Original Article

The Relationship of Gestational Weight Gain with Familial and Social Properties

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Abstract

Objective: Determining the familial and social factors affecting weight gain during pregnancy is highly important for women who plan a healthy pregnancy and birth. This study was carried out to determine the relationship between gestational weight gain (GWG) and familial and social characteristics.

Materials and methods: A descriptive cross-sectional study was conducted 269 pregnant women among between June 2014-April 2015 in a university hospital from Turkey. The researcher used the pregnant woman self-report form, The Multidimensional Scale of Perceived Social Support (MSPSS) form and The Marital Adjustment Test (MAT) form in collection of the data. The pregnancy weights and heights of the women were measured by the researcher using the same calibrated weighing instrument during the interview. The data were analyzed using software package.

Findings: The median gestational age of the pregnant women was 38.30 ± 0.80 weeks. Most of the pregnant women were in normal body mass index (BMI) class according to their pre-pregnancy BMI classification (46.9%), and many of whom gained insufficient weight (36.4%), and the median weight taken during pregnancy was 11.50 ± 8.55 kg.

Conclusions: In line with the data obtained from this study, we found a relationship between GWG and familial properties such as employment status, monthly income, duration of the marriage, number of pregnancies, number of live births, number of live children and whether the pregnancy is wanted. There was no relationship between GWG and MSPSS scores. There was no significant difference between MAT scores of the women and their GWG.

Keywords: BMI; pregnancy; social support; weight gain.

Introduction

The social and familial habitat which a pregnant woman is in has long been considered to have a great impact on her eating behavior, and thus, on the start of her abnormal gestational weight gaining problems. Although the Institute of Medicine (IOM) (2009) and World Health Organization (WHO) (2016) have issued GWG limits, the numbers of overweight and obese pregnant women seem to be increasing increase worldwide (Rasmussen et. al., 2009a; World Health Organization, 2016).

A safe and effective method for preventing excessive GWG is not yet available. Studies that investigate the relationship between pregnancy and obesity are often focusing on control of diet in pregnancy via social and familial support and an exercise program. However, they (Kinnunen et.al., 2007; Asbee et.al., 2009; Guelinckx et.al., 2010; Hui et.al., 2012) have revealed that such interventions do not prevent GWG and that familial and social factors have complicated implementation of such practices and even stopped them (Campbell et.al., 2011). Also the social stratum to which the pregnant woman belongs can directly affect her choice of foods that lead to obesity and/or physical activity habit (Ramos et.al., 2005; Thomas et.al., 2003). Thus, familial and social properties affect GWG. These

include social support, marital satisfaction and the quality of marriage, family history of obesity, age, pre-pregnancy body mass index (BMI), parity, education level, and family income (Hill et.al., 2013).

Determination of which of these factors affect GWG the most may contribute to the planning of GWG of women to prevent the negative outcomes of pregnancy and birth. This study aimed to determine the relationship of GWG with familial and social properties.

Materials and Methods

Research Questions: This study sought answers to the following two questions:

• Is there a relationship between GWG and familial properties (family type, educational status of the pregnant and the husband, perceived income level, social security, employment status, obstetric features of the pregnant woman and whether the pregnancy is wanted, marital status, the duration of the marriage, and marital adjustment)?

• Is there a relationship between GWG and social properties (perceived level of social support)?

This cross-sectional study was carried out in a university hospital from Turkey. The subjects were pregnant women who were admitted to this hospital from June 2014 to April 2015 at their 37th or later gestational weeks, had low risk, risky or high risk pregnancy, were at least elementary school graduates, did not have psychiatric disorders, had single fetus pregnancy, did not visit the hospital on an emergency basis, were healthy enough to be interviewed and agreed to participate in the study.

To carry out the study and collect data, approval of the Ethics Committee of Aydın Adnan Menderes University, Faculty of Medicine, Non-Interventional Clinical Research Ethics Committee (no: 14083461/050.04-195, Date: 15.05.2015) and of the Obstetrics and Gynecology Department of this university were obtained.

