

**Evaluating The Efficacy of Various Interventions for
Women Diagnosed with Gestational Diabetes: A
Literature Review**

Laurel Kessinger

University of Georgia

HPRB 5410W

Dr. Coffman

October 22, 2022

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Research Question: What are effective interventions for women diagnosed with gestational diabetes to improve maternal and fetal health outcomes?

Abstract

Gestational diabetes (GDM) is one of the most severe complications to arise during pregnancy. This phenomenon occurs when the body is not able to produce enough insulin during pregnancy, causing glucose to build up in the blood rather than be absorbed by cells, which adversely affects systemic tissues in various means. Approximately 50% of women who are diagnosed with diabetes during pregnancy will go on to develop Type 2 *Diabetes Mellitus* later in life. The prevalence of gestational diabetes has been on the rise over the past few decades, displaying that this form of diabetes has great potential to plague healthcare systems and American taxpayers. This literature review discusses efficacious interventions in the treatment of women with GDM that have proven improve maternal and fetal health outcomes. 10 peer reviewed articles were analyzed to determine practices that best control blood glucose concentrations and prevent the development of T2DM and other morbidities later in life. The strategies considered fall under two overarching categories: lifestyle and pharmacologic interventions, with subcategories that consist of nutritional therapies, physical activity, and multidisciplinary interventions, as well as antidiabetic agent's glyburide and metformin, respectively. Interventions discussed throughout this literature review should be implemented more frequently in order to diminish the associated emotional and financial burdens that this disease plagues many women across the globe with. Further research is needed to understand how gestational diabetes manifests in specific populations, according to respective risk factors and health outcomes, so that the prevalence of GDM does not continue to exponentially increase.

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Table of Contents

| | |
|--|-----------|
| Introduction..... | 4 |
| Methods..... | 6 |
| Figure 1. Process for Article Selection..... | 8 |
| Results | 9 |
| Lifestyle Interventions | 9 |
| Nutritional Therapies | 9 |
| Physical Activity | 11 |
| Multidisciplinary Interventions | 11 |
| Pharmacological Interventions | 13 |
| Glyburide | 14 |
| Metformin | 15 |
| <i>Table 1. Detailed Summary of Articles Reviewed.....</i> | <i>17</i> |
| Discussion..... | 21 |
| Limitations | 21 |
| Further Research and Practices | 23 |
| Conclusion | 23 |
| References | 24 |

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Introduction

Gestational diabetes (GDM) affects approximately 10% of pregnancies worldwide each year, leading to a vast number of potential complications (Plows et al., 2018). GDM is defined as glucose intolerance and resistance discovered for the first-time during pregnancy and increases the risk of adverse maternal and fetal health outcomes (Morlando et al., 2021). This includes the development of Type 2 *Diabetes Mellitus* (T2DM) later in life, miscarriage and stillbirth, and macrosomia (increased insulin levels leading to the overgrowth of the fetus due to increased nutrient intake) (Morlando et al., 2021). Women who are of higher maternal age (≥ 35 years), are overweight (BMI ≥ 25 kg/m²) or obese (BMI ≥ 30 kg/m²), have a close relative with T2DM, have high blood pressure or cardiovascular disease (CVD), and with prior fetal macrosomia are most affected by GDM (Morlando et al., 2021). Additionally, those with polycystic ovarian syndrome (PCOS), another insulin-resistant syndrome are greatly impacted by GDM, and women of minority as they are two times more likely to develop GDM versus white women (Daneshmand et al., 2019).

Fetuses born to women with GDM are two times more likely to develop childhood obesity than those born to women with normal pregnancies. Maternal malnutrition in the womb increases the risk of GDM as it indicates placental dysfunction (Plows et al., 2018). For GDM cases, genes regarding fat storage, energy utilization, and appetite regulation have the potential to be altered which impacts the nutritional status of the child throughout life (Plows et al., 2018). Maternal hyperglycemia (elevated blood glucose levels) is most often due to pancreatic B cell function dysfunction and can lead to a myriad of health implications (Plows et al., 2018). These include but are not limited to fetal hypoglycemia, which if not controlled can lead to serious

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

brain injury, as well as the he overproduction of free radicals which damage systemic tissues that have been seen to slow glycogen synthesis in the liver and muscles (Plows et al., 2018).

Additionally, insufficient functioning of the primary glucose transporter (GLUT4), inhibits plasma membrane insulin signaling, and decreased functioning and overall number of mitochondria in skeletal muscles, which decrease proper glucose utilization (Plows et al., 2018).

It is known that diet composition plays a huge role in the onset of diabetes during pregnancy. Foods high in saturated fats, refined sugars, and red and processed meats have been linked to increased GDM rates. However, foods high in fiber, micronutrients, and polyunsaturated fats (as they have anti-inflammatory properties) have been found to be protective factors against the development of the disease (Plows et al., 2018). (Wexler et al., 2018)

Patients have claimed poor GDM management due to limited medical access, financial hindering, language barriers, psychological stressors, low health literacy, differing approaches across professions, affordability, violence preventing food and access, transportation, household instability and the high cost of insulin causing poor adherence to medications (Daneshmand et al., 2019). Notably, ethnic and racial differences contribute to different risk factors and biomarker thresholds, thus inhibiting proper management (Daneshmand et al., 2019).

