EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 5
Issue: 3
245-249
Year: 2018

REVIEW OF GESTATIONAL DIABETES: RISK FACTOR, DIAGNOSIS, MANAGEMENT AND FUTURE PERSPECTIVES

Vaishali Verma* and Shailja Jain

Department of Food and Nutrition, Govt. K. R. G. (PG) College, Gwalior, India.

***Corresponding Author: Vaishali Verma**
Department of Food and Nutrition, Govt. K. R. G. (PG) College, Gwalior, India.

Article Received on 28/12/2017 **Article Revised on 18/01/2018** **Article Accepted on 08/02/2018**

ABSTRACT
Recently, Gestational diabetes mellitus (GDM) has become a common pregnancy disorder worldwide. Through the study, we try to review the prevalence, diagnostic criteria, and management and future perspectives to GDM. To prepare the review, we collect some literature, available on digital libraries, databases (Scopus, Google scholar, PubMed), etc. and then after a thorough study, we consider those, closely related to our concern. This review concludes that GDM is a serious pregnancy disorder worldwide and in future more significant research must be done to prevent the pregnancies from such GDM. It suggests that more improved diagnostic criteria must be followed to assess the effects of GDM and treated in well-organized manner.

KEYWORDS: Gestational Diabetes, Pregnancy, Perinatal Diet, Body Mass Index.

INTRODUCTION

Recently, gestational diabetes mellitus (GDM) has become a common pregnancy disorder in society. According to the study,[1] gestational diabetes is spiraling and effecting up to 5% of all pregnancies. American Diabetes Association (ADA) also reported that approximately 7% of all pregnancies are affected by GDM.[2] In general, GDM is defined as carbohydrates intolerance resulting in hyperglycemia, with first onset or detection during pregnancy.[3] A study by Buckley et al.[4] discussed the risk factor and diagnosis of GDM in Europe. According to their discussion, 2-6% of pregnancies in Europe are affected by GDM. The study focused the prevalence, current diagnosis methods and barriers towards screening of GDM. The conclusion is that there is urgent need for well designed research that can perform the best practice on GDM diagnosis and screening.

In 2012, Wendland et al.[5] discussed the diagnostic criteria suggested by the International Association of Diabetes in Pregnancy Study Group (IADPSG) and the World Health Organization (WHO). It was the first systematic review to obtain the magnitude of the association between different GDM diagnostic criteria and several clinically relevant out comes. Their study is the estimate of relative risk that demonstrates that GDM diagnostic criteria based on both WHO and IADPSG can predict perinatal and maternal adverse out comes.

Since, India is known as a diabetic capital of the world and it has been well recognized that women especially pregnant and located from one of the most vulnerable segments of the population from nutritional point of view, are subject to higher risk of GDM. To enhance awareness, Mahanta et al.[6] conducted a cohort study in an area of rural Assam, India, served by Rural Block Primary Health Center (PHC). They considered all consented pregnant women in first trimester registered between June and August 2011. All the pregnancies were followed up in second and third trimester to measure incidence of GDM along with maternal and fetal outcome measuring during delivery and postnatal period. They concluded that there is increased cesarean section rate, admission to a Neonatal Intensive Care Unit (NICU) among women who had GDM during pregnancy.

In author study, Tutino et al.[7] discussed that there has been a marked increase in the prevalence of diabetes in Asia over recent years. They discussed that there are a number of challenges to characterizing the true prevalence of gestational diabetes in a given region. Most notable are:(1) the lack of universal screening; (2) definition of gestational diabetes vs. preexisting diabetes; (3) the diagnostic criteria used; (4) population studied (urban vs rural); (5) ethnicity; and (6) changing incidence over time. However, they characterized the true prevalence of gestational diabetes and suggested that there is an urgent need to harmonize diagnostic criteria, taking into account regional and ethnic considerations. The WHO took a step towards this end by recently updating their diagnostic criteria for GDM, adopting the

IADPSG recommendations. However, more innovative research and implementations are needed.

