



Maternal age and BMI in relation to infant birth size: a study in public health centers in the north of Iran

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ABSTRACT

Birth weight is one of the best indexes for determine mother's nutritional status and pregnancy care. The main aim of this study is determine the association between mother's BMI and birth weight based on age in rural areas in the north of Iran. This study was established on the 2459 under-five- children that were chosen from 20 villages. Birth weight and Birth height have been recorded by health file in primary health system and mothers BMI has been measured. SPSS 18.0 software was used for statistical data analysis. T-test and ANOVA were used for comparing quantities groups. P-value under 0.05 included significations. Totally, the mean \pm standard deviation of birth weight and birth height was 3211.9 ± 520 g and 49.7 ± 2.75 cm, respectively. Statistical differences were significant in both of them among three age groups ($P=0.001$ for all). Post hoc test was significant between age groups (except between 25-34 years and > 35 years age mothers based on birth weight) ($P<0.001$ for all). In >25 years mothers, the association between mother's BMI and birth weight was not steady, while it was increased with mother's BMI in 25-34 years ($P=0.001$) and in >35 years age groups ($P=0.001$). The mean of birth weight and birth height increased when mother's BMI increased except for birth weight in <25 years mothers. Dependence was found between mother's BMI and birth weight and birth height in older mothers while it was not established in younger of them. Needing food supplement in younger pregnant women should be considered in future.

Keywords: Birth weight, Mother's age, BMI, Iran

INTRODUCTION

Birth weight is one of the most related factors on the mortality rate and infancy complications [1] and it was a main role on the physical growth during infancy [2]. Some factors influence on the birth weight is included mother's age, parity, pregnancy interval, mother's BMI and smoking [3,4]. In that way, recognize of this factors and control of them is very necessary [5]. Low mother's BMI in early pregnancy increased the intrauterine growth retardation (IUGR) [6] and preterm delivery [7].

The birth weight was increased with both growing maternal pre-pregnant BMI and maternal weight gain during the 30 weeks of pregnancy [8]. Both pre-pregnancy BMI and gestational weight gain are associated with the offspring of pregnancy [8,9,10].

Several studies have demonstrated a relation between high maternal BMI and large offspring [11] and also a consistent association was seen between maternal weight gain and birth weight [12,13]. The determinants of birth weight are likely to be socially patterned [14,15]. The birth weight as a person's health trajectory over the life-course is one of the health indexes that have been associated with a host of diseases in adulthood [14,16]. Some studies [17,18] approved the association between mother's age and their children's birth size.

Of 1.7 million populations in the Golestan province (north of Iran), 43.9% and 56.1% are living in urban and rural area, respectively. The main job of rural population is agriculture and different ethnic groups such as Fars-native, Turkman and Sistani are living in this region [19].

The objective of the present study was thus to estimate the association between maternal BMI and maternal age on the birth weight and birth height in rural regions in the north of Iran in 2013.

MATERIALS AND METHODS

Study design

This was a retrospective, cross-sectional study, which carried out on 2459 from 20 villages in the north of Iran. Villages and children have been chosen by simple sampling. The calculated sample sizes of 2401 respondents at least were needed for a 95% confidence and a maximum marginal error 0.02. For all of cases, a questionnaire with contain questions on the social-demographic condition of families of children was completed by a learned team. Birth weight and Birth height have been recorded by health file in primary health system.

Mother's age has been recorded as quantities and classified by three groups: 1) 25> years, 2)25-34 years and 3) 35≤ years.

BMI was calculated as weight (kg)/height² (m²). Those with a BMI of 25.0-29.9 kg/m² was classified as overweight, whilst those with a BMI≥30.0-39.9 kg/m² was classified as obese and BMI≥ 40 was classified as pathologic obese(20).

Statistical Analyses

SPSS 18.0 software was used for statistical data analysis. T-test, ANOVA and Tukey's post hoc test were used for comparing quantities groups. P-value under 0.05 included significations. The mothers who did not like to participate in our study, has been excluded.

This study approved by Ethical Research Committee of Golestan University of Medical Sciences (G-P-35-1112). Verbal informed consent was received from all cases.

RESULTS

Totally, the mean ± standard deviation of birth weight and birth height was 3211.9±520 g and 49.7±2.75 cm, respectively. Statistical differences were significant in both of them among three age groups (P=0.001 for all). Post hoc test was significant between age groups (except between 25-34 years and > 35 years age mothers based on birth weight) (P<0.001 for all) Table 1.

