Maternal Lifestyle and Behavioral Factors Affecting on the Prevalence of Spontaneous Preterm Birth

Sabah Lotfy Mohamed*, Mohamed Lotfy Mohamed**

*Obstetric and Gynecology Nursing Department, Faculty of Nursing, Zagazig University, Egypt

* Obstetric and Gynecology Department, Faculty of Medicine, Zagazig University, Egypt

ABSTRACT

The problem of preterm births (PTBs) is a multidimensional public health concern affecting not only maternal and child health but also reflects on the society. **Aim**: The study was conducted to identify maternal lifestyle and behavioral factors affecting the prevalence of spontaneous preterm birth. **Subjects and Methods:** A descriptive case-control design was used to conduct the study, between March 2014 and December 2014, in Zagazig University Hospital. Questionnaire was included: A structured interview questionnaire sheet, and maternal lifestyle and behavior factors assessment sheet. **Results**: The prevalence rate of spontaneous preterm birth was 5.0% among all deliveries encountered in the study setting. The most significant risk factors associated with risk of spontaneous preterm births were inadequate number of antenatal visits, interpregnancy period less than one year, type of occupation, and night work. Moreover, the maternal short sleep duration (≤6 hours) and vital exhaustion were determined as significant risk factors for spontaneous preterm births. **Conclusion**: The study concluded that proper nutrition, appropriate sleep and work, avoiding serious life event are approaches that may aid prevention of spontaneous preterm births problem in Egyptian society. In addition, raising awareness of mothers about lifestyle and behavior characteristics to reduce the risk of spontaneous preterm birth. **Recommendations:** There is a need for better understanding of intervention strategies to improve lifestyle conditions in pregnancy.

Keywords: Spontaneous preterm birth, sleep duration, exhaustion.

INTRODUCTION

Preterm birth (PTB), defined as birth occurring before the 37th week of pregnancy and can be classified as spontaneous or provider-initiated **(Goldenberg et al., 2012)**. Preterm birth rates have been reported to range from 5% to 7% of live births in some developed countries, but are estimated to be substantially higher in developing countries **(Mathews and Dorman, 2010)**. Approximately 85% of this burden was concentrated in Africa and Asia, where 10.9 million births were preterm. Almost, 0.5 million preterm births occurred in Europe and the same number in North America, while 0.9 million occurred in Latin America and the Caribbean **(Zeitlin et al., 2013)**. About, 30% of preterm birth are caused by maternal or fetal complications such as preeclampsia or intrauterine growth restriction, whereas 70% of them are caused by spontaneous preterm labor **(Romero et al., 2014).** Nearly, 45-50% of preterm births are idiopathic, 30% are related to preterm rupture of membranes (PROM) and another 15–20% are attributed to medically

indicated or elective preterm deliveries **(Beck et al., 2010)**.

Factors postulated to influence risk for preterm birth include those associated with adverse lifestyle and behavior such as: stress, smoking, drug use and nutrition **(Goldenberg et al., 2012)**. Lifestyle and behavior represent a complex mixture of environmental exposures such as: particulates in air pollution or specific nutrients in food, added to several lifestyle conditions (stress, strenuous work, standing work) and habits (**Muglia and Katz, 2010).**

A variety of predisposing factors examined include low prepregnancy weight, low or high gestational weight gain, lack of or delayed prenatal care, experiencing a short interval between pregnancies, exposure to socio-environmental stressors such as poverty, food insecurity, or violence, **(Hamilton et al., 2011; Shah et al., 2011)**.

Public educational interventions can inform the public about avoidable risks associated with PTB and encourage lifestyle changes such as smoking cessation and prenatal supplement usage prior to conception. Public and professional policies can also be effective as primary intervention. For example, policies aiming to protect pregnant women in their workplace by improving safety and reducing their weekly working hours can immediately reduce the preterm rate. Primary prevention strategies during pregnancy include the recommendation of treatment such as multivitamin supplementation and the use of screening tests such as urine culture to identify risk factors (i.e. urinary tract and/or bladder infection) and provide adequate treatment. Prenatal and periodontal care has also been suggested as preventive interventions **(Iams et al., 2008)**. Intervention aimed at reducing the morbidity and mortality associated with preterm birth can be directed towards all women prior to or during pregnancy (primary interventions), directed at women with known risk factors (secondary interventions) or can be initiated after signs of imminent delivery have been recognized (tertiary interventions) **(Iams et al., 2008)**.

Significance of the study:

Preterm delivery is the chief problem in obstetrics today, approximately 10% of all births are preterm **(Merialdo & Requejo, 2013)**. Unfortunately, there are currently no effective diagnostic measures for preterm labor resulting in preterm birth and no effective early interventions for prevention but some preventive measures play an important role, where raising socioeconomic standards with proper medical care of pregnant women including proper nutrition, health education are of utmost importance **(Iyoke et al., 2014)**. Maternal lifestyle and behavioral factors for spontaneous preterm births have not been evaluated in Zagazig, so this study was done.

Aim of the Study:

The study was conducted to identify maternal lifestyle and behavioral factors affecting the prevalence of spontaneous preterm birth.

Research questions:

The objectives of the study were met by answering the following research questions:

1. What is the prevalence of spontaneous preterm birth in the Zagazig University Hospital?

2. What are the maternal lifestyle factors affecting on risk of spontaneous preterm birth?

3. What are the maternal behavioral factors affecting on risk of spontaneous preterm birth?

Operational definitions:

- Preterm cases were defined as mothers who delivered of a live singleton infant at less than 37 completed weeks of gestation and in whom the delivery was preceded by spontaneous labor or rupture of the membranes without induction or elective cesarean birth for maternal or fetal indications.

- Term controls were defined as women who were delivered of a live singleton infant between 37 and 41 completed weeks of gestation in whom the delivery was preceded by spontaneous labor or rupture of membranes without induction or elective cesarean birth for maternal or fetal indications

- Antenatal visiting: According to the "Routine for maternal health care", promulgated by the Ministry of Health in 2011, antenatal visiting should be ≥ 5 times (**http://www.nhfpc.gov.cn/**).

- Antenatal visiting: According to the "Routine for maternal health care", promulgated by the Ministry of Health in 2011, antenatal visiting should be ≥ 5 times, so the antenatal time of was categorized junior ≤ 4 times, and > 4 times (http://www.nhfpc.gov.cn/).

- Inter-pregnancy interval was defined as that interval between the termination of one pregnancy and the conception of another and was categorized as two groups: ≤12 months, and >12 months.

