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Current Status of Weight Management during Pregnancy

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Abstract

This paper summarizes the significance, impact and management measures of pregnancy weight management, providing ideas for the future of domestic pregnancy weight management, in order to create pregnancy management measures in line with the national conditions of our country.

Keywords

Pregnancy Period, Weight Management, Status Quo

1. Introduction

Gestational weight management (GWM) refers to the control of gestational weight gain through prenatal monitoring, dietary guidance, and exercise interventions to achieve the goal of achieving a healthy pregnancy. According to the 2010-2013 monitoring of the nutrition and health status of Chinese residents, the prevalence of low and moderate weight among women over 18 in China was 8.4%. The overweight rate was 29.9%; The obesity rate is 11.7%, and overweight and obesity are increasing year by year. According to a multi-center study in China, according to the IOM (United States Institute of Medicine) recommended standards for pregnancy weight gain in pregnant women, only 37% of pregnant women have appropriate weight gain, and 38% and 25% of pregnant women have the problem of excessive weight gain and insufficient weight gain respectively [1]. Observational studies [2] [3] show that excess GWG among women with overweight or obesity synergistically increases their elevated risk of having gestational diabetes, a cesarean delivery, a large for gestational age infant, and post-partum weight retention, and increases their child's risk of obesity. Thus, improving GWG among women with overweight or obese is a public health priority and a serious concern for healthcare delivery systems. Therefore, gestational weight control is

particularly important, and this article analyzes the development status of gestational weight management to provide guidance for gestational weight management and complete a healthy pregnancy process.

2. Weight Management Implications

Weight management during pregnancy is an important management measure that requires a synergy of three aspects: the pregnant woman, the health care provider, and the pregnant woman's family. However, most pregnant women and their families misunderstand weight management, which is influenced by the traditional beliefs of our country, and most pregnant women believe that for the fetus to grow healthily, a large amount of food should be supplemented during pregnancy. These ideas have led to the current situation of weight control of pregnant women in China is not optimistic, which leads to a linear upward trend of hypertension, eclampsia, diabetes, and other diseases in pregnant women, and there is a certain probability of adverse pregnancy events, such as neonatal congenital malformations, stillbirth, macrosomia, etc. However, studies have found that if weight management is done properly, it can reduce the risk of these diseases, which is good for both the mother and the baby.

3. The Important Impact of Weight Management

3.1. Weight Management Has a Significant Effect on the Amount of Weight Gain in Pregnant Women

Studies have shown [4] that scientific weight management controls the weight growth of pregnant women. Li *et al.* compared the amount of weight gain during pregnancy by implementing weight management intervention between the two groups of pregnant women. The results showed that the pregnancy weight gain of the experimental group was significantly lower than that of the control group after pregnancy nutrition and weight management, indicating that scientific weight management had a significant effect on the weight gain of pregnant women.

3.2. Effect of Weight Management on Pregnancy Complications

Li *et al.* found that the incidence of pregnancy complications in the experimental group, such as gestational hypertension, gestational diabetes mellitus, and anemia, was significantly lower than that in the control group. These results suggest that weight management has a significant role in preventing complications during pregnancy.

3.3. Effect of Weight Management on Pregnancy Outcomes

Jia *et al.* [5] conducted a meta-analysis of 14 studies on the relationship between gestational weight management and pregnancy outcomes, and the results showed that gestational weight management can reduce the rate of cesarean section and reduce the risk of macrosomia.

4. Weight Management Measures

4.1. Dietary Guidance

4.1.1. Nutritional Supplementation

A meta-analysis by Yu and colleagues [6] showed that in-person dietary is the most efficacious in managing GWG among pregnant women who are overweight or obese.

