ISSN: 2588-5715; Health Education and Health Promotion. 2019;7(4):197-203

Effect of Educational Intervention on Appropriate Weight Gain in Pregnant Women: A Primary Prevention Approach

ARTICLE INFO

Article Type
Original Research

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How to cite this article
Abedi Aminloui E, Amin-Shokravai F, Zarei F. Effect of Educational Intervention on Appropriate Weight Gain in Pregnant Women: A Primary Prevention Approach. Health Education and Health Promotion. 2019;7(4):197-203.

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Article History
Received: October 14, 2019
Accepted: October 29, 2019
ePublished: December 21, 2019

ABSTRACT

Aims A pregnant woman's nutrition is the main source for fetal development that affects both her and the fetus. The aim of this study was to investigate the effect of educational intervention on appropriate pregnancy weight gain in first-time pregnant women.

Materials & Methods This quasi-experimental study was conducted on 86 first-time pregnant women who attended eight urban health centers in Khorram Darreh, Zanjan, Iran in 2018-2019. The subjects were selected by stratified sampling method and randomly divided into intervention (N=43) and control (N=43) groups. Before intervention, maternal body mass index was measured and the NUTRIKAP questionnaire was used on both groups. The education was provided by a trained nutritionist in three hour-long sessions in the first, second, and third trimesters of pregnancy. The posttest was done immediately after training. At the end of the third trimester, the weight of the pregnant women was measured in both groups. Data were analyzed by SPSS 16 software using independent T, Chi-Square, and Univariate ANCOVA tests.

Findings By controlling the pre-test effect, after the intervention, the mean scores of knowledge (p=0.019) and practice (p<0.001) were significantly different between intervention and control groups, but there was no significant difference between the two groups in terms of attitude variable (p=0.311). The two groups had a statistically significant difference in weight gain during pregnancy (p<0.015).

Conclusion The educational intervention is effective on appropriate pregnancy weight gain in first-time pregnant women.

Keywords Pregnant Women; Education; Weight Gain

CITATION LINKS

[1] A low intensity dietary intervention for reducing ... [2] The National Comprehensive Guidline for Mothers is ... [3] New guidelines for weight gain during pregnancy: what ... [4] Weight gain during pregnancy: reexamining the ... [5] Williams Obstetrics ... [6] The prevalence of gestational diabetes mellitus and its related risk ... [7] The impact of change in pregnancy body mass ... [8] Relationship between gestational weight gain and birthweight among ... [9] Trends in gestational weight gain: the pregnancy risk ... [10] Gestational weight gain during pregnancy and ... [11] Nutritional indices of pregnant mothers nutrition ... [12] Pregnancy weight gain: still ... [13] Maternal obesity: pregnancy complications, gestational ... [14] Effect of individual dietetic intervention on .. [15] Weight control program and gestational weight gain in ... [16] Effect of diet and exercise intervention in Chinese ... [17] Designing an educational intervention to prevent ... [18] Knowledge, attitude and practice of urban and rural ... [19] Study on Nutritional Knowledge, Attitude and ... [20] Nutrition education and counseling provided by ... [21] Inadequate gestational weight gain and adverse pregnancy ... [22] Intervention during pregnancy to reduce excessive ... [23] Relationship between mothers' nutritional status and ... [24] Pregnant women's knowledge and awareness of ... [25] Effects of nutrition education on levels of nutritional ... [26] Midwives and nutrition education during pregnancy ... [27] The role of lifestyle in preventing low birth ... [28] Obesity in pregnancy: outcomes and ... [29] Factors that influence excessive gestational weight gain: moving beyond ... [30] Culture and nutrition knowledge, and their relationship with ... [31] Lifestyle intervention to prevent obesity during pregnancy: ... [32] Diet and nutritional status of women in ... [33] Health and nutrition knowledge, attitudes and ... [34] Effects of education based on health belief model on dietary behaviors ... [35] Effectiveness of nutrition education based on health... [36] Food and nutrition: customs ... [37] The effect of an educational package on nutritional ... [38] Effectiveness of antenatal preparation for childbirth ... [39] The effect of an educational intervention in early...

