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SYSTEMATIC REVIEW ARTICLE

EDUCATIONAL INTERVENTIONS FOR A HEALTHY DIET PROMOTION DURING PREGNANCY

INTERVENÇÕES EDUCATIVAS PARA A PROMOÇÃO DA DIETA SAUDÁVEL NA GRAVIDEZ INTERVENCIONES EDUCATIVAS PARA LA PROMOCIÓN DE DIETA SALUDABLE EN EL EMBARAZO

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ABSTRACT

Objective: to identify the effectiveness of educational interventions designed to improve obstetric and/or neonatal clinical outcomes, and healthy eating behaviors in pregnant women. **Method:** systematic review performed in accordance with the orientation for revisions in health care of the Center for Reviews and Dissemination at the University of York in which five databases of articles published between 2000-2011 and references cited in articles that were initially selected, but not identified in the relevant databases, were included. Methodological characteristics were described using the Consolidated Standards of Reporting Trials Criteria. The score of the Jadad scale was used to measure the methodological quality of eligible randomized clinical trials. **Results:** The educational strategies included the use of interactive videos, advice on diet and life style, and the use of brochures. The significant results of strategies were the increased intake of fruits, vegetables, legumes and fiber-rich foods and reduced intake of fat and sugar. **Conclusion:** the scarcity of studies indicates a gap in the use of strategies for nutritional education in pregnancy. **Descriptors:** Clinical Practice Based on Evidence; Health Education; Nursing; Nutrition, Prenatal Care; Pregnancy.

RESUMO

Objetivo: identificar a eficácia das intervenções educativas destinadas a melhorar os resultados clínicos obstétricos e ou neonatal, e comportamentos alimentares saudáveis em mulheres grávidas. **Método:** revisão sistemática realizada de acordo com a orientação para revisões em cuidados de saúde do Centre for Reviews and Dissemination at the University of York em que cinco bases de dados de artigos publicados entre 2000-2011 e referências citadas em artigos que foram inicialmente selecionados, mas não identificadas nas bases de dados relevantes, foram incluídos. Características metodológicas foram descritas utilizando as normas Consolidated Standards of Reporting Trials Criteria. A pontuação da escala de Jadad foi utilizada para medir a qualidade metodológica dos ensaios clínicos randomizados elegíveis. **Resultados:** as estratégias educativas incluíram o uso de vídeos interativos, aconselhamento sobre dieta e estilo de vida, e o uso de brochuras. Os resultados significativos das estratégias foram o aumento do consumo de frutas, verduras, legumes e alimentos ricos em fibras e ingestão reduzida de gordura e açúcar. **Conclusão:** a escassez de trabalhos sinaliza uma lacuna na utilização de estratégias para educação nutricional na gestação. **Descritores:** Prática Clínica Baseada em Evidências; Educação em Saúde; Enfermagem; Nutrição, Cuidado Pré-Natal; Gravidez.

RESUMEN

Objetivo: Determinar la efectividad de las intervenciones educativas diseñadas para mejorar los resultados clínicos obstétricos y/o neonatales, y comportamientos saludables de alimentación en mujeres embarazadas. **Método:** revisión sistemática realizada en conformidad con la orientación para las revisiones del Center for Reviews and Dissemination at the University of York, en la que cinco bases de datos de artículos publicados entre 2000-2011 y las referencias citadas en los artículos que fueron seleccionados inicialmente, pero no identificadas en las bases de datos relevantes, fueron incluidos. Se describieron las características metodológicas utilizándose Consolidated Standards of Reporting Trials Criteria. La puntuación de la escala de Jadad fue utilizada para medir la calidad metodológica de los ensayos clínicos aleatorios elegibles. **Resultados:** Las estrategias educativas incluyeron el uso de videos interactivos, asesoramiento sobre dieta y estilo de vida, y el uso de los folletos. Los resultados significativos de estrategias fueron el aumento en el consumo de frutas, verduras, legumbres y alimentos ricos en fibra y la reducción de la ingesta de grasa y azúcar. **Conclusión:** la escasez de estudios indica una brecha en el uso de estrategias para la educación nutricional en el embarazo. **Descriptores:** Práctica Clínica Basada en la Evidencia; Educación en Salud; Enfermería; Nutrición; Atención prenatal; Embarazo.

