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ORIGINAL RESEARCH

Epidemiology and Related Risk Factors of Preterm Labor as an Obstetrics Emergency

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Abstract: **Introduction:** Preterm birth is still a major health problem throughout the world, which results in 75% of neonatal mortality. Preterm labor not only inflicts financial and emotional distress, it may also lead to permanent disability. The present study was conducted to determine therelated risk factors andpreventive measuresof preterm labor. **Methods:** This retrospective cross-sectional study assessed all preterm labors, as well as an equal number of term labors, during seven years, at an educational hospital. Probable risk factors of preterm labor were collected using medical profiles of participants by the aid of a pre-designed checklist. Significant related factors of preterm laborwere used for multivariate logistic regression analysis with SPSS 21.0. **Results:** 810 cases with the mean age of 28.33 ± 6.1 years were evaluated (48.7% preterm). Multipartite; fetal anomaly; prenatal care; smoking; not consuming folic acid and iron supplements; in vitro fertilization; history of infertility, caesarian section, trauma, systemic disease, and hypertension; amniotic fluid leak; rupture of membranes; cephalic presentation; vaginal bleeding; placenta decolman; oligohydramnios; pre-eclampsia; chorioamnionitis; uterine abnormalities; cervical insufficiency; intercourse during the previous week; short time since last delivery; and mother's weight significantly correlated with preterm labor. **Conclusion:** Based on the results of the present study, intercourse during the previous week, multipartite, short time from last delivery, preeclampsia, fetal anomaly, rupture of membranes, hypertension, and amniotic fluid leak, respectively, were risk factors for preterm labor. On the other hand, iron consumption, cephalic presentation, systematic disease, history of caesarian section, prenatal care, and mother's weight could be considered as protective factors.

Keywords: Premature birth; infant, premature; obstetric labor, premature; fetal membranes, premature rupture; emergencies

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1. Introduction

Preterm labor is an obstetrics emergency and a threat to population health. 75% of infant mortality is related to preterm labor (1, 2). Preterm labor not only inflicts financial and emotional distress on the family, it may also lead to permanent disability (physical or neural damages) in infants. Approximately one-third of preterm labor survivors suffer from severe long-term neurological disabilities, such as cerebral palsy or mental retardation (3). Furthermore, preterm infants carry increased risk of a range of neurodevelopmental impairments and disabilities including behavioral problems, school learning difficulties, chronic lung disease, retinopathy of prematurity, hearing impairment, and lower growth attainment (4). Over the last two decades, preterm birth rate has remained unchanged or even risen in most countries, despite the increased understanding of possible risk factors and their pathological mechanisms (5-7). Although neonatal mortality rate has fallen globally between 1990 and 2009 (8), the absolute number and rate of preterm births has increased during this period. Preterm birth was the second leading cause of death in children under 5 years old (9). In 2013, preterm birth rate in Germany, BrazilandUnited States were 8.7%, 10.7 and 12%, respectively (10, 11). The vast majority (85%) of global preterm births occur in Asia and Africa, where health systems are weak and inade-

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quate (12, 13). In Iran incidence of preterm labor was 7.2% in Tehran, 5.5% in Shiraz, and 8.4% in Khorramabad (14-16). Although in most cases preterm births occur idiopathically, fetal, uterine, and placental factors as well as maternal chronic diseases, can affect preterm birth (17). In the USA, 70% of preterm births were idiopathic and the rest were due to pre-eclampsia (50%), fetal distress (25%) and abruption (25%) (18). In another study, preterm multifetal pregnancies and hypertension were introduced as the major factors affecting preterm birth (19). In order to determine the incidence and etiologic factors of preterm labor, the present study was conducted on newborns at the obstetrics emergency department of Shohadaye Tajrish Hospital with a view to identifying preventive measures.

2. Methods

2.1. Study design and setting

This retrospective cross-sectional study assessed all preterm labors during seven years, from March 2008 until March 2015, at Shohadaye Tajrish Hospital, Tehran, Iran, by normal vaginal delivery or cesarean section, using census method. An equal number of term labors were selected by simple random sampling as the control group. The study protocol was approved by the Ethical Committee of Shahid Beheshti University of Medical Sciences. The researchers adhered to the principles of Helsinki Declaration, as well as confidentiality of patient data and patient rights.