Introduction

A pregnant woman's diet is the main source of nutrients for the fetus. Therefore, the mother's nutrition during pregnancy affects both her and the fetus. Also, the weight gained by the mother during this period is greatly influenced by her diet [1], emphasizing the importance of nutrition during pregnancy. The range of pregnancy weight gain is very wide and it can be concluded that the incidence of clinical complications at both ends of this spectrum increases [2-4]. On the other hand, the pattern of weight gain is as important as weight gain itself among pregnant mothers with higher-than-normal values of adverse pregnancy outcomes. Increased risk of hypertension and preeclampsia, difficult labor, macrosomia, birth defects, unsuccessful vaginal delivery and increased rates of Cesarean section, postpartum hemorrhage, pregnancy infections, low Apgar score and overweight and postpartum obesity are more common in these mothers [5-7]. Poor weight gain as well as excessive weight gain are both considered as undesirable weight gain during pregnancy. Pregnancy complications in these mothers are also more frequent than those who have a favorable weight gain during pregnancy. Moreover, fetal growth restriction and birth weight loss are more common in these mothers [8]. Accordingly, proper weight gain before and during pregnancy through good and adequate nutrition are considered as effective strategies in preventing pregnancy complications.

A study was conducted by the Center for Disease Control and Prevention (CDC) on a large number of women who gave birth between 2000 and 2009. The results showed that 36% of the women had approximately normal, 44% had more than normal and 20% had less than normal weight gain [9]. Global statistics on weight gain in pregnant women appear to be consistent with those of national studies. According to only four studies, 57% of women with normal pre-pregnancy BMI had favorable weight gain during pregnancy [10]. Based on the extraction of weight gain indices among pregnant mothers until the first quarter of 2018, 2.9% of mothers were underweight, 47.9% were of normal weight, and 35% were overweight, while 13.9% were classified as obese. According to statistics, 70.1% of mothers had favorable pregnancy weight gain, and about 30% had undesirable weight gain; 9% of which had less desirable and 20.9% had more desirable weight gain [11].

Pregnancy weighing, which is one of the basic measures of prenatal care, is one of the approaches adopted by the Iranian health care system at the first visit, once the pregnancy is confirmed [12]. Pregnant women, regardless of their weight, should have healthy weight gain. Therefore, based on nutrition-based interventions, every pregnant mother's health must be monitored by either a health professional, nutritionist, midwife or physician during prenatal visits [13]. Numerous studies have recommended optimal weight gain guidelines based on educational interventions [14-17]. One of the most important challenges, regardless of the importance of proper nutrition education to a pregnant mother, is calculating the due date. Currently, the routine practice at health-care centers is that pregnant mothers receive nutritional training from midwives during prenatal care, and are referred to a nutrition expert only in cases of undesirable weight gain [2].

Maternal nutrition during pregnancy and its role in maternal and fetal health has great importance. Several studies have demonstrated the effect of adverse pregnancy weight gain on raising pregnancy complications. Moreover, statistics have shown a high prevalence of undesirable weight gain among pregnant mothers. Therefore, a regular training program during pregnancy must be implemented. This requires a primary preventive educational intervention with the aim of affecting maternal weight gain. Furthermore, from the beginning of their pregnancy, pregnant mothers should be under the supervision of a nutrition expert to monitor their weight gain during pregnancy.

Therefore, the aim of this study was to investigate the effect of educational intervention on appropriate pregnancy weight gain in first-time pregnant women.

Materials and Methods

This quasi-experimental study with pretest-posttest design with control group was conducted on pregnant mothers (n=90) who attended eight urban health centers in Khorram Darreh, 90 km east of Zanjan in 2018-2019.

The inclusion criteria were, reading literacy, willingness to participate in the study and to complete the consent form, being 18-35 years old, first pregnancy, gestational age of 8 to 12 weeks, absence of chronic diseases that required specialized care during pregnancy, an intended pregnancy, absence of any eating disorders requiring specific nutrition during pregnancy, failure to become pregnant with assisted reproductive technology and to not be on a specific or vegetarian diet. Mothers who were unwilling to continue their cooperation, wished to have an abortion or had an early delivery were excluded.