Studies have shown that rapid prenatal weight gain has become a public health challenge that needs to be addressed urgently. For mothers, a balanced intake of a variety of nutrients is essential. During pregnancy, women's dietary choices need to be closely aligned with their individual nutritional needs, following the nutrition pyramid principle, which is to lay a solid nutritional foundation with grains, fruits, and vegetables, and high-quality protein as the core. Because many foods naturally contain fat, a pregnant woman's diet should be low in fat, cholesterol, and vitamins. Specifically, cereals prefer coarse grains and whole wheat products; vegetables and fruits emphasize freshness and variety; protein sources recommend high-quality proteins such as soy products and fish; fat intake should avoid animal fats and choose nuts rich in healthy fats such as walnuts and peanuts instead. In terms of beverages, we advocate plain water and weak tea and limit the intake of alcohol and sugary drinks.

Within this dietary framework, it is also necessary to flexibly adjust the daily caloric intake to ensure that the energy requirements are met and the excess is avoided, taking into account the weight status, daily activity level, and possible health conditions. At the same time, regular weight and blood glucose monitoring should be carried out, and the dietary structure should be precisely adjusted according to the specific changes of gestational age, to achieve personalized nutrition management strategies and promote maternal and infant health [7].

Dietary polyphenols and fiber may reduce the risk of diabetes and complications. A recent 18-week randomized controlled trial [8] included 34 women with a mean BMI of (35.5 ± 4.0) kg/m^2 who were randomly assigned to an intervention group (280 g of blueberries and 12 g of soluble fiber per day) and a control group (standard prenatal care) by 20 weeks of pregnancy. The study showed that blueberry and soluble fiber supplementation prevented excessive pregnancy weight gain and improved glycemic control and inflammation in obese women. Another study that included 98 pregnant women with a BMI ≥ 24 kg/m^2 showed a reduced incidence of gestational diabetes mellitus in the fiber-supplemented group (8.3% versus 24.0%, P = 0.036), as well as a reduced risk of excessive weight gain and preterm delivery, but did not improve lipids [9].

Inositol is a polyalcohol widely found in cells and has some insulin-sensitizing effect. A randomized controlled trial study found that inositol supplementation of obese pregnant women during early pregnancy resulted in a significant reduction in the incidence of gestational diabetes and inositol may prevent gestational diabetes by reducing insulin resistance [10]. Wei *et al.* [11] included the results of a meta-analysis of seven RCTs that showed that supplementation with 4 g of inositol

per day reduced the incidence of GDM (RR = 0.30, 95% CI: 0.18 - 0.49, P < 0.001) and significantly lowered blood glucose levels, as well as decreasing the need for insulin therapy, and decreasing the incidence of preterm labor and neonatal hypoglycemia.

Probiotic supplementation during pregnancy regulates the composition of the gut microbiota and improves glucose and lipid metabolism. A randomized controlled trial study conducted by Callaway *et al.* [12] suggested that taking probiotics from mid-pregnancy did not prevent the risk of gestational diabetes in overweight/obese pregnant women. Pellonperä *et al.* [13] also conducted a randomized controlled trial study of a combined fish oil and probiotic intervention. The results similarly showed that the differences in maternal and infant pregnancy outcomes and intervention-related adverse effects between the intervention groups were not statistically significant. Currently, the effectiveness of various nutritional supplements in preventing gestational diabetes mellitus in overweight/obese women is variable. Dietary fiber and inositol still have a preventive effect in overweight/obese people, and probiotics seem to have a limited effect in preventing gestational diabetes. Dosage, pregnancy, and other factors should be considered when choosing nutritional supplements.

4.1.2. Personalized Nutrition Guidance

The best way to control maternal weight gain is to implement individualized nutrition guidance for pregnant women and guide pregnant women to adjust their dietary behaviors. Precision nutrition control focuses more on the special differences between individuals and integrates various factors such as dietary preferences, dietary behaviors, physical activity levels, psychology, intestinal microbiota, metabolomics, and genetic factors to formulate individualized dietary plans and interventions to optimize health or prevent, manage, and treat diseases [14].

