

Employment-related Physical Activity during Pregnancy: Birth Weight and Still Birth Delivery in Karachi, Pakistan

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ABSTRACT

Aim: To evaluate the association of employment related-physical activity during pregnancy with birth weight and still birth.

Methods: A prospective cohort study was carried out in the four hospitals. All singleton pregnant women ≥ 20 weeks' gestational age attending antenatal care at the tertiary care hospitals were selected. They were followed up from the 20th week of gestation till delivery. The outcomes of this study were low birth weight and stillbirth. The exposed women were those who were employed throughout the current pregnancy and were involved in excessive and hard physical activity at work while unexposed women were unemployed throughout the current pregnancy. Descriptive statistics included frequency, mean and standard deviation for continuous variables while categorical variables were assessed by computing frequencies and percentages. P values were calculated using Chi-Square/Fisher exact test and T Test.

Results: The mean age of the pregnant females was 28.66 ± 4.87 years. Excessive physical activity at work was significantly associated with low birth weight and stillbirth. The risk of low birth weight was 1.46 times higher among pregnant women with excessive physical activity (RR = 1.46, 95% CI=1.12-1.91). The risk of stillbirth is 2.85 times higher among pregnant women with excessive physical activity (RR=2.85, 95% CI=1.22-6.63).

Conclusion: The study demonstrated a significant association between excessive physical activities on birth outcomes in employed pregnant females. A high percentage of females exposed to extensive physical activity ended up with low birth weight and stillbirth. Woman's age during pregnancy, women's education and husband's education are significantly associated with birth outcomes.

Keywords: Physical Activity, Employment, Low Birth Weight, Still Birth, Birth outcome

INTRODUCTION

Women participation in the labor force has risen in many developing countries in recent years. There are at least three factors that explain this trend. With economic development and the ensuing shift of population from rural and agricultural sectors, more women choose to participate in the labor force. Second, with higher education, women tend to participate in greater numbers in order to capture returns on their investment. Third, falling real incomes of households and rising poverty in certain countries seem to have persuaded women to participate in the labor force in greater numbers¹. In Pakistan, the female labor force has increased from 1.4 million to 4.7 million². Though one finds females in wide range of occupations, majority of them belong to the categories of "elementary (unskilled) occupations" including home-based and low-paying piece-rate work, such as sewing, crochet, and embroidery, salon workers or employed as cooks, maids, sweepers, washwomen, street cleaners, etc.

Though increasing female employment in Pakistan has contributed in improving their social status but has exposed them to very hard working conditions including prolonged standing, lifting of heavy weights, and long hours on job. In addition to this the patriarchal culture in Pakistan makes women responsible for domestic work like the care for children, the elderly and the sick, and for household chores like cooking and cleaning. Therefore a Pakistani woman has double burden which continues during their pregnancies too and could be a risk to her own health as well as the health of the baby as hard physical activity during pregnancy could be a risk for adverse pregnancy outcomes such as low birth weight (LBW) and stillbirth³.

LBW is a high priority and potentially preventable public health problem, particularly in the developing countries⁴. It contributes substantially to neonatal, infant and childhood mortality and morbidity^{5,6}. LBW is defined by the World Health Organization (WHO) as a birth weight < 2500 gm. Birth weight, however, is determined by two processes: duration of gestation and rate of fetal growth⁷. Thus, infants can have a birth weight < 2500 g either

because they are born early (preterm birth) or are born small for gestational age (SGA), a proxy for IUGR (intrauterine growth retardation). Globally 18 million LBW babies are estimated to be born every year of which 90% are born in developing countries^{8,9}. In Asia the proportions of LBW range from 5-25%¹⁰⁻¹⁴. Approximately 25% of newborns in Pakistan have LBW¹⁵.

Fetal mortality refers to stillbirths or fetal death. It encompasses any death of a fetus after 20 weeks of gestation or 500 gm. The prevalence of stillbirth is on average three times more common in the less developed areas of the world than in the more developed areas. This differential emerged clearly from a systematic review covering 50 countries and 70 studies. The review, which involved a meta-analysis, found that in less developed settings 1.17% of births were still- births versus 0.5% in more developed settings¹⁶. Fetal mortality remains a challenge in the care of pregnant women worldwide, particularly in developing countries. To address this problem, factors associated with stillbirth, a major contributor of over 50% of fetal deaths in developing countries, must be understood.