Table 1: Mean (standard deviation) of birth weight and birth height according to Mothers' age groups

Mother' Age(y)	N	Birth Weight (g) Mean(SD)	Birth Height (cm) Mean(SD)
<25	743	3159.3(525.3)A	49.37(2.93)D
25-34	1375	3222.3(512.8)B	49.80(2.67)E
≥35	347	3280.8(528.7)C	50.33(2.62)F
Total	2465	3211.9(520.2)	49.74(2.75)
P-Value#		0.001	0.001

ANOVA /Post Hoc is significant between A and B, A and C, D and E, D and F, E and F (P<0.001 for all)

In >25 years group, the association between mother's BMI and birth weight was not steady, while it was increased with mother's BMI in 25-34 years (P=0.001) and in >35 years age group(P=0.001). The positive association was seen between mother's BMI and birth height in three age groups and it was significant in 25-34 years (P=0.02) and in ≥35 years groups (P=0.012) (Table 2).

Table 2: Mean (standard deviation) of birth weight and birth height according to Mother’s BMI and age groups

Mother’ Age(y)	Mothers’ BMI(kg/m ²)	N	Birth Weight (g) Mean(SD)	Birth Stature (cm) Mean(SD)
<25	<18.5	52	4850.0(283.7)	3058.2(592.9)
	18.5-24.9	369	4932.7(295.1)	3144.7(488.3)
	25.29.9	232	4954.3(280.1)	3205.8(500.2)
	≥30	90	4956.1(339.5)	3140.1(691.2)
	Total	743	4936.5(295.9)	3157.0(528.2)
P-Value			0.250	0.057
25-34	<18.5	53	4932.1(175.1)	3005.0(423.1)
	18.5-24.9	548	4969.2(260.2)	3153.3(481.7)
	25.29.9	473	4984.3(284.9)	3263.8(526.9)
	≥30	301	5005.2(256.6)	3334.2(513.0)
	Total	1375	4980.8(265.7)	3224.5(514.4)
P-Value			0.001	0.020
≥35	<18.5	10	4965.0(208.2)	3107.0(520.7)
	18.5-24.9	112	4976.3(239.4)	3145.0(504.7)
	25.29.9	122	5053.7(215.9)	3340.5(545.5)
	≥30	103	5059.4(309.7)	3402.2(497.1)
	Total	347	5028.7(256.2)	3289.0(527.4)
P-Value			0.001	0.012
Total	<18.5	115	4897.8(235.4)	3037.9(511.3)
	18.5-24.9	1029	4956.9(271.5)	3149.3(486.1)
	25.29.9	827	4986.0(275.9)	3258.9(523.4)
	≥30	514	5007.4(282.3)	3311.5(546.1)
	Total	2465	4974.1(275.3)	3213.2(519.0)
P-Value			0.001	0.001

The mother’s BMI and mean of birth weight and birth height based on age groups has been compared in Figure 1. The mean of birth weight and birth height increased when mother’s BMI increased except for birth weight in <25 years mothers. Compared with birth weight, a more convergence is seen between mother’s BMI and birth stature. A more convergence between mother’s BMI and birth height compared with birth weight was observed.

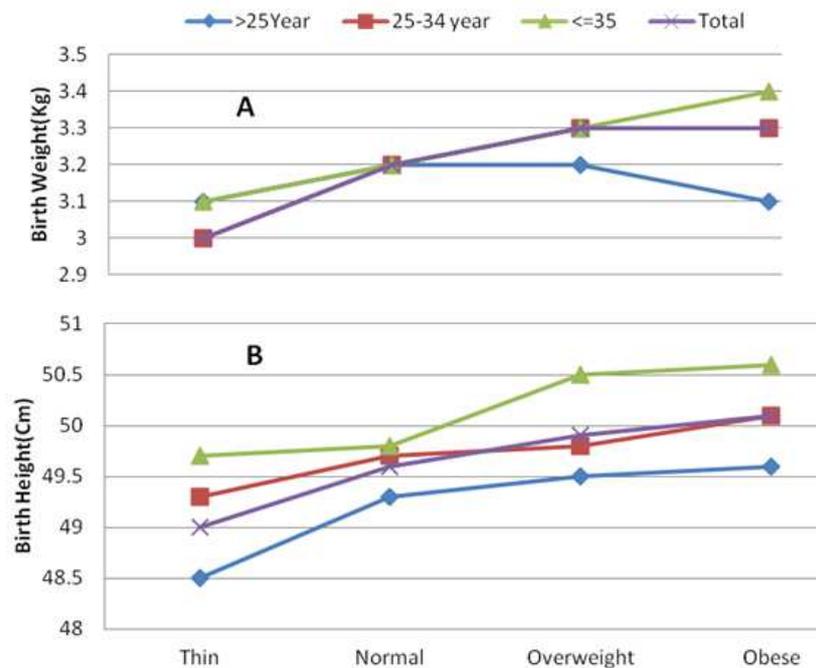


Fig. 1. The comparison of weight (A) and height (B) at birth based on mother’s age and BMI