Risk Factor: In 2014, Dayeon Shin and Won O. Song[8] discussed about the risk factor for gestational hypertension, gestational diabetes, preterm labor, and small for gestational age (SGA) and large for gestational age (LGA) infants. They used the data of 219868 women form Pregnancy Risk Assessment Monitoring System (PRAMS) between 2004 to 2011. Multivariate logistic regression analysis was performed to examine the effects of pre-pregnancy BMI for gestational hypertension, gestational diabetes, preterm labor, and SGA and LGA infants with consideration of gestational weight gain. It has been reported that women with overweight and obese pre-pregnancy BMI has increased risk of gestational diabetes and women with gestational diabetes may have a higher risk of glucose intolerance in their offspring than healthy woman, partially due to shared genetic factors or similar dietary and physical activity in their families.

However, this study may have limitation as the retrospective cross-sectional study design may not establish a cause-effect relationship. Mothers who were surveyed 2-4 months postpartum could have had some recall bias with memory lapse. No information was available on family history of type-2 diabetes, which could impact on gestational diabetes. Besides this, they conclude that pre-pregnancy BMI an independent predictor of the pregnancy out comes such as gestational diabetes, gestational hypertension, preterm labor, and SGA and LGA infants after controlling gestational weight gain. This confirms that weight status before the start of pregnancy is critically important and then special attention need to be given to pre conception care and counseling for all reproductive aged women, particularly those with obesity.

As a modifiable factor, dietary habits have been shown to contribute to the development of type-2 diabetes, while research into the relationship between dietary factors and GDM is just emerging.[9] For instance, several cross-sectional or retrospective studies have shown that high intake of saturated fat, cholesterol or eggs are associated with an increased risk GDM.[10,11,12] In contrast, another study has found no association between the risk of GDM and intake of total dietary, saturated and poly unsaturated fat.[13] In addition, a recent prospective study, has found that high intakes of animal protein increased the risk of GDM, while high intakes of vegetable protein decreased the risk.[14] Most of the previous studies exploring the effects of dietary factors on the risk of GDM have focused on individual nutrients or food items. However, individual foods contain numerous nutrients, and foods are not consumed in isolation, thus, studying a single nutrient or food item cannot account for the complex interactions of multiple nutrients. In contrast, dietary pattern analysis could present a broader view of food and nutrients consumption, and examine the effects of overall diet on health. Most of the previous studies, were focused on western population.

To discuss the relationship between dietary patterns and the risk of GDM in Asian population He et al.[15] conducted a large prospective cohort study in China. They used data collected from pregnant women, recruited between February 2012 and February 2014. During the period, total 9494 pregnant women were approached, who were attending their first routine antenatal examinations and 94.4% of them found eligible. However, a total 6252 (69.4%) women agreed to participate in their study. Of the women recruited, they excluded 3189 women due to their medical history such as diabetes, gestational hypertension, and pregnancy termination or still birth, multiple gestation, etc., resulting in a final total of 3063 women. Participants were asked about the frequency of consumption of sixty-four specified food item as well as additional questions about soup, beverages and cooking oil. They were routinely given a75g, 2h OGTT (Oral Glucose Tolerance Test) for GDM screening at a prenatal care visit. The diagnosis of GDM was made based on the criteria developed by the international association of diabetes and pregnancy study groups ([16]). Finally, authors concluded that the vegetable dietary patterns were significantly associated with a decreased risk of GDM, while the sweets and seafood patterns was positively associated with the risk of GDM.

Diagnosis of GDM: In order to determine definitive international diagnosis criteria for gestational diabetes, the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study.[17] examined the effects of varying degrees of maternal glycemia on pregnancy outcome. A total of 23316 women had a 75g Oral Glucose Tolerance Test (OGTT) at 24-32 weeks gestation. The study found a continuous association between maternal glucose levels and birth weight and one surrogate outcome (cord blood C peptide levels, which reflect fetal insulin secretion), even below glucose levels that are diagnostic of diabetes. However, no infection point for diagnosis was evident.