Skyrocketing healthcare costs already impact the regular American taxpayer, displaying that efficient preventative measures need to be researched to ensure these costs do not financially cripple citizens of differing economic backgrounds. In Italy, 54,783 pregnancies were impacted by GDM in just 2014 which led to \$44.8 million U.S. dollars in extra costs for the Italian National Health Service (Meregaglia et al., 2018). When researchers modeled this study in

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

America, a country with already higher healthcare costs, they found that the associated economic burden totaled to \$1.8 billion, however, they used a 5.5% prevalence rate causing there to be disproportions in numbers (Meregaglia et al., 2018). Those with GDM have an average of 29.2% higher costs than women with normal pregnancies due to increased number of hospital visits and costs of additional oral glucose tests (Meregaglia et al., 2018). Associated total financial strains likely amount to much higher than previously thought.

Little is known about the effectiveness of various treatment options of medical or non-pharmaceutical options, thus, it is important to expand the knowledge on GDM. The purpose of this literature is to evaluate the efficacy of various treatment options for women diagnosed with Gestational Diabetes Mellitus to improve maternal and fetal health outcomes for populations most affected by the disease.

Methods

This literature review utilizes various article types from two databases, PubMed and PsycInfo. PubMed is the National Library of Medicine and was chosen due to the vast amount of peer-reviewed work it contains. PsycInfo is the largest database in areas regarding behavior sciences and mental health, which is valuable because improvement of gestational diabetes outcomes is often linked to implementing behavior changes and lifestyle interventions.

For PubMed, the culmination of these search terms came down to (management of gestational diabetes mellitus OR type 2 diabetes) AND preventative factors AND fetal outcomes with the inclusion and exclusion criteria being peer reviewed and limited to the years 2010-2022 in order to analyze the most up to date information. For PsycInfo, the best results derived from the search terms gestational diabetes AND treatments AND management options with the

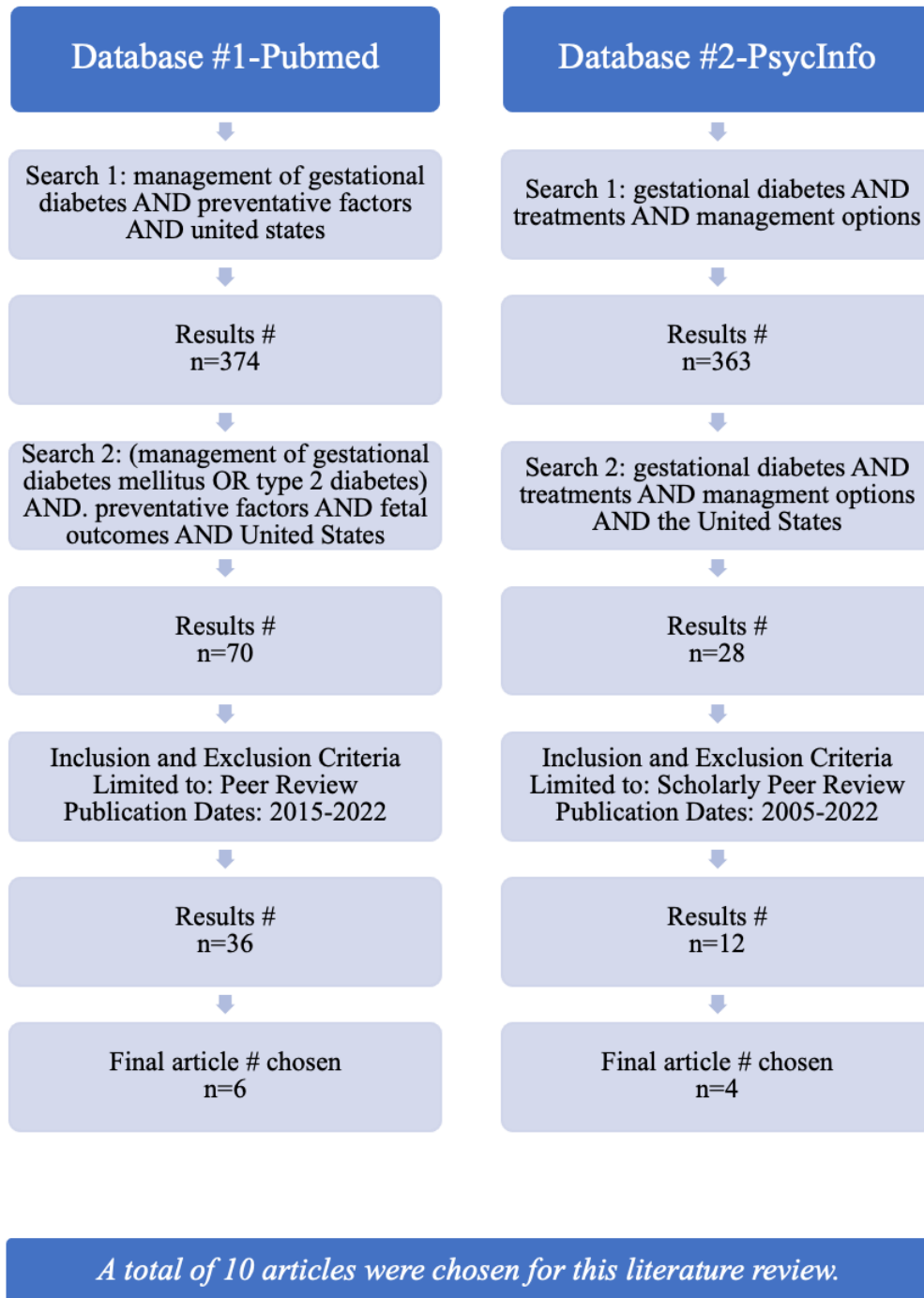
EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