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INTRODUCTION

The European Aligned Micronutrient Recommendations (EURRECA) recognizes pregnancy as a vulnerable group with increased nutritional needs to support the fetal growth and maternal development.¹

The Institute of Medicine (IOM) of the National Academy of Sciences of the USA recommends increased nutritional needs during pregnancy. These needs include increase in carbohydrates, fiber, protein and micronutrients (vit A, B complex vitamins, folate and iron).² However, official organs indicate health promotion for behaviors and healthy lifestyles, among them, the proper nutrition at different stages of life, which comprises the pregnancy.¹⁻³

Studies have demonstrated the importance of food education as a component of health promotion, disease prevention strategies, health and well-being, knowledge about nutrition, behavioral changes in food consumption and physical activity. Health professionals need to receive clarifications on issues related to maternal nutrition and care with the pregnancy to develop nutritional care and to produce effective health outcomes.⁴⁻⁵

Educational interventions for healthy eating behaviors are emphasized as tools to promote health and healthy lifestyles during pregnancy, which include adequate weight gain, physical activity, consumption of appropriate foods, supplementation of vitamins and minerals, avoiding tobacco, alcohol and other substances.⁵⁻⁶ A study shows the need for evidence-based information and strategies to develop skills to influence healthy behaviors during pregnancy.⁷

This study was conducted to evaluate the current state of science on educational interventions for healthy eating behaviors

OBJECTIVE

- To identify the effectiveness of educational interventions aimed at improving the obstetric and/or neonatal clinical outcomes, increasing healthy eating behaviors in pregnant women.

METHOD

This systematic review occurred in accordance with the orientation for reviews in health care of the Center for Reviews and Dissemination at the University of York; these guidelines govern the formulation of the review question, selection of the studies according to selection criteria, extraction of the results of the included studies, quality assessment of studies, summary of results and dissemination of the findings of the review.⁸

♦ Search strategy

The search included articles published from January 2000 to December 2011 and was conducted in five electronic databases: CINAHL, SCOPUS, PubMed/Medline, Lilacs and Cochrane. Initially, the research was carried out without the limits of time line. However, after the initial search, several relevant studies were identified. Therefore, we decided to examine only the period of the last ten years. The research strategy employed a combination of specific descriptors of each database and was purposely expanded to capture studies that could be eligible for this review (Figure 1). The list of references cited in the selected articles were searched to identify and add other studies with potential for inclusion. Oliveria, SC and Lopes, MVO developed the strategy, implemented by Oliveira, SC.

Descriptors	Databases
1 Diet habits AND intervention studies AND pregnancy	SCOPUS; PubMed/Medline; CINAHL
2 Diet habits AND health education AND pregnancy	SCOPUS; PubMed/Medline; CINAHL
3 Food nutrition education AND pregnancy	Cochrane; CINAHL;LILACS
4 Diet AND Habits AND pregnancy / Intervention AND Health AND Education	Cochrane; LILACS
5 Intervention studies AND health education	PubMed/Medline; CINAHL;LILACS
6 Food and nutrition education AND pregnancy	PubMed/Medline; CINAHL
7. Diet habits AND health promotion	SCOPUS; PubMed/Medline; CINAHL

Figure 1. Search strategy of the descriptors in the databases. Fortaleza (CE), 2014, Brazil.

♦ Inclusion criteria

Study design: this review included only randomized controlled trials (RCTs), published in English, Spanish and Portuguese.

Types of participants: pregnant women aged over 18 years who were part of the

control group (pregnant women who received prenatal care routine) and well-defined intervention group (pregnant women who received an appropriate intervention).

Types of interventions: the review included any intervention aimed at healthy eating

behaviors for promoting the health of pregnant women, individually or in combination, intended to modify risk factors for behavioral health to improve obstetric or neonatal clinical outcomes.

Types of measured results: the effects of educational interventions related to the modification of eating behaviors, changes in behavioral risk factors for maternal health and reduction of obstetric or neonatal risks and diseases. Thus, these results included the following outcomes:

Changes in eating behavior (for example, improvements in the consumption of fruits, vegetables and fibers and reductions in the consumption of saturated fats, sodium and sugar).

Changes in the level of knowledge (for example, following the official dietary recommendations to increase the knowledge about proper nutrition).

Gestational weight changes or control (for example, controlled gestational weight, gestational weight reduction).

Changes in obstetric and neonatal outcomes (e.g., gestational hypertension, Gestational Diabetes Mellitus, low birth weight, reduced fetal growth).

◆ Exclusion criteria

Studies without educational intervention on healthy eating behaviors

Studies: qualitative, observational, non-experimental and review literature.