Still, agreeing on the diagnostic cut-offs for gestational diabetes remains problematic. The International Association of Diabetes in Pregnancy Study Group (IADPSG) recently published a consensus derived from the Hyperglycemia Adverse Pregnancy Outcome (HAPO) study data, suggesting that all pregnant women without known diabetes should have a 75g OGTT at 24-28 weeks gestation.[16] Gestational diabetes would be diagnosed if one or more value met or exceeded the following levels of glucose: fasting 5.1 m mol/l, 1h post glucose 10.0 m mol/l and 2h post glucose 8.5 m mol/ l. Use of these criteria will result in 17.8% of the pregnant population being diagnosed with gestational diabetes. A detailed analysis of the same HAPO study information and other recent related publication raised issue that one

worthy of further debate in the wider diabetes community.

In,[18] E. A. Reyan discussed the diagnostic criteria in detail. To discuss, author considered several studies and explained that diagnosing gestational diabetes has cost implications. While, some diabetes organizations specifically exclude a cost benefit analysis when determining guidelines.[19, 20] major expenses occur when diagnosing more cases, especially when they may translate into opportunity costs for other aspects of diabetes, e.g. type 2 diabetes in pregnancy. Increased cost includes those associated with care from nurses, dietitians and physicians, as well as with glucose monitoring therapy of the diabetes.[21] Several centers have developed policies that dictate delivery protocols for women diagnosed with gestation diabetes, particularly those who have been started on insulin regardless of glycemic control achieved or fetal size.

Based on HAPO,[17] Reyan[18] proposed that for the diagnosis of gestational diabetes could be that all pregnant women without a diagnosis of diabetes should have a 50 g glucose lead between 24 and 28 weeks of gestation, without regard to fasting and with determination of plasma Glucose 1 h later. The findings should then be introduced as follows: (1) a value of > 11.1 m mol /l would merit a diagnosis of gestation diabetes; (2) value of 7.8- 11.0 m mol /l would warrant conducting a 75 g OGTT, with OGTT cut-off at 5.3 m mol /l fasting 10.6 m mol /l 1 h post challenge and 9.0 m mol /l 2h challenge, one of which would be sufficient for diagnosis if equaled or exceeded; and (3) a value < 7.8 m mol/l would indicate that gestation diabetes is not present.

Management of GDM: In recent years, GDM has been become a common complication of pregnancy and it is required that all women and adolescents of reproductive age must be trained to manage GDM. There are several counseling methods based on life style management, food and nutrient intake and drug therapy. However, life style and food management are the most important methods to manage GDM.

According to Tobias et al.[22] physical activity has long been known for its role in improving glucose homeostasis through its direct or indirect impact on insulin sensitivity via several mechanisms. Several studies.[23,24,25] have reported that physical activity has independent effects on glucose disposal as well as exert long term effects on improvement in insulin sensitivity though increased fat free mass. In[22] it is concluded that greater total physical activity before pregnancy or during early pregnancy was significantly associated with a lower risk of GDM. However, there are some limitations like misclassification of questionnaires, misclassification of pre pregnancy physical activity, etc. Another study,[26] reported that there is a lack of consistent evidence regarding the benefits of physical activity on glucose tolerance and insulin sensitivity and preventing GDM. However, it appears that physical activity may help to achieve good glycaemic control and limit insulin use in GDM women.

To assess the effects of life style intervention on GDM women, a randomize controlled trial study is done by Koivusalo et al.[27] In the study, 293 women are enrolled and finally 269 of there were analyzed. The participants in the intervention group increased their physical activity and improved their dietary quality during pregnancy. In contrast, the control group participants did no improvement in their physical activity or dietary intake. As a result of the combined moderate physical activity and diet intervention, the overall incidence of GDM was reduced by 39%. To discuss the GDM management by nutritional intake, Meinila et al.[28] conducted a study on pregnant women they considered the pregnant women at primary health care centers and antenatal clinics, as well as by news paper advertisement and targeted social media announcement. The study was carried with the help of two trained nutritionists and the food intake records were taken on their consecutive week's day. The study observed that excessive intake of saturated fatty acids and low intake of carbohydrates among women at high risk of GDM may further increase their risk of GDM. Also, suggested that pregnant women with high risk of GDM should take sufficient intake of vitamin D and folate.