- Family income/month: According to the report from women and it was including 2 categorized adequate or inadequate.

Subjects and Methods:

Study design:

A descriptive case-control design was used to conduct this study**.**

Study setting:

The study was carried out in the postpartum wards at the department of Obstetrics at Zagazig University Hospital.

Study period:

The period of the study lasted for ten months. It started from beginning of March to end of December 2014.

Selection criteria of the study subjects:

Eligible inclusion criteria were: The criteria of the preterm cases group were including: 1) Mothers who had given both vaginal and caesarean sections birth; 2) Mothers newly delivered to a singleton preterm baby (28–37 weeks of gestation) as a result of spontaneous idiopathic preterm labor with intact membranes. The criteria of the term control group were including**:** 1) Mothers newly delivered a full-term baby (37-42 weeks of gestation) either a spontaneous, uncomplicated birth of a singleton or an (elective) uncomplicated caesarean section.

The exclusion criteria were: 1) Mothers with a history of preterm delivery in two groups; 2) Mothers who delivered prior to 37 completed weeks of gestation as a result of medical intervention, intrauterine fetal death and highly urgent cases; 3) Mothers had an acute or a serious chronic disease; and 4) Mothers having

minor and major fetal malformations. Other exclusion criteria included pre-eclampsia, placental abruption, uterine malformations.

Sample size:

Approximately, there were 3650 deliveries during the study period. All mothers with preterm delivery were 183 cases (accounting for 5% of the total deliveries), while mothers with term delivery were 3467 controls. The sample size was calculated using the following formula:

$$\mathbf{n = (1 - P)xPx\frac{Z^2}{D^2}}$$

Where:

- N = Sample size
- Z = The standard error from the mean corresponding to 95% confidence interval, which is 1.96
- P = The incidence of preterm delivery which is 13%
- D = The absolute precision which is 5% (0.05)
- N = 1.962 * 0.13 * 0.87 / 0.052 = 160.6823
- N = 160 by increasing this figure by 20% for non response N=180

The actual sample size was increased to 200 subjects to compensate for non-responses, with a response rate of 94.3%. Thus, the study included 100 preterm cases (study group) and 100 term controls (control group).

Sample technique:

A purposive sample was chosen according to certain criteria from total of 200 mothers.

Tools of data collection:

Questionnaire sheet was designed by the researchers in light of related literatures and the relevant of different studies to collect data from women **(Ayman and Abdelwahid, 2015; Lutfi, and Ezat, 2015)**. It includes the following:

I. A structured interview questionnaire: It contains the following parts:

1) **Maternal sociodemographic characteristics;** age, educational level, residence, BMI, the socioeconomic status in this study includes income, number of persons and number of rooms in the house.

2) **Menstrual history:** Date of the last menstrual period was used to define gestational age and was confirmed by an ultrasound examination for weeks of gestation.

3) **Past obstetric history** such as history of preterm delivery, abortion, pregnancy spacing and antenatal care during pregnancy (total number of antenatal care visits attended, and time of attending antenatal care). So, the antenatal time was categorized into < 5 times (inadequate), and ≥ 5 times (adequate).

4) **Gynecological history**. A history of congenital gynecological problems, cervical procedures, vaginal and cervical infections.

5) **Medical history:** A history of medication used and pre-existing medical conditions, such as hypertension and diabetes mellitus.

II. Maternal lifestyle and behavioral questionnaires were performed based on the following:

1) **Some lifestyle factors that contribute to spontaneous preterm birth include;** stress and excessive physical work or long times spent standing. Also, strenuous work e.g., How many hours she worked per day during pregnancy, and What kind of work was she doing? **(Muglia and Katz, 2010)**.

2) **Exposure to serious life events during pregnancy**. It was determined by the woman responses to the questions: "Over the past months of pregnancy, did any of the following life events occur?" e.g., financial trouble, violence or argument with husband, e.g., Has she ever been emotionally or physically abused by her husband? (Hit, slapped, kicked, or physically hurt), and stress.

3) **Maternal nightly sleep duration during the first 6 months of pregnancy.** It was determined by the response to the question: "During the first 6 months of pregnancy, how many hours per night did she sleep?" Responses were recorded as integers. Any amount of sleep that was less or more than 7– 8 hours/night was indicative of poor sleep quality or abnormal sleep duration **(Guendelman et al., 2013)**. Participants were classified into three groups based on short (≤ 6 hours), normal (7-8 hours), and long (≥ 9 hours) sleep duration. These categorizations were decided upon a priori, based on previously reported cut-points used by the investigators, who focused on sleep problems among pregnant women **(Kelman and Rains, 2005).**

4) **Maternal report of vital exhaustion in early pregnancy**. It was observed or discovered by asking the woman: "During the first 6 months of pregnancy, how often did she feel exhausted (except after exercise)?" Response choices were: (1) No, (2) Yes [1–3 times per month; 4 times per month or weekly; and daily] **(Qiu et al., 2015)**.

Content validity:

Checking the content validity of the questionnaire by specialists from the department of Obstetric and Gynecology at both the Faculty of Nursing and medicine at Zagazig University for revision and guarantee these elements appropriately developed what is assumed to evaluate. This revealed and guided them in the process of questionnaire designing.

Pilot study:

A pilot study was carried out on 20 women (10 preterm cases and 10 term controls women) of the total study sample and who had the inclusions' criteria before the actual study. The piloted subjects were later excluded from the study sample. The questionnaire sheet was modified according to the necessities before carrying out the study.

Data collection procedure:

- Data were collected after the researchers had been obtained the approval of administrators and supervisors of nursing of the department of obstetrics at Zagazig University Hospital, and participants women. Women who participated in the study were identified as eligible preterm cases and term controls during their postpartum stay in the hospital. Participants' women were provided with an oral explanation about the study, they had the opportunity to ask questions about their participation, and they agreed to participate in an interview, and the researchers were granted permission to access the women's health records to collect additional data related to risk factors for spontaneous preterm birth.

- The researchers introduced themself to all participants at the beginning of each visit.

- The study sample was collected by interview with the women after the delivery at the postpartum ward in the morning, and afternoon shifts by two days per week and until the predetermined sample size was collected and each woman took 20 minutes to answer the questionnaire sheet with the researchers.

- The subjects of case group were all postpartum women with spontaneous preterm birth (birth before 37 weeks of gestation).

- The subjects of control group comprised 1:1 agreed pregnant women of term birth (birth after 37 weeks of gestation).