The sample size was calculated using G-power 3.1.3 statistical software. It was found as 269 with 95% probability (α=0.05) for the analysis of variance, f=0.25 effect size (moderate), and power=0.80 (80%), whereas it was found as 199 for the significance test of the difference between the pairs with 95% probability (α=0.05), d=0.2 effect size (small) and power = 0.80 (80%). In order to increase the power of the study, the sample size, 269, which determined the power of variance analysis as 80%, was accepted. The data were collected using an information form for pregnant women who were designed by the researcher in light of the literature, the MAT and the MSPSS. The GWG was taken as the dependent variable, whereas the obstetric characteristics of the women, the familial information of the women and of their husbands, and their MAT and MSPSS scores were taken as independent variables.

The Information Form for Pregnant Women: The information form for pregnant women aims to collect information about the demographic characteristics of the pregnant women and their husbands and the women's obstetric properties. It consists of a total of 35 items including 10 for the pregnant women, 3 for the husbands, and 22 for the women's obstetric and GWG properties.

The Marital Adjustment Test (MAT): MAT is a 15-item scale that measures the quality of marriage. It was developed by Locke and Wallace (1959) and adapted for use in Turkey by Tutarel-Kıslak (1999). The scores in the scale increase from badly-adjusted (2) to well-adjusted (158). The cut-off point which can distinguish individuals with well-adjusted and badly adjusted marriage is 43.5. To determine the reliability of the MAT, internal consistency coefficient, split-half reliability, test-retest reliability, and item-test correlations for all the participants were calculated. The internal consistency (Cronbach's Alpha) coefficient was 0.84 (0.83 for males and 0.85 for females). Split-half reliability of the scale was determined to be r = 0.84 (Celik, 2006).

The Multidimensional Scale of Perceived Social Support (MSPSS): The scale was developed by Zimet et. al. (1988) and adapted for Turkey by Eker and Arkar (1995). It consists of three subscales with 12 items showing the source of perceived social support (friends, family, and a special person) as in the original version. The scale, which measures the adequacy of the source of the individual's social support, is a 7-item Likert type self-assessment scale ranging from "totally disagree" (1) to "totally agree" (7). It measures the source of the perceived social support in three sub-scales such as family (items 3, 4, 8, 11), friends (items 6, 7, 9, 12), and significant others (items 1, 2, 5, 10). The lowest score for the subscales is 4 and the highest is 28. The lowest score for the overall scale is 12 and the

highest is 84. High scores from the score indicate that perceived social support is high (Cakır & Palabıyıkoglu, 1997).

Statistical Analysis: The data were analyzed using PASW 18 (Predictive Analytics Software) software package. The analyses included descriptive statistics, Mann Whitney-U, variance analysis, significance test of the difference between two means in independent groups, Kruskal-Wallis, and correlation analysis. Stepwise method and multiple linear regression analysis were used for determining the factors affecting the GWG. Values at $p < 0.05$ and $p < 0.01$ levels were considered statistically significant. Power analyzes were performed using G-power 3.1.3 statistical software.

Results

Familial and Social Characteristics: The mean age of women in the study was 28.86±5.61, range 18 to 46 years. The mean age of the spouses was 33.27±5.90, range 21 to 53 years. The mean length of marriage of the women was 6.00±7.00, range: 1-30 years. The average monthly income was 1350.00±1000.00 Turkish Liras (range: 500.00-13000.00 Turkish Liras). The average gestational age of the women was 38.30 ± 0.80, range 37 weeks 5 days to 42 weeks. Socio-demographic characteristics of the pregnant women were shown in Table 1.

Obstetric Features of the Pregnant Women: The mean length of gestation for women was 38.30±0.80 weeks (range 37 to 42 weeks and 5 days). The percentage of planned pregnancy was 81.0 %, while 2.2 % on a treatment for being pregnant, and 72.1 % were healthy. Other findings were as follows: number of pregnancies, 2.00±2.00 (range 1-10); number of live births, 1.00±2.00 (range 0-7); number of living children 1.00±1.00 (range 0-7); number of stillbirths, 0.00±0.00 (range 0-1); number of miscarriages, 0.00±0.00 (range 0-4); and number of curettage, 0.00±0.00 (range 0-6).