inclusion of peer reviewed sources and the exclusion of work published outside the years 2005-2022. From there, 6 articles were obtained from PubMed and 4 articles were collected from PsycInfo, as seen below in *Figure 1*.

When evaluating the efficacy of intervention routes, it is necessary to discuss the treatment and management options currently being administered. The management of gestational diabetes was included in the first search for both databases as analyzing management strategies and how patients are responding correlates to the strengths of the distinctive interventions. Treatments were included in the second database because both treatment and management protocols should be unique to specific populations and individuals in order to best serve those diagnosed with gestational diabetes.

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Figure 1.



EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Results

Treatment and management options for Gestational Diabetes Mellitus are not currently keeping up with the increasing prevalence of the chronic disease and the negative societal, emotional, financial, and political burdens associated with it. Different subpopulations impacted by GDM experience contrasting risk factors, management options and adherences, and health care in general, which brings about different health outcomes for particular groups and individuals. In order to diminish the predicted economic and emotional ramifications on society, knowledge regarding practices that best ameliorate the health of specific populations is pertinent. The remainder of this literature will delve into two overarching findings, efficacious lifestyle interventions comprised of nutritional therapies, physical activity, and multidisciplinary interventions, as well as pharmacological treatments with an emphasis on glyburide and metformin.

Lifestyle Interventions

Sufficient physical activity, dietary, and lifestyle interventions have proven to be effective in the management of 70-85% of patients diagnosed with GDM (Lende & Rijhsinghani, 2020)). Many women diagnosed with GDM are unclear on the associated risk factors and complications of the disease, displaying that efficient interventions should emphasize advancements in health literacy domains (Alejandro et al., 2020).

Nutritional Therapies

For those with metabolic syndromes, such as this one, nutritional diet therapy is the premier treatment option due to emphasis on correcting and maintaining glucose control

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

(Alejandro et al., 2020). For women who do not have GDM, typical recommendations for food intake are to eat three meals with 2 snacks incorporated throughout the day, but oftentimes this is not adequate in treating those diagnosed with the disease. Interventions where the patient meets with a dietician regularly to develop specific meal plans based on appropriate cultural customs, financial means, and the availability of nutrient-dense cuisine, with the inclusion of foods the patient prefers has been seen to be easier for patients to adhere to (Lende & Rijhsinghani, 2020). Foods that have proven to increase the risk of the development of GDM include sweets, processed foods, and fats, and should be avoided in nutritional interventions (Alejandro et al., 2020). Moreover, those with diets that lack adequate vitamin D and contain higher dietary acidic loads may increase the chances of GDM development and should therefore be amended to improve health outcomes (Alejandro et al., 2020). Additionally, fiber is believed to reduce postprandial glycemia due to its absorptive properties and may in part impact maternal and fetal outcomes (Farabi & Hernandez, 2019). The American Diabetes Association (ADA) advises that calories in daily diets should be composed of 20-35% from fats, 45-65% carbohydrates, and 15-20% proteins (Lende & Rijhsinghani, 2020). The incorporation of high-quality complex carbohydrates with lower glycemic indexes have proven to reduce postprandial hypoglycemia (large spikes in blood glucose levels) (Lende & Rijhsinghani, 2020) and even improve insulin sensitivity levels (Alejandro et al., 2020). Diets low in glycemic indexes may reduce the need for insulin (Farabi & Hernandez, 2019). One study found that moderate tea and coffee consumption may possibly have a protective effect in the risk of development of GDM, which is something to consider when implementing nutritional management tactics (Hinkle et al., 2015). Overall, a very effective dietary intervention including these complex carbohydrates, healthy fats, and at most 20% protein while prioritizing portion control as the forefront. Another

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

valuable intervention tool is to encourage patients to write down each meal with their blood glucose levels next to it to facilitate deciphering which foods contribute to postprandial hyperglycemia (Lende & Rijhsinghani, 2020).