2.2. Data gathering

Probable risk factors of preterm labor such as: mother's age, weight, body mass index, and job; type of delivery (natural or caesarian section), baby's sex and weight; apgar score at 1 and 5 minutes; multi-partite; fetal abnormalities;prenatal care; smoking, alcohol, and opium abuse; history of folic acid, metformin, and iron consumption; history of in vitro fertilization, infertility, abortion, preterm delivery, trauma, vaginal bleeding, intra uterine fetal death (IUFD), dental infection, respiratory infection, and caesarian section; amniotic fluid leak; rupture of membranes; cephalic presentation; vaginal infection; placenta decolman; placenta praevia; polyhydramnios; oligohydramnios; urinary tract infection; systemic disease; anemia; hypertension; preeclampsia; eclampsia; chorioamnionitis; uterine abnormalities, cervical insufficiency; placental insufficiency; polycystic ovary; history of intercourse during the previous week; and timefrom last delivery were collected using medical profiles of participants by the aid of a pre-designed checklist. Incomplete patient files were excluded. Short time from last delivery was considered to be 1 year.

2.3. Statistical analysis

The data were analyzed with SPSS software version 21.0. Qualitative data were reported as mean ± standard deviation and quantitative ones as frequency and percentage. Frequency of all risk factors were compared between the two groups (preterm and term) using chi square and Fisher's exact tests. Multivariate logistic regression analysis was applied to independent statistically significant factors for developing a predictive model and odds ratio (OR) of each risk factor was calculated. P value under 0.05 was considered significant.

3. Results:

810 cases with the mean age of 28.33 ± 6.1 (14 -64) years were evaluated (48.7% preterm). Table 1 depicts baseline characteristics of the studied patients. Among the studied risk factors, multipartite ($p < 0.001$), fetal anomaly ($p = 0.022$), prenatal care ($p = 0.005$), smoking ($p = 0.004$), not consuming folic acid ($p = 0.004$), not consuming iron supplements ($p < 0.001$), in vitro fertilization ($p = 0.014$), history of infertility ($p = 0.005$), amniotic fluid leak ($p < 0.001$), rupture of membranes ($p < 0.001$), history of caesarian section ($p < 0.001$), cephalic presentation ($p < 0.001$), history of trauma ($p = 0.015$), vaginal bleeding ($p < 0.001$), placenta decolman ($p = 0.003$), oligohydramnios ($p < 0.001$), history of systemic disease ($p < 0.001$), history of hypertension ($p = 0.006$), pre-eclampsia ($p = 0.001$), chorioamnionitis ($p = 0.003$), uterine abnormalities ($p = 0.034$), cervical insufficiency ($p = 0.001$), intercourse during the previous week ($p < 0.001$), short time since last delivery ($p = 0.040$), and mother's weight ($p = 0.012$) significantly correlated with higher risk of preterm labor. Table 3 shows the results of multivariate logistic regression analysis.Intercourse during the previous week (OR: 23.1), multipartite (OR: 21.8), short time from last delivery (OR: 4.8), pre-eclampsia (OR:4.7), fetal anomaly (OR:3.6), rupture of membranes (OR:3.5), hypertension (OR:3.3), and amniotic fluid leak (OR:2.1), respectively, were risk factors andiron consumption (OR:0.3), cephalic presentation (OR:0.4), systematic disease (OR:0.6), history of caesarian section (OR: 0.6), prenatal care (OR:0.6), and mother's weight (OR:0.98), respectively, were preventive factors of preterm labor.

4. Discussion

Based on the findings of the present study, independent related factors ofpreterm labor were multipartite, fetal anomaly, prenatal care, smoking, not consuming folic acid, not consuming iron supplements, in vitro fertilization, history of infertility, amniotic fluid leak, rupture of membranes, history of caesarian section, cephalic presentation, history of trauma, vaginal bleeding, placenta decolman, oligohydramnios, history of systemic disease, history of hyperten-