There are numerous factors contributing to LBW and still birth: maternal and fetal. Though many maternal risk factors are biologically and socially interrelated, majority of these are modifiable. The relationship of prenatal excessive physical work to pregnancy outcome is now days a subject of increasing attention. For women employed during pregnancy, characteristics of employment have been associated inconsistently with the low birth weight and stillbirth¹⁷. Numerous methodological differences and explanations contribute to this inconsistency of observed results, including variability in the definition of strenuous work activities (e.g., prolonged standing, lifting, working long hours and higher energy expenditures), lack of information on potential confounders, lack of information on actual workplace exposures and failure of most studies to consider the additional potential effects of physical demands outside the workplace. A methodologically sound research study is needed to identify the risk factors that are prevalent in our setting so as to address this major public health problem.

In Karachi an urban city of Pakistan a large number of women are involved in hard physically demanding jobs to earn a better living; therefore, it is important to gather more information

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regarding the outcome of pregnancies of these women in Pakistan. Providentially, employment related risk factors are modifiable and with a better understanding of these risk factors associated with low birth weight and stillbirth successful interventions can be introduced so as to lower the burden of this public health concern. The objective of this study was to evaluate the association of employment related-physical activity during pregnancy with birth outcomes i.e. low birth weight and stillbirth among pregnant women in Karachi, Pakistan.

METHODS

A prospective cohort study was conducted in four selected public and private tertiary care hospitals in Karachi. Singleton pregnant women were selected at the ≥ 20 weeks of gestational age attending antenatal care in the hospital. They were followed up from the 20th week (5th month) of gestation till delivery. The gestational age of ≥ 20 weeks was chosen as an attempt to include stillbirths. Women with multiple pregnancies, with diagnosed gestational morbidity such as diabetes, hypertension or diabetes and unwilling to participate were not included in the study.

The outcomes of this study were low birth weight defined as infants weighing less than 2.5 kilograms at birth and still birth defined as delivery of a baby without signs of life after ≥ 20 weeks of gestation. We defined the exposed women as those who were employed throughout the current pregnancy and were involved in excessive physical activity at work during pregnancy while unexposed women were unemployed throughout the current pregnancy. Excessive activity at work during pregnancy was taken as long working hours. Hard physical activity included climbing stairs, lifting weight, pushing/pulling weight.

Trained female nurses collected information about the baby and mother from the hospital record file. Three local lady health workers (LHW) and three traditional birth attendants (TBA) were also trained for women's follow-up in their homes. The TBAs visited all registered pregnant women on alternate days when their gestational age approached 34 weeks.

Records from the antenatal clinics of hospitals were used to identify women who were ≥ 20 weeks pregnant attending the clinic at that time. These women were asked about their employment status during the index pregnancy. If the woman had been employed throughout the index pregnancy then she was invited for participation in the study as an exposed subject. For every exposed woman an unexposed i.e. unemployed woman ≥ 20 weeks pregnant was selected on the same day. The initial interviews were conducted in antenatal clinics. All the women were followed up till the delivery. The gestational age was estimated using an ultrasound examination report and the date of the last menstrual period. For those women whose ultrasound was not being available their gestational age was estimated by the date of their last menstrual period.

Sample size was calculated to detect the risk ratio (RR) of 2.0, power of 80%, specifying alpha at 5% and accounting 10% for the non-responders. The proportion for the employed women was taken to be 16%^{18,19}. Since it was expected to get enough cases because of high prevalence of LBW in Pakistan the exposed to unexposed ratio of 1:1 was selected. Finally, the calculated sample size was 280 exposed and 280 unexposed. Sample size was calculated using Epi Info Version 6.

A pre-coded structured questionnaire was developed to obtain the required information. Information on the pregnancy outcome was recorded within one day of delivery. Information was collected for the type of delivery (spontaneous vaginal, assisted and caesarean section), duration of gestation, birth weight and stillbirth from the hospital records.

Socio-demographic information such as maternal age, education, and monthly income was collected. Information regarding the antenatal care visits, number of previous pregnancies live born children, previous miscarriage, bleeding per vagina was also gathered. Employment related factors were whether the woman is employed, lifts heavy objects as part of her job, climbing stairs and the number of hours spent per day in the standing position. The duration of employment, travel time to and from work, daily working hours and taking breaks at convenience during the day were also noted. Information was also gathered categorically regarding rest after coming from job and support from the family for rest. Information regarding

husband's education and monthly income was also collected. Anthropometric measurements of maternal weight, height and mid-arm circumference were measured as per standard techniques. Birth weight was recorded within one day of birth. Infant length was measured on an infantometer.