Physical Activity

Women who are pregnant are advised to moderately exercise 30 minutes every day for 5 days out of the week (Lende & Rijhsinghani, 2020). If this cannot be accomplished due to limitations in timing, resources, body composition, etc. it is recommended to take 10–15-minute light walks after meals (Lende & Rijhsinghani, 2020). Even mild exercise can improve the control of blood glucose levels (Lende & Rijhsinghani, 2020).

Multidisciplinary Interventions

To clinically, financially, and resourcefully improve intervention strategies, more healthcare settings have utilized quality improvement methods that focus on measuring the strengths of the current practices in place to see where revisions can best be made to serve the populations at hand (Lorenz et al., 2020). Such interventions use real time data to track patient performances, which enables professionals to give individualized patient feedback by determining unique options for health progress, and thus health literacy (Lorenz et al., 2020). For example, a practical intervention model is SMART (specific, measurable, achievable, realistic, and timely) aims which functions to collect evidence-based data on practices pertinent to addressing patient health outcomes and has been used in recent GDM and T2DM initiatives in Ohio (Lorenz et al., 2020). Interventions with components such as these have the likelihood to diminish adverse health consequences associated with GDM due to the continual monitoring and evaluation of patients. The most meaningful interventions have been seen to be those with the

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

utmost support of healthcare providers so that they can gain a holistic review of the patient to hone in on the specificities each patient needs, whether it be emphasized self-efficacy or motivational factors (Yee et al., 2020). Interventions delivered in group settings contain therapeutic interactions between patients and are typically cost-effective (Perez et al., 2015). This literature displays the importance of lower cost strategies, since GDM typically impacts women of lower socioeconomic status.

Increasing patient health literacy levels is a valuable intervention strategy for women already diagnosed with GDM due to the increased risk of development of GDM in future pregnancies, and the birth complications that ensue (vaginal c-sections, and fetal macrosomia) (Yee et al., 2020). Allotting more time for physician-patient interactions discussing care, recommendations, and consequences of GDM is successful in both short-term and long-term management treatments (Yee et al., 2020). Institutions with a implement the mentioned strategies in their day-to-day lives, displaying that interventions with these concepts in place are advantageous in bettering the health of patients (Yee et al., 2020). Physicians that frame their explanation of diagnosis of a disease that is conquerable and non-threatening through therapies and continuous glucose monitoring saw that it increased patients' sense of self-efficacy and overall adherence (Yee et al., 2020). Interventions aimed at specific populations are extremely effective in proper management of GDM. For example, Latinos are at the highest risk for developing T2DM in the United States and Hispanic women have a higher risk of developing the disease over men, 52% versus 45%, respectively (Lorenz et al., 2020). This, along with a myriad of other risk factors, contributes to this demographic's higher rates of GDM development compared to Caucasian women. However, the inclusion of promotera-led lifestyle interventions for Latina women who are pregnant with GDM is a valuable strategy in decreasing the

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

associated health disparities within this demographic because of their knowledge on social and cultural behaviors (Lorenz et al., 2020). Their unique perspective because they are members of these communities specifically targets the populations they are intended to serve. Interventions in genetic diagnosis have proven to improve optimal therapy, control of glycemic levels, decrease healthcare costs, and potentially lead to the diagnosis of family members (Kleinberger et al., 2016).

Pharmacological Interventions

If after 10-14 days of the inclusion of nutritional, physical, and other lifestyle interventions is not successful in controlling hyperglycemia, pharmacological agents are typically administered (Alejandro et al., 2020). This occurs for 15-30% of patients who are pregnant and diagnosed with GDM (Lende & Rijhsinghani, 2020). Insulin is the safest profile treatment because it is such a large molecule that is fully understood to not cross the placenta (Lende & Rijhsinghani, 2020). Insulin therapy is utilized to mimic the physiology of insulin secretion and women with GDM who seek insulin therapy between the 20th and 30th week of gestation seem to benefit regarding achieving controlled glycemic levels (Langer, 2006).

Due to the insanely high costs of insulin, lower cost options have been increasingly studied. The two main oral hypoglycemic agents this literature evaluates are glyburide and metformin. When comparing medications, it is necessary to evaluate the placental transfers, effectiveness, and cost-to-benefit ratio (Langer, 2006). Glyburide and metformin are comparable treatment options with respect to controlling glucose and adverse effects (Langer, 2006). One study found that 89% of patients found that the use of one or both medications together was effective in glycemic control, which previously was at 69% for treatment success. This resulted

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

in only 11% of patients in the study needing insulin as treatment (Nachum et al., 2017).

Knowing this, along with the low costs of these drugs, provides patients of lower socioeconomic status and other barriers to access to be able to get the needed interventions in order to properly manage GDM. Insulin, glyburide, and metformin may all be administered alone or in conjunction with one another (Langer, 2006). These two alternative oral medications are alluring in that they have great potential to increase patient compliance because of their diminished costs and ease of administration, in comparison to insulin (Nachum et al., 2017). Also, to evaluate the efficacy of these treatments it is necessary to analyze the impact on the fetus. Measurements in neonatal blood levels of bilirubin, calcium, magnesium, along with birthweight and head circumference are found to be useful in gaining further insight into how antidiabetic drugs affect neonatal outcomes (Nachum et al., 2017).