Table 1: Baseline characteristics of studied patients based on age of delivery

Variable	Term	Preterm	P value
Age (year)	28.25 ± 5.9	28.37 ± 6.34	0.766
Weight (Kg)	76.38 ± 13.11	73.78 ± 14.19	0.012
Job			
Home keeper	319 (46.9)	361 (53.1)	0.626
Employee	7 (50)	7 (50)	
Type of delivery			
Natural	302 (54)	257 (46)	0.002
Caesarian section	101 (42.8)	135 (57.2)	
Baby's Sex			
Boy	205 (46.8)	233 (53.2)	0.065
Girl	195 (55.1)	159 (44.9)	
Baby's weight (gram)	3184 ± 542	2080 ± 1012	< 0.001
Apgar (1^{th} minute)	7.1 ± 2.3	5.7 ± 3.0	0.076
Apgar (5^{th} minute)	8.9 ± 0.6	7.9 ± 2.4	< 0.001

Data are presented as mean ± standard deviation or number (%).

sion, preeclampsia, chorioamnionitis, uterine abnormalities, cervical insufficiency, intercourse during the previous week, short time since last delivery, and mother's weight. Intercourse during the previous week, multipartite, short time from last delivery, preeclampsia, fetal anomaly, rupture of membranes, hypertension, and amniotic fluid leak, respectively, were risk factors for preterm labor. On the other hand, iron consumption, cephalic presentation, systematic disease, history of caesarian section, prenatal care, and mother's weight could be considered as protective factors. Preterm labor, as mentioned before, is a major obstetric and pediatric challenge because it is a common, persistent, and often devastating condition with considerable medical, economic, emotional, and social impact (20). It is thought to be a syndrome initiated by multiple mechanisms, consisting of infection or inflammation, uteroplacental ischaemia or haemorrhage, uterine overdistension, stress, and other immunologically mediated processes. However, adefined mechanism cannot be established in most cases (21). Despite advancesin understanding risk factors and mechanisms related to preterm labor, the preterm labor rate has risen in most industrialized countries. In the USA, preterm labor rate increased from 9.5% in 1981 to 12.7% in 2005 (22, 23). In the present study, low maternal weight has increased the risk of preterm labor, while in retrospective studies, this factor weakly correlated with preterm birth (24-26). Although most of the term births were via natural delivery and most of the preterm laborsvia caesarian delivery, no significant relationship was found. The mean age of mothers with preterm laborin this study, were the same as mothers with term infants, while the incidence of prematurity in different studies was greater in old mothers (27, 28). Several studies have demonstrated that adequate utilization of pre-natal care is accompanied with improved birth weights and lower risk of preterm birth. On the other hand, inadequate pre-natal care is often referred to as a risk factor for poor pregnancy outcomes. In our study, women who had nowell-designed pre-natal care program, were atrisk for preterm labor (29, 30). Infections and vaginosis are well-known risk factors for preterm birth. In a study, presence of bacterial vaginosis at 28 weeks gestation was associated with an increased risk of spontaneous preterm birth (31). Nevertheless, these factors were not associated with preterm birth in our study. Antibiotic therapy could either eliminate infections or modify their effects on pregnancy outcome (32-34). Smoking has been linked to preterm labor, and in this study this factor hadan association with it (35, 36). Although sexual activity, particularly intercourse, during pregnancy has been connected to preterm labor, because of direct effects of semen on initiating preterm labor or alteration of vaginal pH, there is evidence that shows sexual activity during pregnancy is not associated with preterm birth. In this study, intercourse during the previous week affected preterm birth (37). High levels of alcohol consumption during pregnancy have obvious adverse effects on fetal development, but in this project there is no consistency between use of alcohol and chance of preterm birth (38). Various studies have suggested lower rates of preterm birth in women taking dietary supplements (39). Dietary supplements taken before, but not after conception, were linked with a reduced rate of preterm birth; however, a placebo-controlled trial of vitamin supplementsin women before conception and 2 months after pregnancy, reported no effect on preterm birth rate (40, 41). Our results showed that folic acid and iron consumption significantly decrease the rate of preterm birth. Preterm rupture of fetal membranes leads to 30% of preterm births in industrialized countries. Management, consists of maternal and fetal surveillance for labor, infection, and abruption, and administration

Table 2: Comparison of studied risk factors of preterm delivery between term and pre term pregnancy