DISCUSSION

In our study, the mean and standard deviation of birth weight and birth stature was 3211.9 ± 520 g and 49.7 ± 2.7 cm, respectively. These indexes in some hospitals in Tehran were 3139 g and 49.33 cm [21]. Birth weight in Qazvin (a capital city in center of Iran) [22] was 3248.2 ± 485 g, and in China [23] was 3233 ± 555 g. Compared with above studies, the birth weight and birth stature status in our regions is similar.

In present study, birth weight and birth stature increased with mother age. The risk of low birth weight and low birth stature were seen in under 20 year mothers [24] specially in under 16 years age of them [25,26]. Positive association was seen between mother's age and birth weight and birth stature [21,22]. In other studies [27,28] birth weight in under 25 years and over 40 years mothers was more than other age groups.

Low birth weight and low birth stature in younger mothers maybe related to preterm delivery [24,25,26]. In other hand more BMI is seen in older mothers [29,30]. Thereby more birth weight and birth stature in older mothers is explainable.

We seen positive association between birth weight and birth stature with mother's BMI after 25 years. This relation has been established in another study [31], whereas Maddah [32] was seen the effect of mother's BMI on the birth weight only in low educated subjects. Casta (33) believed that pre-pregnancy BMI have a strong influence on the birth stature. Low economic status was another factor for low birth weight [34]. Low birth weight and low birth stature in younger mothers maybe related to low BMI and preterm delivery.

We didn't assessment the food intake, pre-pregnancy BMI, supplementary during pregnancy and pregnancy care status. They are limiting factors for our study.

CONCLUSION

Dependence was found between mother's BMI and birth weight and birth stature in older mothers while it was not established in younger of them. This variation maybe related to hormonal changing during pregnancy or the body's nutritional reserves. The need supplementation during pregnancy in younger women should be considered in future.

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REFERENCES

- [1] Veghari G, Marjani A, Rahmati R, Hosseini. The State Of Birth Weight In The North Of Iran. *Journal of Clinical and Diagnostic Research*. 2009; (3)1297-1301.
- [2] Veghari G. Iron supplementation during pregnancy and birth weight in Iran: a retrospective study. *Pak J Biol Sci*. 2009; 12(5):427-32.
- [3] Shapiro C, Sulija VG, Bush J. Effect of maternal weight gain on infant weight. *J. Perinat. Med*. 2000; 28(6): 428-431.
- [4] Hickey CA. Sociocultural and behavioral influences on weight gain during pregnancy. *Am J Clin Nutri* 2000; 71(5): 1364S-1370S.
- [5] Aldous MB, Edmondson MB. Maternal age at first childbirth and risk of low birth weight and preterm delivery in Washington State. *JAMA*. 1993;270: 2577.
- [6] Neggers Y, Goldenberg RL. Some Thoughts on Body Mass Index, Micronutrient Intakes and Pregnancy Outcome. *Am Soc Nutr Sci* 2003; 133: 1737-1740.
- [7] Ehrenberg H, Dierker L, Milluzzi C, Mercer B. Low maternal weight, failure to thrive in pregnancy, and adverse pregnancy outcomes. *Am J Obstet Gynecol* 2003; 189: 1726-1730.
- [8] Stammen Koepp UM, Frost Andersen L, Dahl-Joergensen K, Stigum H, Nass O, Nystad W. Maternal pre-pregnant body mass index, maternal weight change and offspring birthweight. *Acta Obstet Gynecol Scand*. 2012; 91(2): 243-9.