Glyburide

The purpose of glyburide is to “increase insulin secretion, decrease hepatic glucose production with resultant reversal of hyperglycemia, and indirect improvement of insulin sensitivity” (Langer, 2006). The utilization of glyburide as an alternative medical treatment stem from the ease of administration compared to insulin and the improved patient satisfaction because it is a non-invasive option (Langer, 2006). Additionally, this medication holds the most data claiming the safety compared to other antidiabetic drugs. When comparing the placentas of both diabetic and nondiabetic women, one study found that glyburide does not cross the human placenta from the mother to fetus in significant amounts, providing further assurance of the drug (Langer, 2006). This is valuable as it adds to the knowledge that glyburide will not affect fetal hypoglycemia or cause fetal malformations because it does not circulate across the placenta (Langer, 2006). Adverse effects that lead to patient discontinuation of this drug are oftentimes

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

hypoglycemia, however metformin can be used as a second line of treatment when this occurs (Nachum et al., 2017). Many recent studies have indicated that glyburide is a comparable medication to insulin in establishing glycemic control and improving pregnancy outcomes and that glyburide might even (Langer, 2006). Glyburide is proven to be significantly less costly than insulin with average savings of \$166-\$200 per patient (which is likely higher now due to the year this study was conducted) (Langer, 2006).

Metformin

Metformin functions to decrease insulin resistance throughout systemic tissues in the body (Langer, 2006). The oral antidiabetic drug has proven to be unrelated to congenital malformations in women with PCOS (risk factor for GDM) and reduces GDM occurrences (Langer, 2006). Adverse outcomes relating to the use of metformin are typically gastrointestinal discomfort and generally can be ameliorated with switching over to glyburide as a second line of treatment, or insulin as the last alternative (Nachum et al., 2017). An effective solution to digestive problems is to reduce the dose by half for one month before returning to typical dosage numbers (Lorenz et al., 2020). One randomized controlled study found that 87% of patients that took metformin as the first line of treatment had success in glycemic control, and only 50% of patients that were administered glyburide demonstrated controlled levels of blood glucose, showing that metformin might be more advantageous (Nachum et al., 2017). With respect to placental circulation of metformin on neonatal blood glucose levels, umbilical cord concentrations are found to be like or higher than maternal levels (Lende & Rijhsinghani, 2020)). Patients who began with metformin treatment were less likely to require insulin overall (Nachum et al., 2017). Additionally, metformin led to less maternal weight gain, which is the foremost tool to display the efficacy of preventing or delaying the development of T2DM (Lorenz et al.,

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

2020). The effectiveness of metformin is due to the increased insulin sensitivity for target organs without causing hyperinsulinism (Nachum et al., 2017). A meta-analysis utilized all randomized controlled studies on metformin to find that the pooled weight loss of those taking the drug was lower than the weight loss of placebo treatment groups, which was statistically significant (Lorenz et al., 2020).

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Table 1. Detailed Summary of Articles Reviewed

| | Author | Year | Article Title and Journal | Purpose of Article | Sample Info | Type of Research | Research Findings | Limitations of Article |
|----|---|------|---|---|---|---|---|---|
| 1. | Alejandro, E. U., Mamerto, T. P., Chung, G., Villavieja, A., Gaus, N. L., Morgan, E., & Pineda-Cortel, M. R. B. | 2020 | Gestational Diabetes Mellitus: A Harbinger of the Vicious Cycle of Diabetes <i>International Journal of Molecular Sciences</i> | Elaborate on the long-lasting nutritional effects on maternal and fetal outcomes Summarize relevant GDM knowledge surrounding screening, diagnosis, and associated complications | N/A | Review | Specific nutritional therapies effect on metabolic syndromes, improved outcomes from web and group based educational sessions, and experimental pathophysiology on animals to use for future research models. | Studies in review underscore the gravity of GDM and its challenges to management. |
| 2. | Farabi, S. S., & Hernandez, T. L. | 2019 | Low-Carbohydrate Diets for Gestational Diabetes <i>International Journal of Molecular Sciences</i> | Assessing the effects of low and high carbohydrate nutrition restriction on glycemia. | N/A | Meta-analysis of Randomized Controlled Trials | Carbohydrate restriction resulted in improved maternal glycemia, and low restrictive approaches led a better balance of high-quality carbs, and thus health outcomes. | Adherence to nutrition therapy is a confounder in mentioned clinical studies, and many countries studies mentioned in the literature, making it hard to generalize to specific populations, |
| 3. | Hinkle, S. N., Lau S. K., Catov, J. M Olsen, J., & Bech, | 2015 | First trimester coffee and tea intake and risk of gestational diabetes mellitus: a study within a national birth cohort | Determining whether coffee and tea consumption during the first trimester of pregnancy is related to GDM risk. | 71,239 pregnancies, both with and without GDM, in Denmark | Population-based cohort study | Coffee and tea consumption during the first trimester was not significantly related to elevated GDM | There were potential misclassifications of GDM cases, differences in tea and coffee type made it hard to |