The subjects were selected by stratified sampling method. In the city of Khorram Darreh, eight affiliated and nonaffiliated urban health centers provide health care to pregnant women. In other words, all pregnant women in the city are covered by these eight centers. In this study, all urban health centers were included. Based on the population covered by each center, the demographic characteristics and socioeconomic status, these eight health centers were divided into four equal binary groups by applying the lottery method. They were then divided into either

intervention or control groups. In fact, randomization has been done at the centers to prevent contamination of information.

In Khorram Dareh, according to the data extracted from the electronic records of 90 pregnant women, the sample size for each of the intervention and control groups was 45. In the intervention group, one mother was excluded due to emigration and another due to preterm labor. In control group too two mothers were excluded due to emigration. The final participants in both group were 43. The study was based on a gestational age of 8 to 12 weeks. Given that some pregnant mothers were more than 12 weeks pregnant, sampling was done gradually to reach the intended sample size. Thus, the intervention was carried out on the samples at each given time and therefore took four months to complete.

Research tools

The NUTRIKAP structured questionnaire was used in this study [18]. The questionnaire consisted of two sections. The first section included demographic information, including questions about the age of the pregnant mother and her spouse, their educational status, the spouse's occupation and ethnicity, housing status and family welfare. The second part of the questionnaire consisted of nutritional questions and assessed the three 'knowledge', 'attitude' and 'practice' sections. The questionnaire consisted of 27 'knowledge questions', 32 'attitude questions' and 32 'practice' questions. A score was assigned to each knowledge question. The numbers one and zero were applied to known and unknown answers, respectively. Since the scores of knowledge questions ranged from zero to 59, based on the quartiles, the level of knowledge was divided into 3 groups; a score less than 29.5 was equivalent to a knowledge less than 50%, a score of 29.5-44.25 equaled a 50-75% knowledge score and a score greater than 44.25 was considered equivalent to knowledge greater than 75%. It should be noted that in the knowledge section, some of the questions themselves consisted of several further separate questions, and therefore, all of them were scored separately.

The 'attitude' section consisted of 32 questions, and scoring was based on the Likert scale with five assigned values; "totally agree", "agree", "no idea", "disagree", and "strongly disagree". A score of five was assigned to the "totally agree" option, and a score of 1 to the "strongly disagree" option, so attitude scores ranged from 32 to 160. A score less than 96 equaled an attitude of less than 50%, a score of 96-128 equaled an attitude of 50-75% and a score higher than 128 equaled an attitude above 75%. Moreover, in some questions (3, 6, 9, 10, 11, 12, 13, 14, 19, 20, 22, 23, 25, 26, 28, 29, 30, 31), the score was reversed according to the answer. A score of 5 meant "strongly disagree" and a score of 1 meant "totally agree". Therefore, a higher score meant a stronger attitude.

A score was also assigned to each 'practice' question. The score of 2 was assigned to good practice, 1 to average practice and 0 to poor practice. Given that some of the questions in the 'practice' section itself consisted of several separate questions, the practice scores ranged from 0 to 104. In the classification, a score less than 52 was considered as a practice less than 50%, a score of 52-78 was equivalent to 50-75% practice and a score above 78 equaled a practice above 75%.

The validity and reliability of the questionnaire have been previously measured by Fatehi *et al*. where the reliability was 0.79, determined by Cronbach's alpha coefficient [19]. The knowledge section's questions were completed by the researcher through a questionnaire according to the type of answers that she "knew" and "did not know", while the questions of attitude and practice were completed by the pregnant mothers. The purpose of this measure was to avoid orientating the pregnant women when answering the attitude and practice questions. At the beginning of the participants' pregnancies, their body mass index (BMI) was calculated by dividing weight by square meter to determine each subject's appropriate weight gain during pregnancy. The subject's height was measured using a bar meter attached to the weight scale, without shoes and with a measurement error of 1 cm. The participant's weight was measured using 'RASA' digital Balances (Rahbanan Sazendegi; Iran), with a margin of error of 100 grams. To prevent errors of the weight scale, the scale used was evaluated with the control scale at the centers. The participants were told to stand still in the middle of the scale. All mothers were required to take off their shoes and extra clothing (such as the hijab) to avoid weighing errors. At the end of the third trimester, the pregnant mothers' weight in both groups was measured again and the rate of maternal weight gain during pregnancy was determined.