Marriage Adjustment of the Pregnant Women: The mean total score for the MAT was 51.00±9.00 (range: 6-58). Of the women 81.0 % (*n*=218) had a well-adjusted marriage (score of 43.5 and above), while 19.0 % (*n*=51) had a badly-adjusted marriage (score of below 43.5).

MSPSS and Subscale Scores: The mean total score for MSPSS was 64.12±15.99 (range: 15-84). The mean score for the family subscale was 28.00±1.00 (range: 4-28), 20.87±7.36 (range: 4-28) for the friend subscale, and for the special person subscale 19.00±24.00 (range: 4-28). Since family and special person scores did not show a normal distribution, median and Interquartile Range (IR) values were taken.

GWG of the Pregnant Women: The height of women 161.00±0.59 cm (range 147-178 cm), the mean pre-pregnancy weight was 64.00±19.00 kg (range: 36-140 kg), and the current mean weight was 74.40±19.00 kg (range: 43.9-149.3 kg). The mean BMI of the women was 24.61±7.38 (range: 14.98-53.33), and the mean weight gain was 11.50±8.55 kg (range: -14.90-40 kg). The mean GWG was 0.00±3.00 kg (range: 0-11kg) in the first trimester, and 3.00±2.00 kg (range: 0-12 kg) in the second trimester. Of the participants 149 stated that they had gained an average of 11.00±7.00 kg (range: 0-40 kg) in their first pregnancy, 55 that they had gained an average weight of 11.20±5.86 kg (range 0-25 kg) in their second pregnancy, and 10 participants that they had gained an average of 10.70±4.76 kg (range: 4-18 kg) in their third pregnancy (Table 2). Those who had 4 or more pregnancies could not remember their GWGs. Table 3 showed the distribution of features relating to GWG. The percentage of the women who changed their nutritional habits during their pregnancy was 52.0 % (Table 3). Of these 59.3 % reported that their appetite grew, 37.1 % said their appetite decreased, and 3.6 % stated that they went on a diet to control their GWG. The percent of the pregnant women receive a course on GWG was 14.5 %. Of them 74.3 % took exercise courses from the hospital, 23.1 % from the Family Health Centers, and 2.6 % from the prenatal preparatory classes. The training was given by a dietician in 64.1 %, from a midwife in 25.6 %, and 10.3 % from a practitioner (10.3 %) in the same clinic. While 9.7 % of the pregnant women planned GWG in their current pregnancies, 90.3 % stated that they did not make any plans for GWG. In 25 of 26 women who planned GWG, the mean gain was 10.96±3.32, range 4-17 kg. Some 15.4 % of those who intended to GWG planned it with their dietician, 50.0 % with a doctor or 15.4 % with a midwife in the same clinic, 11.5 % through the internet, and 7.7 % on their own decision.

Statistical Comparisons: No significant difference was found between GWG of the women

and their level of education (X^2_{K-W}=6.427, df=3, p=0.093, p>0.05) and their income levels (X^2_{K-W}=0.582, df=2, p=0.748, p>0.05). However, though weak, a positive correlation was found between GWG and monthly income obtained from the correlation analysis (p<0.05). Thus, as the monthly income increased, the weight gained increased (r=0.125, p=0.042, p<0.05).A significant difference was found between employment status and GWG (U=4108.000, Z=-3.185, p=0.001, p<0.05). A weak negative correlation was found between duration of marriage and GWG (r=-0.207, p=0.001, p<0.01) so that as the duration of marriage increased, the weight gained decreased.