Another study towards association between dietary factors and GDM is done by Schoenaker et al.[29] and it is concluded that previous studies supports current dietary guideline for pregnant women with high risk of GDM . However, further studies are needed to examine dietary patterns both before and during pregnancy in relation risk of GDM. In,[30] R. S. Opie et al. discussed the outcome of a dietary intervention study conducted at a hospital in Melbourne, Australia. The study considered dietary intervention group (92) women and control group (125 women) of obese pregnant women with gestation (< 21 weeks) and age > 18 years. This study was associated with significant improvements in diet quantity of obese pregnant women. However, the protective effect of diet on GDM incidence was independent of weight changes.

CONCLUSION

Recently, gestational diabetes mellitus has become an emerging pregnancy complication. The issue has been studied by several researchers and to enhance awareness, we presented a literature review on GDM. To prepare the review, we searched several digital libraries and databases like scholar Google, PubMed, Scopus, etc. and collected the articles related to our concern. After a thorough review, we found that the awareness about GDM is insufficient. The diagnosis methods and criteria are to be implemented properly. However, the risk factors discussed in the literature are significantly not associated to GDM. To define significant risk factors, more innovative research is needed in the direction of

nutritional values and GDM. This review also suggests that innovation towards diagnostic methods and criteria are needed.

REFERENCES

1. Hu FB. Globalization of diabetes. Diabetes care, 2011; 34(6): 1249–1257.
2. American Diabetes Association. American diabetes association position statement: Gestational diabetes mellitus. Diabetes care, 2004; 27(suppl 1): s88–s90.
3. World Health Organization. Definition, diagnosis and classification of diabetes mellitus and its complications: report of a WHO consultation. part 1, diagnosis and classification of diabetes mellitus, 1999.
4. Buckley BS, Harreiter J, Damm P, Corcoy R, Chico A, Simmons D, Vellinga A, Dunne F. Gestational diabetes mellitus in Europe: prevalence, current screening practice and barriers to screening. a review. Diabetic medicine, 2012; 29(7): 844–854.
5. Wendland EM, Torloni MR, Falavigna M, TrujilloJ, Dode MA, Campos MA, Duncan BB, Schmidt MI. Gestational diabetes and pregnancy outcomes-a systematic review of the world health organization (who) and the international association of diabetes in pregnancy study groups (iadpsg) diagnostic criteria. BMC pregnancy and childbirth, 2012; 12(1): 23.
6. Mahanta TG, Deuri A, Mahanta BN, Bordoloi P, Rasaily R, Mahanta J, Baruah S, Gogoi P. Maternal and foetal outcome of gestational diabetes mellitus in a rural block of assam, india. Clinical Epidemiology and Global Health, 2014; 2(1): 9–15.
7. Tutino G, Tam W, Yang X, Chan J, Lao T, Ma R. Diabetes and pregnancy: perspectives from asia. Diabetic Medicine, 2014; 31(3): 302–318.
8. Shin D, Song WO. Prepregnancy body mass index is an independent risk factor for gestational hypertension, gestational diabetes, preterm labor, and small-and large-for-gestational-age infants. The Journal of Maternal-Fetal & Neonatal Medicine, 2015; 28(14): 1679–1686.
9. Zhang C, Ning Y. Effect of dietary and lifestyle factors on the risk of gestational diabetes: review of epidemiologic evidence. The American journal of clinical nutrition, 2011; 94(6 Suppl): 1975S–1979S.
10. Bo S, Menato G, Lezo A, Signorile A, Bardelli C, De Michieli F, Massobrio M, Pagano G. Dietary fat and gestational hyperglycaemia. Diabetologiam, 2001; 44(8): 972–978.
11. Gonzalez-Clemente J, Carro O, Gallach I, Vioque J, Humanes A, Sauret C, Abella M, Gimenez-Perez G, Mauricio D. Increased cholesterol intake in women with gestational diabetes mellitus. Diabetes & metabolism, 2007; 33(1): 25–29.
