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Effectiveness of Diet/Exercise in Prevention of Gestational Diabetes Mellitus and Associated Cesarean Section Delivery

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Abstract

Gestational diabetes mellitus (GDM) is becoming a more common diagnosis during pregnancy. GDM is defined as glucose intolerance diagnosed during pregnancy. Women diagnosed with GDM during pregnancy are at an increased risk for emergent or planned cesarean section delivery and the development of overt diabetes mellitus post pregnancy. Complications related to GDM include eclampsia, macrosomia, shoulder dystocia, stillbirth, and cesarean section delivery. Initial treatment consists of diet and exercise and if glucose can not be controlled then pharmacotherapy is introduced. A literature review was performed utilizing scientific databases, mesh terms, and keywords to gather statistically relevant research to analyze the effects of diet and exercise on the prevention of GDM and cesarean section delivery. Studies that met criteria for inclusion analyzed the effects of diet and exercise individually, as well as, combined on GDM prevention and cesarean section delivery. The current data available indicates that exercise is safe during pregnancy and when combined with diet prove beneficial in prevention of GDM and cesarean section delivery.

Keywords: gestational diabetes mellitus, diet, exercise, cesarean section, prevention, female, macrosomia, pregnancy.

Introduction

Gestational diabetes mellitus (GDM) is becoming a more prevalent disease commonly diagnosed in the second or third trimester of pregnancy. Women are generally screened for GDM around 24-28 weeks gestation with a one-hour glucose tolerance test. If the original glucose test is positive, then a three-hour glucose tolerance test is performed for confirmation. A few risk factors for developing GDM are family history, history of GDM, cardiovascular disease (CVD), hypertension (HTN), hypercholesterolemia, polycystic ovarian syndrome (PCOS), obesity, and a sedentary lifestyle. The American Diabetes Association (2014) stated, "Approximately 7% of all pregnancies (ranging from 1 to 14%, depending on the population studied and the diagnostic tests employed) are complicated by GDM, resulting in more than 200,000 cases annually" (para. 29). Due to the prevalence of type 2 diabetes, these numbers are felt to be increasing in our society. Complications related to GDM include, but are not limited to, preeclampsia, eclampsia, preterm delivery, stillbirth, shoulder dystocia, macrosomia, and planned or emergent cesarean section delivery. Control of GDM starts with diet and exercise, and if uncontrolled, initiation of pharmacotherapy.

Statement of the Problem

Women who put themselves at risk during pregnancy of developing gestational diabetes are categorized with a 37% chance of having a birth by cesarean section delivery. This statistic does not factor in an individual's increased potential if the pregnant woman does not control the GDM diagnosis. In turn, GDM can lead to increased fetal growth causing the cephalo-pelvic ratio to be disproportionate. This increased fetal growth rate is referred to as macrosomia. Furthermore, the fat deposition in these babies is more often than not found to be disproportionate with an increase in the chest to head and shoulder to head ratios. This macrosomia often leads to either a planned cesarean section delivery at roughly 38-39 weeks gestation or a cesarean section delivery intrapartum due to a failed trial of labor.

Research Question

What are the effects of diet and exercise on the prevention of gestational diabetes mellitus and associated cesarean section delivery?

Literature Review

Pathophysiology of Gestational Diabetes Mellitus

- Papadakis, McPhee, and Rabow (2020) define gestational diabetes mellitus as an abnormal glucose tolerance during pregnancy.
- Around 7% of all pregnancies are complicated by gestational diabetes mellitus (McCance et al., 2019).
- After being diagnosed with gestational diabetes mellitus, management should begin with a consultation on diet and exercise (DynaMed, 2018).
- The primary concern after the diagnosis of gestational diabetes mellitus is increased fetal growth, which can increase the risk of morbidity to the mother and infant. This increase in fetal growth leads to an increase in risk for cesarean section delivery and preeclampsia (Papadakis et al., 2020).

Cesarean Section Delivery with Gestational Diabetes Mellitus

- Boriboonhirunsarn & Waiyankikorn (2016) conducted a study comparing the occurrence of emergency cesarean section deliveries between pregnant women with and without gestational diabetes.
 - 31.6% emergent cesarean section delivery rate in pregnant women with gestational diabetes mellitus (p=.002). (Figure 2)
 - 19.4% emergent cesarean section delivery rate in pregnant women without gestational diabetes mellitus (p=.002). (Figure 2)
- Gorgal et al. (2011) found similar results to the study above concluding that there is an increased risk of non-elective cesarean section delivery in pregnant women diagnosed with gestational diabetes mellitus.
 - There was an increased rate of cesarean section in patients with gestational diabetes mellitus 19.5%, (95% CI [1.04, 2.02])

