



Contents lists available at ScienceDirect

Diabetes & Metabolic Syndrome: Clinical Research & Reviews

journal homepage: www.elsevier.com/locate/dsx

Barriers and interventions for postpartum reclassification of glycemic status in women with gestational diabetes mellitus: A scoping review

Aline Kimmy Ikemoto Sato ^{a,*}, Rebecca Zerbinatti Pereira ^a,
 Pedro Henrique Moreira dos Santos ^a, Alessandra Mazzo ^a, Lenita Zajdenverg ^b,
 Carlos Antonio Negrato ^a

^a University of São Paulo - Bauru Campus (USP-Bauru), Brazil

^b Federal University of Rio de Janeiro (UFRJ), Brazil

ARTICLE INFO

Article history:

Received 6 May 2022

Received in revised form

13 June 2022

Accepted 15 June 2022

Keywords:

Gestational diabetes

Barriers

Postpartum

Health Services Accessibility

ABSTRACT

Background and aims: Our aim was to summarize, analyze and disseminate the current state of knowledge about the barriers and facilitators in postpartum reclassification that women who have had gestational diabetes face.

Methods: Data collection was carried out from January to March 2021 in PubMed, Scopus, Web of Science (WoS), Embase and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases.

Results: Of the 361 studies initially retrieved in the search, 32 articles published between 2010 and 2020 were selected because they were within our objective.

Conclusion: Multiple barriers and interventions were found regarding the reclassification of the glycemic status of women who had Gestational Diabetes during pregnancy. Therefore, further studies are needed to achieve a better intervention for this condition.

© 2022 Diabetes India. Published by Elsevier Ltd. All rights reserved.

1. Introduction

Gestational diabetes mellitus (GDM) is defined as the presence of hyperglycemia diagnosed during pregnancy, with lower glucose levels than those considered for the diagnosis of diabetes mellitus (DM) outside of pregnancy, which may persist or not after delivery [1–3].

Current diagnostic criteria for GDM were proposed by the International Association of Diabetes in Pregnancy Study Group (IADPSG) in 2010, and were based on data obtained from the Hyperglycemia and Adverse Pregnancy Outcome (HAPO) study, which found that the risks of adverse pregnancies outcomes increased in parallel with the increase of maternal blood glucose levels [4]. It is estimated that 18.0% of Brazilian pregnant women have GDM [5].

The gold standard for GDM diagnosis is the oral glucose tolerance test (OGTT) performed with 75g of anhydrous glucose between 24th and 28th weeks of gestation. It should be done in all pregnant women without prior diagnosis of DM. The OGTT should be performed, in pregnant women with a fast of at least 8 h, with

blood samples collection at fasting, one and 2 h after glucose load. If at least one altered blood glucose value is found, i.e. fasting ≥ 92 mg/dl, or ≥ 180 mg/dl 1 h and ≥ 153 mg/dl 2 h after glucose load, the diagnosis of GDM is confirmed. If fasting blood glucose is ≥ 126 mg/dl or 2-h ≥ 200 mg/dl, the diagnosis of DM diagnosed in pregnancy (overt diabetes) is confirmed, instead of GDM [6,7].

GDM is associated with an increased risk of morbidity and mortality among the offspring such as fetal macrosomia, respiratory distress syndrome, hyperbilirubinemia, neonatal hypoglycemia, obesity, DM and cardiovascular diseases that may present even in early adulthood. The mother has increased risks of hypertensive disorders, polyhydramnio, need for cesarean section and higher risk of other obstetric complications such as birth trauma. Women who have had GDM are also at increased risk of developing Type 2 Diabetes (T2D), persisting with impaired fasting glucose, or presenting glucose intolerance soon after the end of pregnancy and in the following years [3,8].

In addition to proper diagnosis and treatment of GDM being essential to reduce perinatal risks, it is also very important the postpartum follow-up and reclassification of glycemic status of these patients, since GDM is the main risk factor for the development of T2D. Therefore, after delivery these patients should be followed up taking in account that they are people at high risk of

* Corresponding author.

