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PARENTAL ANTHROPOMETRIC RISK FACTORS OF PRETERM BIRTH IN PAKISTAN

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Abstract:

Objective: *To explore parental anthropometric risk factors of preterm birth in Pakistan.* ***Methodology:*** *The study design for this multicentre study was case-control and data was collected using convenience sampling. Data was collected from departments of Obstetrics and Gynecology of 4 different hospitals after a prior written permission and study was complied at Hajvery University, Lahore. The study was started in Oct 2016 and was completed till the end of September 2017. A total of 364 cases (preterm birth) and more than double controls (full term birth) were taken. Whereas cases and controls were defined as birth of baby before 37 weeks of gestation (on dating scan) and controls were defined as birth of babies at 37-41 weeks of gestation (on dating scan). We measured their weight in kilogram (kg), height in meters (m), obesity (BMI ≥ 30) of both mother and fathers were asked.* ***Results:*** *Using unadjusted OR ratio, the highest risk of PTB was seen with short statured parents i.e. OR = 2.72, proceeded by short stature of father i.e. OR = 2.27, obese parents i.e. OR = 1.80, short statured mother i.e. OR = 1.72, obese father i.e. OR = 1.62 and obese mother i.e. OR = 1.53. Using adjusted OR mother's BMI and father's short stature was found as risk factor of preterm birth with respective OR of 1.057 [1.034, 1.081] and 1.800[1.157, 2.801].* ***Conclusion:*** *It is concluded that weight and BMI being modifiable factors has positive role in occurrence of PTB, so by proper strategies and with healthy life style the risk of preterm birth can be minimized.*

Keywords: *Obesity, short stature, preterm birth, risk factors, logistic regression, odds ratio.*

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INTRODUCTION:

Risk factors for PTB can be classified in different major domains like, modifiable and non-modifiable risk factors, including age of mother and father. [1-3] Maternal weight and BMI is postulated to have substantial part in the etiology or risk of PTB. Studies have also proposed that low weight before pregnancy tend to increase the risk of PTB [4]. World Health Organization (WHO) defines obesity if BMI >29.9 kg/m^2. Whereas BMI value ranging from 25 kg/m^2 to 29.9 kg/m^2 is called as "overweight" [5]. The 50% of population is either overweight (BMI 25.0 to 29.9) or obese (BMI ≥30) in underdeveloped and developed countries [6]. Obesity is a common problem among younger age because of sedentary lifestyle, over intake of calories and less mechanical work [7, 8]. Short term poor fetomaternal consequences are also associated with maternal obesity [9]. Maternal obesity is also linked with long term maternal and fetal outcomes, such as metabolic syndrome, postpartum weight retention, and obesity in the offspring [9]. On the other hand a relatively high risk of spontaneous and induced PTB and LBW is also verified in singletons born to underweight women [10]. Excessive weight gain during pregnancy also leads to poor maternal and offspring consequences. The associated mechanism remain uncertain, because weight gain during pregnancy displays maternal nutritional level and gestational tissue expansion, due to accumulation of fat and fluids [11]. According to latest guidelines an ideal gestational weight gain is given as for underweight (28 to 40 lb), normal-weight (25 to 35 lb), overweight (15 to 25 lb) and obese (11 to 20 lb) [12]. About 20 to 40% of women put more than the suggested gestational weight in developed countries [13]. Moreover, a progressive incline in the odds of having PTB is related with the maternal short stature among Swedish women. Accordingly, the odds of having PTB are lowest in the tallest females while highest for short heighted females [14].

Targeting risk factors, specifically anthropometric factors like weight, short stature and BMI of both mother and father and of both parents (when combined) for preterm birth in epidemiological studies might provide clues to the mechanisms leading to preterm birth, and help to identify women at risk.