Risk factor	Term n (%)	Preterm n (%)	P value
Multipartite			
Yes	3 (6.7)	42 (93.3)	< 0.001
No	403 (53)	357 (47)	
Fetal anomaly			
Yes	8 (29.6)	19 (70.4)	0.022
No	398 (51.2)	380 (48.8)	
Prenatal care			
Yes	159 (56.8)	121 (43.2)	0.005
No	247 (47)	278 (53)	
Smoking			
Yes	0 (0)	8 (100)	0.004
No	406 (50.9)	391 (49.1)	
Alcohol usage			
Yes	0 (0)	1 (100)	0.496
No	406 (50.5)	398 (49.9)	
Opium usage			
Yes	4 (28.6)	10 (71.4)	0.083
No	402 (50.8)	389 (49.2)	
Folic acidconsumption			
Yes	149 (57.3)	111 (42.7)	0.004
No	257 (47.2)	288 (52.8)	
Metforminconsumption			
Yes	5 (62.5)	3 (37.5)	0.372
No	401 (50.3)	396 (49.7)	
Iron consumption			
Yes	371 (55.1)	302 (44.9)	< 0.001
No	35 (26.5)	97 (73.5)	
In vitro fertilization			
Yes	6 (26.1)	17 (73.9)	0.014
No	400 (51.2)	382 (48.8)	
History of infertility			
Yes	26 (35.6)	47 (64.4)	0.005
No	380 (51.9)	352 (48.1)	
History of abortion			
Yes	71 (51.1)	68 (48.9)	0.471
No	335 (20.3)	331 (49.7)	
History of preterm delivery			
Yes	8 (36.4)	14 (63.6)	0.131
No	398 (50.8)	385 (49.2)	
History of IUFD			
Yes	8 (36.4)	14 (63.6)	0.131
No	398 (50.8)	385 (49.2)	
Amniotic fluid leak			
Yes	79 (33.3)	158 (66.7)	<0.001
No	327 (57.6)	241 (42.4)	
Rupture of membranes			
Yes	30 (22.9)	101 (77.1)	< 0.001
No	376 (55.8)	298 (44.2)	
History of caesarian section			
Yes	142 (65.1)	76 (34.9)	< 0.001
No	264 (45)	323 (55)	
Cephalic presentation			
Yes	343 (56.6)	263 (43.3)	< 0.001
No	63 (31.7)	136 (68.3)	
History of trauma			
Yes	3 (20.3)	12 (80)	0.015
No	403 (51)	387 (49)	

IUFD: Intrauterine fetal death.

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Table 2: Comparison of studied risk factors of preterm delivery between term and pre term pregnancy

Risk factor	Term n (%)	Preterm n (%)	P value
History of surgery			
Yes	34 (54)	29 (46)	0.326
No	372 (50.1)	370 (49.9)	
Vaginal bleeding			
Yes	6 (18.8)	26 (81.3)	< 0.001
No	400 (51.7)	373 (48.3)	
Vaginal infection			
Yes	5 (35.7)	9 (64.3)	0.200
No	401 (50.7)	390 (49.3)	
Placenta decolman			
Yes	3 (16.7)	15 (83.3)	0.003
No	403 (51.2)	384 (48.8)	
Placenta praevia			
Yes	4 (40)	6 (60)	0.365
No	402 (50.6)	393 (49.4)	
Polyhydramnios			
Yes	3 (37.5)	5 (62.5)	0.353
No	403 (50.6)	394 (49.4)	
Oligohydramnios			
Yes	12 (25)	36 (75)	< 0.001
No	394 (52)	363 (48)	
Urinary tract infection			
Yes	65 (56.5)	50 (43.5)	0.095
No	341 (49.4)	349 (50.6)	
Systemic disease			
Yes	133 (60.2)	88 (39.8)	< 0.001
No	273 (46.7)	311 (53.3)	
Anemia			
Yes	31 (51.7)	29 (48.3)	0.475
No	375 (50.3)	370 (49.7)	
History of hypertension			
Yes	58 (40.6)	85 (59.4)	0.006
No	348 (52.6)	314 (47.4)	
Preeclampsia			
Yes	13 (27.7)	34 (72.3)	0.001
No	393 (51.8)	385 (48.2)	
Eclampsia			
Yes	1 (20)	4 (80)	0.181
No	405 (50.6)	395 (49.4)	
Chorioamnionitis			
Yes	1 (8.3)	11 (91.7)	0.003
No	405 (51.1)	388 (48.9)	
Uterine abnormalities			
Yes	6 (28.6)	15 (71.4)	0.034
No	400 (51)	384 (49)	
Cervical insufficiency			
Yes	0 (0)	10 (100)	0.001
No	406 (51.1)	389 (48.9)	
Placental insufficiency			
Yes	0 (90)	3 (10)	0.121
No	406 (50.6)	396 (49.4)	
Polycystic ovary			
Yes	1 (33.3)	2 (66.7)	0.493
No	405 (50.5)	397 (49.5)	
Body mass index			
Yes	12 (63.2)	7 (36.8)	0.187
No	394 (50.1)	392 (49.9)	
Intercourse during the previous week			
Yes	1 (6.3)	15 (93.8)	< 0.001
No	405 (51.3)	384 (48.7)	

