 (58.7)	74 (41.3)	109 (60.9)	70 (39.1)	100 (55.9)	79 (44.1)	106 (59.2)	73 (40.8)
P	0.25		0.28		0.40		0.61		0.31	
Infant gender										
Male	100 (58.8)	70 (41.2)	87 (51.2)	83 (48.8)	109 (64.1)	61 (35.9)	98 (57.7)	72 (42.2)	91 (53.5)	79 (46.5)
Female	82 (58.6)	58 (41.4)	83 (59.3)	57 (40.7)	85 (60.7)	55 (39.3)	82 (58.6)	58 (41.4)	85 (60.7)	55 (39.3)
P	0.96		0.15		0.54		0.87		0.20	
Parity										
0	114 (57.3)	85 (42.7)	110 (55.3)	89 (44.7)	126 (63.3)	73 (36.7)	110 (55.3)	89 (44.7)	116 (58.3)	83 (41.7)
1	47 (56.6)	36 (43.4)	46 (55.4)	37 (44.6)	52 (62.7)	31 (37.3)	51 (61.5)	32 (38.5)	48 (57.8)	35 (42.2)
≥2	15 (71.4)	6 (28.6)	9 (42.9)	12 (57.1)	11 (52.4)	10 (47.6)	13 (61.9)	8 (38.1)	9 (42.9)	12 (57.1)
P	0.44		0.54		0.62		0.58		0.39	

Data are presented as No. (%) or Mean ± SD.
Numbers within subgroups vary slightly because of missing values for some variables.
JCQ, Job Content Questionnaire; ERI, effort–reward imbalance.
[a]Based on score of JCQ – low, <50th percentile; high, ≥50th percentile.
[b]Based on score of ERI model – low, <50th percentile; high, ≥50th percentile.

Table 3. Association between gestational age at birth and birthweight with JCQ and ERI scores

	Gestational age (weeks)[a]		Birthweight (g) Model 1[a]		Birthweight (g) Model 2[b]	
	b (SE)	P	b (SE)	P	b (SE)	P
JCQ						
Decision latitude	0.007 (0.009)	0.43	4.79 (2.49)	0.05	3.74 (2.16)	0.08
Psychological demand	–0.011 (0.018)	0.56	4.51 (5.18)	0.38	3.55 (4.43)	0.42
Physical demand	–0.070 (0.104)	0.50	–17.78 (29.48)	0.55	–11.31 (25.55)	0.66
ERI						
Effort	–0.009 (0.036)	0.81	–0.74 (10.07)	0.94	–3.07 (8.65)	0.72
Reward	0.047 (0.018)	0.01	10.59 (5.10)	0.04	5.06 (4.48)	0.26
Ratio[c]	–0.429 (0.199)	0.03	–78.88 (56.52)	0.16	–36.38 (49.12)	0.46

$n = 279$, b = regression coefficient.
JCQ, Job Content Questionnaire; ERI, effort–reward imbalance.
[a]Adjusted for maternal age, pre-pregnancy BMI, education, income, physical activity during pregnancy, environmental tobacco smoke, infant sex, and parity.
[b]Adjusted for gestational age, maternal age, pre-pregnancy BMI, education, income, physical activity during pregnancy, environmental tobacco smoke, infant sex and parity.
[c]Natural log scale.

low strain jobs or unemployedmothers.[18] Among commercial and clerical female workers in Denmark, women with a high job demand and low job control were found to be at increased risk of a LBW infant at term [odds ratio = 1.82; 95% confidence interval (CI) 1.02, 3.26].[29] However, other researchers have failed to find a relationship between prenatal job strain and LBW or SGA.[22,23,30,31] Homer *et al*. reported that mothers with high-strain jobs did not have an elevated relative risk (RR) of LBW [RR = 1.4; 95% CI 0.75, 6.8],[22] which is consistent with the results of the present study. In a study of women in Quebec, Canada, job strain alone showed no association with increased SGA risk,[30] and a Mexico City study found that working mothers with high job strain had a RR of an SGA newborn of 1.23 [95% CI 0.95, 1.60].[31]

However, in the present study, the passive group rather than the high strain group was shown to be significantly associated with a reduction in birth-

Table 4. Associations between job strain and gestational age and birthweight

Job strain	n	Gestational age (weeks)[a] b (SE)	P	Birthweight (g) Model 1[a] b (SE)	P	Birthweight (g) Model 2[b] b (SE)	P
Relaxed (low demand/high control)	73	0.00 Reference		0.00 Reference		0.00 Reference	
Passive (low demand/low control)	93	–0.136 (0.23)	0.56	–150.09 (65.92)	0.02	–129.39 (55.93)	0.02
Active (high demand/high control)	49	0.123 (0.27)	0.65	1.01 (76.72)	0.99	–17.65 (65.07)	0.79
High strain (high demand/low control)	64	–0.060 (0.25)	0.811	–42.56 (71.98)	0.55	–33.39 (61.03)	0.58