MATERIALS AND METHODS:

The study design for this multicentre study was case-control and data was collected using convenience sampling. Data was collected from departments of Obstetrics and Gynecology of 4 different hospitals after a prior written permission and study was complied at Hajvery University, Lahore. The study was started in Oct 2016 and was completed till the end of September 2017. A total of 364 cases (preterm birth) and more than double controls (full term birth) were taken. Whereas cases and controls were defined as birth of baby before 37 weeks of gestation (on dating scan) and controls were defined as birth of babies at 37-41 weeks of gestation (on dating scan). Females regardless of age and parity were taken and unwilling females / attendants to participate in the study, females with unconfirmed gestational age, termination of pregnancy before 26 weeks of gestation, and females with short cervix were excluded from the study. Data was collected for all females who were hospitalized after delivery in selected hospitals were taken after taking written informed consent in Urdu language or English. Females after 24 hours of delivery were approached with the help of consultant, duty doctor or duty staff nurse to collect related data. To meet objective of this study, we measured their weight in kilogram (kg), height in meters (m), obesity (BMI ≥ 30) of both mother and fathers were asked. Father's weight and height were asked from mother/attendant of baby and if they were unconfirmed, it was asked on telephone. Short stature was defined if the height was ≥ 2 standard deviations (SD) below the average for gender and age i.e. below the 2.5th percentile. Collected data was entered and analyzed using SPSS version 22. Mean ± S.D was used for quantitative data like weight, height and BMI. Frequency (%) was used for categorical data like obesity and short stature. To measure association we used Chi-square test and unadjusted odd ratio (OR) was applied for 2 x 2 tables. Independent sample t-test / Mann Whitney U test was applied to compare mean/median in both groups. To make a final predictive model forward conditional Logistic regression was applied. *p-value* <0.05 and OR>1 were considered as significant.

RESULTS:

In current study the mother' and father's age was ranged 16-45years and 16-47 years. The mean weight of mother at time of delivery in preterm birth (PTB) and full term birth (FTB) group was 74.52 ± 14.72 kg and 70.82 ± 13.99 kg, respectively. The mean height of mother was 1.68 ± 0.12 m in PTB and 1.71 ± 0.14 m in FTB group with mean body mass index (BMI) in PTB and FTB as 26.67 ± 5.79 and 24.50 ± 5.89, respectively. On comparing maternal weight, height and BMI, a significant difference was observed, as in preterm group median weight and BMI was higher while height was lower, *p-value* <0.001 when compared to FTB. The mean weight of father (kg) in PTB and FTB groups was 81.81 ± 13.30 kg and 79.02 ± 16.74 kg, mean height of father was 1.74 ±

0.13 m and 1.77 ± 0.12 m, respectively. The mean BMI of fathers in PTB was higher i.e. 27.31 ± 5.56 (in pre terms) as compared to full term group i.e. 25.55 ± 6.16, *p-value* <0.0001. These unique findings about father's height are novel results as no previous study focused on these statistics; the reason can be explored in future. The short heighted fathers were generally obese that can justify its role in PTB. In this study there were 126 (11.48%) underweight females, while 504 (45.90%) females had normal BMI, 172 (15.66%) were overweight and 296 (26.96%) females were obese at time of inclusion in this study. Moreover, in this study, 103 (9.38%) fathers were underweight, 474 (43.17%) had normal BMI, 212 (19.31%) were overweight and 309 (28.14%) fathers were obese at time of inclusion in this study. The frequency of obese mothers, father and both parents was 296 (27.0%), 309 (28.1%) and 149 (13.6%), respectively. In current study there were 133 (12.1%) mothers with short stature, 92 (8.4%) fathers with short stature and 48 (4.4%) parents (both husband and wife) had short stature. There was significant association between PTB with obese mothers, obese fathers, obese parents, short stature of mother, father and of both parents, *p-value* <0.05. There were 296 obese mothers in which 177 (24.1%) were in FTB group and 119 (32.7%) were in PTB group while among 309 obese fathers there were 182 (24.8%) in FTB group and 127 (34.9%) in PTB group and when mothers and fathers were studied together it was observed that 82 (11.2%) parents in FTB and 67 (18.4%) parents in PTB group were obese. Short stature of mothers was also taken in this study as a risk factor for PTB. So, among 133 (12.11%) short statured females a total of 45 (6.1%) females were in FTB and 47 (12.9%) mothers were in PTB group. Using unadjusted OR ratio, the highest risk of PTB was seen with short statured parents i.e. OR = 2.72, proceeded by short stature of father i.e. OR = 2.27, obese parents i.e. OR = 1.80, short statured mother i.e. OR = 1.72, obese father i.e. OR = 1.62 and obese mother i.e. OR = 1.53. Using adjusted OR mother's BMI and father's short stature was found as risk factor of preterm birth with respective OR of 1.057 [1.034, 1.081] and 1.800[1.157, 2.801].

