



# The effects of mindfulness eating and yoga exercise on blood sugar levels of pregnant women with gestational diabetes mellitus



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## ABSTRACT

**Aim:** This randomized controlled trial was carried out to investigate the effect of mindfulness eating and yoga exercise on blood sugar levels among pregnant Thai women with GDM.

**Background:** Interventions promoting achievement of good glycemic control result in desired pregnancy outcomes. Little is known about the health benefits of mindfulness eating and yoga exercise on blood sugar levels among pregnant with GDM.

**Methods:** A randomized controlled trial was carried out. Main outcome measures were capillary fasting plasma glucose, 2-h postprandial blood glucose, and hemoglobin A1c.

**Results:** The intervention group showed significantly reduced fasting plasma glucose, 2-h postprandial blood glucose, and glycosylated hemoglobin (HbA1c) in the intervention group ( $p < 0.05$ ).

**Conclusions:** Mindfulness eating and yoga exercise had health benefits on glycemic control in pregnant women with GDM. It should be recommended in clinical and community health services.

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## 1. Introduction

Pregnant women who are overweight or obese and do not take regular exercise regularly are more likely to develop gestational diabetes mellitus (GDM). The prevalence of GDM is increasing worldwide. Between 2 and 9% of pregnant women develop GDM depending on the population. The prevalence of GDM among pregnant women in the United State of America and England was 3–6% and 3.5%, respectively (Bhake & Dayan, 2010). In Thailand, 7.05% of screened pregnant women were diagnosed with GDM (Lueprasitsakul, Teeyapun, Kittivarakul, Srisupundit, & Patumanond, 2008).

GDM is defined as glucose intolerance which is first detected or diagnosed during pregnancy, particular after 24 weeks of gestation (ADA, 2012). Its manifestations include elevated postprandial and fasting blood glucose. According to White's obstetric classification, GDM is classified into two classes: class A1 and class A2. GDM class A1 is diagnosed when fasting plasma glucose is less than 105 mg/dL and 2-h postprandial blood glucose less than 120 mg/dL and can be controlled with medical nutrition therapy alone. GDM class A2 is defined when fasting plasma glucose is more than 105 mg/dL and 2-h

postprandial blood glucose is more than 120 mg/dL. It is necessary to lower blood glucose using insulin along with medical nutrition therapy and some kinds of exercise (Gilbert, 2011).

Research evidence reveals that significant factors associated with developing GDM are high pre-pregnancy body mass index, previous GDM, a history of giving birth to large-for-gestational-age baby, and family history of diabetes (Webb, 2013). The odds ratios of developing GDM among women who are overweight, obese, and severely obese are 2.14, 3.56, and 8.56, respectively, when compared with those who are normal weight (Chu, Callaghan, Kim, Schmid, & Lau, 2009).

Pregnant women with GDM are more likely to develop gestational hypertension, preeclampsia, or preterm labor. A serious metabolic complication is diabetic ketoacidosis, which might cause maternal death (Evans, 2009). Maternal hyperglycemia also results in large-for-gestational-age infants, which are at risk for birth injury due to shoulder dystocia. Infants born to mothers with a history of GDM are more likely to develop neonatal hypoglycemia and hyperbilirubinaemia (Serlin & Lash, 2009).

Management of GDM aims at lowering fasting or preprandial plasma glucose to less than 95 mg/dl and 2-h postprandial blood glucose to less than 120 mg/dl (ADA, 2012; Ballas, Moore, & Ramos, 2012). Using insulin, medical nutrition therapy and exercise are considered standard guidelines for glycemic control in pregnant women with GDM (ADA, 2012; Webb, 2013). In clinical practice, dietitians and staff nurses educate and counsel these women about carbohydrate choices and low glycemic foods. However, it was reported that around 60% of pregnant women with GDM could not achieve the target of glycemic control (Veerawamy, Vijayam, Gupta, & Kapur, 2012).

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Additional and alternative diabetes self-management methods need to be explored. Exercise is suggested for its therapeutic effect of promoting muscular utilization of glucose and improving insulin sensitivity (Jacqueminet & Jannot-Lamotte, 2010). In clinical practice, specific recommendations for pregnant women with GDM are lacking. Moreover, mindfulness eating is widely recommended and practiced for reducing the amount of consumed food and improving eating disorder (Daubenmier et al., 2011). Little is known about the effect of mindfulness eating on glycemic control among pregnant women with GDM. Therefore, this study aimed to determine the effect of mindfulness eating and yoga exercise on blood glucose levels among pregnant Thai women with GDM class A1.

## 2. Methods

### 2.1. Research design

A randomized controlled trial was carried out to determine whether mindfulness eating and yoga exercise had an effect on glycemic control of pregnant Thai women with GDM A1. Randomization of participants into the intervention group or the control group was performed by a research assistant using opaque envelopes technique. Participants in the control group were given standard diabetes care while those in the experimental group received standard diabetes care and practiced mindfulness eating in combination with yoga exercise for 8 weeks. Primary outcome measures were capillary fasting and postprandial blood glucose and hemoglobin A1c.