Statistical Tests:

All data were entered into a computer using the Statistical Package for social Science (SPSS), version 19. Variables were compared between preterm cases and term controls numbers and percentage was calculated, and Chi square (χ^2) test was used as test of significance. Also the t-test was used to determine the difference between the means of preterm cases and term controls. Statistical level of significance was considered at P-value < 0.05.

Ethical considerations:

In the planning stage approvals were obtained from administrators of the above mentioned setting. All mothers were informed about aim of the study and that their participation is voluntary according to medical research ethics and that they were free to withdraw from the study at any time without giving any reason. Then, a written informed consent was obtained from each patient who agreed to participate in the study.

Results:

Figure (1) illustrates the presentation of term and spontaneous preterm births in relation to prevalence rate. It shows that, 5% (183 deliveries) were preterm deliveries at the Obstetric Department of Zagazig University Hospital during the period of study.

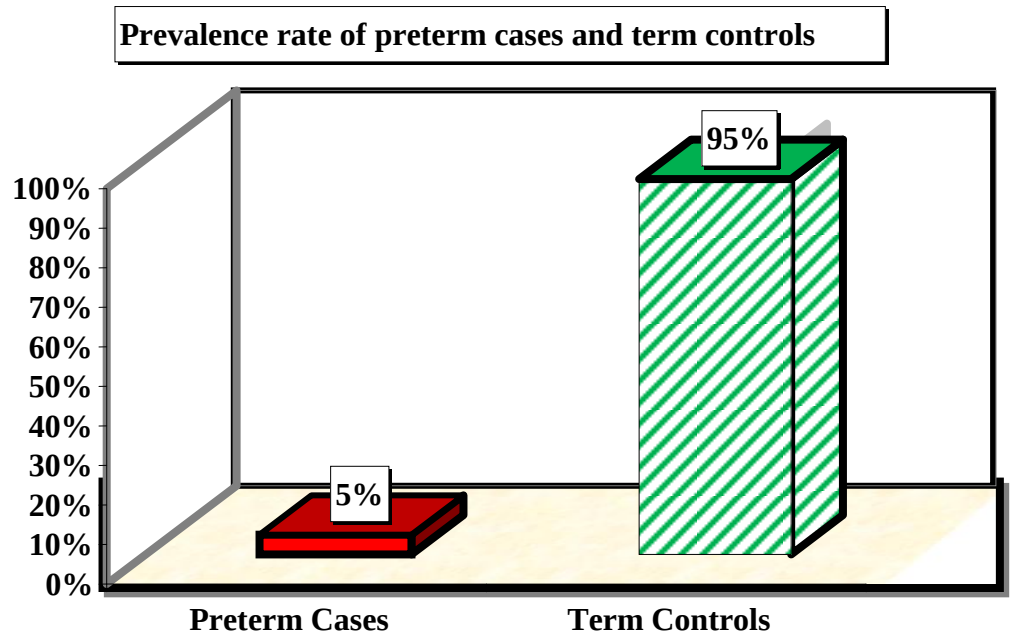

Figure (1): Presentation of term controls and spontaneous preterm births in relation to prevalence rate.

Table 1, illustrates the distribution of the studied mothers according to their socio-demographic characteristics. There were no statistically significant differences were observed between cases and controls regarding age, educational level, place of residence and body mass index. The mean age of preterm cases was 30.93 ± 5.93 years, while for the term controls it was 30.62 ± 5.07 years. Most of participants (89.0% for preterm cases and 92.0% for term controls) were aged 20–<35 years, followed by the age group 35 or more years (6.0% & 5.0%, respectively), and a majority of mothers were aged less than 20 years (5.0% & 3.0%, respectively). There was no significant difference between preterm case and term control group ($t = 0.64$; $P = 0.88$).

As regards level of education, 5.0% of preterm cases and 11.0% of term controls were illiterates, 42.0% of preterm cases and 36.0% term controls had a secondary level. In relation to place of residence, 62.0% of preterm cases and 54.0% of term controls were from urban areas, while 38.0% and 46.0% respectively were from rural areas. Concerning BMI (kg/m^2), there was no statistically significant difference between both groups ($\chi^2 = 2.21$, $P=0.33$). Notably, the income status was significantly associated with spontaneous preterm birth in the study subjects ($X^2 = 6.13$, $P = 0.04$).

Table (1): Distribution of the studied mothers according to their socio-demographic characteristics of term controls and preterm cases

Socio-demographic characteristics	Term control (n = 100)		Preterm cases (n = 100)		Significance test	P-value
	No	%	No	%		
Maternal age (years)						
< 20	3	3.0	5	5.0	0.64	0.88
20–<30	47	47.0	46	46.0		
30–<35	45	45.0	43	43.0		
≥ 35	5	5.0	6	6.0		
Mean±SD	30.62 ± 5.07		30.93 ± 5.93			
Educational status						
Illiterate	11	11.0	5	5.0	4.02	0.25
Primary school	10	10.0	15	15.0		
Secondary school	36	36.0	42	42.0		
College graduate	43	43.0	38	38.0		
Place of residence						
Urban	54	54.0	62	62.0	1.31	0.25
Rural	46	46.0	38	38.0		
Income status						
Adequate	31	31.0	20	20.0	6.13	0.04*
Inadequate	69	69.0	60	60.0		

As shown in table (2) parity, previous history of PTB and abortion were not statistically significant risk factors for SPB. On the other hand, women who gave birth to preterm babies were more likely to report that they didn't receive antenatal care (27.0% versus 14.0% at P = 0.02) compared to women who delivered at term. There was a significant relation between mothers who did not take vitamin supplements during pregnancy, with a higher prevalence of preterm cases (25.0%) than term controls (14.0%) at P = 0.03.

In addition, the percent of antenatal visiting in the preterm case group ≥ 5 times (48.0%), < 5 times (52.0%) and in the term control group, the percent of ≥ 5 times and < 5 times were 76.0% and 24.0%, respectively. Moreover, the prevalence of birth interval < 12 months was higher in cases than control (52.0% versus 33.0%). There were statistically significant differences (X^2 = 7.3, P = 0.006).