Studies focusing on non-pregnant women

Studies focused on educational interventions at birth and postpartum

Gray literature

◆ Study selection

The search in the databases resulted in 5,705 references. Figure 1 summarizes the slection process of the items included in this review. After sorting and reading titles and abstracts and analyzing the inclusion criteria, this study included six articles. The second reviewer (Fernandes, AFC and Vasconcelos, EMR) read the questionable cases, and a joint decision was taken on their inclusion or not.

◆ Data extraction and analysis

Two researchers collected data from the studies included to provide an overview of the information collected (Figure 2). In addition, the characteristics of the educational interventions were extracted (detail of intervention, primary and secondary outcomes, statistical analysis and reviews), as shown in Figure 2. The result of Jadad was used by each reviewer to measure the methodological quality of each eligible RCT (Jadad et al., 1996).⁹ For each study, the reviewers added or deducted points independently according to the protocol of the Jadad scale (Risk of bias and quality of studies). The score was verified among reviewers (Santos, MCL and Oliveira, SC), and the differences were resolved by consensus.

Figure 2. Studies selection flowchart. Fortaleza (CE), 2014, Brazil.

RESULTS

The six studies included in this review were developed in the United States, Canada and Eastern Europe. The size of the samples ranged from 73 to 327 pregnant women

attended at prenatal clinics, public hospitals, community hospitals and maternity hospitals. The figures 2a, b and c describe the characteristics, the intervention and the results of the study, respectively.

Citation	Objectives/ hypotheses/ research question	Study settings and duration	Assessed variables	Participants: number, age, other relevant characteristics
(a) Jackson et al. 2011 ¹⁰	To determine if a medical advice video-type instrument can influence the behavior related to diet and exercise in pregnant women when compared with the usual prenatal.	The study included 05 prenatal clinics, 03 public hospitals, 02 academic practices and 01 community hospital in San Francisco. The groups were asked to return for evaluation after six weeks. The study did not report the video duration or the gestational period for women.	Pregnancy factors, high weight, food, physical activity and knowledge about diet during pregnancy	The study included 327 pregnant women in the intervention groups (IG, n = 163) or control (CG, n = 158). The average age for the IG was 26.1 years and for the CG was 26.9 years. The Hispanic race represented 39% for the IG and 42% for the CG. Education above high school for the IG was 52% and 55% for the CG. The prevalence of multiparous women in the IG was 47% and 54% for the GC. The average gestational age in the IG was 19.7 years and for the CG was 19.1 years. The normal BMI of 19.8 - 26 kgm ⁻² was found in 42% of patients in the GI and 51% in the CG.
Hui et al. 2011 ¹¹	To determine if an intervention aimed at diet and exercise can improve eating habits, increase physical activity and reduce excessive gestational weight gain.	Community Clinic of Winnipeg-Canada. The study lasted two months.	Food intake, physical activity, diabetes mellitus, gestational age, weight, gestational weight gain and birth weight.	The study included 190 pregnant women (IG, n = 102 and CG, n = 88). The average age for the IG was 30.1 years and for the CG, 28.7 years. Pre-pregnancy weight for the CG was 70.7 kg and for the IG was 68.0 kg. The pre-pregnancy BMI was 25.7 and 24.9, for the CG and the IG, respectively.
Guelinckx et al. 2010 ¹²	To determine if a lifestyle intervention based on a leaflet or educational activity can improve the feeding behavior, increase physical activity and reduce obesity in pregnant women.	Prenatal clinic of the Department of Obstetrics and Gynaecology at the University Hospital of Leuven, Belgium. Three group sessions of 1 hour were provided at 15 th , 20 th and 32 nd week of pregnancy	Weight, height, gestational age, parity, smoking, use of supplements during pregnancy, food consumed in the period of seven days during each quarter and physical activity.	The study included 122 pregnant and obese women: a control group (CG, n = 43), a passive group (PG, n = 37) and active group (AG, n = 42). Ages were of 29.4, 28.7 and 28 years, and weight before pregnancy was 90.3, 92.8 and 93.2 kg for the CG, PG and AG, respectively. The use of vitamins was 35% (CG), 26% (PG) and 35% (AG).
Asbee et al. 2009 ¹³	To assess whether an organized and consistent program of dietary advice and lifestyle prevents excess weight during pregnancy.	Obstetric residency clinic in Charlotte, North Carolina. The intervention was carried out during all the prenatal consultations. The average length of follow-up was six weeks after the intervention	Use of cigarettes, educational level, parity, number of pregnancies, pre-pregnancy weight, height, BMI, weight gain and adherence to dietary recommendations	
Wolff et al. 2008 ¹⁴	To determine whether a dietary counseling can restrict weight gain in obese women and if restriction could reduce the insuline, leptin and glucose levels.	Hvidovre Hospital and the city of Herlev, Copenhagen. The study consisted of ten consultations lasting 1 hour, not reporting gestational periods.	The weight, height, blood pressure and heart rate and measures of insulin, leptin and glucose.	The study included 50 obese women (IG, n = 23 and CG, n = 27). The average ages were 28 and 30 years, the weight before pregnancy was 97 and 95.5 kg, BMI was 34.9 and 34.6 kg and gestational age was 15 and 16 weeks for the IG and CG, respectively.