The data was analyzed using SPSS version 25. Descriptive statistics included mean and standard deviation for continuous variable while categorical variable were assessed by computing frequencies and percentages. Employment parameters and birth outcomes between employed and unemployed women were compared using independent sample t-test and chi-square test/Fisher exact test. Relative risk (RR) with 95% confidence interval (CI) were calculated. P-value ≤ 0.05 was considered as statistically significant. Ethical approval of the study was taken from the Ethical Review Committee of all the selected hospitals.

RESULTS

Overall, the mean age of the pregnant females was 28.66 ± 4.87 years and mean age of women at the time of marriage was 22.03 ± 4.19 years. Of the total 512 women, most of them were urdu speakers (52%). About 53.1% of these women had a household income < 15000 (Pak rupee), 32% were matric passed (10 years of formal education) and 69.9% had more than one child. Almost 60.2% of their husbands were matric passed and 37.9% were working as laborers. Multiparous women were more involved in excessive activity at work (Table 1).

Of 512 women, 158 (30.9%) of the females had LBW babies and 27 (5.3%) had stillbirths. The comparative analysis of employment parameters with adverse birth outcomes show statistically significant association between pushing and pulling of heavy objects at work with stillbirth with p-value of 0.003 (Table 2).

The excessive physical activity at work is significantly associated with LBW and stillbirth. The risk of LBW is 1.46 times higher among pregnant women with excessive physical activity as compared to non-excessive physical activity (RR=1.46, 95% CI=1.12-1.91). The risk of stillbirth is 2.85 times higher among pregnant women with excessive physical activity as compared to normal physical activity (RR=2.85, 95% CI=1.22-6.63) (Table 3).

Table 1: Socio- Demographic Characteristics of pregnant women

Characteristics	Overall% (n= 512)	Unexposed n=256 (%)	Exposed n=256 (%)	p-value
Maternal age (yrs)*	27.10 \pm 4.86	25.55 \pm 4.34	28.66 \pm 4.87	0.001*
Maternal age at marriage (years)*	21.50 \pm 3.85	20.97 \pm 3.42	22.03 \pm 4.19	0.002*
Ethnicity				
Sindhi	22 (4.3)	4 (1.6)	18 (7)	
Punjabi	72 (14.1)	26 (10.2)	46 (18)	
Balochi	19 (3.7)	10 (3.9)	9 (3.5)	
Pathan	25 (4.9)	17 (6.6)	8 (3.1)	
Urdu speaking	291 (56.8)	158 (61.7)	133 (52)	
Others	83 (16.2)	41 (16)	42 (16.4)	0.001*
Household income				
<15000 PKR	321 (62.7)	185 (72.3)	136 (53.1)	
15000-30000 PKR	148 (28.9)	57 (22.3)	91 (35.5)	
>30000 PKR	43 (8.4)	14 (5.5)	29 (11.3)	0.001*
Maternal education				
Illiterate	77 (15)	28 (10.9)	49 (19.1)	
Matric	242 (47.3)	160 (62.5)	82 (32)	
Intermediate	97 (18.9)	46 (18)	51 (19.9)	
\geq Graduate	96 (18.8)	22 (8.6)	74 (28.9)	0.001*
Paternal education				
Illiterate	99 (19.3)	39 (15.2)	60 (23.4)	
Matric	244 (47.7)	154 (60.2)	90 (35.2)	
Intermediate	77 (15)	35 (13.7)	42 (16.4)	
\geq Graduate	92 (18)	28 (10.9)	64 (25)	0.001*
Paternal occupation				
Jobless	11 (2.1)	5 (1.9)	6 (2.3)	
Laborer	195 (38.1)	97 (37.8)	97 (37.9)	
Own business	156 (30.5)	78 (30.5)	78 (30.5)	
Private job	151 (29.5)	76 (29.7)	75 (29.3)	0.938
Parity				
Nulliparous	9 (1.8)	1 (0.4)	8 (3.1)	
Primiparous	167 (32.6)	98 (38.3)	69 (27)	
Multiparous	336 (65.6)	157 (61.3)	179 (69.9)	0.002*

*Mean \pm SD

Table 2: Comparison of employment parameters with adverse birth outcomes among pregnant women