Table (2): Distribution of the studied mothers according to their obstetric history among term controls and preterm cases

Obstetric history	Term control (n = 100)		Preterm cases (n = 100)		Significance test	P-value
	No	%	No	%		
Parity						
Nulliparous	54	54.0	57	57.0	0.18	0.66
Multiparous	46	46.0	43	43.0		
Previous history of PTB						
No	78	78.0	72	72.0	0.96	0.32
Yes	22	22.0	28	28.0		
Previous abortion						
No	79	79.0	81	81.0	0.12	0.72
Yes	21	21.0	19	19.0		
Antenatal care visits						
Yes	86	86.0	73	73.0	5.18	0.02*
No	14	14.0	27	27.0		
Initiation of antenatal care						
Care initiated in 1st trimester	45	45.0	30	30.0	4.8	0.02*
Care initiated after 1st trimester	55	55.0	70	70.0		
Adequacy number of antenatal care visits						
Adequate (≥5)	76	76.0	48	48.0	16.6	0.00004**
Inadequate (<5)	24	24.0	52	52.0		
Antenatal vitamin supplements						
Yes	86	86.0	74	74.0	4.5	0.03*
No	14	14.0	25	25.0		
Inter-pregnancy interval (months)						
≤ 12	33	33.0	52	52.0	7.3	0.006*
> 12	67	67.0	48	48.0		

N.B: PTB = preterm birth; P < 0.05 = significant (*); P < 0.001 = highly significant (**)

Table (3) presents the distribution of the studied mothers according to their lifestyle factors among term control and preterm cases. The table reveals that, more than one third 39.0% of cases group were peasant followed by 30.0% were housewife while, only 3.0% were government staff. In the control group, 41.0% were housewife, peasants followed by 28.0% were peasant, and the minimum percent (7.0%) were commercial service. There was a statistically significant difference between preterm case and control group (χ^2 = 14.3, P = 0.006).

From the same table, working conditions during pregnancy includes; strenuous work (industrial, agricultural, and unskilled workers), and those working in a standing position for more than six hours a day have been identified as risk factors of spontaneous preterm birth. In the same way, women working long hours and night work, also had a significantly higher risk of spontaneous preterm births (P = 0.03 & P = 0.00, respectively).

Table (3): Distribution of the studied mothers according to their some lifestyle factors among term control and preterm cases

Some Lifestyle factors	Term control (n = 100)		Preterm cases (n = 100)		Significance test	P-value
	No	%	No	%		
Type of occupation						
Housewife	41	41.0	30	30.0	14.3	0.006*
Peasant	28	28.0	39	39.0		
Commercial service staffs	7	7.0	16	16.0		
Professional staffs occupied	8	8.0	13	13.0		
Government staffs	13	13.0	3	3.0		
Strenuous work						
No	27	27.0	14	14.0	5.18	0.02*
Yes	73	73.0	86	86.0		
Standing work						
≤ 6	40	40.0	25	25.0	5.12	0.02*
> 6	60	60.0	75	75.0		
Workload (daily)						
≤ 8 hours	68	68.0	53	63.0	4.72	0.03*
> 8 hours	32	32.0	47	47.0		
Night work						
No	66	66.0	22	22.0	39.2	0.00**
Yes	34	34.0	78	78.0		

Table (4) displays the distribution of the studied mothers according to their serious life events during pregnancy among term controls and preterm cases. It reveals that, financial trouble is the highest percentage (40.0%) of term cases as compared (25.0%) of term control. There was a statistically significance difference between case and control group (X^2 = 5.6, P =0.01). The prevalence of SPTB according to maternal exposure to argument with husband during pregnancy was 33.0% for term control and 51.0% of preterm cases (X^2 = 6.6, P = 0.009). Women exposed to stress during pregnancy had increased of spontaneous PTB. There was a statistically significance difference among the studied groups (X^2 =7.2, P = 0.007).

Table (4): Distribution of the studied mothers according to their serious life events during pregnancy among term controls and preterm cases

Serious life events	Term control (n = 100)		Preterm cases (n = 100)		Significance test	P-value
	No	%	No	%		
Financial trouble						
No	75	75.0	60	60.0	5.6	0.01*
Yes	25	25.0	40	40.0		
Argument with Husband						
No	67	67.0	49	49.0	6.6	0.009*
Yes	33	33.0	51	51.0		
Stress						
No	*61*	*61.0*	42	42.0	7.2	0.007*
Yes	*39*	*39.0*	58	58.0		

Table (5) shows the distribution of the studied mothers according to their behavioral factors during months of pregnancy. It noted from table (5) that, balanced diet was associated with a decreased risk of preterm birth. There was a statistically significance difference between preterm cases and term control group (X^2 =5.6; P =0.01). As indicated in table (5) the percentage of short sleep duration (≤ 6 hours / night) was 26.0% among preterm cases and 36.0% among term control. The corresponding for long sleep duration (≥ 9 hours per night) was 23.0% for cases and 11.0% for control. It noted that the spontaneous preterm birth were increased with short sleep duration (≤6 hours per night) and long sleep duration (≥9 hours per night) as compared with women who reported sleeping 7–8 hours / night. There was a significant difference among the studied groups (X^2 = 10.51, P = 0.005).

Preterm birth was increased among women who reported feeling a sense of vital exhaustion in pregnancy (unrelated to exercise). Additionally, found of a statistically significant difference between complaints frequency of vital exhaustion and spontaneous preterm birth (P<0.05). Though, weekly complaints of vital exhaustion were associated with greater risk of preterm birth than daily complaints. Results suggest that maternal sleep duration and vital exhaustion are statistically significant with preterm birth.

Table (5): Distribution of the studied mothers according to their behavioral factors during months of pregnancy

Items	Term control (n = 100)		Preterm cases (n = 100)		Significance test	P-value
	No	%	No	%		
Balanced diet						
No	12	12.0	25	25.0	5.6	0.01*
Yes	88	88.0	75	75.0		
Antenatal vitamin supplements						
Yes	86	86.0	74	74.0	4.5	0.03*
No	14	14.0	25	25.0		
Sleep per night (Hours)						
≤ 6 hours	26	26.0	57	57.0	10.51	0.005*
7-8 hours	53	53.0	31	31.0		
≥ 9 hours	21	21.0	12	12.0		
Complaints of vital exhaustion						
No	39	39.0	21	21.0	7.71	0.005*
Yes	61	61.0	79	79.0		
Vital exhaustion						
1-3 times/Month	46	46.0	35	35.0	16.4	0.0002**
4 times/Month – Weekly	12	12.0	23	23.0		
Daily	3	3.0	21	21.0		

Discussion

Spontaneous preterm birth includes birth that follows preterm labor, preterm spontaneous rupture of membranes, and cervical insufficiency, but does not include indicated preterm delivery for maternal or fetal conditions **(Simhan et al., 2012)**. Potential interventions for reducing the incidence of spontaneous preterm birth can be classified as primary (aimed at all women), secondary (aimed at eliminating or reducing risk in women with a previous preterm birth), or tertiary (aimed at preterm infants) **(Iams et al., 2008)**.