Table 1: Comparison of Quantitative Anthropometric Characteristic of Mothers, Fathers and Both Parents in PTB and FTB Groups

	Study groups	**Mean ± S.D**	**Median ± IQR**	**p-value**
Weight of Mother (kg)	*Pre term (n=364)*	74.52 ± 14.72	70 ± 22	<0.001**
	Full term (n=734)	70.82 ± 13.99	68 ± 20	
	Total (n= 1098)	72.05 ± 14.33	70 ± 21	
Height of Mother (feet)	*Pre term (n=364)*	1.68 ± 0.12	1.71 ± 0.09	0.030*
	Full term (n=734)	1.71 ± 0.14	1.74 ± 0.15	
	Total (n= 1098)	1.70 ± 0.13	1.74 ± 0.12	
BMI of mother	*Pre term (n=364)*	26.67 ± 5.79	25.96 ± 9.94	<0.001**
	Full term (n=734)	24.50 ± 5.89	22.99 ± 9.28	
	Total (n= 1098)	25.22 ± 5.95	23.32 ± 9.80	
Weight of Father (kg)	*Pre term (n=364)*	81.81 ± 13.30	80 ± 10	<0.001**
	Full term (n=734)	79.02 ± 16.74	75 ± 20	
	Total (n= 1098)	79.94 ± 15.73	80 ± 15	
Height of Father (feet)	*Pre term (n=364)*	1.74 ± 0.13	1.77 ± 0.15	0.006*
	Full term (n=734)	1.77 ± 0.12	1.80 ± 0.12	
	Total (n= 1098)	1.76 ± 0.12	1.77 ± 0.15	
BMI of father	*Pre term (n=364)*	27.31 ± 5.56	25.68 ± 8.30	<0.001**
	Full term (n=734)	25.55 ± 6.16	24.03 ± 9.52	
	Total (n= 1098)	26.14 ± 6.03	24.85 ± 8.96	