E-mail address: aline.kimmy@usp.br (A.K. Ikemoto Sato).

developing T2D [9]. A previous diagnosis of GDM is a unique time window with great opportunities to make lifestyle changes that can prevent or delay the onset of T2D. The postpartum reclassification of glycemic status of these patients should be performed after childbirth and periodically throughout their lives [1].

The incidence of T2D among women with a previous history of GDM ranges from 3 to 65.0%. These large variations occur due to ethnic differences, diverse diagnostic criteria and methodologies used for the their follow-up. Women at higher risk of developing T2D after GDM are those with fasting glycemia greater than 100 mg/dl during pregnancy, belonging to non-White ethnicity, with a family history of T2D, obesity (mainly central obesity), excessive weight gain during or after pregnancy, use of high fat content diets, sedentary lifestyle and the need to use insulin during pregnancy [10].

According to the Prenatal and Birth Humanization Program of the Ministry of Health, women must have at least one postpartum consultation (up to 42 days after birth) [11], while the World Health Organization (WHO) recommends an OGTT with 75g of anhydrous glucose in the sixth postpartum week [9]. In this visit, a reclassification of glycemic status should be requested for all women with a history of GDM [1,12].

The OGTT with 75g of anhydrous glucose in the sixth postpartum week is considered the gold standard for the reclassification of these patients. Fasting blood glucose and 2 h after glucose load should be measured. Normal values are considered as a fasting glucose <100 mg/dl and 2 h after glucose load <140 mg/dl. Fasting glucose values between 100 mg/dl and 125 mg/dl are classified as impaired fasting glucose. Glucose levels 2 h after glucose load between 140 mg/dl and 199 mg/dl are considered diagnostic of glucose intolerance, while fasting glucose ≥ 126 mg/dl or ≥ 200 mg/dl 2 h after glucose are considered diagnostic of DM. The states of impaired fasting glucose and glucose intolerance are also called prediabetes. The measure of glycated hemoglobin in the postpartum period is not validated for the diagnosis of DM in the puerperium. If the OGTT is normal, it is recommended that the patient should be reevaluated annually and receive orientations on the importance of maintaining healthy lifestyle, of reaching and maintaining adequate body weight, following an individualized diet and practicing physical exercises regularly, aiming to prevent the onset of T2D [2].

However, in reality, many women do not perform the postpartum reclassification. The rates of women returning for postpartum reclassification of glycemic status range from 19 to 73.0% [2]. The low patients' adherence for the postpartum reclassification test is due to several factors inherent to the patient and to the health services to which they are linked to Refs. [13,14].

1.1. Clinical relevance

This reclassification is extremely important for the health and quality of life of these women. Due to the high rates of discontinuity of follow-up in the postpartum period of patients who had the diagnosis of GDM, we conducted this scoping review aiming to gather information that identify the barriers that impair the full follow-up of these women and which intervention strategies could increase the adherence to this screening.

We carried out this scoping review with the objective of gathering information that identifies the barriers that make it difficult to fully monitor these women, and which intervention strategies could increase adherence to this screening. The topic of our scoping review is still little explored, and we did not find other reviews of defined methodology that address both barriers and interventions in the follow-up of gestational diabetes.

Also, we set up tables for quick consultation, showing the most relevant data found in the databases. Therefore, authors who are

interested in the area will find in our study data that can guide the way to develop more research within this scope, data such as the frequency of barriers and facilitators, patients' perspective, health professionals' view, information from health services and a summary of relevant studies that were published during the period studied.

2. Methods

This study is a scoping review elaborated according to the standards of Joanna Briggs Institute [15] that was conducted following these consecutive steps: 1) elaboration of the guide question and the objective of the research, 2) elaboration of search strategy, 3) literature research, 4) selection of articles based on the title and abstract, 5) selection of articles after reading the full text, 6) summary of the results and 7) discussion of the results. The PRISMA tool adapted for scoping reviews (PRISMA-ScR) was also applied, which consists of a checklist with 20 essential items and 2 optional items that guide the proper performance of this review model [16].