Adverse pregnancy outcomes such as preterm delivery can have major consequences that have significant impacts not only on the individuals, but also on their families and the health care system. Although most of the organs of prematurely born infants are immature, the brain and the respiratory system are the systems primarily susceptible to complications arising from PTB **(Saigal & Doyle, 2008).**

The prevalence of the spontaneous preterm birth rate found in the current study accounted for 5.0% of total deliveries, which is lower than the rates reported for African (12.6%), Asian (9.8%), and some European countries (6.7%) as well as the figures reported in Vietnam (11.8%) but is higher than rate of 4.4% reported in Italy **(Renzo et al., 2011)**. However, the rate of spontaneous preterm birth found in the present study is similar to those of studies conducted in the Islamic Republic of Iran (i.e. Qom 5.6% and Mashhad 6.1%) **(Dolatian et al., 2012)**. The low rate of preterm birth found in the present study might reflect the success of different programs introduced by hospital to improve health service quality delivered to pregnant women including pre-pregnancy and pregnancy health care in the

last decade. A better understanding of the factors associated with spontaneous preterm birth is of utmost importance for planning effective measures to reduce the burden of its increasing rates.

In Europe, **Zeitlin et al. (2013)** showed that both spontaneous and induced preterm deliveries contributed to increasing preterm birth trends between 1996 and 2008. In 2008, rates of nonspontaneous singleton preterm births ranged from 1.1 to 3.0%, whereas spontaneous onset preterm births ranged from 2.8 to 4.8%. For multiples, the rates of nonspontaneous preterm birth ranged from 12.0 to 34.4%, and spontaneous onset births from 15.1 to 38.2%. In Scotland, for instance, between 1989 and 2004, nonspontaneous onset deliveries increased by almost 50% and spontaneous deliveries by 10% **(Norman et al., 2009).** These wide variations in preterm birth rates in different countries are affected by obstetric practices and economic factors.

Also, this study finding was in agreement with a center-based cross sectional study was conducted to detect the percentage and factors affecting preterm births (PTBs) in an area in South Cairo, through a secondary health care facility (Al-Moneera General Hospital, MOH). The study revealed that 41 deliveries (8.2%) were preterm deliveries among all deliveries in the obstetric unit of the El Moneera general hospital during the period from July to December 2014 **(Ayman and Abdelwahid, 2015)**. Although, in the United States **VanderWeele et al. (2012)** showed that overall preterm births increased from 11.2 to 12.8% between 1989 and 2004, medically induced rates increased 94% from 3.4 to 6.6% and spontaneous rates declined by 21%, from 7.8 to 6.2%.

Socio-demographic factors have been sought to explain spontaneous preterm birth and although do not necessarily imply causation. In Brazil, **Passini et al. (2014)** they reported that socio-demographic characteristics of women were not significantly associated with spontaneous preterm birth. So, identifying at-risk women will help initiate risk specific interventions.

The current study showed that there was an insignificant relationship between age and spontaneous preterm birth (P=0.88). This study was consistent with that of **Sebayang et al (2012),** in Lombok, Indonesia, they showed that maternal age was not significantly associated with preterm birth. In Pakistan, **Irshad et al. (2012),** in a study of 205 preterm births, found that about 25% of the mothers were aged 35 years and above. In contrast, **Abu Hamad et al. (2007),** found in their study in the Gaza Strip a significant positive relationship between age 35 years and risk of preterm birth, explaining the differences in the presence of confounding factors such as pre-existing medical problems.

Education level was not associated with spontaneous preterm delivery in the present study. In Nigeria, **Oliver et al. (2012)** had reported conflicting findings on the association between maternal education and preterm birth. This may be due to increased access to basic education among the mothers in this study whose background was mainly urban. In another study in Lombok, Indonesia, **Sebayang et al. (2012)** had shown that women with high school education had 36% lower odds of having a preterm birth, compared with women with no primary education. In contrast to the study finding **Grjibovski et al. (2005)**, a cohort study done about large social disparities and spontaneous preterm birth in transitional Russia found an increased risk of preterm delivery in women with lower levels of education. This was explained by differences in sociodemographic factors between the two groups.

Low economic status is also believed to be an important risk factor for spontaneous preterm birth. It is associated with unhealthy or risky behaviours, exposure to stress and psychological reactions that influence gestation negatively. A similar phenomenon was observed in Nova Scotia, **Joseph et al. (2014)** study which showed that socioeconomic position was associated with crude rates of spontaneous preterm birth but not with crude rates of iatrogenic preterm birth. Previously, in their study, **Al-Dabbagh and Al-Taee (2006)** they found that the main determinant of preterm birth in Iraq was low socioeconomic status. This result was in contrast with **Aragao et al. (2006)** who found that family income and household factors were not found to be significant risk factors for preterm birth. The possible cause of this is that the study was carried out at public hospitals, where the women are from the same socioeconomic class with no social disparities. In addition, barriers to antenatal care exist for many women with lower socioeconomic status, since these women are more likely to be uninsured or have difficulty accessing healthcare services.

As regards the relation between obstetric history and risk of SPTBs, results of this study revealed that the number of deliveries (para), abortions, and previous history of preterm birth were not found to be risk factors for spontaneous preterm birth. A study conducted in Rafidia Hospital, Kingdom of Saudi Arabia, by **Lutfi and Ezat (2015)** their study findings showed that the number of pregnancies (gravida), deliveries (para), and abortions had insignificant relationship with preterm birth (P=0.246). Another study carried out by **Victor et al. (2011)** found no association between past history of PTBs and abortion and development of PTBs.

However, **Lutfi and Ezat (2015); Ayman and Abdelwahid (2015)** in their recent studies they recognized that there is a significant association between preterm birth and previous preterm birth. The reasons for this finding could be explained as preterm birth was included besides the difference in the study population, and this may be due to the persistence of the same factor which led to that condition e.g. hemorrhage or hypertension.

The present study results revealed a significant negative relationship between the total number of antenatal care visits and having a preterm birth. It is also important to note that this study found that women who reported inadequate antenatal care were more likely to have a preterm birth. As in a study carried out by **Abu Hamad et al. (2007)**, a hospital-based case–control was carried out at the 2 main governmental hospitals in the Gaza Strip, El-Shifa and Khan-Younis hospitals. The risk of preterm birth increased 2.4-fold among those who attended <4 visits than those who attended 4 visits during the entire pregnancy period. This confirms the importance of conducting population-oriented programs encouraging attendance at antenatal care, focusing on the importance of early attendance

In the USA, a study conducted by **Chen et al. (2008)** reported that teenage mothers are more likely to get inadequate prenatal care which has been strongly associated with preterm birth. Adolescents with good access to health care often do not show a higher risk of complications. It is worth noting that sufficient timely antenatal health care can be favorable in detecting and treatment of pregnant complications, especially for the high-risk group. More attention needs to be paid to the effectiveness and quality of each antenatal care visit, especially for women with risk factors of preterm birth or other complications.