Kinnunen et al. 2007 ¹⁵	To show whether the individual counselling on diet and physical activity during pregnancy can have a positive effect on diet and physical activity and prevention of excessive gestational weight increase.	Six primary care maternity clinics in Finland. The information based on diet for one month before pregnancy and a follow-up of the previous months. The records were obtained in the first visit through the 37 th week of pregnancy.	Age, weight, height, body mass index, educational level and smoking.	The study included 105 pregnant women (IG = 49 and CG = 56). The average age was 27.6 and 28.8 years, pre-pregnancy weight was 65.7 and 61.0 kg, the BMI was 23.7 and 22.3. Secondary education was obtained in 57% and 36% of patients and 68% and 46% of the patients were non-smokers in the IG and CG, respectively.
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Citation	Intervention details	Primary results: definition, method, variables	Secondary results: definition, method, variables
(b) Jackson et al. 2011 ¹⁰	The IG received counseling focused on increased grains, fruits and vegetables intake and reduced consumption of fatty and sugary foods. The video emphasized diet and exercise behavioral changes related to weight gain during pregnancy. The intervention was part of routine prenatal care; the participants of this group discussed nutrition, exercise and weight gain with the research assistant during the consultation and subsequently received the educational computer-based video. The CG did not interact with the doctor and only received routine prenatal care; the research assistant did not ask if nutrition, weight and exercise were discussed. Maternal dietary intake was assessed by determining the food frequency of 18 items, including brief messages about the diet quality, daily and weekly, of fruits, vegetables, grains, fish, nuts and unhealthy foods, such as refined flour, fried foods and sweets	Reports of daily healthy portions of healthy foods (e.g., fruits, vegetables and grains) and unhealthy foods (for example, sweets, fatty and fried foods) and the duration and frequency of exercise.	Food knowledge, recommendations for weight gain and weight gain above the recommended BMI.
Hui et al. 2011 ¹¹	The IG received dietary counseling sessions and interviews at initial visit and again two months later. Nutritionists provided and recorded the guidelines. The interview was assisted by the use of "Food Choice Map" on the computer. At the end of each interview, the nutritionists knew the type and amount of food consumed and the total calories. Based on the Food Choice Map, the nutritionist provided guidance to food choices. The recommendations are provided according to the dietary recommendations of the country. Dietary intake was measured using a three-day food record.	Prevalence of excess gestational weight gain.	Obstetric outcomes (labor, maternal weight, NB weight, caesarean and forceps use)
Guelinckx et al.	The intervention included three groups. The first group (control group-CG) received routine prenatal care. The second group (passive group-PG) received a brochure during the first prenatal consultation. The last group (active group-AG) received the brochure and counseling with a nutritionist. The leaflet was developed specifically for the study and contained advices on nutrition, physical	Feeding habits (proteins, carbohydrates, saturated fats, dietary fiber, calcium, fruits	Obstetric results (induced hypertension, chronic hypertension, preeclampsia, labor induction, caesarean, gestational weight) and neonatal results (low birth weight, weight > 4 kg and NB size) were measured in the three groups.