** Highly significant (significant at 0.001) & * significant at 0.05

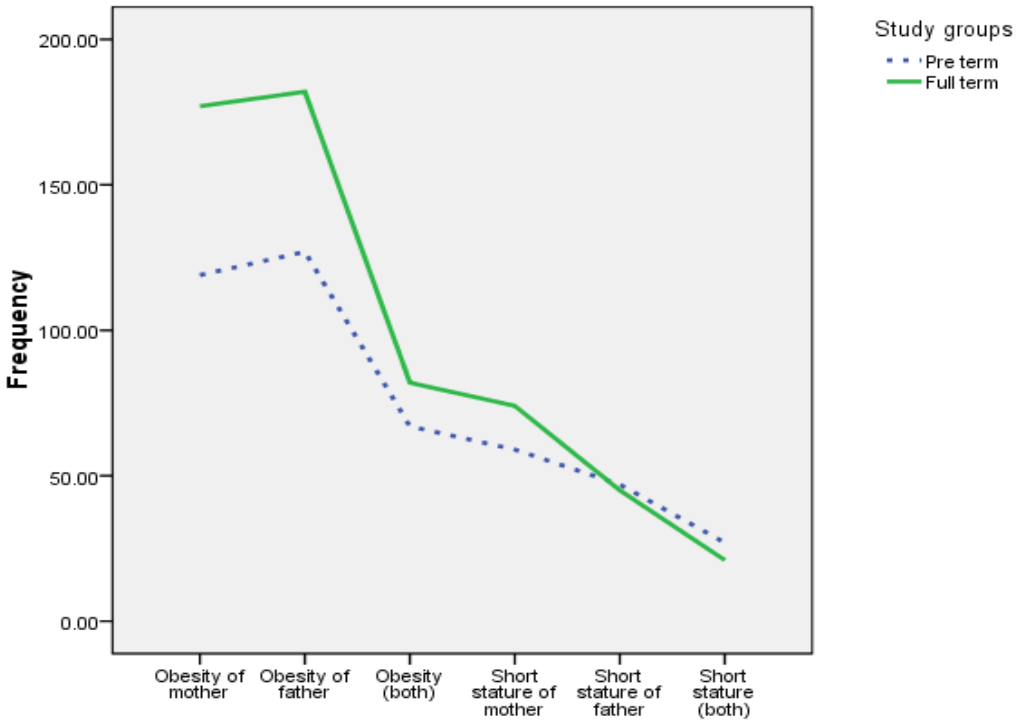

Fig 1: Comparison of Anthropometric Risk Factors in PTB and FTB

Table 2: Comparison of Anthropometric Characteristics in PTB and FTB

		Study groups (n= 1098)		*p-value*	OR (95% CI)
		PTB (n=364)	FTB (n=734)		
Obesity (Mother)	***Yes***	119 (32.7%)	177 (24.1%)	0.003*	1.53 (1.16, 2.20)
	No	245 (67.3%)	557 (75.9%)		
Obesity (Father)	***Yes***	127 (34.9%)	182 (24.8%)	<0.001**	1.62 (1.24, 2.14)
	No	237 (65.1%)	552 (75.2%)		
Obesity (both parent)	***Yes***	67 (18.4%)	82 (11.2%)	0.001*	1.80 (1.26, 2.55)
	No	297 (81.6%)	652 (88.8%)		
Short stature (Mother)	***Yes***	59 (16.2%)	74 (10.1%)	0.003*	1.72 (1.19, 2.49)
	No	305 (83.8%)	660 (89.9%)		
Short stature (Father)	***Yes***	47 (12.9%)	45 (6.1%)	<0.001**	2.27 (1.48, 3.49)
	No	317 (87.1%)	689 (93.9%)		
Short stature (Both)	***Yes***	27 (7.4%)	21 (2.9%)	0.001**	2.72 (1.52, 4.88)
	No	337 (92.6%)	713 (97.1%)		

** Highly significant (significant at 0.001) & * significant at 0.05

TABLE 3: LOGISTIC REGRESSION MODEL FOR PARENTAL ANTHROPOMETRIC RISK FACTORS FOR PRETERM BIRTH

	β	S.E	Wald	d.f	p-value	Adj OR [C.I, 95%]
Mother's BMI	0.056	0.011	25.008	1	<0.001**	1.057 [1.034, 1.081]
Father's short stature	0.588	0.226	6.797	1	0.009*	1.800[1.157, 2.801]
Constant	-2.177	0.292	55.709	1	<0.001**	0.113

** Highly significant (significant at 0.001) & * significant at 0.05

DISCUSSION:

A study reported that the highest rate of PTB of

25.2% occurred in underweight women and inadequate weight gain with AOR = 3.44 and 95% CI (2.80, 4.23) [15]. Similarly, another study was conducted among women who were overweight or obese before pregnancy, those with inadequate weight gain in early pregnancy were protected from PTBs. Among 100 normal weighted women, PTB was more likely among those with inadequate Gestational weight gain (GWG) i.e. OR = 1.57 95% with CI, 1.08, 2.22), and excessive GWG i.e. OR = 1.46, 95% CI (1.02, 2.09), compared to women with adequate GWG [16]. In addition, the women who do not reach the recommended gestational weight gain are more likely to have a PTB compared to the women which reach this weight (OR = 1.8 p <0.05) [17]. These modifiable abnormalities in pregnancy like weight gain, BMI during pregnancy impact 25% of the PTB that could identify to start preventive strategies to reduce the risk of PTB. [15] It is said that pregnant women who are obese are at an increased risk for certain complications during pregnancy, labour and delivery and in the post-partum period [18]. Maternal obesity has been reported to be associated with inflammatory up-regulation [19] through increased production of adipokines by adipose tissue and enhanced systemic secretion of pro-inflammatory cytokines [20]. In pregnancy, visceral fat mass is increased, particularly in obese women, [21] and adipokines from visceral fat are known to increase systemic inflammation [22] which subsequently leads to PTB. In current study on comparing maternal weight, height and BMI, a significant difference was observed, as in preterm group median weight and BMI was higher while height was lower, *p-value* <0.001 when compared to FTB. The mean BMI of fathers in PTB was higher i.e. 27.31 ± 5.56 (in pre terms) as compared to full term group i.e. 25.55 ± 6.16, *p-value* <0.0001. These unique findings about father's height are novel results as no previous study focused on these statistics; the reason can be explored in future. The short heighted fathers were generally obese that can justify its role in PTB. The evidence regarding risk of PTB in relation to height was taken from literature as well. A study stated that significant risk factor associated with PTB was low maternal weight (<50kg), recorded as (39%) of preterm vs. (21.7%) of full term mothers [23]. While another study reported that the risk of PTB with lower BMI was increased with OR = 2.4 [24]. These findings are further owned by another research in which they reported that women who belong to the underweight group are more likely to have PTB with OR = 2.7 [17]. Similarly a Pakistani study reported that weight of the mother during pregnancy is one of the significant factor for PTB with risk of 2.90 times [25]. Another study reported that in obese females with single pregnancy there are 16.4% time higher rate of PTB i.e. ARR of 1.5 [26]. The findings of these reported studies and current study are consistent so high body mass index must be controlled in order to reduce the risk of PTB. It is well known that short maternal stature and pelvic disproportion leads to possible prematurity [27].