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

| | | | | | | | | |
|----|-------------------------------|------|--|--|---|-------------------|--|---|
| | | | <i>BJOG: International Journal of Obstetrics and Gynecology</i> | | from 1996-2002 | | risk, however with the most of the risk ratio's being below one, consumption may indicate a potential protective factor. | generalize findings, and no information on caffeine consumption prior to pregnancy was noted. |
| 4. | Langer, O. | 2006 | Management of gestational diabetes: pharmacologic treatment options and glycemic control <i>Endocrinology and Metabolism Clinics of North America</i> | Discussing intensified therapies, treatment modalities, the efficacy and conditions of hypoglycemic agents, and the impacts of the implementation of these medications in management strategies. | N/A | Systematic Review | Insulin lispro is likely to not cross the placenta, and the benefits include reduction of hypoglycemic episodes and facilitated patient self-administration. Glyburide is a cost-effective alternative to insulin therapy. | Limited research on evidence based pharmacologic therapies due to fear of adverse health outcomes. The ethics and legality of this phenomenon limit the desire to conduct studies. |
| 5. | Lende, M., & Rijhsinghani, A. | 2020 | Gestational Diabetes: Overview with Emphasis on Medical Management <i>International Journal of Environmental Research and Public Health</i> | Emphasizing the evolution of medical management of the condition Evaluating safety and efficacy of pharmacotherapeutic options during pregnancy | Review of studies published in Pubmed, Cochrane Library, national guidelines, and WHO guidelines with the keywords "gestational diabetes," "diabetes management," | Review | Specific dietary values and recommendations for patients with GDM and associated ramifications, and when insulin treatment should be avoided by using pharmacologic agents. | Failure to include all publications due to vast amount of literature out there. Limited to management of GDM in the United States, not generalizable to other countries with different incidence rates and available resources. |

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

| | | | | | | | | |
|----|---|------|---|---|--|-----------------------------|--|--|
| | | | | | and “pregnancy.” | | | |
| 6. | Lorenz, A., Oza-Frank, R., May, S., Conrey, E. J., Panchal, B., Brill, S. B., RajanBabu, A., & Howard, K. | 2020 | A quality improvement collaborative increased preventive education and screening rates for women at high-risk for type 2 diabetes mellitus in primary care settings <i>Primary Care Diabetes</i> | Evaluate primary care practices efficacy in changing practice workflow to better identify women at high risk of developing T2DM for strategies on preventative education and clinical screenings. | 1500 women aged 18-44 years from 13 participating primary care physician sites in Ohio | Randomized Controlled Study | After implementation of collaborative quality improvement models, preventative education, screening education, and screening rates all increased. | Time limited and geographically limited to Ohio. Assessment criteria may have led to overreporting of non-compliance rates. Baseline measurements taken after start of project, potentially underrepresenting true findings. |
| 7. | Nachum, Z., Zafran, N., Salim, R., Hissin, N., Hasanein, J., Gam Ze Letova, Y., Suleiman, A., & Yefet, E. | 2017 | Glyburide Versus Metformin and Their Combination for the Treatment of Gestational Diabetes Mellitus: A Randomized Controlled Study <i>Diabetes Care</i> | Evaluate the efficacy and safety of hypoglycemic agents, glyburide and metformin, separately and in conjunction with one another | 53 patients treated with metformin and 51 patients treated with glyburide | Randomized Controlled Study | Both medications are comparable treatment options in glycemic control and adverse health outcomes. When combined, reduce the need for insulin treatment. Metformin has a potential advantage over glyburide. | Providers and patients were not blinded to treatment groups and second line administration of medications were secondary outcomes. |
| 8. | Perez, A., Alos, V. A., Scanlan, A., Maia, C. M., Davey, A., Whitaker, R. C., Foster, G. D., Ackermann, R. T., & O'Brien, M. J. | 2015 | The rationale, design, and baseline characteristics of PREVENT-DM: A community-based comparative effectiveness trial of lifestyle intervention and | Comparing effectiveness of metformin and the U.S. Diabetes Prevention Program (DPP), and standard care settings for Latinas with | 92 patients randomized into one of three treatment groups: standard care, DPP | Randomized Controlled Study | Promotera-led diabetes prevention programs is a low cost and culturally appropriate model for addressing | Recruitment disadvantages due to resource limitations with only one full time staff recruiter, and lower SES population and lower compliance |