The current study results demonstrated a significant relationship between interpregnancy intervals (IPIs)

(less than 12 months) and increased risk of spontaneous preterm birth (P =0.006). Similar results have been obtained in Al Ain, United Arab Emirates, by **Al-Jasmi et al. (2002)** who clarified that short interpregnancy interval is a risk factor for spontaneous preterm birth. As well, in Ohio, the northeastern US, **DeFranco et al. (2014)** study showed that mothers with shorter IPIs were more likely to give birth prior to 39 weeks of gestation when compared to women with optimal birth spacing. Following a short IPI of less than 12 months, 53.3% of women had delivered before 39 weeks, compared to 37.5% of women with an optimal IPI. Birth after the estimated due date (more than 40 weeks) occurred less often in women with short IPI of less than 12 months, 16.9% compared to 23.1% for a normal IPI. Short pregnancy interval certainly predisposes to PTBs as it leads to nutritional deficiency and incomplete return of normal maternal tissue. This indicates the importance of conducting population-based programs about the importance of spacing between pregnancies.

Concerning the relation between some lifestyle characteristics and risk of SPTBs, the results were obtained from the current case-control study indicated that high levels of work stresses (strenuous work, those working long hours, and standing for long periods) and night work are associated with risk of preterm birth. As well, similar results were obtained from a large European case-control study carried out by **Saurel-Cubizolles (2004)** in the mid-90s findings showed a moderate excess risk of preterm birth for pregnant women employed as manual workers and for those working long hours, standing for long periods, and reporting dissatisfaction with their job, or long standing position and long working hours.

Similarly, a case–control study conducted by **Escribà-Aguir et al. (2001)** in Spain showed that medium or high intensity physical workload (strenuous postures, load carrying, standing) increased the risk of pre-term birth with an odds ratio (OR) of 1.6 and 2.3, respectively . This might be attributed to that stresses are associated with the release of stress hormones that may lead to preterm births. This study underlines that more attention should be given to women's working conditions during pregnancy, and effort should be intensified towards reducing exposure to long working hours for pregnant women.

The current study investigated the influence of several pregnancy-related maternal lifestyle factors on spontaneous preterm birth. The results showed that pregnant women who have serious lifestyle events showed to a significant increase of SPTB. Similarly, a prospective study carried out in the People's Republic of China in 2008 evaluated the effects of maternal exposure to serious life events, included financial, emotional, traumatic, and spousal-related events. After adjustment for confounders, **Zhu et al. (2010)** reported an increased risk of PTB, with increasing numbers of life events during the first and second trimesters. However, preconception counseling regarding stressful lifestyle should not be neglected

Experiencing more than one serious life event during pregnancy may impact PTB in part due to the cumulative effect of stress or may be due to the increased chance that any one of the events will occur at a time period when the pregnancy is more vulnerable to stress as identified by **Traviss et al. (2013)**. A population-based study done in Sweden by **Class et al. (2011)** they examined the association of stress, and found that the risk for PTB was elevated when the event occurred during the 5th and 6th month of pregnancy.

In the present study, adequate maternal diet before and during pregnancy

is important for the health of women and their growing fetus, while inadequate diet is associated with a risk of spontaneous preterm birth, which is similar to another study in Beijing, a case-control study was conducted by **Zhang et al. (2012)** on 1391 women with preterm birth (the case group) and 1391 women with term delivery (control group). They stated that adequate nutrition is critical for fetal development and reduce the risk of a preterm delivery

The current study finding showed that vitamin supplements had a significant decline in risk of preterm birth. Among previous studies, two large cohort studies set in Denmark (n=35897) and the USA (n=34480) examined folic acid effects on different clinical phenotypes of preterm birth. Both **Bukowski et al. (2009) and Catov et al. (2011)** found a protective effect of multivitamins on spontaneous preterm birth, but not on iatrogenic preterm birth or PPROM. In southern China, a study carried out by **Li et al. (2014)** revealed that daily intake of 400 μg folic acid alone during the periconceptional period was associated with a reduced risk of spontaneous preterm birth. Presumably, these agents inhibit production of proinflammatory cytokines.

Wagner et al. (2013) studied the effectiveness of vitamin D supplementation in reducing preterm birth risk in 494 pregnant women at the medical university of South Carolina Charleston and observed similar results with inverse relation between vitamin D supplementation and preterm birth. As well, **Shibata et al. (2011)** studied that vitamin D sufficiency may protect against preterm birth from preliminary analysis of a large cohort of pregnant women supplemented with vitamin D in South Carolina and their initial findings showed that the risk of preterm birth at 37 and 32 weeks was reduced among women taking vitamin D.

According to maternal sleep duration and complaint of vital exhaustion, the current study results suggested that short sleep duration (≤ 6 hours of nightly sleep), long sleep duration (≥ 9 hours of nightly sleep), and any complaint of vital exhaustion were highly associated with increased risk of spontaneous preterm birth. These findings are congruent with those of several studies performed at the Hospital Nacional DOS de Mayo, the Instituto Nacional Materno Perinatal de Lima, and the Hospital Edgardo Rebagliati Martins in Lima, Peru, in 2009-2010 which examined the relationship between maternal sleep and SPTB. In their study, **Kajeepeta et al. (2014)** suggested that short sleep duration (≤6 hours of nightly sleep), long sleep duration (≥9 hours of nightly sleep), and any complaint of vital exhaustion were associated with increased odds of all subtypes of spontaneous preterm birth. Nevertheless, the relationship between sleep disorder and preterm birth was not significant as detected by **Dolatian et al. (2014).**

As well the findings differ from those of **Guendelman et al. (2013)** in Southern California, who found no association between sleep duration (either short or long) and odds of preterm delivery. The differences might be due to that, the present study sleep data were from the first trimester of pregnancy, whereas others measured sleep duration only in the second trimester of pregnancy. Another explanation for the inconsistent findings is that the authors did not differentiate between spontaneous and medically indicated preterm birth. For, the present study, focused on assessment of risk factors for spontaneous preterm birth. These findings call for increased attention and intervention strategies to improve sleep in early pregnancy with the aim of decreasing the risk of preterm birth.