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Table 2: Comparison of studied risk factors of preterm delivery between term and pre term pregnancy

Risk factor	Term n (%)	Preterm n (%)	P value
Short time since last delivery			
Yes	7 (30.4)	16 (69.6)	0.040
No	399 (51)	383 (49)	
History of dental infection			
Yes	1 (14.3)	6 (85.7)	0.59
No	405 (50.8)	393 (49.2)	
History of respiratory infection			
Yes	2 (50)	2 (500)	0.681
No	404 (50.4)	397 (49.6)	

IUFD: intrauterine fetal death.

Table 3: The results of multivariate logistic regression analysis

Variable	Odds ratio (95% CI*)	P value
Intercourse during the previous week	23.1 (2.7-194.2)	0.004
Multipartite	21.8 (4.8-97.9)	<0.001
Short time from last delivery	4.8 (1.4-16.2)	0.012
Preeclampsia	4.7 (1.9-11.6)	0.001
Fetal anomaly	3.6 (1.1-11.2)	0.024
Rupture of membranes	3.5 (2-6.2)	<0.001
Hypertension	3.3 (1.9-5.5)	<0.001
Amniotic fluid leak	2.1 (1.4-3.4)	0.001
Mother's Weight	0.98 (0.96-0.99)	0.005
Prenatal care	0.6 (0.04-0.09)	0.036
History of caesarian section	0.6 (0.4-0.9)	0.020
Systematic Disease	0.6 (0.4-0.9)	0.010
Cephalic presentation	0.4 (0.2-0.6)	<0.001
Iron consumption	0.3 (0.2-0.6)	<0.001

CI*: confidence interval.

of corticosteroids or antibiotics (42, 43). Ruptures of the fetal membranes are remarkably seen in preterm birth. The availability of medical reproductive techniques has increased the number of multiple pregnancies. In addition, multiple pregnancies resulting from reproductive medical treatments are more common in women of advanced maternal age (44). The preterm birth rate for multiple pregnancies stands at 40-60% (45). Multipartite and in vitro fertilization directly correlated with preterm birth. In our study, pre-eclampsia was 72.3% in preterm labor and 27.7% in term labors. In our study, history of chronic hypertension was seen in 59.4% of mothers with preterm labor and 40.6% in mothers with term labor. In other studies the most common maternal disease was hypertension (16). Using the results of this study and similar onesto eliminate the risk factors and reinforcethe protective factors would be helpful in decreasing the rate of preterm labor and its human and social burden. Yet, for accurately determining these factors, studies with better design, such as cohort studies, with proper follow-up period and large study population, are needed. Since the studied hospital is a referral center for these patients, it represents the general population of the country to a great extent. Still, the final decision regarding factors definitely affecting pre-term labor should be made after further studies.

5. Conclusion

Based on the results of the present study, intercourse during the previous week, multipartite, short time from last delivery, preeclampsia, fetal anomaly, rupture of membranes, hypertension, and amniotic fluid leak, respectively, were risk factors for preterm labor. On the other hand, iron consumption, cephalic presentation, systematic disease, history of caesarian section, prenatal care, and mother's weight could be considered as protective factors.

