Inflammatory Markers and the Impact of Weight Loss in Older Women with a History of Gestational Diabetes

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Abstract

The goal of this study was to compare systemic inflammation between older women with a history of gestational diabetes (GDM) and impaired glucose tolerance (IGT) or type 2 diabetes (T2DM) and that between older women with normal glucose tolerance (NGT), as well as to examine the impact of weight loss (WL) brought on by diet and exercise training on systemic inflammation and adipokine levels in these women. This was a long-term clinical study of overweight or obese women (BMI: 32 kg/m2) aged 59 years and older who had a history of GDM and either normal glucose tolerance (NGT) or IGT/T2DM (). Women received VO2max, body composition, blood sampling, glucose tolerance testing, and 2-hour hyperinsulinemia-euglycemic clamps (40 mU m2 min) after completing 6 months of weight loss brought on by diet and activity. In the NGT group, glucose utilisation (M) was 42% greater. In comparison to the NGT group, CRP was twice as high in the IGT/T2DM group. In comparison to the IGT/T2DM group, the NGT group's adiponectin levels were 59% higher. The NGT group had a greater level of IL-6sR. Body weight, body fat, visceral fat, and subcutaneous abdominal fat were all reduced in the women. Following the intervention, fasting glucose, fasting insulin, glucose, and insulin AUC all decreased. M went up by 21%. In contrast to TNF, IL-6, SAA, and adiponectin, CRP (16%) and TNFR1 (6%) tended to decline in the group. In conclusion, despite having a similar BMI and degree of total and abdominal obesity to older women with a history of GDM who have developed IGT or T2DM, older women with these conditions have greater CRP and lower levels of adiponectin. Without significantly changing inflammatory markers or adiponectin levels over the course of six months, WL brought on by diet and activity improves body composition and raises insulin sensitivity.

Keywords: Gestational diabetes; Weight loss; metabolomics; Metabolites; Biomarkers; Nutrition; Nutritional metabolomics; Infertility; Reproductive

Introduction

The total prevalence of diabetes during pregnancy is estimated to be around 17% worldwide, including both known and previously undiagnosed cases. According to estimations, gestational diabetes mellitus (GDM) increases the mother's lifetime chance of having type 2 diabetes by 7–12 times and carries a long-term risk of 6.0 for the condition overall. Our findings suggest that postmenopausal women with prior GDM are more insulin resistant than postmenopausal women controls of similar age, adiposity, and activity levels and are as insulin resistant as women with T2DM, supporting the notion that these women are at risk for developing diabetes [1].

Inflammatory indicators are raised with obesity and diabetes, and inflammation is linked to an increased risk for cardiovascular disease. When compared to pregnant women without GDM, inflammatory markers are generally higher in GDM women. In addition, maternal adiponectin levels are markedly lower and TNF and leptin levels are greater in GDM patients compared to controls in a thorough meta-analysis. As a result, it makes sense to surmise that inflammation may contribute to the increased insulin resistance seen in older women with a history of GDM [2].

A lifestyle intervention started at or after the 16th week of gestation did not lower the risk of GDM, according to a recent meta-analysis of about 30 randomised controlled trials of diet, exercise, or both. Lifestyle interventions throughout pregnancy resulted in an 18% reduction in the risk of GDM. Women with a history of GDM may also benefit from lifestyle programmes postpartum. An increase in physical activity can reduce the chance of developing type 2 diabetes mellitus by half, and even a little amount of postpartum weight loss is linked to better glucose metabolism. We found that aerobic exercise combined with moderate weight loss decreased body weight, visceral and subcutaneous abdominal fat, and enhanced insulin sensitivity in older women with a history of GDM. However, in older women with a history of GDM, the effects of lifestyle change on adipokines were not studied. In a broader sense, however, moderate weight loss in overweight and obese adults—either on its own or in combination with exercise-reduces inflammatory markers [3].

Our data indicate that older overweight, sedentary women with a history of GDM are insulin resistant, although it is unclear what role inflammation plays in this situation. The hypothesis was that women with a history of gestational diabetes who later developed impaired glucose tolerance (IGT) or type 2 diabetes would have higher inflammatory markers and lower adiponectin levels than women with a history of GDM who have normal glucose tolerance, and that lifestyle changes would lower inflammatory profiles. In order to compare systemic inflammation in older women with a history of GDM who developed IGT or type 2 diabetes to that in those with NGT, as well as to assess the impact of weight loss brought on by diet and exercise training on systemic inflammation and adipokine levels in these women, was the purpose of this study [4].

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For this study, women from the Baltimore metropolitan region were sought for as participants. Each had a documented history of GDM that dated back between 5 and 32 years, according to a doctor or healthcare professional. Women aged 41–68 who had a body mass index (BMI) between 26 and 38 kg/m2 were overweight or obese. They were inactive, which is defined as doing aerobic exercise for less than 20 minutes twice a week, and had a weight stability score of 2.0 kg over the previous year. The study received approval from the University of Maryland Institutional Review Board. Each woman signed a formal declaration of consent. A medical history and physical examination, fasting blood chemistries, a 12-lead resting ECG, and

a graded exercise treadmill test were all performed on the subjects as part of the screening process [6]. Hormone replacement therapy, smoking, cancer, and any sign of liver, renal, haematological, or other illnesses were among the exclusion criteria [7].