To elaborate the research question, the Population, Concept and Context (PCC) strategy was used, being P- Women with a history of GDM; C- Barriers and interventions and C- Postpartum reclassification of glycemic status. Based on these definitions, the following research question was elaborated: "What are the evidences regarding the barriers and interventions for the postpartum reclassification of glycemic status in women with a history of GDM?"

The search strategy was elaborated by the researchers with the collaboration of a librarian. Keywords and health descriptors (Decs/Mesh) that related to each of the elements of the research question were chosen, i.e.: P – Gestational Diabetes; C- Barriers to accessing health services OR Maternal-Child Health Services OR Health Services Accessibility, C- Postpartum Period OR Postnatal Care OR Aftercare OR Loss to Follow-Up OR Follow-up Studies; as well as their respective alternative terms. Among the terms the Boolean operators OR and AND were used to define the search strategy to be used in selected databases. Those databases analyzed were PubMed, Scopus, Web of Science (WoS), Embase and Cumulative Index to Nursing and Allied Health Literature (CINAHL). The bibliographic survey took place from January to March 2021. Included studies were original researches, integrative, narrative, scoping and systematic reviews, meta-analyses and guidelines, published in English, Spanish and Portuguese, from 2010 to 2020 and that answered the research question. Articles whose focus was not GDM, those that did not address barriers or interventions related to the adherence of these patients for the postpartum reclassification of glycemic status, gray literature articles as well as those published in languages other than English, Spanish and Portuguese, were excluded.

In total, 361 articles were found and incorporated into the Mendeley software for initial screening of repetitions. Fifty-seven articles that were published in more than one database were excluded. From the remaining 304 studies, reading of the title and abstract was performed and among these, 85 articles containing original studies, reviews, meta-analyses and guidelines were selected for full reading. At the end of the process, 32 articles met the pre-established inclusion criteria and took part in this study. The selection of articles and data collection of each manuscript was performed by three independent readers that also discussed the results to guarantee objective data extraction (AKYS, RZP and PHMS). Fig. 1 shows the flowchart of the search process. The 32 selected studies were called articles and numbered from 1 to 32. The results are presented as tables and discursive report (Fig. 1).

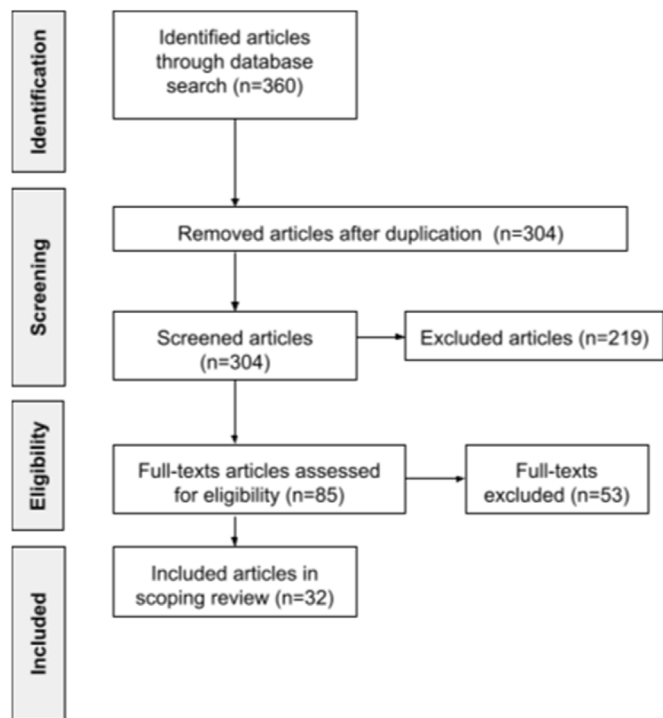


Fig. 1. Flowchart of articles identification and selection process.

3. Results

Among the 32 selected studies, 23 (71.9%) were published between 2015 and 2020, and were conducted in the United States, Australia, New Zealand, China, India, Iran, Canada, Finland, United Kingdom and Singapore. Regarding the methodological design, most of the studies consisted of descriptive statistics and sample size and diverse characteristics of the included subjects (women with GDM or health professionals). Table 1 shows the studies according to authorship, title, year of publication, journal, country of publication, study design, population and study sample (Table 1).