6. Appendix

6.1. Acknowledgements

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6.2. Authors Contributions

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6.3. Funding Support

None

6.4. Conflict of Interest

None

References

1. Kliegman RM, Behrman R, Jenson H. Stanton B. Nelson textbook of pediatrics. Germany: Elsevier Health Sciences; 2007.
2. Cunningham F, Leveno K, Bloom S, Hauth J, Rouse D. Spong CY Williams Obstetrics. USA: The McGraw-Hill Companies, Inc. Medical Publishing Division; 2010.
3. Lawn JE, Cousens S, Zupan J, Team LNSS. 4 million neonatal deaths: when Where Why The Lancet. 2005;365(9462):891-900.
4. Saigal S, Doyle LW. An overview of mortality and sequelae of preterm birth from infancy to adulthood. The Lancet. 2008;371(9608):261-9.
5. Blencowe H, Cousens S, Oestergaard MZ, Chou D, Moller A-B, Narwal R, et al. National, regional, and worldwide estimates of preterm birth rates in the year 2010 with time trends since 1990 for selected countries: a systematic analysis and implications. The Lancet. 2012;379(9832):2162-72.
6. Langhoff-Roos J, Kesmodel U, Jacobsson B, Rasmussen S, Vogel I. Spontaneous preterm delivery in primiparous women at low risk in Denmark: population based study. Bmj. 2006;332(7547):937-9.
7. Norman JE, Morris C, Chalmers J. 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 medicine. 2009;6(9):1009.
8. Oestergaard MZ, Inoue M, Yoshida S, Mahanani WR, Gore FM, Cousens S, et al. Neonatal mortality levels for 193 countries in 2009 with trends since 1990: a systematic analysis of progress, projections, and priorities. PLoS Med. 2011;8(8):e1001080.
9. Organization WH. Born too soon: the global action report on preterm birth. 2012.
10. Zeitlin J, Szamotulska K, Drewniak N, Mohangoo A, Chalmers J, Sakkeus L, et al. Preterm birth time trends in Europe: a study of 19 countries. BJOG: An International Journal of Obstetrics, Gynaecology. 2013;120(11):1356-65.
11. Martin JA, Hamilton BE, Ventura SJ, Osterman MJ, Wilson EC, Mathews T. Births: final data for 2010. National vital statistics reports. 2012;61(1):1-72.
12. Beck S, Wojdyla D, Say L, Betran AP, Merialdi M, Requejo JH, et al. The worldwide incidence of preterm birth: a systematic review of maternal mortality and morbidity. Bulletin of the World Health Organization. 2010;88(1):31-8.
13. Lawn JE, Gravett MG, Nunes TM, Rubens CE, Stanton C. Global report on preterm birth and stillbirth (1 of 7): definitions, description of the burden and opportunities to improve data. BMC pregnancy and childbirth. 2010;10(Suppl 1):S1.
14. Afrakhteh M, Ebrahimi S, VALAEI N. PREVALENCE OF PRETERM DELIVERY AND ITS RELATED FACTORS IN FEMALES REFERRING TO SHOHADA TAJRISH HOSPITAL, 1995-99. 2002.
15. Pourarian S, Vafafar A, Zareh Z. The incidence of prematurity in the Hospital of Shiraz university of medical sciences and health services, 1999. Razi Journal of Medical Sciences. 2002;9(28):19-25.
16. MOHSENZADEH A, SAKET S, KARIMI A. Prevalence of preterm neonates and risk factors. 2011.
17. Gomella T. Polycythemia and hyperviscocity. Dalam: Gomella TL, Cunningham MD, Eyal FG, Zenk KE, penyunting. Neonatology: management, procedures, on call problems, diseases and drugs. Edisi ke-5. NewYork: McGraw-Hill; 2004.
18. Meis PJ, Goldenberg RL, Mercer BM, Iams JD, Moawad AH, Miodovnik M, et al. The preterm prediction study: risk factors for indicated preterm births. American journal of obstetrics and gynecology. 1998;178(3):562-7.
19. Burke C, Morrison JJ. Perinatal factors and preterm delivery in an Irish obstetric population. Journal of perinatal medicine. 2000;28(1):49-53.
20. McCormick MC. The contribution of low birth weight to infant mortality and childhood morbidity. New England journal of medicine. 1985;312(2):82-90.
21. Romero R, Espinoza J, Kusanovic JP, Gotsch F, Hassan S, Erez O, et al. The preterm parturition syndrome. BJOG: An International Journal of Obstetrics, Gynaecology. 2006;113(s3):17-42.
22. Hamilton BE, Martin JA, Ventura SJ. Births: preliminary data for 2005. National vital statistics reports. 2006;55(11):1-18.
23. Goldenberg RL, Rouse DJ. Prevention of premature birth. New England Journal of Medicine. 1998;339(5):313-20.
24. Kramer MS. Determinants of low birth weight: methodological assessment and meta-analysis. Bulletin of the World Health Organization. 1987;65(5):663.
25. HEDIGER ML, SCHOLL TO, BELSKY DH, ANCES IG, SALMON RW. Patterns of weight gain in adolescent pregnancy: effects on birth weight and preterm delivery. Ob-

