

## REVIEW ARTICLE

# A Review on the Factors Influencing the Attendance of Postpartum Diabetes Screening for Mothers with Gestational Diabetes Mellitus

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## ABSTRACT

Women with gestational diabetes mellitus (GDM) during their pregnancy have a greater risk of developing overt diabetes mellitus and dysglycemia (prediabetes, impaired glucose tolerance or impaired fasting glucose) later in future, compared to mothers with normal pregnancy. Postpartum screening is crucial for early identification of type 2 diabetes (T2DM) in women with GDM. Nevertheless, despite various strategies, its rate remains low. A systematic review using databases of PubMed/Medline, Science Direct and CINAHL from 2008 to 2018, was conducted to identify the factors influencing the attendance of postpartum diabetes screening. Open access English articles, focusing on observational studies were reviewed. Primary screening of titles and abstracts of 91 articles were done, secondary screening of 31 articles resulted in 6 articles, included in this manuscript. Various factors identified to be associated with the attendance to postpartum diabetes screening, which are age, education, ethnicity, some obstetric factors like multiparity, and history of insulin usage previously. Many women fail to be screened for diabetes during the postpartum period, and this delays T2DM diagnosis, which in turn gives rise to various complications. Further research that considers these factors is necessary for developing interventions to improve postpartum T2DM screening for mothers with GDM during their pregnancy

**Keywords:** Postpartum diabetes screening, Gestational Diabetes Mellitus (GDM), Diabetes testing attendance, Type two diabetes mellitus (T2DM) screening adherence

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## INTRODUCTION

Gestational Diabetes Mellitus (GDM) is diagnosed during the late second or early third trimester of pregnancy that is associated with Type 2 Diabetes Mellitus (T2DM). The condition is caused by dysglycaemia as articulated by the American Diabetes Association (ADA) Standards of Diabetes Care 2017 (1). GDM is a potential risk factor for the development of T2DM during the postpartum period. In particular, patients with GDM normally develop T2DM after a period of 5 to 10 years (2, 3). The time taken for the patients diagnosed with GDM to show T2DM is influenced by the population studied (4) and the screening methods employed for a particular study (5). The level of glucose tolerance varies from 11% to 42% for T2DM patients and impaired fasting glycaemia respectively (6).

GDM has been perceived as a complication of pregnancy

that will resolve after childbirth. However, studies have established that this diagnosis may imply a lifetime of health problems (3, 7, 8). Women with gestational diabetes are at increased risk of some complications during pregnancy and delivery, as are their infants. GDM is associated with an up to a seven-fold increase in the risk of manifest T2DM compared with normoglycemic pregnancies (3, 9). Studies show that achieving glycaemic control with lifestyle modifications and/or pharmaceutical intervention during pregnancy prevents or considerably reduces the risk of adverse pregnancy outcomes (10,11).

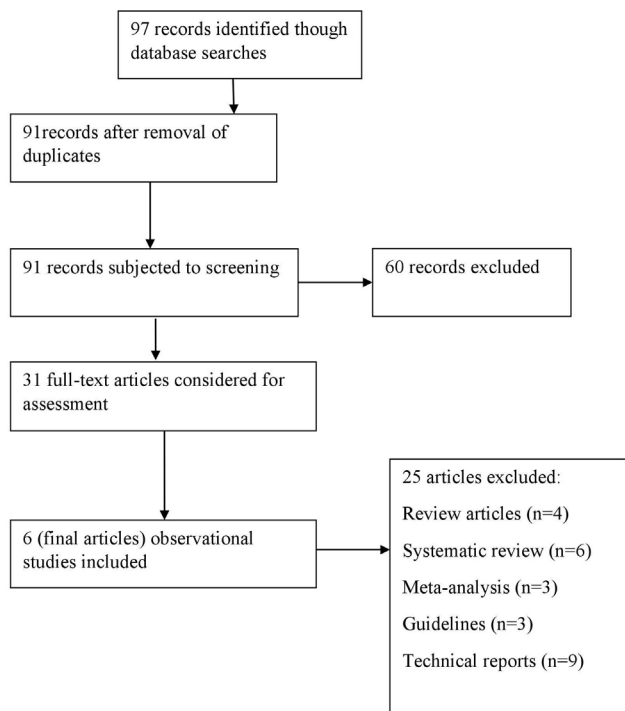
Screening for T2DM is important to identify the diabetic status of postpartum mothers. The main reasons for the screening for type 2 diabetes are, that there is an asymptomatic period in which the condition can be detected (12, 13), a substantial proportion of people with T2DM are undiagnosed, the seriousness of the immediate effects and long-term complications of type 2 diabetes and the rising prevalence of type 2 diabetes worldwide (14). In Malaysia, the postpartum screening for T2DM for a mother who had GDM during her antenatal period is performed with a Modified Oral Glucose Tolerance

Test (MGTT) between 6 to 8 weeks postpartum. The postpartum T2DM screening is considered as one of the golden opportunity to detect and diagnose this disease among women because GDM presents women and their providers with an impressive opportunity for prevention of a major cause of chronic illness and disability among long, latent mid-life and older women (15).