2010 ¹²	activity and weight gain during pregnancy. The sessions provided information with recommendations on balanced and healthy diet, based on official national nutritional recommendations. Dietary intervention intended to replace high calorie foods (for example, fast food and sweets) by healthy alternatives (for example, fruit) to increase the low-fat foods and to reduce the intake of saturated fat. A technique of behavior modification was used to enable women to control emotions and prevent binge eating. Eating habits were measured with a 7-day food record.	and vegetables) and physical activity during the first trimester of pregnancy.	
Asbee et al. 2009 ¹³	The CG received routine prenatal care, including routine visits to the American College of Obstetricians and Gynecologists. Advice about diet and exercise during pregnancy included a standard prenatal brochure called "what to do when you are having a baby". Doctors and nurses advised participants to change any kind of diet or lifestyle. The IG received a standardized protocol on specific advice of pregnancy diet and changes in life habits. Diet recommendations were consuming 40% carbohydrates, 30% protein and 30% fat.	The rate of adherence to dietary recommendations.	Effect of weight gain and type of delivery. Other results included the rate of vaginal birth, neonatal weight and the incidence of preeclampsia, gestational Diabetes Mellitus, laceration of vagina/perineal and shoulder dystocia.
Wolff et al. 2008 ¹⁴	Pregnant women in the IG received 10 sessions of 1 hour of training on diet during pregnancy. The participants were instructed to eat a healthy diet according to the Danish official dietary recommendations (maximum 30% fat, 15-20% protein and 50-55% carbohydrates). The CG did not receive dietary guidance, and its energy and gestational weight gain were not restricted.	Weight, height and amount of food, proteins, fats, carbohydrates and alcohol	Blood samples were collected in the 27 th week of pregnancy to measure the glucose and neonatal outcomes.
Kinnunen et al. 2007 ¹⁵	The IG received intensive counseling during routine visits by public health nurses. Nine nurses worked with the IG and six nurses with the CG. Educational interventions included information on gestational weight gain according to the body mass index, physical activity counseling and advice for a healthy diet for preventing excessive weight gain. Guidelines for a healthy diet included a regular meal pattern, the importance of breakfast and eating more than one meal a day, five servings a day of different vegetables and fruits, consuming mainly high-fiber bread and reducing amount of candy and snacks for less than a serving a day. Pregnant women also received two healthy leaflets to take home.	Gestational weight gain in relation to weight gain above the recommended levels.	Standard meals and consumption of vegetables, fruits, fibers (portion/day), fiber-rich bread and sugar-rich snacks.

Citation	Analyzed results: statistical analysis and summary of results	Comments and limitations
(c) Jackson et al. 2011 ¹⁰	The groups were analyzed using Chi-square test and Student's t-test. The results showed an increase in fruits and vegetables (+0.4 servings/day), grains (+0.7 servings/day), fish, avocado and nuts (+0.7 servings/week) and a significant reduction in sugar food (-0.4 servings/day), fried food (-0.7 servings/week) and fast food (-0.5 servings/week) in the IG. All these changes were statistically significant. In contrast, there were no differences in these variables in the CG. The rate of weight gain was not different between both groups. Satisfaction with the program named "Video Doctor" was 98%. The level of general knowledge about diet, whole grains and fat was not significantly different between the CG and the IG prior to intervention ($p = 0.52$, $p = 0.081$ and $p = 0.15$, respectively). After the intervention, the IG showed greater knowledge about diet ($p = 0.009$) and dietary fat ($p = 0.0001$).	Participants reported positive effect of intervention during the follow-up. However, the lack of blinding among researchers and participants of the CG and IG may have resulted in bias. The use of video has an effect on public health due to improvements in food and exercise behavior during pregnancy.
Hui et al. 2011 ¹¹	The groups were analyzed using Chi-square test and Student's t-test. The Bonferroni correction was used for multivariate data. There was a significant decrease in fat ($p = 0.0001$), calories ($p = 0.002$), saturated fat ($p = 0.00004$) and cholesterol intake ($p = 0.001$) in the IG. The daily consumption of vegetables and fruits was not significantly different ($p = 0.43$ and $p = 0.39$, respectively) between the groups. The difference in weight gain between the two groups was not significant (CG = 15.2 +/- 5.9 kg and IG = 14.1 +/- 6.0 kg). Gestational diabetes, cesarean procedures ($p = 0.87$) and birth weight ($p = 0.73$) were not significantly different in the CG when compared to the IG. The low prevalence of excessive gestational weight gain was statistically significant in the IG ($p = 0.008$).	The authors did not describe the limitations of the study or risk of bias. Individualized interventions aimed at physical exercise and diet during pregnancy reduced the prevalence of excess gestational weight gain.
Guelinckx et al. 2010 ¹²	The groups were analyzed using analysis of variance (ANOVA), post hoc tests, Kruskal-Wallis test, and Kendall's tau-B test. Average calorie during pregnancy changed in all groups, but the significance was higher in the PG ($p = 0.016$) and AG ($p = 0.004$) compared to the CG. Saturated fat and protein decreased during the first and third trimester of pregnancy in the AG and PG compared to the CG. Calcium increased significantly in all groups. Significant increase in consumption of vegetables (PG, $p = 0.002$; AG, $p = 0.021$) in relation to the CG. Despite significant improvements in the eating habits of the IG, gestational weight gain was not significantly different between the AG (9.8-7.6 kg) or PG (10.9-5.6 kg) compared to the CG (10.6-6.9 Kg). The percentage of women with gestational weight gain according to the recommendations was 23.3%, 27% and 26.2% for the CG, PG and AG, respectively ($p = 0.981$). Gestational weight gain was correlated to pre-pregnancy BMI ($r = -0.369$, $p = 0.001$). There were no significant effects of the intervention on birth weight, pregnancy and childbirth. Hypertension was the most common complaint reported among groups.	As limitation of the study, the authors mentioned that the patients in the control group were aware that they would be included in a study aimed at promoting healthy lifestyles and reducing gestational weight gain. This factor may have influenced the 7-day food records, resulting in an underestimation of the effects of the intervention. The authors concluded that both interventions, based solely on the use of the brochure or in-group and individual sessions, improved eating habits in obese patients.
Asbee et al. 2009 ¹³	The potential differences between the groups were analyzed using Chi-square and t-test (Fisher and Mann-Whitney). Estimated odds ratios, confidence intervals and multivariate logistic regression models were also used. Participants in the IG showed less weight gain (+ 28.7/-12.5 kg compared to 35.6 +/- 15.5 kg in the CG, $p = 0.1$). However, there were no differences between these groups regarding adherence to dietary recommendations. Separately, 61.4% of participants in the IG obtained the recommended weight gain, compared to 48.8% in the CG ($p = 0.21$). A normal prepregnancy BMI was highly predictive for adherence to dietary recommendations. There was no statistical difference between the groups regarding adherence to dietary recommendations and rate of caesarean births, preeclampsia, gestational diabetes, vaginal births and vaginal lacerations	The authors described limitations, including the inability to achieve the predetermined power, the short time available to recruit pregnant women and non-exclusion of the Hawthorne effect.
Wolff	The differences were analyzed using Student's t-test and 95% confidence intervals. Dichotomous variables	The authors suggest that the effect of the intervention may have been