Diet Effects on Gestational Diabetes Mellitus and Cesarean Section Delivery

- Lifestyle interventions were defined as a healthy diet, exercise, and blood glucose monitoring. Women undergoing lifestyle interventions were found to have a decreased infant delivery risk with large for gestational age and neonatal fat mass (Brown et al., 2017).
- The Dietary Approaches to Stop Hypertension (DASH) diet, represented a decreased incidence of cesarean section delivery (Han et al., 2017).
 - RR 0.53, CI [0.37, 0.76]
- A Mediterranean style diet reduces odds of gestational diabetes mellitus by 35% (Watter et al., 2019).
 - Reduction in gestational diabetes mellitus by 35%, (95% CI [0.47, 0.91]), p=.01.

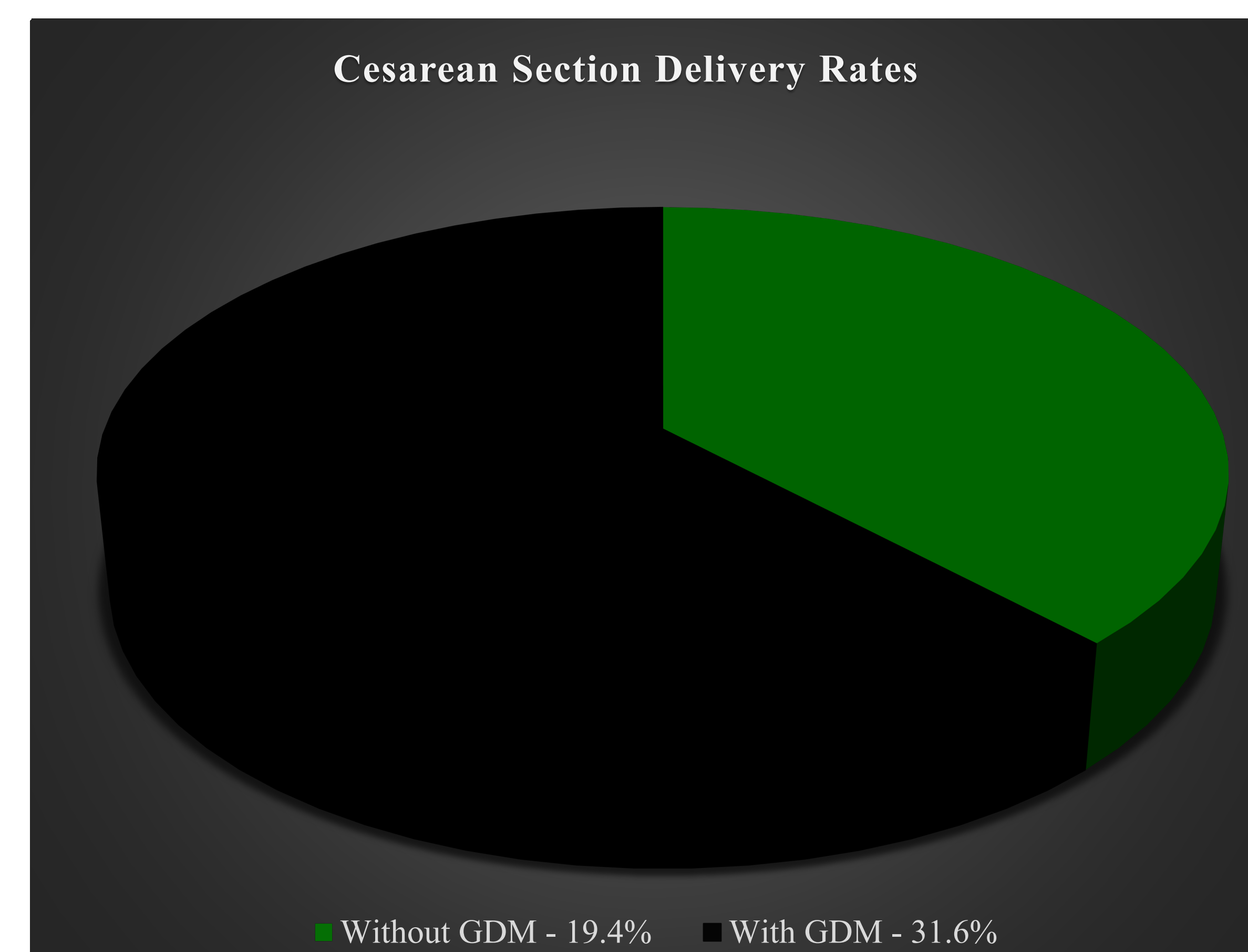


Figure 2: By Jonathyn Marx, data from Boriboonhirunsarn & Waiyankikorn (2016). Notes: Cesarean section delivery rates occur at a higher rate in women diagnosed with GDM.