Moreover, a negative statistical relationship between maternal height and PTB is seen, meaning that the taller the woman the less likely she was to have a PTB. There is inconsistency in the literature regarding the role of maternal height as a contributing factor for preterm delivery. Yet in another study no significant relationship was found between maternal height and PTB [28]. A case-control study was conducted on 153 antenatal women with PTB in India and they indicated that the PTB rate was 5.8% and commonest risk factor associated with PTB was height <1.50 m (16.8%) [29]. In 2013, another study was done on 3497 women. Women with shorter stature had shorter pregnancy length and lower risk of post-term births than taller women. In the crude analysis, taller women (≥ 173 cm) had 90% higher odds of post-term pregnancy (>42 weeks of GA) compared to the reference group (37 - 42 weeks of GA) i.e. OR = 1.9 with 95% CI (1.3, 2.9). One possible biological mechanism linking short stature directly to PTB is low uterine volume and/or small pelvic size [30]. In current using unadjusted OR we found that short stature of mother, father and of both parents were risk factors of PTB while on adjusting the OR it was found that only mother's higher BMI and father's short stature was a risk factors for preterm birth, this link must be explore in future researches.

CONCLUSION:

It is concluded that weight and BMI being modifiable factors has positive role in occurrence of PTB, so by proper strategies and with healthy life style the risk of preterm birth can be minimized.

REFERENCES:

1. Saurel-Cubizolles MJ, Zeitlin J, Lelong N, Papiernik E, Di Renzo GC, Bréart G. Employment, working conditions, and preterm birth: results from the Europop case-control survey. J Epidemiol Community Health. 2004;58(5):395-401.
2. Pompeii LA, Savitz DA, Evenson KR, Rogers B, McMahon M. Physical exertion at work and the risk of preterm delivery and small-for-gestational-age birth. Obstet Gynecol. 2005;106(6):1279-88.