Conclusion:

On the light of the study results, it can be assumed that maternal characteristics were not significant risk factors for spontaneous preterm birth. Meanwhile, precautionary policies to reduce the risk of preterm birth included: proper nutrition, avoiding stressful lifestyle events, seeking appropriate health care services, and control of preterm birth risk factors (e.g. working long hours while standing on feet, stressful lifestyle events exposure, sleep disorders and other factors). Therefore, nurses should be aware of the importance of preterm birth arrest

Recommendations:

These recommendations can focus efforts on early identifying women at risk of spontaneous preterm birth and ensuring that they get better quality care, guidance, increased funding from public and private resources to health care institutions to enhance the performance of popular sites, and health education. Furthermore, maternal lifestyle modifications and support either from family or health care providers are needed to increase the likelihood of a healthy pregnancy. Further studies should be carried out on other settings and large sample for evidence and generalization of the results.

Reference

Abu Hamad, K., H., Abed, Y. and Abu Hamad, B. (2007): Risk factors associated with preterm birth in Gaza strip: Hospital-based case-control study. East Mediterr Health J; 13: 1132-41.

Al-Dabbagh, S. A., Al-Taee, W. Y. (2006): Risk factors for pre-term birth in Iraq: A case-control study. BMC Pregnancy Childbirth; 6: 13.

Al-Jasmi, F., Al-Mansoor, F., Alsheiba, A., Anne, O. C., Thomas, P. C., Moshaddeque, M., H. (2002): Effect of interpregnancy interval on risk of spontaneous preterm birth in Emirati women United Arab Emirates. Bulletin of the World Health Organization 2002;80:871-875.

Aragão, V. M.F., Silva, A.A.M., Aragão, L.F., Barbieri, M.A., Bettiol, H., Coimbra, L.C. (2006): Risk factors for preterm births in São Luís, Maranhão, Brasil. Cad Saúde Pública; 20:57-63.

Ayman S. A. and Abdelwahid, A. (2015): Rate and risk factors of preterm births in a secondary health care facility in Cairo. World Journal of Medical Sciences; 12 (1): 09-16. DOI: 10.5829/idosi.wjms.2015.12.1.9243.

Beck, S., Wojdyla, D., and Say, L. (2010): The worldwide incidence of preterm birth: A systematic review of maternal mortality and morbidity. Bull World Health Organ ;88(1): 31– 8 .

Bukowski, R., Malone, F., D., Porter, F., T., Nyberg, D., A. and Comstock, C. H. (2009): Preconceptional folate supplementation and the risk of spontaneous preterm birth: A Cohort Study. PLoS Med 6(5): e1000061.

Catov, J.M., Bodnar, L. M., Olsen, J., Olsen, S., Nohr, E. A. (2011): Periconceptional multivitamin use and risk of preterm or small-for-gestational-age births in the Danish National Birth Cohort. Am J Clin Nutr;94:906–12.

Chen, X., When, S. W., Fleming, N., Demissie, K., Rhoads, G.G. and Walker, M. (2007). Teenage pregnancy and adverse birth outcomes: A large population based retrospective cohort study. International Journal of Epidemiology, 36, 368-373.

Class, Q. A., Lichtenstein, P., Långström, N., and D'Onofrio, B. M. (2011). Timing of prenatal maternal exposure to severe life events and adverse pregnancy outcomes: A population study of 2.6 million pregnancies. Psychosom Med.; 73(3):234–41.

DeFranco, E. A., Ehrlich, S., and Muglia, L. J. (2014): Influence of interpregnancy interval on birth timing. BJOG; DOI: 10.1111/1471-0528.12891.

Dolatian, M., Mirabzadeh, A., Forouzan, A. S., Sajjadi, H., Alavi-Majd, H., and Moafi, F. (2014): Preterm delivery and psycho-social determinants of health based on World Health Organization model in Iran: A narrative review. Glob J Health Sci.; 5(1):52-64.

Dolatian, M., Mehraban, Z. and Sadeghniat , K. (2014): The effect of impaired sleep on preterm labor. West Indian Medical Journal; 63(1): 62-7.

Escribà-Aguir, V., Sandiago, P. H., and Saurel, M.J. (2001): Physical load and psychological demand at work during pregnancy and preterm birth. Int Arch Occup Environ Health; 74:583-588.

Goldenberg, R., L., Gravett, M., G., Iams, J., Papageorghiou, A., T., and Waller, S., A. (2012): The preterm birth syndrome: issues to consider in creating a classification system. Am. J. Obstet. & Gynecol.; 206(2): 113–8.

Grjibovski, A.M., Bygren, L.O., Yngve, A. & Sjöström, M. (2005): Large social disparities in spontaneous preterm birth rates in transitional Russia. Public Health; 119 (2): 77–86.

Guendelman, S., Pearl, M., Kosa, J., L., Graham, S., Abrams, B., and Kharrazi, M. (2013): Association between preterm delivery and pre-pregnancy body mass (BMI), exercise and sleep during pregnancy among working women in Southern California. Maternal Child Health J.; 17:723-31.

Hamilton, B., Martin, J., and Ventura, S. (2011). Births: Preliminary data for 2010. National Vital Statistics Reports. ; 60:2. Hyattsville, MD: National Center for Health Statistics.

Iams, J. D., Romero, R., and Culhane, J. F. (2008): Primary, secondary, and tertiary interventions to reduce the morbidity and mortality of preterm birth. Lancet; 371:164–175.

Irshad, M., Ahmad, A., and Fawad, K. A. (2012): Risk factors for preterm births in a tertiary care hospital JPMI; 26(22):158-164.

Iyoke, C. A., Lawani, L. O., Ezugwu, E. C., Ilo, K. K., Ilechukwu, G. C., and Asinobi, I. N. (2014): Maternal risk factors for singleton preterm births and survival at the University of Nigeria Teaching Hospital, Enugu, Nigeria. Niger J Clin Pract;18:744-50. Available at: http://www.njcponline.com/text.asp?

Joseph, K.S., Fahey, J., Shankardass, K., Victoria, M. A. O'Campo, P., Dodds, L., Robert, M. L., and Alexander, C. A. (2014): Effects of socioeconomic position and clinical risk factors on spontaneous and iatrogenic preterm birth. BMC Pregnancy Childbirth; 14: 117. doi: 10.1186/1471-2393-14-117.