The Mann Whitney-U test showed a significant difference between GWG and the wanted for the current pregnancy (U=4302.500, Z=-2.513, p=0.012, p<0.05). Those who had an unplanned pregnancy gained an average of 9.00±9.80 kg whereas those who had planned pregnancy gained an average of 12.05±6.22 kg. Correlation analysis between obstetric characteristics and current GWG, showed a weak negative relationship between gestational weight gain and the number of pregnancies (r=-.211, p=0.000, p<0.01), number of live births (r=-.217, p=0.000, p<0.01), and number of living children (r=-.212, p=0.000, p<0.01). As the numbers of pregnancies, live births, and living children increased, the weight the women gained in their current pregnancies decreased. There was a weak negative correlation between pre-pregnancy BMI and GWG of the women (r=- 0.247, p=0.00, p<0.01).The women with a well-adjusted marriage as determined by their MAT scores gained an average of 11.56±6.92 kg, whereas those with a badly-adjusted marriage gained an average of 11.88±6.41 kg. There was no significant difference between marital adjustment scores of the women and their GWG (t=0.307, p=0.759, p>0.05). Correlation analysis showed no significant correlation between marital adjustment scores of the women and their GWG (r=-0.021, p =0.737, p> 0.05). The relationship between the MSPSS and subscale scores of the women and their weight gain was not significant between the current GWG of the pregnant women and their total MSPSS score (r=0.035, p=0.567, p> 0.05), family subscale score (r=-.030, p=0.624, p> 0.05), friend subscale score (r=0.066, p=0.282, p>0.05), and the special person subscale score (r=0.020, p=0.738, p>0.05).

Four models were formed to determine the factors that affect GWG of the women. In the first, pre-pregnancy BMI, marital adjustment status, social support family subscale score, social support friend subscale score, social support special person score, and social support scale total score were taken into consideration and no autocorrelation was determined among the data (Durbin-Watson=1.719). In the second, age, educational status, and social security status were taken as an independent variable and no autocorrelation was found among the data (Durbin-Watson=1.785). The third focused on marital status, age and educational status of husbands, family type, monthly total income, and perceived income level. This showed no autocorrelation among the data (Durbin-Watson=1.748). In the fourth, the number of pregnancies, live births, living children, stillbirths, miscarriages and curettage, and pre-pregnancy health problems, status of pregnancy intention, fertility treatment, health problems during pregnancy, and gestational week were considered as independent variable. No autocorrelation was found among the data (Durbin-Watson = 1.749).

Stepwise multiple regression analyses were also performed to determine the factors that affect GWG of the women in the study. These analyses showed that there were six variables which were statistically significant and increased the exploratory rate. There was a negative relationship between GWG of the women and their pre-pregnancy BMI, age, duration of marriage, number of live births, and pre-pregnancy weight, while there was a positive relationship between the GWG and the employment status of the participants (Table 4).

Table 1. Socio-demographic Characteristics of the Pregnant Women

Descriptive Information	Number (n=269)	Percentage (%)
Education		
Elementary school	75	27.9
Middle school	79	29.4
High school	60	22.3
University and above	55	20.4
Longest place of settlement		
Mediterranean Region	10	3.7
Black Sea Region	3	1.1
Aegean Region	226	84.0
Central Anatolia Region	8	3.0
Eastern Anatolia Region	11	4.1
Southeastern Anatolia Region	7	2.6
Marmara Region	4	1.5
Social security		
Yes	247	91.8
No	22	8.2
Employed		
Yes	53	19.7
No	216	80.3
Marriage (Registered)		
Yes	266	98.9
No	3	1.1
Type of Family		
Nuclear (core)	217	80.7
Extended	52	19.3
Perceived Income (n=267)*		
Low	62	23.2
Middle	197	73.8
High	8	3.0
Health Problem Before Conception		
Yes	48	17.8
No	221	82.2
Education of Husband		
Illiterate	1	0.4
Elementary School	90	33.5
Middle School	50	18.6
High School	63	23.4
University and/or above	65	24.1
Employment of Husband		
Employed	265	98.5
Unemployed	4	1.5
Pregnancy Status		
Planned Pregnancy	218	81.0
Unplanned Pregnancy	51	19.0

*Two of the pregnant women in the study did not respond to this question.