3. Newman R, Goldenberg R, Moawad A, Iams J, Meis P, Das A, et al. Occupational fatigue and preterm premature rupture of membranes. Am J Obstet Gynecol. 2001;184(3):438-46.
4. Zhong Y, Cahill AG, Macones GA, Zhu F, Odibo AO. The association between prepregnancy maternal body mass index and preterm delivery. American journal of perinatology. 2010;27(4):293-8.
5. Salih S, Sutton P. Obesity, knee osteoarthritis and knee arthroplasty: a review. BMC sports science, medicine and rehabilitation. 2013;5(1):25.
6. Thangaratinam S, Rogozińska E, Jolly K, Glinkowski S, Roseboom T, Tomlinson J, et al. Effects of interventions in pregnancy on maternal weight and obstetric outcomes: meta-analysis of randomised evidence. BMJ. 2012;344:e2088.
7. Jackson K, Barisone GA, Diaz E, Jin Lw, DeCarli C, Despa F. Amylin deposition in the brain: A second amyloid in Alzheimer disease? Annals of neurology. 2013;74(4):517-26.
8. Knight JA. Diseases and disorders associated with excess body weight. Annals of Clinical & Laboratory Science. 2011;41(2):107-21.
9. Gaillard R, Durmuş B, Hofman A, Mackenbach JP, Steegers EA, Jaddoe VW. Risk factors and outcomes of maternal obesity and excessive weight gain during pregnancy. Obesity. 2013;21(5):1046-55.
10. Liu S, Allen A, Fraser W. Fetal and infant health outcomes. Canadian Perinatal Health Report. 2008.
11. Ay L, Kruithof C, Bakker R, Steegers E, Witteman J, Moll H, et al. Maternal anthropometrics are associated with fetal size in different periods of pregnancy and at birth. The Generation R Study. Int J Obstetr Gynaecol. 2009;116(7):953-63.
12. Rasmussen KM, Catalano PM, Yaktine AL. New guidelines for weight gain during pregnancy: what obstetrician/gynecologists should know. Curr Opin Obstet Gynecol. 2009;21(6):521-6.
13. Thangaratinam S, Jolly K. Obesity in pregnancy: a review of reviews on the effectiveness of interventions. BJOG. 2010;117(11):1309-12.
14. Derraik JG, Lundgren M, Cutfield WS, Ahlsson F. Maternal Height and Preterm Birth: A Study on 192,432 Swedish Women. PLoS One. 2016;11(4):e0154304.
15. Lengyel CS, Ehrlich S, Iams JD, Muglia LJ, DeFranco EA. Effect of Modifiable Risk Factors on Preterm Birth: A Population Based-Cohort. Maternal Child Health J. 2016:1-9.
16. Zhan L. Gestational Weight Gain, Pregnancy Outcomes, and Use of Perinatal Health Services. 2014.
17. Xinxo S, Bimbashi A, Kakarriqi EZ, Zaimi E. Association between maternal nutritional status of pre pregnancy, gestational weight gain and preterm birth. Materia socio-medica. 2013;25(1):6.
18. Magann EF, Doherty DA, Chauhan SP, Klimpel JM, Huff SD, Morrison JC. Pregnancy, obesity, gestational weight gain, and parity as predictors of peripartum complications. Archives of gynecology and obstetrics. 2011;284(4):827-36.
19. Ramsay JE, Ferrell WR, Crawford L, Wallace AM, Greer IA, Sattar N. Maternal obesity is associated with dysregulation of metabolic, vascular, and inflammatory pathways. J Clin Endocrinol Metab. 2002;87(9):4231-7.
20. Wisse BE. The inflammatory syndrome: the role of adipose tissue cytokines in metabolic disorders linked to obesity. J Am Soc Nephrol. 2004;15(11):2792-800.
21. Soltani H, Fraser RB. A longitudinal study of maternal anthropometric changes in normal weight, overweight and obese women during pregnancy and postpartum. Br J Nutr. 2000;84(01):95-101.
22. Fontana L, Eagon JC, Trujillo ME, Scherer PE, Klein S. Visceral fat adipokine secretion is associated with systemic inflammation in obese humans. Diabetes. 2007;56(4):1010-3.
23. Abdelhady AS, Abdelwahid A. Rate and Risk Factors of Preterm Births in a Secondary Health Care Facility in Cairo. World J Med Sci. 2015;12(1):09-16.
24. Lynch AM, Hart JE, Agwu OC, Fisher BM, West NA, Gibbs RS. Association of extremes of prepregnancy BMI with the clinical presentations of preterm birth. Am J Obstetr Gynecol. 2014;210(5):428. e1-. e9.
25. Baig SA, Khan N, Baqai T, Fatima A, Karim SA, Aziz S. Preterm birth and its associated risk factors. A study at tertiary care hospitals of Karachi, Pakistan. JPMA. 2013;63(3):414-8.
26. Wang T, Zhang J, Lu X, Xi W, Li Z. Maternal early pregnancy body mass index and risk of preterm birth. Arch Gynecol Obstetr. 2011;284(4):813-9.
27. Abu Hamad K, Abed Y, Abu Hamad B. Risk factors associated with preterm birth in the Gaza Strip: hospital-based case-control study. East Mediterr Health J. 2007;13(5):1132-41.
28. Lao TT, Pun TC. Preterm Brith Unrelated to Maternal Height in Asain Women with Singleton Gestations. J Soc Gynecol Investig. 2001;8(5):291-4.

29. Rao CR, de Ruiter LE, Bhat P, Kamath V, Kamath A, Bhat V. A case-control study on risk factors for preterm deliveries in a secondary care hospital, southern India. ISRN Obstetr Gynecol. 2014;2014:1-5.

30. Kramer MS, McLean FH, Eason EL, Usher RH. Maternal nutrition and spontaneous preterm birth. Am J Epidemiol. 1992;136(5):574-83.