et al. 2008 ¹⁴	were analyzed using Chi-square test. The IG had a gestational weight gain of 6.675 kg average in comparison with the weight gain of 13.377 kg in the CG (average difference of 6.7 kg, 95% gap:-10.8-2.6 kg, p = 0.002); In addition, the decrease in the percentage of fat and carbohydrates was statistically significant (p = 0.001) in the IG compared to the CG. The difference in food intake in both groups was not statistically significant. The intervention produced no effect on fetal growth and showed low incidence of pregnancy and delivery complications	limited due to the CG participants' awareness that they were involved in a study on maternal weight restriction.
Kinnunen et al. 2007 ¹⁵	The analysis of covariance (ANCOVA), Chi-square and Fisher's exact test were used to analyze the results. There was no significant difference in the change in weight (p = 0.88). A higher proportion of women in the IG exceeded the body mass index compared to the CG (46% vs. 30%) after adjustment by confounding factors. The odds ratio (OR) for excessive gestational weight gain was not statistically significant between the groups (OR = 1.82, 95% CI 0.65-5.14). The intake of fruits and vegetables increased 0.8 servings per day (95% CI 0.3-1.4, p = 0.004) and dietary fiber increased 3.6 mg/day (95% CI 1.0-6.1, p = 0.007) in the IG compared to the CG. The differences in snacks, sugar and at least one hot meal per day (breakfast) were not statistically significant between the groups (IG = 88% and CG = 86% at baseline, while IG = 100% and CG = 96% at 36 th /37 th week of gestation). The pregnant women's adherence to the guidelines for weight gain was greater in the IG (61.4%) compared to the CG (48.8%), while weight gain was lower (28.7 +/-12.5 kg in the IG compared to 35.6 +/-15.5 kg for the CG, p = 0.01). There was no significant difference in adherence between the CG and IG. The most predictive factor of adherence to recommendations was the normal BMI before pregnancy (OR = 1,000). Eight (15%) children had high birth weight (>= 4,000 g) in the CG in comparison with zero children in the IG (P = 0.006). There were no statistical differences between the groups in the incidence of low birth weight (< 2,500 g) or other obstetric or fetal outcomes.	The small size of the sample was a major limitation of the study, reducing the possibility of detecting statistical significant effects of the intervention. In addition, there was a greater fall in the IG (29%) than in the CG (11%).