12. Qiu C, Frederick IO, Zhang C, Sorensen TK, Enquobahrie DA, Williams MA. Risk of gestational diabetes mellitus in relation to maternal egg and cholesterol intake. American journal of epidemiology, 2011; 173(6): 649–658.
13. Radesky JS, Oken E, Rifas-Shiman SL, Kleinman KP, Rich-Edwards JW, Gillman MW. Diet during early pregnancy and development of gestational diabetes. Paediatric and perinatal epidemiology 2008; 22(1): 47–59.
14. Bao W, Bowers K, Tobias DK, Hu FB, Zhang C. Prepregnancy dietary protein intake, major dietary protein sources, and the risk of gestational diabetes mellitus. Diabetes Care, 2013; DC 122 018.
15. He JR, Yuan MY, Chen NN, Lu JH, Hu CY, Mai WB, Zhang RF, Pan YH, Qiu L, Wu YF, et al.. Maternal dietary patterns and gestational diabetes mellitus: a large prospective cohort study in china. British Journal of Nutrition, 2015; 113(8): 1292–1300.
16. Metzger BE PBea Gabbe SG. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. Diabetes care, 2010; 33(3): 676–682.
17. Group HSCR, et al.. Hyperglycemia and adverse pregnancy outcomes. N Engl j Med 2008; (358): 1991–2002.
18. Ryan EA. Diagnosing gestational diabetes. Diabetologia, 2011; 54: 480–486.
19. Group GD, et al. Guidelines: management of diabetes from preconception to the postnatal period: summary of nice guidance. BMJ: British Medical Journal, 2008; 336(7646): 714.
20. Cheng A. Canadian diabetes association 2013clinical practice guidelines for the prevention andmanagement of diabetes in canada. introduction. Canadian journal of diabetes 2013; 37: S1–3.
21. Cundy T, Ackermann E, Ryan EA. Gestational diabetes: new criteria may triple the prevalence but effect on outcomes is unclear. BMJ: British Medical Journal 2014; 348.
22. Tobias DK, Zhang C, Van Dam RM, Bowers K, Hu FB. Physical activity before and during pregnancy and risk of gestational diabetes mellitus. Diabetes care, 2011; 34(1): 223–229.
23. Annuzzi G, Riccardi G, Capaldo B, KAUSER L. Increased insulin-stimulated glucose uptake by exercised human muscles one day after prolonged physical exercise. European journal of clinical investigation, 1991; 21(1): 6–12.
24. Devlin JT. Effects of exercise on insulin sensitivity in humans. Diabetes Care, 1992; 15(11): 1690–1693.
25. Shulman GI, Rothman DL, Jue T, Stein P, DeFronzo RA, Shulman RG. Quantitation of muscle glycogen synthesis in normal subjects and subjects with noninsulin-dependent diabetes by 13c nuclear magnetic resonance spectroscopy. New England Journal of Medicine, 1990; 322(4): 223–228.
26. Ruchat SM, Mottola MF. The important role of physical activity in the prevention and management of gestational diabetes mellitus. Diabetes/ metabolism research and reviews, 2013; 29(5): 334–346.

27. Koivusalo SB, R¨on¨o K, Klemetti MM, Roine RP, Lindstr¨om J, Erkkola M, Kaaja RJ, P¨oyh¨onen-Alho M, Tiitinen A, Huvinen E, et al.. Gestational diabetes mellitus can be prevented by lifestyle intervention: The finnish gestational diabetes prevention study (radiel). Diabetes Care, 2016; 39(1): 24–30.
28. Meinil¨a J, Koivusalo SB, Valkama A, R¨on¨o K, Erkkola M, Kautiainen H, Stach-Lempinen B, Eriksson JG. Nutrient intake of pregnant women at high risk of gestational diabetes. Food & nutrition research, 2015; 59(1): 266-76.
29. Schoenaker DA, Mishra GD, Callaway LK, Soedamah-Muthu SS. The role of energy, nutrients, foods, and dietary patterns in the development of gestational diabetes mellitus: a systematic review of observational studies. Diabetes Care, 2016; 39(1): 16–23.
30. Opie RS, Neff M, Tierney AC. A behavioural nutrition intervention for obese pregnant women: Effects on diet quality, weight gain and the incidence of gestational diabetes. Australian and New Zealand Journal of Obstetrics and Gynaecology, 2016; 56(4): 364–373.