This review identified barriers related to the postpartum reclassification of glycemic status regarding both patients and health services. Table 2 shows the studies grouped according to the barriers found and their respective frequencies.

Regarding patients, the most important barrier was the inconvenience of performing the OGTT (37.5%), concerns about the baby (34.8%), existence of other family priorities (32.0%), fear of having the diagnosis of DM (28.1%), presence of financial difficulties that make it difficult the access to the laboratory for the OGTT performance (25.0%), belonging to racial minorities (15.6%) and greater parity (12, 5%). Other barriers such as forgetting the need to perform the test, patients' younger age, previous adverse experiences with the health service to which they are linked, living far from the place where the test is performed and not having health care insurance were also mentioned (9,4, %). Less frequently, the absence of a personal or family history of GDM, language barriers, lack of family support, lower education level, not breastfeeding the baby, poor adherence to GDM treatment and procrastination to perform the test were mentioned (3.1%).

Regarding barriers related to health services, the most frequently found was the lack of knowledge or insufficient knowledge by health professionals, regarding the importance of reclassifying the glycemic status of these patients, about the metabolic and cardiovascular risks associated with GDM and

insufficient training to deal with this condition (53.1%), presence of information fragmentation in health services (25%), lack of communication between patients and health services, long waiting time to perform the test (15.6%), work overload and poor organization of health services (6.3%) (Table 2).

In addition to these barriers, many studies mentioned interventions aiming at patients and at health services to improve adherence to the reclassification. Table 3 shows the studies grouped according to the frequency of indicated strategies.

Regarding health services, the main intervention strategies presented were to educate and make both patients and health professionals aware of the importance of reclassifying glycemic status after GDM diagnosis (34.4%), improving the communication between health professionals and patients (32.0%) and even among health professionals (25.0%), as well as restructuring health services according to the socioeconomic needs of the patients (12.5%) and finally, the standardization of the screening strategies of these patients in all health services (6.3%). Regarding the main interventions to be carried out with patients, the main one was to promote a multidisciplinary education approach centered on patients (21.9%). The active search for these patients, a better training of professionals, the use of alternative screening methods, such as performing OGTT immediately after delivery or at home, were also proposed (12.5%) (Table 3).

4. Discussion

In view of the importance of postpartum reclassification of glycemic status in women with a history of GDM, this study highlighted the main barriers encountered by patients and health services that contribute to the discontinuity of postpartum follow-up. In this context, a literature review was carried out including 32 articles published between 2010 and 2020, distributed in 17 cross-sectional observational studies, 5 longitudinal observational studies, 4 interventional studies, 4 narrative reviews, 1 systematic review, 1 cross-sectional study protocol and 1 case report. Among the analyzed studies, 16 were conducted in the United States, 6 in Australia (of these, 1 was also conducted in New Zealand), 2 in China, 2 in India, 2 in Iran, 1 in Canada, 1 in Finland, 1 in the United Kingdom and 1 in Singapore. There was a notable lack of studies carried out in Latin America and Africa (Table 1).

4.1. Barriers encountered

The postpartum follow-up rate of women with a history of GDM is known to be lower than intended, as has been noted in a Brazilian study in which only 13.8% patients with GDM returned to perform OGTT [17]. In this sense, this scoping review identified several resistances both in patients' perspectives and in biases among health professionals, in order to develop effective intervention strategies in the current scenario.

Among the difficulties related to the health services, the lack of knowledge and awareness about the risks associated with GDM stood out. Although professionals have greater access to information, the understanding of this disease is still unsatisfactory. So, in a review it was found that only 40% of obstetricians and gynecologists knew about the possibility of GDM progressing to T2D [36], and a discrepancy was also reported between understanding the disease and testing (71% 21%, respectively) [43]. In addition, other studies showed that 55%–60% of health professionals consider postpartum reclassification of glycemic status to be a low priority, as well as not needing to be performed universally, but only in selected patients with some risk factors which should undergo the test [41] or receive adequate education [24].

Another issue to be considered is the fragmentation of care, due to ineffective communication between primary care services and

Table 1
Studies according to authorship, title, year of publication, journal, country of publication, study design, population and study sample.