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

| | | | | | | | | |
|-----|---|------|---|---|---|-------------------|--|---|
| | | | metformin among Latinas with prediabetes <i>Contemporary Clinical Trials</i> | prediabetes, in “real world” settings. | intervention, or metformin. | | diabetes during pregnancy for Latinas. | and retention rates. |
| 9. | Rodriguez, M. I., Kaufman, M., Lindner, S., Caughey, A. B., DeFede, A. L., & McConnell, K. J. | 2021 | Association of Expanded Prenatal Care Coverage for Immigrant Women with Postpartum Contraception and Short Interpregnancy Interval Births <i>JAMA Open Network Journal</i> | Determining whether prenatal care coverage when included in Emergency Medicaid improves postpartum contraception and reduces interval between subsequent pregnancies. | 26,586 live births of women enrolled in emergency Medicaid in Oregon and South Carolina | Cohort Study | Expanded Medicaid coverage that included prenatal care increased rates of prenatal screenings and vaccines, however, was not associated with improving postpartum contraception or short interval pregnancies lengths. | Factors that may influence prenatal care and labor, such as hospital of delivery or documentation status were not included. The two locations included, Oregon and South Carolina, limits generalizability. |
| 10. | Yee, L. M., Leziak, K., Jackson, J., Niznik, C. M., & Simon, M.A. | 2020 | Health Care Providers' Perspectives on Barriers and Facilitators to Care for Low-Income Pregnant Women With Diabetes <i>Diabetes Spectrum</i> | Investigating health care providers perspectives on barriers to patient healthcare access and facilitating factors in GDM management. | 29 health care providers (physicians, nurses, medical assistants, social workers, CHES) | Qualitative Study | Health outcomes are determined by specific environmental, access-related, institutional, interpersonal, knowledge-based, and individual factors. | Study conducted at one hospital so limited generalizability, participant may not have captured full facilitators and or barriers. |

Discussion

The increasing prevalence of type 2 diabetes in women who are pregnant causes poor maternal and fetal outcomes that can have long lasting ramifications on health later in life. Tremendous advancements have been made in the past 70 years to improve health and the longevity of life. However, this progress may be dismantled with the rise of chronic diseases, most notably if these impacts influence the health of a fetus. This has the potential to implicate the ability to perform daily functions and live in an optimal state of health. Research and further development into better treatment and management strategies will not only improve the wellness and lives of people now but will positively impact the health of future generations. It is of considerable importance to implement interventions aimed at reducing insulin resistance.

Lifestyle interventions that focus on nutritional therapies, physical activity, and multidisciplinary tactics have proven to be effective in 70-85% of patients with GDM. Emphasizing diets with adequate amounts of healthy fats, proteins, and complex carbohydrates with an emphasis on portion control is sufficient in nature. Additionally, culturally appropriate and sensitive foods with patient preferences as a priority generally enhances patient adherence to interventions and improved health outcomes. Even mild physical activity implemented into day-to-day life for pregnant women living with GDM is seen to limit blood glucose spikes.

Interventions that aim to measure and evaluate data in real time and allot more time for meaningful physician-patient interactions that signify improvements in health literacy are pragmatic in approach for improving health outcomes. Population-specific interventions with leaders who are members of their communities and or have cultural awareness for the population at hand can be seen to deliver better patient acceptance. For women that these strategies are not

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

efficient in reducing blood glucose concentrations are then typically administered insulin. However, with the elevated costs of insulin, oral antidiabetic agent's glyburide and metformin are comparable solutions due to their lower costs and ease of administration as they are non-invasive unlike insulin, which all function to increase patient compliance. Both glyburide and metformin, especially when in conjunction with one another, reduce the need for insulin. This provides better approaches to treating pregnant women with GDM who cannot afford the high costs of insulin.

These findings enhance the current knowledge associated with the controversies surrounding diabetes while pregnant. Seeing greater rates of efficacy of glyburide and metformin has the potential to become the front lines of treatment and emphasizing studies concerning specific subpopulations in order to figure out the differences between the risk factors and health outcomes will continue to bring social awareness. These findings further indicate that studies involving oral medications and improved access to healthcare need to be replicated even more so that this knowledge can be more widespread and function to ameliorate the health and societal implications that GDM will continue to plague Americans with.

Limitations

This review incorporates the knowledge stemming from only 10 articles. Further research may have been conducted since the publication of these articles as well as the current ongoing research that would provide better insight. This issue has wider complications than was mentioned in these articles due to GDM being the foremost complication in all pregnancies.

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Further Research

Replication of studies analyzed in this literature are needed to address specific interventions aimed at populations with different risk factors and outcomes, such as the study regarding interventions of Latina women with GDM. Glyburide and metformin use is increasing, yet knowledge on their true efficacy is still not fully developed. Further research and practices should be focused on reducing barriers to healthcare access so that women of lower socioeconomic status are able to get the treatments needed to properly manage diabetes during pregnancy and to minimize the chances of developing T2DM later in life. Preventative research and tools need further development as well so that the economic burdens associated with *Diabetes Mellitus* and GDM are not exacerbated.

Conclusion

Health literacy about lifestyle factors, unique and structured patient programs catered to specific subgroups, and further research is needed in order to curb the complications of gestational diabetes on the individual and the social and economic burdens that ensue.