[a]Adjusted for maternal age, pre-pregnancy BMI, education, income, physical activity during pregnancy, environmental tobacco smoke, infant sex and parity.
[b]Adjusted for gestational age, maternal age, pre-pregnancy BMI, education, income, physical activity during pregnancy, environmental tobacco smoke, infant sex and parity.

weight. Furthermore, control over work rather than work demand may be the particular toxic component of work stress with regard to birthweight. This result is supported by previous studies, in which job control was found to be related to birth outcomes such as LBW and preterm birth. A Norwegian study found that work stress in the form of low job control was significantly associated with higher risk for LBW in firstborns.[32] In a study, using a Swedish job exposure matrix, low levels of job control were associated with increased risk for LBW and very low birthweight (VLBW).[33] Chronic stress, such as low job control, has been suggested to increase one's general vulnerability, for example through its adverse effects on cardiovascular health and the immune system.[34] As compared with self-paced work, lower control over work pace has been shown to induce more stress and irritation in some experimental studies.[35,36] Therefore, a simple comparison of pregnancy outcome in women with high-strain jobs and women in all other jobs would be too crude, and important relationships are likely to be missed.[23] Johnson and colleagues suggested that in the job strain model, control over work rather than a high job demand or job strain is the crucial component of a healthy work environment.[37] On the other hand, as there are few participants available for analysis, particularly in individual job strain model categories (e.g. active group or high strain group), this would not be adequate for detecting any differences and could limit the study's power.

In the present study, psychosocial job stress, as assessed by the demand–control model, correlated only with birthweight, not GA. However, we found the ERI ratio was inversely related to GA. Also, GA increased with reward scores. These findings are in line with previous studies that found no significant association between high-strain jobs and preterm delivery.[19,22,23,31,38] Brett *et al*. found that the risk of preterm delivery was elevated only among black women working beyond gestation week 30 in a high strain job.[19] Another study only observed an association between work-related stress and preterm delivery among women who did not want to continue working during pregnancy but had no choice.[22] The job strain model has some limitations, because high job demands and low decision latitude only assess pressure at work, whereas the model does not consider other potential sources of stress, such as low pay, hazardous conditions and job insecurity.[39] To our knowledge, this is the first report to compare the associations between components of the ERI model and the job strain model with pregnancy outcome. The findings of the present study further suggest that the components of the two alternative job stress models (i.e. the ERI model and job strain model) could contribute differentially to measures of specific birth outcomes.

One of the limitations of the present study is that data about job stress were collected by self-report, which might not have reflected objective tasks accurately or might have resulted in bias.[11] However, we collected the stress-related data prospectively before pregnancy outcomes were identified, and outcomes are unlikely to have influenced the reports of pregnant women regarding job stress. Furthermore, self report measures are known to correspond with externally assessed working conditions.[27] Brandt and Nielsen found that only self-reported scores were associated with differences in birth outcomes.[29] In addition, we collected information on job stress during early pregnancy. Thus, we do not know whether working conditions changed during pregnancy, and thus are not aware of work-related stress later in pregnancy. Furthermore, we reduced the number of items in the extrinsic part of the ERI model for convenience, and this may have attenuated the reliability of the respective scales.[27] On the other hand, the employment rate of subjects for this study's participants (30.5%) is lower than the 48.7% employment rate for the general population of Korean women in Korea, which might suggest a sampling bias. However, Korean women's employment rate decreases markedly after marriage (37.3%), and further before delivery of their first child (29.7%), and after their final child is born (21.8%).[40] Therefore, it seems less likely that the present study has a sampling bias. In addition, the sex ratio in this study, 54.8% boys to 45.2% girls, shows a slight overrepresentation of males, when compared with the national vital statistics data (51% male, 49% female).[1] However, we attribute this to random variations due to the study's small sample size, as there is no statistically significant difference in maternal job stress between the male and female newborns. Furthermore, we adjusted for infant gender in the multivariable analyses, and thus this gender distribution is unlikely to affect the study's results.

Despite the limitations, this study has several strengths. Although most studies conducted on job stress have used Karasek's demand–control model (job strain model), one of the strong points of our study was that we investigated work-related stress using two well-validated models. For the ERI model, Cronbach's alpha coefficients for effort and reward were 0.73 and 0.79, respectively, indicating satisfactory internal consistency. Furthermore, data were collected prospectively from early pregnancy, and thus we were able to assess work-related stress before information on pregnancy outcome was obtained.

In the present study, we found that the component of job control in the demand–control model influenced birthweight, and that ERI ratio was associated with GA. Our findings suggest that organisational-level interventions in the workplace[41] should be provided to prevent the effects of work stress on pregnant women.

Acknowledgements

This study was supported by MOCEH (Mothers and Children's Environmental Health) project of the Ministry of Environment, Republic of Korea; the research for this paper was funded by RP-Grant 2009 of Ewha Womans University.

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