Developing and implementing a training program

After dividing the eight urban health centers into four equal binary groups, each of the groups' bases were divided into intervention and control groups through the stratified sampling method. After completing the required form, volunteers who met the inclusion criteria completed the consent form. Subsequently, all pregnant mothers in both groups were visited by a researcher and their height, weight and BMI were measured. 'Knowledge', 'attitude' and 'practice' of mothers about nutrition was assessed by the NUTRIKAP questionnaire once before the first educational session in the first trimester of pregnancy, and a second time in the third trimester of pregnancy and after the end of the third educational session by both intervention and control group participants. The training sessions and their timing were designed according to the pretest results and the training package developed by the health education expert. Based on the pretest and the results of this study, the contents of the training package were prioritized according to the educational topics. In addition to the material extracted from available

resources on maternal nutrition, the educational package also included contents from the week-by-week pregnancy self-care book. The nutritionist briefed the participants on the training method, training package formulation, scheduling of training sessions, duration and method of training, and the difference between this method of intervention and the routine method implemented by the health education expert.

Lectures and Q&A sessions for the intervention group subjects were held in the first, second and third trimesters. Under the supervision of a health education expert and according to the training package, three hour-long training sessions were delivered by a nutritionist. Pregnant mothers were monitored by a nutritionist from the beginning of pregnancy and trained according to the training package. In fact, in this intervention, the health educator formulated the training package based on the results of the needs assessment and planned the training sessions while the nutrition expert taught the content prepared by the health educator during the specified times. On the other hand, the control group was visited by a nutritionist according to the routine method and received training whenever they experienced undesirable weight gain.

Curriculum evaluation

After the training sessions, in the third trimester of pregnancy, the NUTRIKAP questionnaire was again completed by the intervention and control group participants to assess their knowledge, attitude and practice regarding nutrition during pregnancy. All subjects who were assigned to the two groups took the test, except for four people who were later excluded in the posttest. At the end of the third trimester of pregnancy, the weight of both intervention and control group subjects was measured. Finally, the proper nutrition during pregnancy, knowledge, attitude and practice scores of mothers and their weight gain during pregnancy were compared in both groups.

Data analysis

The data were analyzed by SPSS 16 software. Descriptive statistics including frequency, percentage, mean and standard deviation were used to interpret the data. Independent t-test for quantitative demographic variables and chi-square test for qualitative demographic variables were applied to ensure that the intervention and control groups are homogeneous. Chi-square test and univariate analysis of covariance (ANCOVA) were used to determine the effectiveness of intervention.

Findings

The number of household members in all of the studied samples was two, as the mothers were pregnant with their first child. There was no significant difference between intervention and control groups in terms of quantitative and qualitative demographic variables and they were homogeneous (p>0.05; Table 1).

Table 1) Comparison of quantitative and qualitative demographic variables between intervention (N=43) and control (N=43) groups

Demographic variables	Intervention group	Control group	P value
• **Quantitative variables** (Mean±SD)			
Pregnant women's age (years)	25.67±5.32	25.16±4.67	0.637
Pregnant women's years of education	12.07±2.61	12.65±2.71	0.314
Spouse's age (years)	29.63±5.36	29.95±3.72	0.744
Spouse's years of education	11.21±2.83	11.81±3.19	0.355
• **Qualitative variables** (No. and %)			
Occupation of spouse			
Employee	2 (4.6)	4 (9.3)	
Manual worker	27 (62.8)	31 (72.1)	0.553
Freelance job	12 (27.9)	7 (16.3)	
Unemployed	2 (4.6)	1 (2.3)	
Housing situation			
Private property	21 (48.8)	16 (37.2)	0.643
Rental property	19 (44.2)	23 (53.5)	
Relatives property	3 (7.0)	4 (9.3)	
Ethnicity			
Fars	6 (14.0)	4 (9.3)	0.501
Turkish	37 (86.0)	39 (90.7)	

By controlling the pre-test effect, after the intervention, the mean scores of knowledge (p=0.019) and practice (p<0.001) were significantly different between intervention and control groups, but there was no significant difference between the two groups in terms of attitude variable (p=0.311; Table 2).