Figure 3. Characteristics of the included studies. Fortaleza (CE), 2014, Brazil.

◆ Studies interventions

All six studies focused on promoting changes in dietary habits in the population of pregnant women. Furthermore, they included the modification of physical activity^{10-2,15} and reduction/restriction of gestational weight gain.¹¹⁻¹⁵

As a strategy for educational intervention, the authors of the studies used in this review used the interactive video "Video Doctor"¹⁰; advice with nutritionist/ video on physical activity¹¹; use of a brochure / advice from nutritionist¹²; intensive counseling through the program of dietary guidance and life style¹³; dietary individual counselling in accordance with the Danish official recommendations¹⁴; intensive counseling from the routine visits made by public health nurses.¹⁵

A study used the principles of the approach of motivational interviews. In this study, the video actors simulate a conversation between healthcare providers and patients. The thoughts expressed by participants were shown, compared and advised without trial.¹⁰ The authors used the computational tool helped by the "Food Choice Map" and interview conducted by a nutritionist. Regarding physical activity, an educational video was produced for pregnant women to watch at their homes, in addition to the counseling.¹¹ Another study produced a brochure with tips on nutrition, physical activity and weight gain during pregnancy. However, the authors did not describe the process of producing the brochure (texts, images or messages).¹²

A standardized protocol on dietary advice and life style was prepared. The doctors and nurses received technical training as well as the study protocol. Each pregnant woman in the intervention group received individual guidelines. The professionals encouraged the adoption of the recommendations at each prenatal consultation.¹³

A study used 10 consultations, 1 hour each, during pregnancy with skilled nutritionist. The pregnant women of the IG received individualized guidelines.¹⁴ Authors implemented an intervention during five prenatal routine consultations and reinforcement sessions with public health nurses. The dietary advice occurred through two leaflets on healthy food delivered to pregnant women and home visits, where they discussed the need to change eating habits, as well as the barriers to change them. The model of Laitakari and Asikainen (1998) for physical activity promotion was also applied to the dietary counseling.¹⁵

A common point of the intervention element, among the six studies in this review, was the use of differentiated educational strategies than those applied in the prenatal routine. All authors sought the interaction among the subjects that participated in the study with their peers and research team, as well as the adoption of intervention strategies that would stimulate such interaction.

The time of each intervention varied between the studies, there was no uniformity of application time. Figures 2 a,b shows details of interventions.

◆ Results obtained with the interventions

With respect to the change of healthy food habits, this review studies sought to measure: consumption of fruits, vegetables, legumes, foods rich in fibers, low fat and sugars and/or nutrients (protein, carbohydrates, sugars).^{10-1,14-5} The follow-up of pregnant women regarding the official

Regarding the obstetric and neonatal outcomes, the authors of this review measured in their studies: birth weight, maternal weight, hypertension, rate of cesareans, pre-eclampsia, gestational diabetes, vaginal delivery, vaginal laceration and fetal macrosomia, but without statistical significance.¹¹⁻¹⁵

The studies included in this review, when analyzed individually, showed the occurrence of change in dietary habits in the intervention group when compared to the control group. The consumption of vegetables^{10,12,15}, fruit and fibers^{10,15} increased, as well as the consumption of foods rich in saturated fat^{10-1,14}, carbohydrate¹⁴ and sugars¹⁰ decreased.

Moreover, the results show statistically significant changes in the level of knowledge about nutrition.¹⁰ Nevertheless, the authors reported lack of statistically significant results because they did not control the content of the advice provided during the visits. These authors argued that the guidelines on weight gain, nutrition and exercise should be standardized to modify the behavior.¹³

The RCT that used the individual counseling through programs of dietary guidance in the prevention of excessive gestational weight gain pointed out that the interventions changed food habits, but their effect was limited to the gestational weight gain.^{13,15} However, the restriction of gestational weight gain from an intervention with individual counseling was statistically significant.^{11,14} Figure 2c details the results of the studies.

◆ Risk of bias and quality of the studies

The evaluation of the methodological quality of the studies ranged between low and

excellent.⁹ A study presented inappropriate randomization sequence according to allocation of clinics for the control and intervention groups with Jadad score equal to two.¹⁵ Good methodological quality (Jadad = 3) was attributed to the studies^{10,12,13} and Jadad = 4¹¹. A study was classified as excellent methodological quality (Jadad = 5).¹⁴

The difference between the score of the methodological quality among other studies of score 3 is the description and/or existence of the blinding while implementing the intervention.