References

- Alejandro, E. U., Mamerto, T. P., Chung, G., Villavieja, A., Gaus, N. L., Morgan, E., & Pineda-Cortel, M. R. B. (2020). Gestational Diabetes Mellitus: A Harbinger of the Vicious Cycle of Diabetes. *Int J Mol Sci*, 21(14). <https://doi.org/10.3390/ijms21145003>
- Daneshmand, S. S., Stortz, S., Morrissey, R., & Faksh, A. (2019). Bridging Gaps and Understanding Disparities in Gestational Diabetes Mellitus to Improve Perinatal Outcomes. *Diabetes Spectr*, 32(4), 317-323. <https://doi.org/10.2337/ds19-0013>
- Farabi, S. S., & Hernandez, T. L. (2019). Low-Carbohydrate Diets for Gestational Diabetes. *Nutrients*, 11(8). <https://doi.org/10.3390/nu11081737>
- Hinkle, S. N., Laughon, S. K., Catov, J. M., Olsen, J., & Bech, B. H. (2015). First trimester coffee and tea intake and risk of gestational diabetes mellitus: a study within a national birth cohort. *BJOG*, 122(3), 420-428. <https://doi.org/10.1111/1471-0528.12930>
- Kleinberger, J. W., Maloney, K. A., & Pollin, T. I. (2016). The Genetic Architecture of Diabetes in Pregnancy: Implications for Clinical Practice. *Am J Perinatol*, 33(13), 1319-1326. <https://doi.org/10.1055/s-0036-1592078>
- Langer, O. (2006). Management of gestational diabetes: pharmacologic treatment options and glycemic control. *Endocrinol Metab Clin North Am*, 35(1), 53-78, vi. <https://doi.org/10.1016/j.ecl.2005.09.007>
- Lende, M., & Rijhsinghani, A. (2020). Gestational Diabetes: Overview with Emphasis on Medical Management. *Int J Environ Res Public Health*, 17(24). <https://doi.org/10.3390/ijerph17249573>

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

- Lorenz, A., Oza-Frank, R., May, S., Conrey, E. J., Panchal, B., Brill, S. B., RajanBabu, A., & Howard, K. (2020). A quality improvement collaborative increased preventive education and screening rates for women at high-risk for type 2 diabetes mellitus in primary care settings. *Prim Care Diabetes*, *14*(4), 335-342. <https://doi.org/10.1016/j.pcd.2019.09.010>
- Meregaglia, M., Dainelli, L., Banks, H., Benedetto, C., Detzel, P., & Fattore, G. (2018). The short-term economic burden of gestational diabetes mellitus in Italy. *BMC Pregnancy Childbirth*, *18*(1), 58. <https://doi.org/10.1186/s12884-018-1689-1>
- Morlando, M., Savoia, F., Conte, A., Schiattarella, A., La Verde, M., Petrizzo, M., Carpentieri, M., Capristo, C., Esposito, K., & Colacurci, N. (2021). Maternal and Fetal Outcomes in Women with Diabetes in Pregnancy Treated before and after the Introduction of a Standardized Multidisciplinary Management Protocol. *J Diabetes Res*, *2021*, 9959606. <https://doi.org/10.1155/2021/9959606>
- Nachum, Z., Zafran, N., Salim, R., Hissin, N., Hasanein, J., Gam Ze Letova, Y., Suleiman, A., & Yefet, E. (2017). Glyburide Versus Metformin and Their Combination for the Treatment of Gestational Diabetes Mellitus: A Randomized Controlled Study. *Diabetes Care*, *40*(3), 332-337. <https://doi.org/10.2337/dc16-2307>
- Perez, A., Alos, V. A., Scanlan, A., Maia, C. M., Davey, A., Whitaker, R. C., Foster, G. D., Ackermann, R. T., & O'Brien, M. J. (2015). The rationale, design, and baseline characteristics of PREVENT-DM: A community-based comparative effectiveness trial of lifestyle intervention and metformin among Latinas with prediabetes. *Contemp Clin Trials*, *45*(Pt B), 320-327. <https://doi.org/10.1016/j.cct.2015.10.011>

EFFECTIVE TREATMENTS OF GESTATIONAL DIABETES

Plows, J. F., Stanley, J. L., Baker, P. N., Reynolds, C. M., & Vickers, M. H. (2018). The Pathophysiology of Gestational Diabetes Mellitus. *Int J Mol Sci*, 19(11).

<https://doi.org/10.3390/ijms19113342>

Wexler, D. J., Powe, C. E., Barbour, L. A., Buchanan, T., Coustan, D. R., Corcoy, R., Damm, P., Dunne, F., Feig, D. S., Ferrara, A., Harper, L. M., Landon, M. B., Meltzer, S. J., Metzger, B. E., Roeder, H., Rowan, J. A., Sacks, D. A., Simmons, D., Umans, J. G., & Catalano, P. M. (2018). Research Gaps in Gestational Diabetes Mellitus: Executive Summary of a National Institute of Diabetes and Digestive and Kidney Diseases Workshop. *Obstet Gynecol*, 132(2), 496-505. <https://doi.org/10.1097/AOG.0000000000002726>

Yee, L. M., Leziak, K., Jackson, J., Niznik, C. M., & Simon, M. A. (2020). Health Care Providers' Perspectives on Barriers and Facilitators to Care for Low-Income Pregnant Women With Diabetes. *Diabetes Spectr*, 33(2), 190-200. <https://doi.org/10.2337/ds19-0044>