Nutrition guidance includes regular knowledge lectures and health education. Wen Suiwen *et al.* [15] proposed that obstetricians, dietitians, and midwives should participate in the joint participation of United States National Institutes of Medicine (IOM) standards to determine the range of weight gain at different stages of pregnancy according to the pregnancy BMI, formulate weight management goals, formulate dietary plans, and provide consultation and guidance by dietitians and midwives in the management process. The results showed that this was effective in controlling weight and reducing complications. Recent studies abroad have shown that effective guidance and nutritional interventions can change the adverse outcomes of pregnancy and ensure the health of mothers and newborns, and they are relatively simple and easy to follow.

A multi-center randomized trial demonstrated that Mediterranean dietary intervention improved pregnancy weight gain and reduced the risk of gestational diabetes mellitus in pregnant women at metabolic risk without increasing the risk of near- and long-term disease in mothers and offspring [16]. Studies have shown that dietary fiber in a high-protein, low-fat diet structure helps to reduce insulin resistance, stimulate insulin secretion, and activate pancreatic receptors to regu-

late glucose release and increase pancreatic sensitivity, while a low-fat dietary regimen reduces the risk of energy overload in pregnant women and achieves the goal of controlling excessive weight gain [16]. Adherence to the Mediterranean diet during pregnancy is associated with a reduced risk of gestational diabetes mellitus, gestational hypertension, preeclampsia, and preterm labor, according to a secondary analysis of a cohort study [17]. However, there is still a lack of substantial RCTs confirming the effectiveness of this dietary pattern for the prevention of gestational diabetes mellitus, especially for overweight/obese individuals at high risk for gestational diabetes mellitus.

A recent randomized controlled feasibility trial showed that reduced-carbohydrate dietary (providing 130 - 150 g carbohydrate/day) had higher retention, and gained less weight compared to the control group [18]. The feasibility study, however, was not powered to detect differences in clinical outcomes. It is therefore unclear whether a substantial reduction in total carbohydrate intake is feasible in women with overweight or obese during pregnancy, and a full trial to test this specific approach is not warranted based on current evidence. In a study comparing the maternal glucose metabolism and pregnancy outcomes in the second half of pregnancy overweight and obese women, Goletzke and colleagues [19] failed to show an effect of a low glycemic load diet on maternal anthropometric and metabolic measures in overweight and obese pregnant women. However, the provision of detailed dietary counseling to obese pregnant women reduced the risk of excess gestational weight gain, large-for-gestational-age infants, and macrosomia. Of note, the low-GL-diet group had significantly lower energy and added sugar intakes, suggesting a potentially overall healthier diet. Furthermore, the dietary Glycemic index only differed by 2.2 units, which reflects this study's primary objective to modify the carbohydrate intake and, thereby, achieve a difference in GL, which might have prevented differences due to the dietary intervention. A meta-analysis of randomized controlled trials of low glycemic load diets in pregnancy shows a reduction in the risk of developing hyperglycemia among high-risk women [20]. The National Institute for Health and Clinical Excellence guidelines recommend a low-fat diet but do not set limits on energy [21]. Therefore, dietary interventions for pregnant women must be based on meeting their energy needs and avoiding unconventional diets that do not meet their metabolic characteristics and nutritional requirements. The aim of dietary interventions during pregnancy should be to improve dietary quality and/or control weight gain during pregnancy, not weight loss.

Dietary interventions have a complex pattern, with different proportions of nutrients consumed, as well as the timing of the start of the intervention and the duration of the intervention all likely to have an impact. Characteristics of the sample (e.g., age, ethnicity, socioeconomic conditions, number of births, and underlying medical conditions) may also have an impact on the effectiveness of the intervention [22]. Therefore, there is a large heterogeneity of studies of dietary interventions, and it is difficult to obtain a high level of evidence that a particular

dietary pattern intervention significantly reduces gestational diabetes mellitus. It is desirable to conduct future high-quality randomized controlled studies to assess the effectiveness of dietary interventions during pregnancy in preventing gestational diabetes mellitus and improving maternal and infant outcomes.