An aerobic exercise and diet-based 6-month weight loss programme was successfully completed by 19 qualified women. A bigger sample size was used to report the effects of weight loss on body composition and insulin sensitivity; however, the impact of glucose tolerance on inflammatory cytokines and adiponectin levels was not studied. The American Heart Association's (AHA) Step I weight loss guidelines were covered in the weekly weight loss classes all of the ladies attended, which were led by a qualified dietitian. They were told to consume between 250 and 350 less calories per day. For six months, some ladies worked out on motorised treadmills and cycle ergometers three times per week for 45 minutes each session. Exercise had to be done for 45 minutes at a set intensity of between 50 and 60 percent of one's maximum heart rate. Heart rate monitors were used to keep an eye on the heart rate while exercising (Polar Electro Inc., Lake Success, NY) [8].

Subjects completed research testing that included body composition assessments, maximal exercise tests, oral glucose tolerance tests, and blood draws before and after they lost six months' worth of weight. For BMI (kg/m2), height (cm) and weight (kg) were calculated. In order to compute fat-free mass (FFM = lean tissue + BMC), subjects had dual-energy X-ray absorptiometry (DXA) scans (Model DPX-L, Lunar Radiation Corp., Madison, WI) that measured their bone mineral content (BMC), fat mass, and lean tissue mass. In order to identify visceral (VAT) and subcutaneous abdominal adipose tissue (SAT) areas, women additionally underwent a L4-L5 abdominal computed tomography (CT) scan (PQ 6000 Scanner General Electric Hi-Light, Cleveland, Ohio). In order to measure VO2max, a continuous treadmill test procedure was employed, and individuals had to meet two of the following three criteria, including an oxygen plateau [9].

Discussion

Results from studies that looked at inflammatory markers during pregnancy are a little ambiguous. Compared to 800 unaffected women, women with GDM had higher TNF but not CRP levels in the first trimester, although greater CRP levels were seen in a different case-control study of GDM women. In comparison to the same number of healthy pregnant women, adiponectin levels were shown to be lower in 30 GDM women. In a different study, CRP and TNF levels were greater in GDM pregnant women than in NGT pregnant women, but differences vanished after age, family history of T2DM, prior history of GDM, and prepregnancy BMI were considered. Different measurement schedules (trimester), confounder adjustments, sample sizes, and ethnicity might all play a role in explaining these discrepant findings A comprehensive review and meta-analysis of 27 trials found that GDM women had greater maternal TNF and leptin levels than controls and lower adiponectin concentrations, which would support the idea that some inflammatory markers are altered during pregnancy [10].

Information on inflammatory markers in females with a history of GDM is scarce. Soluble TNF-R2 and IL-6 levels were greater in young women with a history of GDM than in young women without a history of GDM seven years prior to enrolment.j A larger waist circumference was adversely correlated with adiponectin and significantly correlated with increased CRP, leptin, and resisting in a cross-sectional investigation of young women three years after a difficult pregnancy with GDM. Even though most women (about 70%) did not engage in the recommended amount of physical activity each week, doing so reduced their risk of developing cardiovascular and metabolic diseases. The skeletal muscle TNF gene expression in young women with GDM was not only five to six times higher than that in women with NGT during late pregnancy, but it remained three times higher than that in NGT women at one year after delivery. Further evidence that inflammation continues after GDM is provided by the fact that postpartum changes in circulating TNF did not occur in GDM women but a considerable reduction did in NGT women [11].

The current study is distinctive in that it looks at older women who have a history of GDM. Despite the fact that we did not compare older women with and without a history of GDM, the CRP, TNF, TNFR1, IL-6, and IL-6sR levels from our earlier investigation of postmenopausal women without a history of GDM do not seem to differ from those of the women in the current study with a history of GDM. TNF, TNFR1, IL-6, and SAA were not substantially different between groups in the current investigation, where all of the participants were female and had a history of GDM. However, those who developed IGT or type 2 diabetes had higher CRP levels. We have demonstrated that in women with a history of GDM, total body fat mass and subcutaneous abdominal fat are connected to insulin resistance, and we now add that elevated CRP is associated with decreased insulin sensitivity. Additionally, we are not aware of any research that have looked at adiponectin levels in elderly women with a history of GDM. According to our findings, the NGT women with a history of GDM had higher adiponectin levels than the IGT/T2DM group. In addition, increased adiponectin levels were linked to improved insulin sensitivity by the glucose clamp in this group of women who had a history of GDM, similar to our earlier study in women without a history of GDM. As a result, inflammation, as shown by high CRP and low adiponectin, may change [12].

Conclusions

According to the study's findings, older women with a history of GDM who had developed IGT or T2DM had higher CRP and lower adiponectin levels than women who had NGT, even though their fitness and adiposity levels were similar. The glucose clamp results also showed that these older women had IGT or T2DM had a relationship with insulin resistance and sensitivity, respectively, compared to women who had NGT. However, this group of older women experienced very minor improvements in inflammation as a result of the lifestyle modification. As a result, inflammation in older women with a history of GDM seems to contribute to insulin resistance, even though other factors may have a greater impact on the metabolic improvements seen with weight loss and exercise.

Conflict of Interest

None

Acknowledgement

None

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