GDM is a risk factor for T2DM (16) and the postpartum screening provides a route for assessing the women who could benefit when subjected to preventive measures (1). Various guidelines available for postpartum T2DM screening, however, the rates of postpartum screening among women with a history of GDM are low; only half of the women in most populations are screened (17). This study was aimed to identify the factors influencing the attendance of postpartum diabetes screening.

**MATERIALS AND METHODS**

A systematic review was conducted for this study. The databases that were included in the search are PubMed/Medline, Science Direct and CINAHL from 2008 to 2018, using following keywords factors, predictor, determinant, postpartum, after delivery, diabetes screening, diabetes follow-up, diabetes testing, attendance, adherence, and non-adherence. The search was limited to open access English articles that were focused on observational studies, mainly. The articles, which were excluded for review, were systematic reviews, review articles, technical reports, and meta-analysis. The search was conducted electronically according to the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (18). Figure1 describes the flow diagram for the study selection. The quality



**Figure 1: PRISMA flow diagram of the review**

of the articles reviewed was controlled based on the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) statement.

**RESULTS**

The six final articles that were reviewed revealed the factors that influence the attendance of postpartum diabetes screening. The identified factors are socio-demographic factors, socio-economic factors, obstetric factors, and health system factors. The results are shown in Table I and Table II. The summary of the factors influencing the attendance of postpartum diabetes screening, in illustrated in Table III.

**Table I: Factors influencing the non-adherence to Postpartum Screening**

Author/Year/Country	Study Design/Sample Size/Participant	Tools	Postpartum T2DM screening	Findings
McGovern et al., 2014	Quantitative retrospective cohort study involving 127 primary care practices across England were used to identify and follow-up females with GDM. There were 1667 women involved in this study.	Electronic general practice records	OGTT at postpartum 6 to 12weeks	Non-Asian women were less likely to get tested
England				
McCloskey, Bernstein, Winter, Iverson & Lee-Parritz., (2014)	A retrospective cross-sectional study of 415 women who had a diagnosis of GDM and gave birth at Boston Medical Center (BMC) during a 6- year period (2003–2009).	Profoma on Clinical and administrative data	OGTT within 10weeks of postpartum	Women aged ≥35 years of age and women that had her prenatal follow-ups with a family medicine provider were significantly less likely to be tested
US				
Morrison, Collins, & Lowe., (2009)	Cross-sectional study involving 1372 women diagnosed with GDM between 2003 and 2005, sampled from the National Diabetes Services Scheme database	Self-administered questionnaire	OGTT at postpartum 6 to 8 weeks	Increasing age (five years increment) was associated with a lower likelihood of returning for postnatal testing
Australia				

**DISCUSSION**

**Summary of Main Results**

This study was aimed to identify the factors influencing the attendance of postpartum diabetes screening. Different factors were established that influences the attendance of postpartum diabetes screening. For instance, a study by McCloskey et al (19), established that non-adherence was attributed to lack of awareness and some missed management by the family medicine practitioners during the prenatal follow-ups. These results generally show that the adherence to postpartum diabetes screening is very low despite having guidelines in place in clinical settings. However, studies showed that non-adherence decreases when an active search is conducted. To illustrate this, women who began postpartum visits showed increased adherence compared to those who do not attend the visits (20).

**Table II: Factors influencing the adherence to Postpartum Screening**

Author/Year/Country	Study Design/Sample Size/Participant	Tools	Postpartum T2DM screening	Findings
Lawrence, Black, Hsu, Chen & Sacks, (2010). US	Retrospective study of 11,825 women who were identified as having GDM using the 100-g oral glucose tolerance test (OGTT) from 1999 to 2006.	Test results from laboratory databases and delivery details from medical records	OGTT within 6 months after delivery	Odds of testing were independently associated with Women age 35 to 39, an Asian/Pacific Islander, women with high school graduate, women with high household income, women that were born Outside U.S, and women with only 1 child
Stasenکو, Cheng, McLean, Jelin, Rand, & Caughey, (2010) US	Retrospective cohort study involving 745 women with GDM who delivered at the University of California, San Francisco (UCSF) from 2002 to 2008.	Medical records and laboratory reports	OGTT within 6 months after delivery	Asian race remained a statistically significant predictor for having obtained a postpartum glucose test as compared with white women. Women aged ≥ 35years, with higher level of education and with history of Insulin use during pregnancy were more likely to return for testing
Morrison, Collins, & Lowe., (2009) Australia	Cross-sectional study involving 1372 women diagnosed with GDM between 2003 and 2005, sampled from the National Diabetes Services Scheme database	Self-administered questionnaire	OGTT at postpartum 6 to 8 weeks	Factors related to return for postnatal OGTT at six to eight weeks post-GDM pregnancy was receiving health professional delivered risk reduction advice, received written information after the birth, being under the care of an endocrinologist and not tertiary educated and seeing an obstetrician as well as diabetes educator during GDM pregnancy
Oza-Frank, (2014) US	Secondary data analysis was conducted using data from the 2009 and 2010 Pregnancy Risk Assessment Monitoring System from three states and one city (Colorado, Minnesota, Utah, and New York City). The total sample size of women with a history of GDM surveyed in the sample was 909.	Self-administered questionnaire	OGTT at postpartum 6 to 12 weeks	Women aged 25–34, with higher income and with a pre-pregnancy BMI classified as obese were more likely to report postpartum testing