Table 2. Height, weight, and weight gain of pregnant women

Feature	Mean/Median (n=269)	SS / IR
Height	161.00	0.59
Pre-pregnancy weight*	64.00	19.00
BMI*	24.61	7.38
Current weight*	74.40	19.00
Weight gain*	11.50	8.55
Weight gain during 1st trimester (n=238)*	0.00	3.00
Weight gain during 2nd trimester (n=229)*	3.00	2.00
Weight gain during 1st pregnancy (n=149)*	11.00	7.00
Weight gain during 2nd pregnancy (n=55)	11.20	5.86
Weight gain during 3rd pregnancy (n=10)	10.70	4.76

***** Pre-pregnancy weight, current weight, weight gain in 1st trimester, weight gain in 2nd trimester, weight gain in t 1st pregnancy, BMI, and the mean total weight gain did not show a normal distribution; thus, median and IR values were presented.

Table 3. Distribution of features relating to GWG

Features about weight gain	Number (n=269)	%
Pre-pregnancy BMI		
Underweight (<18,5)	18	6.7
Normal (18,5-24,9)	126	46.9
Overweight (25,0-29,9)	73	27.1
Obese (30 and above)	52	19.3
Status of GWG*		
Adequate	83	30.9
Low	98	36.4
High	88	32.7
Change in diet during pregnancy		
Yes	140	52.0
No	129	48.0
Receive a course on GWG		
Yes	39	14.5
No	230	85.5
Planned GWG		
Yes	26	9.7
No	243	90.3

*Classified based on IOM [1]

Table 4. Factors affecting GWG of pregnant women

Factors	Beta	Std. Error	t	% 95 confidence interval		Total R^2
				Bottom	Top	
Model 1						
Constant	18.696	1.744	10.720*	15.262	22.130	
Pre-pregnancy BMI	-0.275	0.066	-4.169*	-0.405	-0.145	0.061
Model 2						
Constant	13.238	2.300	5.754*	8.708	17.767	0.051

Employment status	3.275	1.040	3.150*	1.228	5.322	
Age	-0.192	0.074	-2.596*	-0.337	-0.046	
Model 3						
Constant	13.481	0.675	19.972*	12.152	14.810	
Duration of the marriage	-0.282	0.082	-3.421*	-0.444	-0.120	0.042
Model 4						
Constant	17.171	1.640	10.473*	13.943	20.399	
Number of live births	-1.143	0.386	-2.964*	-1.902	-0.384	
Pre-pregnancy weight	-0.066	0.024	-2.700*	-0.114	-0.018	0.072

*p< 0.05

Discussion

Our study showed that almost half of the group of pregnant women was within the normal BMI range before conception and their GWG was 11.50±8.55 kg. Correlation analysis of their pre-pregnancy BMI against GWG showed that weight gain decreased when the BMI increased. Bodnar et al. (2010) also found similar results. Contrary to these two results, Holowko et al. (2014) reported that high pre-pregnancy BMI was associated with the increased risk of higher GWG and that, although 67 % of their pregnant women had a normal BMI value before conception, about half of them gained excessive weight during their pregnancy. Their results may indicate the importance of familial effects on the eating habit of pregnant women rather than their pre-pregnancy BMI value because both Bodnar et al. (2010) and Holowko et al. (2014) studied the middle to high-level income classes while we studied middle to low-level income groups. In addition, if the value of Turkish currency relative to currencies in the countries they studied is taken into account then our subjects would be considered to be low-level income earners. Besides that many of our subjects stated that they did not know anything about exercises and had no idea about nutritional intervention.