4.2. Prenatal Surveillance

Antenatal monitoring includes maternal self-monitoring and regular hospital maternal check-ups. Pregnant women's self-tests include weekly monitoring and recording of weight and abdominal circumference at home. Prenatal testing is when a health care provider asks a pregnant woman to have a prenatal examination promptly and asks the doctor to record the weight gain. Instruct pregnant women to self-monitor their fetus, calculate fetal movements, identify risks, and seek medical attention immediately if they feel unwell.

4.3. Exercise Interventions

Previous guidelines suggested that pregnant women should reduce physical activity [23]. However, over the past 20 years, research has shown that conventional wisdom may be too conservative and that aerobic exercise and strength training do not increase the risk of early pregnancy miscarriage, late pregnancy complications, fetal growth abnormalities, or other adverse fetal outcomes [24]. The results of a randomized controlled trial conducted by Wang and colleagues [25] showed a significant reduction in the incidence of gestational diabetes in overweight/obese pregnant women who engaged in supervised cycling for at least 30 min three times per week during early pregnancy. Recently, a randomized controlled trial by Pelaez *et al.* [26] increased the intensity of exercise and found that a supervised moderate- to vigorous-intensity exercise intervention was effective in reducing weight gain in overweight/obese women. Recently, a study examining the effects of combined aerobic and resistance exercise at moderate to vigorous intensities of physical activity during pregnancy on labor-related outcomes for pregnant women and infants showed that the combined exercise promoted better labor outcomes, including increased placental weight and infant birth weight, without an increased risk of macrosomia or preterm labor [27].

Notably, diet and exercise interventions are often dependent on strong adherence by study participants to achieve effective control. A study in New Zealand adopted a downloadable heart rate monitoring device and a home-based exercise intervention without gravity loading (exercise bicycle) to monitor and improve subjects' adherence, as well as to ensure the safety and feasibility of the exercise intervention [28]. While the study addresses participant adherence excellently, the requirements for equipment and research funding may be high, limiting its practical application. Therefore, the focus of future interventional studies should not be only on the effectiveness but also on the cost-effectiveness of the intervention. The results of an umbrella evaluation and updated meta-analysis based on a randomized controlled trial suggest that the effectiveness of exercise interventions

may be influenced by factors such as subject compliance, intensity of the intervention, and the presence of medically supervised interventions [29]. Notably, exercise during pregnancy for obese pre-pregnant women should start at low intensity and short duration and then gradually intensify. Exercise interventions for pregnant women with pre-pregnancy obesity are likely to be of greater benefit when initiated early in pregnancy or even before pregnancy than when initiated in mid-pregnancy.

4.4. Other Interventions

4.4.1. Adopt the "Internet Ten" IMB Model

The information motivation behavioral skills model (IMB) is a theoretical model of behavioral change that includes three modules: information, motivation, and behavior and is designed to provide patients with health-related information to enhance their motivation to change, and then prompt them to adopt healthful behaviors. The intervention based on the IMB model not only provides the necessary knowledge to the participants but also draws on psychological motivation enhancement therapy to provide motivational interventions to increase the willingness of the participants to adopt healthy behaviors [30]. Behavioral skills training, on the other hand, helped the study participants acquire objective skills and at the same time increased their self-confidence. Therefore, compared with other theoretical interventions, the IMB model places more emphasis on the importance of motivation for behavioral change, shifting the previous imbalance of focusing on knowledge but neglecting behavioral motivation [31]. Shao *et al.* [32] used the "Internet+" integrated IMB model framework to implement systematic management of the gestational weight of primiparous mothers. The results showed that the construction of the model significantly enhanced the effectiveness of pregnancy weight management of primiparous mothers, effectively curbed the phenomenon of weight gain beyond the reasonable range, and further reduced the proportion of low birth weight babies and macrosomia babies, and improved the success rate of spontaneous delivery. The IMB model can be used to understand the weight management needs of primigravid women and the questions they encounter through interviews and to develop a personalized weight management plan for them, which will lead to a change in their out-of-hospital weight management behaviors [33], complemented by behavioral skills training to help them develop a sense of good weight management behaviors, which will improve the effectiveness of weight management during pregnancy and reduce the occurrence of overweight gain during pregnancy. This series of achievements has far-reaching clinical value and guiding significance for promoting the improvement of maternal and infant health.