Table 2) The mean scores of knowledge, attitude and practice in intervention and control groups before and after intervention and comparisons of the posttest scores between the two groups

Variables	Before	After	F	p. value
Knowledge (0-59)				
Intervention group	34.23±8.09	39.69±6.66	5.769	0.019
Control group	36.65±6.40	39.83±6.96		
Attitude (32-160)				
Intervention group	124.30±8.96	126.91±8.99	1.038	0.311
Control group	119.88±8.65	123.39±8.22		
Practice (0-104)				
Intervention group	71.42±7.10	73.95±6.72	51.010	<0.001
Control group	66.46±12.27	66.86±12.31		

The two groups had a statistically significant difference in weight gain during pregnancy (p<0.015; Table 3).

Table 3) Comparisons of absolute and relative frequency distribution of optimal weight gain between intervention (N=43) and control (N=43) groups (the numbers in parentheses are percentages)

Weight	Intervention group	Control group
Less than normal	7 (16.3)	16 (37.2)
Normal	27 (62.8)	14 (32.6)
More than normal	9 (20.9)	13 (30.2)

Discussion

The purpose of this study was to evaluate the effect of an educational intervention on appropriate weight gain in pregnant women attending Khorram Darreh's urban health centers. Given the questions of the demographic section of the questionnaire and the

statistical tests conducted, both groups were homogenous in terms of the age of the mother and spouse, educational level of mother and spouse, occupation of spouse and other demographic characteristics. The results indicated that the primary preventive educational intervention was effective in weight gain control in pregnant women. The results of a study by Shahnazi *et al*. confirm these findings [17]. Alijahan *et al*. also demonstrated that a nutritionist's educational intervention improves maternal weight gain during pregnancy [20]. Similarly, the results of a study by Wen and Lv which is in line with the present study, showed that education is effective in pregnancy weight gain and that healthcare providers play an important role in this regard [21]. However, the results of Ronberg *et al*.'s study indicated that mothers' weight control alone is not sufficient in achieving proper weight gain during pregnancy [22].

The findings of this study showed that an educational intervention with a primary prevention approach increased the mean scores of knowledge in the intervention group. The findings of the study by Fadakar *et al*. were also consistent with the present study [23]. Blondin *et al*. had also concluded that educational interventions were effective in raising pregnant mothers' knowledge of nutrition [24]. The results of other studies, together with the present study, indicate that educational interventions have a positive effect on increasing pregnant mothers' knowledge [25, 26]. There have also been studies showing that holding training sessions alone cannot have a significant effect on improving the nutritional status of pregnant women, and other factors such as lifestyle and economic status should also be considered [27-29].

In this study, we observed that pregnant mothers who received midwifery education learnt the correct principles of nutrition during pregnancy, which affected the effect of inter-group educational intervention on knowledge. It seems that in addition to having standard and appropriate educational content, the prenatal care educator also plays an effective role in promoting maternal knowledge.

Findings showed that the intervention had no effect on the mean score of attitude. The results of Gholizadeh *et al*.'s study were also in line with the present study [30]. Also, the study by Hill *et al*. indicated that several factors such as social and cultural factors could not alter the attitude scores of individuals, despite educational interventions [31]. The results of the study by Rao *et al*. also indicated the influence of each region's culture on the nutritional status of individuals in that particular region [32]. On the other hand, some studies, contrary to the results of the present study, showed that educational interventions have had significant effects on pregnant mothers' attitudes [33-35]. It can be said that since nutrition and nutritional habits are fundamentally culture-based [36], nutrition-related attitudes are also influenced by customs, traditions and culture. As an example of the influence of our participants' (Turkish people of Zanjan province) cultural beliefs, the use of high-fat local products was believed to be beneficial. Therefore, since the attitude questions of the NUTRIKAP questionnaire are less culturally orientated, the non-significance of the statistical results of the attitude section are not unexpected.