Exercise Effects on Gestational Diabetes Mellitus and Cesarean Section Delivery

- Daily exercise during pregnancy was proven safe through all national guidelines (Savvaki et al., 2018).
- Ming et al. (2018) conducted a systematic review and meta-analysis on the effects of exercise during pregnancy and found that gestational diabetes mellitus is associated with a decreased incidence in normal-weight women undergoing exercise during pregnancy without increasing the occurrence of cesarean section.
 - RR 0.58, 95% CI [0.37, 0.90], p = .01
- Russo et al. (2015) found similar results to the study above concluding a significant decrease in risk of developing gestational diabetes mellitus in pregnant women undergoing exercise during pregnancy.
 - Decreased risk of developing gestational diabetes mellitus by 28%, (95% CI [0.58, 0.91]), p=.005.
- Sanabria-Martinez et al. (2015) also found similar results to the above two studies demonstrating decreased risk of gestational diabetes mellitus in pregnant women undergoing physical activity during pregnancy.
 - 31% reduction with physical activity during pregnancy.
 - 36% reduction with physical activity throughout the pregnancy.
- Wang et al. (2017) conducted a study that demonstrated a lower prevalence of gestational diabetes mellitus and cesarean section delivery in pregnant women undergoing regular exercise during pregnancy.
 - 22% lower prevalence of gestational diabetes mellitus (p<.01). (Figure 3)
 - 29.5% lower prevalence of cesarean section delivery (95% CI [0.494, 1.529]), p=0.6.

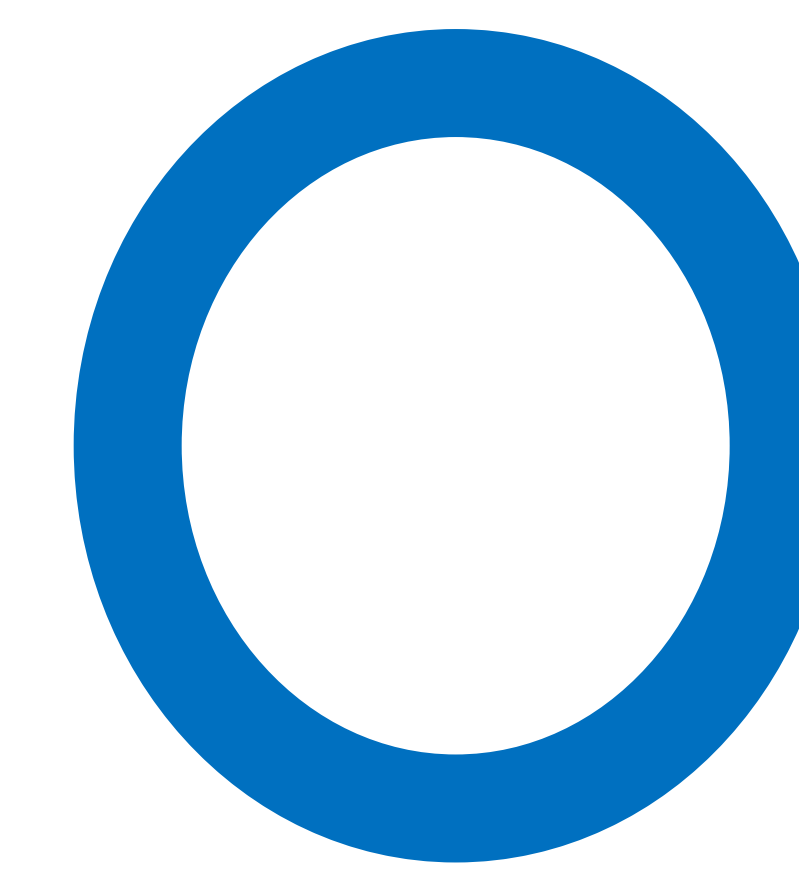


Figure 3: Universal Symbol of Diabetes, by the International Diabetes Federation, 2020. Reproduced with permission.

Discussion

Cesarean Section Delivery with Gestational Diabetes Mellitus

- Patient diagnosed with gestational diabetes mellitus demonstrate statistically significant increased risk of non-elective and emergent cesarean section deliveries.

Diet Effects on Gestational Diabetes Mellitus and Cesarean Section Delivery

- Patients diagnosed with gestational diabetes mellitus undergoing a DASH diet had decreased risk of cesarean section delivery.
- Patients undergoing a Mediterranean style diet demonstrated statistically significant reduction in risk of developing gestational diabetes mellitus.