Most of the findings revealed that the mothers from younger age group tend to adhere to the postpartum diabetes screening, for instance, the study done in the US by McCloskey et al (19), it was noticed that the mothers from the older age group tend not to get tested during their postpartum period. In fact, it was also discovered that increasing age (increment of five years) was associated with a lower likelihood of returning for postnatal testing (21). Lower education level, as well as low household income, is also noted to be factors of non-adherence towards postpartum diabetes screening (20). From the review, it was noticed that ethnicity

**Table III: Summary of factors influencing attendance of postpartum diabetes screening**

Factors	Authors	Major findings
<b>Socio-demographic factors</b>	Lawrence, Black, Hsu, Chen, & Sacks, 2010; Morrison, Collins, & Lowe., 2009; Stasenکو, Cheng, McLean, Jelin, Rand, & Caughey, 2010; McCloskey, Bernstein, Winter, Iverson & Lee-Parritz., 2014; McGovern et al., 2014; Oza-Frank, 2014	Age, ethnicity
<b>Socio-economic factors</b>	Lawrence, Black, Hsu, Chen, & Sacks, 2010; Stasenکو et al, 2010; Oza-Frank, 2014	Education level, household income
<b>Obstetric factors</b>	Lawrence, Black, Hsu, Chen, & Sacks, 2010; Stasenکو et al, 2010; Oza-Frank, 2014	Parity, History of GDM, history of insulin use during pregnancy,
<b>Health system factors</b>	Lawrence, Black, Hsu, Chen, & Sacks, 2010; Morrison, Collins, & Lowe., 2009; McCloskey, Bernstein, Winter, Iverson & Lee-Parritz., 2014	Did not have any postpartum visits, absence of risk reduction advice, never received written information after the birth, not being under the care of an endocrinologist, not seen by an obstetrician and diabetes educator during GDM pregnancy

also seem to be a factor, whereby Asians were more adhering towards the screening (20, 22) compared to other included ethnicities.

Furthermore, studies had also revealed some obstetrics, especially multiparity, previous history of GDM, history of insulin usage during pregnancy, history of having a Caesarian section as the mode of delivery, as contributing factors towards non-adherence to postpartum diabetes screening (20, 23, 24). Various studies had also discovered that issues related to healthcare system influence patients' adherence towards postpartum diabetes screening. Issues such as not having any postpartum visits, lack of advice on risk reduction, absence of written information after the birth, not being under the care of an endocrinologist and also, not seen by an obstetrician and diabetes educator during GDM pregnancy are among that healthcare system-related factors that contribute to non-adherence towards postpartum diabetes screening.(19 - 21).

**Overall Completeness and Applicability of Evidence**

This review aimed to synthesize the factors associated with non-adherence to postpartum diabetes screening. The overall samples that were included in these reviewed studies were 16933 women with GDM. However, the available evidence was limited, and all 6 included studies were conducted in a high-income country. This limits the applicability of the evidence to low- and middle-income country. As this topic is specific to mothers with gestational diabetes, the studies have only included this population as their study population, however, the applicability is mainly to the high-income countries.

This review had considered observational studies designs for inclusion and is based on comprehensive searches.

However the search was limited to studies conducted in English language.

### Potential Biases in the Review Process

Firstly, the identification of studies of factors associated with non-adherence to postpartum diabetes screening electronically was challenging, which could potentially be a source of biasness. Additionally, the literature included in this review conducted their research in high-income countries, information, and findings that are related to the middle- and low-income countries were not included. The socio-demographic status of patients in these countries are different and thus could influence the rate of adherence differently. Another limitation of this review is that unpublished data could not be obtained so as to ascertain if indeed the data obtained from the published sources were the actual raw data obtained from the field. Finally, the study excluded other original papers that were not published in English, which limits the search.

### CONCLUSION

Various factors were identified which influence the women with the history of GDM to attend their postpartum diabetes screening. Among those factors, maternal age, parity, education status and income status were most influential towards the attendance of postpartum diabetes screening, despite the importance of the screening, there are still many women that fail to be screened and this facilitates the delayed T2DM diagnosis, which in turn gives rise to various complications. By identifying these factors that influence postpartum diabetes screening, various interventions and programs related to this matter can be designed accordingly.

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