According to the findings of this study, performing the educational intervention through the primary prevention approach had a significant effect on mean practice scores. Based on Kamalifard *et al*.'s study on the effect of an educational package on knowledge, attitude and nutritional behaviors in pregnant women, the contents of the educational package promoted their knowledge, beliefs and nutritional behaviors [37]. Shakeri *et al*. also reported similar results by implementing a training program for improving nutritional behaviors [38]. Kiani's study on nutritional practices among pregnant women showed that despite education, physiological changes during pregnancy and changes in calorie intake during this period can affect their nutritional practices [39].

There seemed to be more variation in 'practice', bearing in mind the responses given to questions in different areas, such as the type of food usually cooked or consumed during the day or week. However, as the participants in the study were pregnant, the importance they placed on their fetus's health affected certain eating habits. For instance, when questioned about dairy consumption, they did not believe that high-fat dairy products were unhealthy and could cause harm and lead to certain diseases. Nonetheless, a shift toward the consumption of low-fat pasteurized dairy products was observed in their behavior, mainly due to their status and the fetus's health. Therefore, the changes were most likely temporary and consumption of unpasteurized high-fat dairy products would become the dominant behavior after pregnancy.

Like any scientific study, this study had some limitations and strengths. The time constraints on the completion of the questionnaire, which could affect the accuracy in completing the questionnaire, as well as the type of responses in the knowledge section in completing the questionnaire can be considered as limitations. Holding multiple sessions during all three trimesters of pregnancy due to the mothers' different gestational ages covered by each center in the intervention group consumed greater time for active follow-up of mothers to participate in the educational sessions. Also, in both intervention and control groups, differences in the education of pregnant women covered by each health center by the midwifery staff of that health center may have affected the results of the mean knowledge scores, both before and after the intervention.

In view of the fact that the questionnaire items in the

'attitude' section could not adequately measure the participants' attitude, we recommend that future studies focus their attention on this issue. Furthermore, given that the participants' attitude scores were insignificant after the intervention and the fact that nutritional behaviors vary in different cultures which can affect nutritional practices-it seems that significant changes need to be made in the attitudes section of the questionnaire.

According to the results, certain changes need to be made in the field of 'attitude'. Among these changes are, an increased number of educational sessions, and the use of educational methods tailored to the target community's culture, religion and other specific characteristics, since the participants in this study had different cultural beliefs from those living in a metropolis like Tehran. Studying educational interventions undertaken by nutritionists during prenatal care is recommended. In the area of policy making, we recommend increasing the recruitment of nutritionists in the health system, as all health centers will benefit from the active presence of nutritionists, and pregnant mothers can be monitored from the beginning of pregnancy and their weight gain can be calculated under expert supervision.

Conclusion

Educational intervention with a primary prevention approach has a positive impact on healthy weight gain in pregnant mothers. During pregnancy, significant changes in the knowledge and practice indices are achieved through education.

Acknowledgements: This study was approved by the Medical Faculty of Tarbiat Modares University. We would like to thank all the participants who agreed to participate in the study as well as the Vice-Chancellor of Research of Tarbiat Modares University.

Ethical Permission: The Research Council of Tarbiat Modares University approved this study by IR.MODARES.REC.1397.208 code of ethics. The participants were assured of confidentiality. Participation in the study was voluntary and they could leave the study at any time.

Conflicts of Interests: None declared by authors.

Authors' Contribution: Abedi Aminlouei E. (First Author), Statistical Analyst (30); Amin-Shokravaei F. (Second Author), Main Researcher/Discussion Writer (40%); Zarei F. (Third Author), Introduction Writer/Methodologist (30%)

Funding/Support: This study was supported financially by Tarbiat Modares University

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