4.4.2. Health Education Based on the Theory of Protection Motivation

Protective Motivation Theory (PMT) refers to the process of explaining behavioral change through threat assessment and coping assessment of cognitive regulatory processes and is the main concept of behavioral change by exploring health

behaviors from the perspective of motivational factors [34]. The traditional medicalized or clinician-centered approach increases knowledge, but it does not necessarily lead to behavior change and adherence to recommendations [35]. The protection motivation theory, based on the full assessment of the patient's situation, to provide health education, can help patients understand the seriousness of the disease and the consequences of poor behavior, enhance their awareness of self-management, and promote the formation of rational diet, scientific exercise and other protective behaviors [36]. Hu *et al.* [37] designed a set of feedback-based health education and nursing intervention strategies rooted in the theory of protective motivation in the field of pregnancy weight management of pregnant women, aiming to verify its positive impact on pregnancy weight management and to guide pregnant women to establish a scientific concept of pregnancy weight management and practice healthy behaviors, to provide an empirical basis for optimizing maternal and infant health outcomes. Compared with the traditional nursing intervention model, it not only enhances the self-efficacy of pregnant women and the application ability of pregnancy weight management strategies, but also successfully reduces the rate of cesarean section, the frequent occurrence of complications during pregnancy, and the birth rate of macrosomia, and opens up a new practical path for maternal and infant health protection. It has been noted that psychological factors, social factors (social resources), factors related to education and counseling (information provision and communication), and factors related to effective care (content of care provided and methods of delivering effective care) affect weight management in overweight or obese pregnant women. Healthcare providers should provide tailored and individualized recommendations that take into consideration the factors influencing these women [38].

5. Brief Summary

During pregnancy, overweight pregnant women are more likely to develop diabetes than standard-weight pregnant women due to insulin resistance. A large intake of high-protein, high-fat, and high-calorie foods leads to excess nutrition, and with the reduction of exercise during pregnancy, it is easy to lead to endocrine disorders, resulting in disordered lipid and glucose metabolism [39], and causing gestational diabetes. During pregnancy, pregnant women who are overweight are also more susceptible to hypertension [40].

Weight gain during pregnancy is positively correlated with the birth weight of newborns. The more weight gained during pregnancy, the higher the probability of dystocia in the child, and excessive weight gain during pregnancy leads to fat accumulation, decreased pelvic floor muscle contraction, and slowed labor. Obesity leads to a lack of confidence in vaginal delivery among pregnant women, increasing the incidence of cesarean sections, surgical births, and prenatal miscarriages.

Through the analysis of the current situation, this article guides us to formulate more intervention strategies in line with China's national conditions in future re-

search, and use a variety of methods to combine diet and exercise intervention to improve pregnancy outcomes. To better protect the health of mothers and children.

6. Limitation

There are some limitations to this study. Firstly, at present, there are no uniform standards and guidelines for weight management in pregnancy in China, and one of the major reasons is the lack of high-quality prospective studies. In future studies, researchers should pay attention to the many factors that affect the effectiveness of interventional studies and improve the quality of the studies, to provide more and better clinical bases for the formulation of weight management policies during pregnancy. Secondly, differences in the living environment, medical resources, dietary structure, and cultural practices of pregnant women make their needs and effects on weight management different. In addition, the special needs and coping strategies of special populations (e.g., pregnant women of advanced age, multiple pregnancies, and other complex illnesses) cannot be adequately explored, making it difficult to apply the results of the study to a wide range of pregnant women. Finally, in terms of intervention implementation, there is a lack of uniformity in the intervention programs used in different studies. In dietary interventions, the recommended intake of nutrients and dietary patterns (e.g., number of split meals, proportion of calorie distribution) varied. In addition, there is no uniform specification for the type, intensity, frequency, and duration of exercise in exercise interventions. This makes it difficult to directly compare the results of different studies and clarify the best intervention program.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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