Exercise Effects on Gestational Diabetes Mellitus and Cesarean Section Delivery

- Exercise was proven safe during pregnancy
- Multiple studies prove the benefits of exercise during pregnancy and associated reduced incidence of gestational diabetes mellitus and reduction in cesarean section delivery.

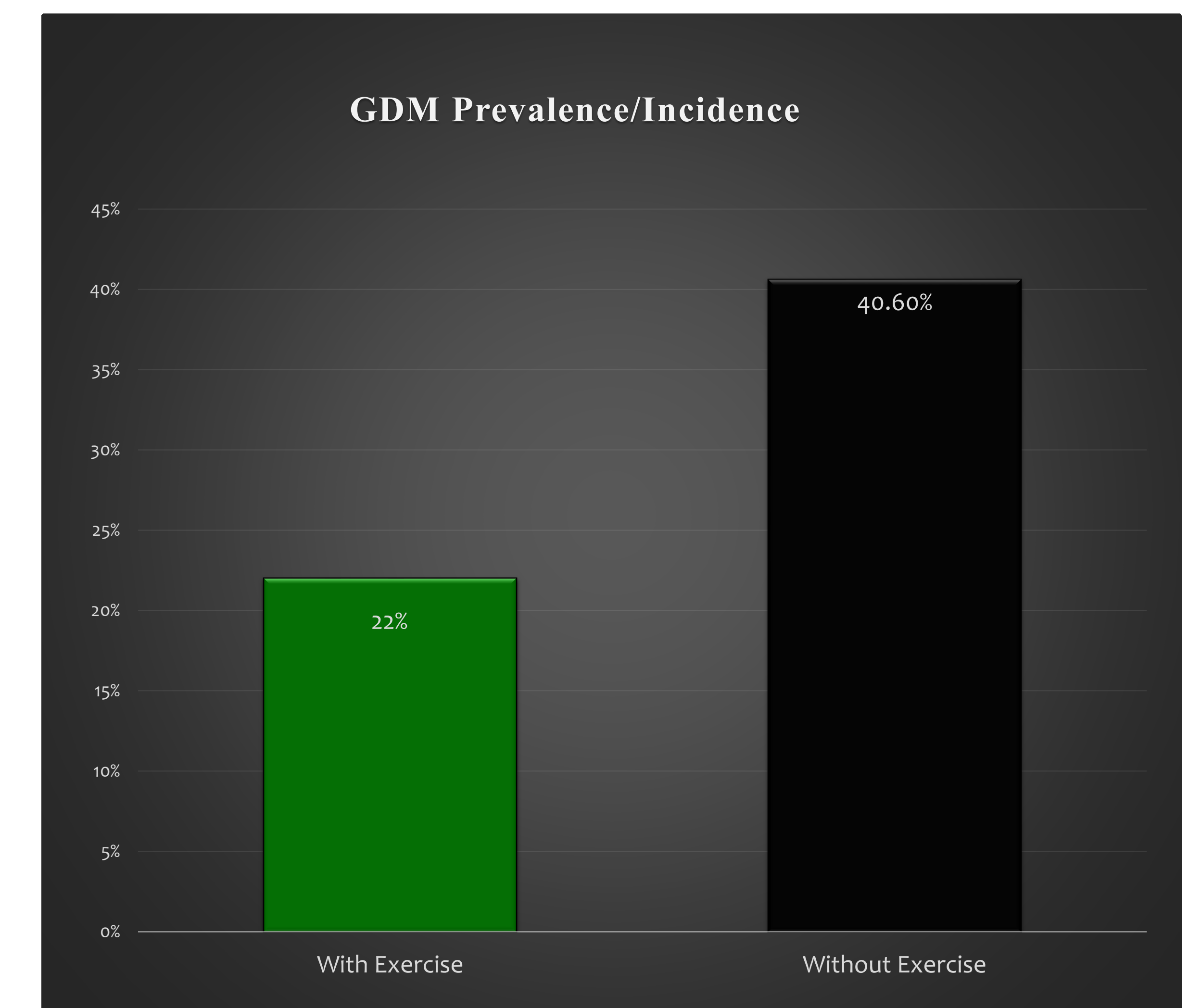


Figure 3: By Jonathyn Marx, data from Wang et al. (2017). Notes: Exercise during pregnancy demonstrates an overall decrease in prevalence of GDM.

Applicability to Clinical Practice

- Provider will be able to review risks associated with increased odds of developing gestational diabetes mellitus and associated cesarean section delivery at the time of each appointment.
- Provider and patient will be able to discuss the prevention and management of gestational diabetes through lifestyle modifications that include physical activity/exercise and diet, which will, in turn, reduce the likelihood of cesarean section delivery.

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