Kajeepeta, S., Sixto, E., S., Gelaye, B., Qiu, C., Barrios, Y. , V., Daniel A., E. and Michelle, A., W. (2014): Sleep duration, vital exhaustion, and odds of spontaneous preterm birth: a case-control study. BMC Pregnancy and Childbirth; 14:337. http://www.biomedcentral.com/1471-2393/14/337.

Kelman, L., and Rains, J. C. (2005): Headache and sleep: examination of sleep patterns and complaints in a large clinical sample of migraineurs. Headache; 45(7):904-10.

Li, Z., Ye, R.,Zhang, L., Li, H, Liu1, J. and Ren, A. (2014): Periconceptional folic acid supplementation and the risk of preterm births in China: A large prospective cohort study. Oxford Journals Medicine & Health International Journal of Epidemiology; 43(4):1132-1139

Lutfi, A. S. and Ezat, H., A. (2015): Risk factors of preterm birth among Palestinian women: Case control study. Austin J Nurs Health Care; 2(1): 1011.

http://www.nhfpc.gov.cn/

Mathews, T.J. and MacDorman, M.F. (2010): Infant mortality statistics from the 2006 period linked birth/infant death data set. Nat Vital Stat Rep; 58: 1-31.

Merialdo, J.H. and Requejo, (2013): Low birth weight and preterm infants: Causes, prevalence and prevention. Encyclopedia of human nutrition, (3rd ed.) pp. 100-103.

Muglia, L., J. & Katz , M. (2010): The enigma of spontaneous preterm birth. New England Journal of Medicine; 362(6): 529– 35.

Norman, J. E., Morris, C., and Chalmers, J. (2009): The effect of changing patterns of obstetric care in Scotland (1980–2004) on rates of preterm birth and its neonatal consequences: Perinatal database study. PLoS Med.; 6:e1000153.

Oliver, C. E., Agatha, N. D., Chidinma, V. G., Ohwodo, H., David, A. O., and Olufunto, O. K. (2012): Incidence of and socio-biologic risk factors for spontaneous preterm birth in HIV positive Nigerian women. BMC Pregnancy and Childbirth; 12:93. DOI: 10.1186/1471-2393-12-93

Passini, R., Jr., Cecatti, J., G., Lajos, G., J., Tedesco, R. , P. and Nomura, M. L. (2014): Brazilian multicentre study on preterm birth (EMIP): Prevalence and factors associated with spontaneous preterm birth. PLoS ONE 9(10): e109069. doi:10.1371/journal.pone.0109069

Qiu,C., Sixto E. S., Gelaye, E., Daniel A. E., Cande V. A., and Michelle A. W. (2015). Maternal sleep duration and complaints of vital exhaustion during pregnancy is associated with placental abruption. J Matern Fetal Neonatal Med.; 28(3): 350–355. doi: 10.3109/14767058.2014.916682

Renzo, G. C. D., Giardina, I., Rosati, A., Clerici, G., Torricelli, M., and Petraglia, F. (2011): Maternal risk factors for preterm birth: A country-based population analysis. Eur. J. Obstet. & Gynecol.; 3:1–5.

Romero, R., Dey, S. , K. and Fisher, S., J. (2014): Preterm labor: one syndrome, many causes. Science; 345:760-5 .

Saigal, S., and Doyle, L. W. (2008): An overview of mortality and sequelae of preterm birth from infancy to adulthood. Lancet; 19; 371(9608):261-9. doi: 10.1016/S0140-6736(08)60136-1.

Saurel-Cubizolles, M., J., Zeitlin, J., Lelong, N., Papiernik, E., Di Renzo, G., C. & Breart, G. (2004): Employment, working conditions, and preterm birth: Results from the Europa case-control survey. Journal of Epidemiology and Community Health.; 58(5):395-401.

Sebayang, S., Dibley, M., Kelly, P., Shanka, A., and Anuraj, H. (2012): Determinants of low birth weight, and small-for-gestational-age and preterm birth in Lombok, Indonesia: Analyses of the birth weight cohort of the SUMMIT trial. Tropical Medicine and International Health; 17 (8):938-950.

Shah, P. S., Balkhair, T., Ohlsson, A., Beyene, J., Scott, F., and Frick, C. (2011): Intention to become pregnant and low birth weight and preterm birth: A systematic review. Maternal and Child Health Journal; 15: 205–216. doi:10.1007/s10995-009-0546-2.

Shibata, M., Suzuki, A., Sekiya, T., Sekiguchi, S., Asano, S., and Udagawa, Y. (2011): High prevalence of hypovitaminosis D in pregnant Japanese women with threatened premature delivery. J Bone Miner Metab;29(5):615-20.

Simhan, N.H., Iams, J.D., and Romero, R. (2012): Preterm birth. In Gabbe SG, Niebyl JR, Simpson JL, Landon MB, Galan HL, Jauniaux ER, editors. Obstetrics: Normal and problem pregnancies. (6th ed). Philadelphia (PA): Elsevier Saunders;628–56.

Traviss, G., Meer, S., West, R., and House, A. (2013): Life events and difficulties and their association with antenatal distress in White and South Asian women in the UK. Soc Psychiatry Psychiatr Epidemiol;48(5):725–734.

VanderWeele, T. J., Lantos, J. D., and Lauderdale, D. S. (2012): Rising preterm birth rates, 1989–2004: Changing demographics or changing obstetric practice? Soc Sci Med; 74:196–201.

Victor, H.G., Yvette, C.C. and Niki, B.I. (2011): Influence of gestational age and reason for prior preterm birth on rates of recurrent preterm delivery. American Journal of Obstetrics and Gynecology; 205:275.e1-275.e5.

Wagner, C. L., McNeil, R., Hamilton, S. A., Winkler, J., Cook, R. C., and Warner, G. (2013): A randomized trial of vitamin D supplementation in 2 community health center networks in South Carolina. Am J Obstet Gynecol.; 208(2):137.e1-13.

Zeitlin, Szamotulska, J., K., Drewniak, N., Mohangoo, A.D., Chalmers, J. and Sakkeus, L., (2013). Preterm birth time trends in Europe: a study of 19 countries. BJOG; 120: 1356-65.

Zhang, Y., P., Liu, X., H., Gao, S., H., Wang J., M., Gu, Y. S. and Zhang, J. Y. (2012) : Risk factors for preterm birth in five maternal and child health hospitals in Beijing. PLoS One.;7(12):e52780.

Zhu, P., Tao, F., Hao, J., Sun, Y. & Jiang , X. (2010): Prenatal life events stress: Implications for preterm birth and infant birth weight. Am J Obstet Gynecol.; 203(1):34. 31–4.