### 2.2. Participants and procedures

The study was conducted in a tertiary hospital in southern Thailand which is the referral center for diabetes care. Sample size was calculated for two independent samples, intervention group and control group. The primary outcomes of interest were fasting and postprandial blood glucose, and hemoglobin A1c. They were each measured on a continuous scale. Sample size per group was  $2c/\delta^2 + 1$ , where delta was the standardized effect size<sup>12</sup>. Delta was the value of mean differences of the experimental group and control group divided by the common standard deviation. A two-sided test of 0.05 significant levels was employed. Power for the study was set at 80%. From a pilot study, delta was 0.7. Calculated sample size per group was 85. Then, the total sample size in this study was 170.

Inclusion criteria for recruitment of participants were: 1) pregnant Thai women diagnosed with GDM A1 with 24–30 weeks gestational age, 2) having fasting blood glucose lower than 105 mg/dl, 3) having postprandial blood glucose lower than 120 mg/dl, 4) not receiving insulin therapy for glycemic control, and 5) having no serious complications such as gestational hypertension, preeclampsia, pre-term labor, or other serious health problems.

### 2.3. The intervention

The study protocol and ethical considerations were approved by the IRB of the Faculty of Medicine, Prince of Songkla University, Thailand. The women in the intervention group were trained to perform mindfulness eating and yoga exercise in two 50-minute sessions. Videos were used in classes, and practicing manuals were offered for all participants to follow. After that they were encouraged to continue mindfulness eating and yoga exercise at home five times a week for 8 weeks. The study protocol comprised two interventions: mindfulness eating and yoga exercise. Mindfulness eating for pregnant women with GDM was developed from the principles of mindful eating (Daubenmier et al., 2011; Solloway & Fisher, 2007) and medical nutrition therapy guidelines (ADA, 2012; Gilbert, 2011). Mindfulness eating for pregnant women with GDM was composed of five steps: 1) setting a goal for blood glucose control, 2) integrating

medical nutrition therapy including carbohydrate choices and low glycemic index food, 3) considering portion size, 4) being aware while consuming diabetic food, and 5) eating slowly for 30 to 45 minutes.

Yoga exercise for pregnant women with GDM was developed using yoga pranayama (deep-breathing techniques) and asanas (posture and movements) (Beddoe, Yang, Kenedy, Weiss, & Lee, 2009; Gore, Vaze, Kulkarni, & Oak, 2008; Sahay & Tiwari, 2009). It was designed for 15–20 minutes daily practice for 5 days per week for 8 weeks. Each posture should be repeated for ten times. Yoga asanas for pregnant women comprised 9 postures namely 1) padmasana, 2) brahma mudra, 3) shoulder circling, 4) modified parvatasana, 5) modified gomukhasana, 6) modified tadasana, 7) modified chakrasana, 8) modified bharadvajasana, and 9) dandasana.

## 3. Data collection

Potential participants who met the study criteria were approached by a registered nurse who had been assigned as a research assistant. After that the researcher informed them about the study objectives and their involvement in the protocol. After obtaining informed consent, baseline data including age, educational level, employment, number of pregnancy, family history of diabetes, previous history of GDM, and diabetic complications were recorded. Practicing mindfulness eating and yoga exercise were encouraged and monitored by the research team every week by phone and on appointment date. Main outcomes measures were fasting, postprandial blood glucose, and hemoglobin A1c. In this study, capillary blood glucose was used for glucometer, and venous blood was sampled for HbA1c testing. A1c was tested in a hospital laboratory using a method that is certified by the National Glycohemoglobin Standardization Program (NGSP) certified and standardized to the Diabetes Control and Complications Trial (DCCT) assay.

## 4. Data analysis

Demographic data were analyzed using frequency and percentage and chi square. Continuous data of body weight, body mass index,

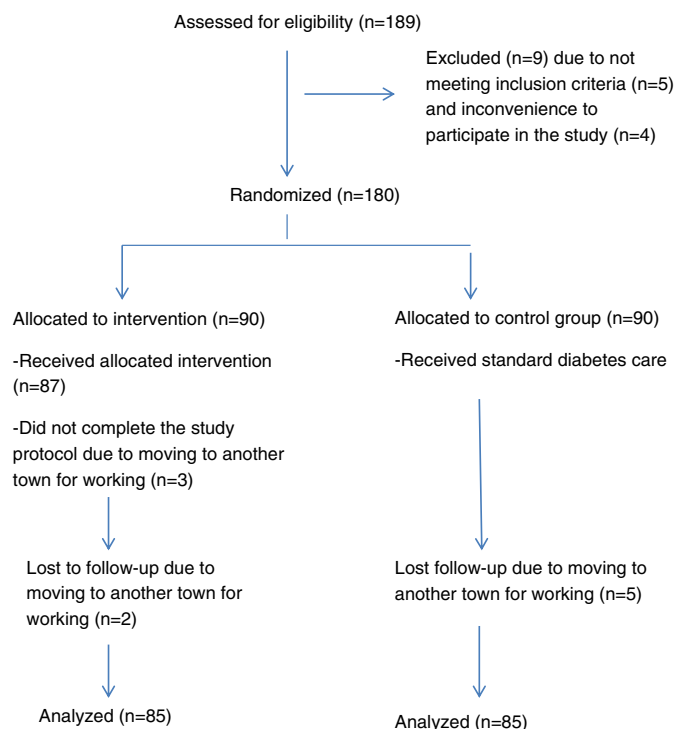


Fig. 1. Flow diagram of the study.

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