The majority of the pregnant women with high pre-pregnancy BMI in this study was found to unaware of the importance of weight gain and had no idea of getting any advice from a healthcare professional (Rasmussen et. al., 2009a). It was understood that only a small part of them (14.5 %) had received a course about GWG; and only 9.7% had planned to GWG on their own. Herring et al. (2008) have reported that normal, overweight, and obese women gained excessive gestational weight when they misunderstood and or misjudged their pre-pregnancy weight. But the women in our study did not seem to misunderstand or misjudge the information given to them related to their pre-pregnancy weight. Rather, they were simply unaware of the negative effects of GWG so did not take any related course. Therefore, misperception and misjudgment cannot be ruled out in our particular study. More than half of the pregnant women agreed to change their nutritional habit during pregnancy. Even though the number of those who reported an increase in their appetite was 59.3 %, the number of women who knew about nutritional intervention was 14.5% and only 3.6% of the women (3.6 %) agreed to go on diet. Despite the increase in their appetite and no control of weight gaining, the

limited elevation in their weight was an odd feature that signaled how important the style of eating. This may also explain why the number of obese participants was small in our study. This may depend on the socio-genetic structure of participants in this study and the eating style of families in the western part of Turkey where the Mediterranean cuisine of vegetables, olives, and olive oil are essential part of the diets.

Our employed women gained more weight than unemployed women. Their inclination to gain weight may have resulted from irregular eating

times at work and change in eating of fast food due to the busy hours of work in stressful working environments. The demographic data indicated also that unemployed women gained less during their pregnancy in comparison to the employed ones. Because they were not performing physical exercises, the only option for them was what they eat. Consuming the healthier and more suitable Aegean Cuisine in a stress-free sedentary life at home may have contributed to less GWG.

We found GWG be related to increase in monthly income. The employment of a wife naturally increases the income of the family, and leads to a higher social stratum and an increase in socio-economic opportunities. However, Olson (2008) reported that low income was associated with excessive GWG. Tovar et al. (2010) also reported that low-income women did not care too much about GWG, while, Rothberg et al., (2011) reported that excessive GWG and the inability to lose weight after birth were quite common among young, low-income, ethnic minority women in USA. These reports indicate that low income and low education level, which were previously thought to be associated with low GWG, are linked to high GWG (Holowko et.al., 2014; Olson, 2008; National Research Council and Institute of Medicine; 2007). As a result, all low-income and low-education level subjects in the above studies were working pregnant women who consumed fast food during the day. Therefore, that fast food consumption leads to obesity is a well-known fact today. We found no link between GWG and having a social security which is also a social property of a pregnant woman. This can be explained since most of the women in our study had a social security over that of their husbands that mean they themselves do not earn their living so that they would benefit from their husbands' security. This also may mean that they may not find enough money for extra expenditure. It is well known that higher income leaves enough money outside the home budget to please the earner; registered marriage and family type were also not significantly linked to GWG. Our results indicate that many of the social features that we studied of pregnant women except higher income do not have any effect on their GWG.We found a weak negative correlation between duration of marriage and GWG. This indicates that length of marriage is more effective than an adjusted marriage and has a reducing effect on GWG. We also found that number of pregnancies had a similar effect in reducing GWG. These two results may be supportive of each other and contribute to the control of GWG together.

There was a weak relation between GWG and numbers of live births, and of living children, but no correlation between the weight gain and the numbers of stillbirths, miscarriages, and curettages. Thus, it can be said that the numbers of pregnancies, live births and living children may somehow down regulates GWG. However, Drehmer et al., (2010) and Hill et al., (2013) counted having children among the factors that increase GWG. Therefore, the decrease in weight gain as the number of children increased is significant since it refutes the misbelief that "pregnancies increase the weight gain".

We found no significant relationship between GWG and the MSPSS and its subscale scores in our women. Rasmussen et al., (2009b) identified lack of social support in pregnancy among factors that trigger GWG. Haobijam et al., (2010) found a significant positive relationship between familial supports during and after pregnancy and maternal and neonatal health. They also reported that emotional support may help pregnant mothers lose weight after giving birth. In our study almost all the women (80.7%) had a core family structure and within their social environment. But this does not mean that they received no social and emotional support from their relatives. But this support, contrary to the findings of the above two reports, was not so much effective on the nutritional habit of the aforementioned pregnant women.

Based on our findings, we found a relationship between GWG and familial properties such as employment status, monthly income, the duration of the marriage, the number of pregnancies, the number of live births, the number of live children and whether the pregnancy is wanted. We found no relationship between GWG and social properties.

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