stetrics, Gynecology. 1989;74(1):6-12.
26. Carmichael S, Abrams B, Selvin S. The pattern of maternal weight gain in women with good pregnancy outcomes. American Journal of Public Health. 1997;87(12):1984-8.
27. Ebrahimi S, Haghbin S, PoorMahmoodi A. Incidence and etiologic factors of prematurity. 2000.
28. Heaman M, Kingston D, Chalmers B, Sauve R, Lee L, Young D. Risk Factors for Preterm Birth and SmallâĂŘforâĂŘgestationalâĂŘage Births among Canadian Women. Paediatric and perinatal epidemiology. 2013;27(1):54-61.
29. Care P. Medicaid Recipients and Uninsured Women Obtain Insufficient Care. Government Accounting Office (GAO), Washington DC. 1987.
30. Sokol RJ, Woolf RB, Rosen MG, Weingarden K. Risk, antepartum care, and outcome: impact of a maternity and infant care project. Obstetrics, Gynecology. 1980;56(2):150-6.
31. Meis PJ, Goldenberg RL, Mercer B, Moawad A, Das A, McNellis D, et al. The preterm prediction study: significance of vaginal infections. American journal of obstetrics and gynecology. 1995;173(4):1231-5.
32. Paige DM, Augustyn M, Adih WK, Witter F, Chang J. Bacterial vaginosis and preterm birth: a comprehensive review of the literature. Journal of Nurse-Midwifery. 1998;43(2):83-9.
33. Romero R, Mazor M. Infection and preterm labor. Clinical obstetrics and gynecology. 1988;31(3):553-84.
34. Holst E, Goffeng AR, Andersch B. Bacterial vaginosis and vaginal microorganisms in idiopathic premature labor and association with pregnancy outcome. Journal of clinical microbiology. 1994;32(1):176-86.
35. Keirse M. An evaluation of formal risk scoring for preterm birth. American journal of perinatology. 1989;6(2):226-33.
36. Shiono PH, Klebanoff MA, Rhoads GG. Smoking and drinking during pregnancy: their effects on preterm birth. Jama. 1986;255(1):82-4.
37. Klebanoff MA, Graubard BI, Kessel SS, Berendes HW. Low birth weight across generations. Jama. 1984;252(17):2423-7.
38. Spohr H-L, Willms J, Steinhausen H-C. Prenatal alcohol exposure and long-term developmental consequences. The Lancet. 1993;341(8850):907-10.
39. Vahratian A, Siega-Riz AM, Savitz DA, Thorp JM. Multivitamin use and the risk of preterm birth. American journal of epidemiology. 2004;160(9):886-92.
40. Czeizel A, Dudas I, Metneki J. Pregnancy outcomes in a randomised controlled trial of periconceptional multivitamin supplementation. Archives of gynecology and obstetrics. 1994;255(3):131-9.
41. Obstetricians ACo, Gynecologists. The importance of preconception care in the continuum of womenâĂŹs healthcare. Committee Opinion No. 313. Obstet Gynecol. 2005;106(3):665-6.
42. Roberts D, Dalziel S. Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth (Review). Cochrane Database Syst Rev. 2006;19:CD004454.
43. Wapner RJ, Sorokin Y, Thom EA, Johnson F, Dudley DJ, Spong CY, et al. Single versus weekly courses of antenatal corticosteroids: evaluation of safety and efficacy. American journal of obstetrics and gynecology. 2006;195(3):633-42.
44. McClamrock HD, Jones HW, Adashi EY. Ovarian stimulation and intrauterine insemination at the quarter centennial: implications for the multiple births epidemic. Fertility and sterility. 2012;97(4):802-9.
45. Ferraretti A, Goossens V, De Mouzon J, Bhattacharya S, Castilla J, Korsak V, et al. Assisted reproductive technology in Europe, 2008: results generated from European registers by ESHRE. Human reproduction. 2012;27(9):2571-84.