Variables related to Excessive physical activity	Low birth weight		P value	Still birth		P value
	Yes (n = 158)	No(n = 354)		Yes(n = 27)	No(n = 485)	
Standing at work						
Yes	63 (39.9%)	135 (38.1%)	0.709	10 (37.0%)	188 (38.8%)	0.858
No	95 (60.1%)	219 (61.9%)		17 (63.0%)	297 (61.2%)	
Squatting and bending at work						
Yes	40 (25.3%)	72 (20.3%)	0.208	8 (29.6%)	104 (21.4%)	0.317
No	118 (74.7%)	282 (79.7%)		19 (70.4%)	381 (78.6%)	
Pushing and pulling at work						
Yes	44 (27.8%)	96 (27.1%)	0.864	14 (51.9%)	126 (26.0%)	0.003*
No	114 (72.2%)	258 (72.9%)		13 (48.1%)	359 (74.0%)	
Lifting of weight at work						
Yes	48 (30.4%)	106 (29.9%)	0.921	10 (37.0%)	144 (29.7%)	0.418
No	110 (69.6%)	248 (70.1%)		17 (63.0%)	341 (70.3%)	
Stair climbing at work						
Yes	61 (38.6%)	149 (42.1%)	0.459	10 (37.0%)	200 (41.2%)	0.666
No	97 (61.4%)	205 (57.9%)		17 (63.0%)	285 (58.8%)	
Break during work						
Yes	5031.6%	99 (28.0%)	0.397	11 (40.7%)	138 (28.5%)	0.171
No	10868.4%	255 (72.0%)		16 (59.3%)	347 (71.5%)	

Table 3: The effect on adverse birth outcomes among pregnant women

Excessive physical activity	Low birth weight		p-value	RR (95% CI)
	Yes	No		
Yes	94 (36.7%)	162 (63.2%)	0.004*	1.46 (1.12-1.91)
No	64 (40.5%)	192 (54.2%)		
Stillbirth				
Yes	20 (7.8%)	236 (92.2%)	0.010*	2.85 (1.22-6.63)
No	7 (2.7%)	249 (97.3%)		

DISCUSSION

According to literature, high levels of physical activity at work are strongly linked to stillbirth and LBW. When compared to pregnant women who do not engage in excessive physical activity, the risk of LBW is 1.46 times higher. Pregnant women who engage in excessive physical activity have a stillbirth risk that is 2.85 times greater than those who do not. Similar to this, a systematic analysis found that working longer hours during pregnancy was associated with a higher risk of having an LBW baby²⁰.

This study identified the significant impact of excessive physical activities during employment with LBW and stillbirth delivery. The influential burden of financial constraint was observed in 53.1% of the women with household income <15000 PKR, which has a detrimental effect on the women's health during the period of pregnancy mainly leading to an adverse effect on birth outcomes that include, LBW, still birth and miscarriages. Several other studies conducted in high-income countries also have demonstrated that women belonging to lower socioeconomic status have high risk of stillbirth²¹. Research has shown that having multiple pregnancies along with tough employment conditions can lead to LBW baby or stillbirth delivery due to physical exertion, stress and frequent mobility at job. Along with these factors, family pressure faced by a woman and lack of adequate rest at home and work can also have an increased effect at these adverse pregnancy outcomes.

According to our study, 30.9% of women delivered an LBW baby and 5.3% had a stillbirth delivery. Frequent pushing and pulling of heavy objects have shown a significant association with stillbirth delivery in our study. In a previous study, adverse effect outcomes have significantly been linked especially to heavy lifting of weight and moving heavy objects. A study found frequent lifting of heavy weight increases risk of miscarriage by 1.5-fold (15 or more times per day)²².

Other associated factors with these adverse birth outcomes are prolonged standing, bending over, lifting weights, climbing stairs, and taking breaks during work have not come as statistically significant variables in our study. The self-reported data was collected therefore chances of error may be present as study subjects were reluctant in disclosing information affecting the results. Recall bias may have been an issue for some questions like stair climbing or lifting weights at work. Few variables were non-significant may be due to the limited sample size or possible that the participant selected may not be representative of the population of women introducing selection bias.

CONCLUSION

The study demonstrated a significant association between excessive physical activities on birth outcomes in employed pregnant females. A high percentage of females exposed to extensive physical activity ended up with low birth weight and stillbirth. Woman's age during pregnancy, women's education and husband's education are significantly associated with birth outcomes. A series of initiatives and

policies are required to reduce the female workload during pregnancy in lower-income countries. The improvement in socioeconomic situation specifically level of education of pregnant women and their husbands will mitigate the adverse birth outcomes.

Future directions for related research would be the inclusion of other adverse birth outcomes like early miscarriages and preterm birth besides LBW and stillbirth. Occupation, climatic variables and antenatal contact can be highlighted in the analysis while conducting future researches.

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