The biases described by the authors refer to the little interaction between patients and little time for in-group discussions¹⁰, the potential selection of healthy patients and the impossibility of controlling the content for the counseling¹³, the self-reporting of weight gained during pregnancy, data collected before randomization, possibility of similar effect of incorrect answers between the control and intervention groups.¹⁴ They do not describe the possible biases during the execution of the study^{11-12,14-15}. Figure 2c describes the limitations of each study.

DISCUSSION

Official recommendations³ include a healthy diet during pregnancy and educational interventions for healthy eating behavior promotion represent a tool for modifying habits. Some authors argued that the nutritional education programs are tools designed to promote a healthy diet during pregnancy. Furthermore, the authors described the importance of pregnant women's access to health professionals' knowledge.¹⁴⁻⁵ Some researchers emphasize the role of midwives in interventions for the nutritional counseling of pregnant women.¹⁶

The six articles used for this review sought to identify the effectiveness of educational interventions for healthy life styles during pregnancy, which included healthy diets, physical activity and weight gain. This review highlight the scarcity of clinical trials that include educational interventions to promote healthy eating behaviors during pregnancy. This shortage is also present in the review of a study, in which the most frequently studied interventions during pregnancy related to smoking cessation and breastfeeding promotion.¹⁷

The conclusions of the six articles discussed in this review demonstrated that combinations of strategies of educational intervention had a positive effect on changes in eating behaviors during pregnancy.¹⁸⁻²⁰ The present study

showed that the educational interventions were effective strategies for changing attitudes and knowledge ($p < 0.05$).²¹

According to the studies in this review, different combinations of educational interventions relate to the introduction of healthy eating behaviors. This effect was also present in studies^{18,20,22} in which pregnant women were motivated to prepare foods with fruits and vegetables ($p < 0.001$) and increased nutrient intake during pregnancy ($p < 0.05$). A study reinforced this discussion, concluding that using a brochure was a useful means for an adequate nutritional promotion.¹⁶ Similar characteristics were described for the use of photographs as an educational tool in a project of dietary education.²³

The duration of the group discussions, the type of dietary advice and actions in health education are components of strategies to increase the effectiveness of intervention or nutritional program with pregnant women.^{10,22,24-25}

In general, the analyzed articles emphasized the interaction between the subjects who participated in the studies with their peers and research team and the adoption of strategies of intervention to encourage this interaction. A study used the Theory of Social Learning to design interventions and reduce the weight gain in pregnant women with diabetes.²² In the same way, the authors emphasized the importance of a participatory and dynamic dietary educational process.²³ A study discussed the use of Multisource Method for developing relevant interventions for health promotion and behavior change in vulnerable populations. The authors described the method for interventions focused on women with low weight in the postpartum period.²⁶

A review demonstrated the importance of the motivational interviewing approach, identifying 24 articles that support the effectiveness of the method for interventions aiming at modifying the diet and the behavior or encouraging physical activity.²⁷ However, none of these studies was carried out with the population of pregnant women.

Nurses have many experiences with strategies for the practice of health promotion and are a valuable part of the primary health care team. The health promotion interventions during pregnancy are important to prevent health conditions associated with the modifiable risk factors, such as inadequate nutrition, physical inactivity, excess weight, smoking and alcoholism. Such interventions involve changes in behavior and lifestyle.²⁸

CONCLUSION

The scarcity of studies included in this review indicates the need for studies of strategies for nutrition education of pregnant women. The results of the analyzed studies showed the effectiveness of multiple educational interventions to promote healthy eating behaviors during pregnancy.

The results showed a positive effect of the intervention, increasing the amount of vegetables, fruits and fibers and decreasing fat-, carbohydrates- and sugar-rich foods for pregnant women. Nevertheless, the changes in obstetric and neonatal outcomes after the interventions in these studies were not significant. Service providers and health professionals will probably collaborate to develop health education interventions to promote healthy eating behaviors during pregnancy.

The synthesis of the articles was hampered by the lack of homogeneity of findings and statistical analysis, for example, the impact of the intervention in food intake in accordance with the recommendations of the IOM; changing the behavior of pregnant women; obstetric and neonatal outcomes and different types of educational intervention and used method.

The implications in clinical practice consists in educational interventions designed to promote healthy dietary behaviors during pregnancy. The research involving strategies of educational intervention for nutritional guidance during pregnancy will contribute to the decision-making process of nurses and the multidisciplinary team.

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