- [9] Villamor E, Cnattingius S. Interpregnancy weight change and risk of adverse pregnancy outcomes: a population-based study. *Lancet*. 2006; 368: 1164–70.
- [10] Cedergren MI. Optimal gestational weight gain for body mass index categories. *Obstet Gynecol*. 2007;110:759–64.
- [11] Surkan PJ, Hsieh CC, Johansson AL, Dickman PW, Cnattingius S. Reasons for increasing trends in large for gestational age births. *Obstet Gynecol*. 2004; 104: 720–6.
- [12] Ludwig DS, Currie J. The association between pregnancy weight gain and birthweight: a within-family comparison. *Lancet*. 2010; 376: 984–90.
- [13] Dietz PM, Callaghan WM, Sharma AJ. High pregnancy weight gain and risk of excessive fetal growth. *Am J Obstet Gynecol*. 2009; 201: 51.e1–6.
- [14] Mortensen LH, Diderichsen F, Smith GD, Andersen AM. The social gradient in birthweight at term: quantification of the mediating role of maternal smoking and body mass index. *Hum Reprod*. 2009; 24: 2629–35.
- [15] Kramer MS, Seguin L, Lydon J, Goulet L. Socio-economic disparities in pregnancy outcome: why do the poor fare so poorly? *Paediatr Perinat Epidemiol*. 2000; 14: 194–210.
- [16] Baker JL, Olsen LW, Sorensen TI. Weight at birth and all-cause mortality in adulthood. *Epidemiology*. 2008; 19: 197–203.
- [17] Olga Basso et al. Mother's age at menarche and offspring size. *Int J Obes (Lond)*. 2010; 34(12): 1766–1771.
- [18] Ong KK, Northstone K, Wells JC, Rubin C, Ness AR, Golding J, et al. Earlier mother's age at menarche predicts rapid infancy growth and childhood obesity. *PLoS Med*. 2007; 4(4):e132.
- [19] Statistical Center of Iran .Population and Housing Census. Available from URL: [<http://www.sci.org.ir>].
- [20] World Health Organization. Obesity and overweight Fact sheet N 311. Available from URL: <http://www.who.int/mediacentre/factsheets/fs311/en/> Updated March 2013.
- [21] Tootoonchi P. A study of neonatal body weight and length at birth in hospitals of Tehran University of Medical Sciences. *Iran J Pediatr*, Oct 2005, Vol 15, No 3[Persian].
- [22] Nasim Bahrami, Mohammad Ali Soleimani, Farnoosh Rashvand, Hamid Sharif Nia, Shokuh Alsadat Haj seid Aboutorabi, et al. Association between seasonal patterns and birth weight. *Koomesh*. Summer 2012, 13 (4): 427 – 433. [Persian]
- [23] Zhu L, Zhang R, Zhang S, Shi W, Yan W, Wang X, et al. Chinese neonatal birth weight curve for different gestational age. *Zhonghua Er Ke Za Zhi*. 2015 Feb;53(2):97-103. [Chinese]
- [24] Xi LS. Relation between maternal age and neonatal physical development. *Zhonghua yi xue za zhi*. 1993; 73(10): 587-9.
- [25] Kinchergast S, Hartmann B. Impact of maternal age and maternal somatic characteristics on newborn size. *Am J Human Biol* 2003; 15(2): 220-8.
- [26] Borja JB, Adair LS. Assessing the net effect of young maternal age on birth weight. *Am J Hum Biol* 2003; 15(6): 733-40.
- [27] World Health Organization. International statistical classification of diseases and related health problems (ICD-10) in occupational health. Geneva 1999; 1-36.
- [28] Chodick G, Shalev V, Goren I, Inskip PD. Seasonality in birth weight in Israel: new evidence suggests several global patterns and different etiologies. *Ann epidemiol* 2007; 17: 440-446.
- [29] Veghari G, Sedaghat M, Joshaghani H, Hoseini A, Niknezhad F, Angizeh A, et al. The prevalence of obesity and its related risk factor in the north of Iran in 2006. *Journal of research in health sciences*.2010; 10(2): 116-121.
- [30] Veghari G, Sedaghat M, Joshaghani H, Hoseini A, Niknadjad F, Angizeh A et al. The prevalence and associated factors of central obesity in Northern Iran. *Iran Cardiovasc Res J*. 2010; 4(4): 164-8.
- [31] Rafraf M, Mahdavi R, Milani S and Mahboob S. The study of some related factors on the weight gain during pregnancy and birth weight. *Tabriz University of Medical Sciences*, 1993; 55:31-37.
- [32] Maddah M, Karandish M, Mohammadpour-Ahranjani B, Neyestani TR, Vafa R, Rashidi A. Social factors and pregnancy weight gain in relation to infant birth weight: a study in public health centers in Rasht, Iran. *Eur J Clin Nutr*. 2005; 59(10): 1208-12.
- [33] Costa e Silva LI, Gomes FM, Valente MH, Escobar AM, Brentani AV, Grisi SJ. The intergenerational effects on birth weight and its relations to maternal conditions, São Paulo, Brazil. *Biomed Res Int*. 2015; 2015: 615034.
- [34] Restrepo-Mesa SL, Zapata López N, Parra Sosa BE, Escudero Vásquez LE, Atalah E. Adolescent pregnancy: maternal characteristics and their association with birth weight of the newborn. *Arch Latinoam Nutr*. 2014 Jun; 64(2): 99-107.