Article	Author	Title	Year	Journal	Country	Study design	Population and sample
A1	CARTER et al. [19]	Pilot Randomized Controlled Trial of Diabetes Group Prenatal Care	2020	Obstetrical & Gynecological Survey	USA	Pilot randomized controlled trial	78 women with diabetes during pregnancy
A2	MACKAY et al. [20]	Improving systems of care during and after a pregnancy complicated by hyperglycemia: A protocol for a complex health systems intervention	2020	BMC Health Services Research	Australia	Cross-sectional study protocol	Does not apply
A3	MATHEW, RAO & NARAYANAN [21]	Barriers to postpartum follow-up of mothers with gestational diabetes mellitus and its implications: a mixed method study	2020	International Journal of Diabetes in Developing Countries	India	Qualitative cross-sectional observational study and narrative review	6 women with a history of GDM
A4	PAUL & FITZPATRICK [22]	Postpartum glucose screening among women with gestational diabetes	2020	Applied Nursing Research	USA	Comparative retrospective longitudinal observational study	175 women with a history of GDM
A5	SUNNY et al. [23]	Facilitators and Barriers to Postpartum Diabetes Screening Among Mothers With a History of Gestational Diabetes Mellitus—A Qualitative Study From Singapore	2020	Frontiers in Endocrinology	Singapore	Qualitative cross-sectional observational study	20 women with a history of GDM
A6	TANG et al. [24]	Factors influencing postpartum blood glucose screening among women with prior gestational diabetes mellitus in a rural community	2020	Journal of Advanced Nursing	China	Multicenter quantitative cross-sectional observational study	465 women with a history of GDM
A7	BAJALI et al. [25]	Gestational Diabetes Mellitus Postpartum Follow-Up Testing: Challenges and Solutions	2019	Canadian Journal of Diabetes	Canada	Narrative review	Does not apply
A8	BOWER et al. [26]	Racial/Ethnic Differences in Diabetes Screening and Hyperglycemia Among US Women After Gestational Diabetes.	2019	Preventing chronic disease	USA	Multiethnic quantitative cross-sectional observational study	765 women with a history of GDM
A9	CASTLING et al. [27]	An analysis of demographic and pregnancy outcome data to explain non-attendance for postpartum glucose testing in women with gestational diabetes mellitus: Why are patients missing follow-up?	2019	Obstetric Medicine	UK	Retrospective longitudinal observational study	1052 women with a history of GDM
A10	KNIPPEN et al. [28]	Predictors of Health-Protective Behavior and Glycemia After Gestational Diabetes, NHANES 2007–2014	2019	Diabetes Educator	USA	Multiethnic quantitative cross-sectional observational study	205 women with a history of GDM
A11	KIRKHAM et al. [29]	Diabetes care in remote Australia: The antenatal, postpartum and inter-pregnancy period	2019	BMC Pregnancy and Childbirth	Australia	Qualitative cross-sectional observational study	82 healthcare professionals and managers
A12	LIU et al. [30]	Glucose screening within six months postpartum among Chinese mothers with a history of gestational diabetes mellitus: a prospective cohort study.	2019	BMC Pregnancy and Childbirth	China	Prospective longitudinal observational study	237 women with a history of GDM
A13	MCCLOSKEY et al. [31]	Navigating a 'Perfect Storm' on the Path to Prevention of Type 2 Diabetes Mellitus After Gestational Diabetes: Lessons from Patient and Provider Narratives	2019	Maternal and Child Health Journal	USA	Qualitative cross-sectional observational study	30 women with GDM and 29 healthcare professionals
A14	NAGRAJ et al. [32]	Women's and healthcare providers' perceptions of long-term complications associated with hypertension and diabetes in pregnancy: a qualitative study	2019	BJOG: An International Journal of Obstetrics and Gynaecology	India	Qualitative cross-sectional observational study	24 pregnant and postpartum women, 47 professionals working in the healthcare system
A15	OZA-FRANK et al. [33]	Healthcare Experiences of Low-Income Women with Prior Gestational Diabetes	2018	Maternal and Child Health Journal	USA	Multiethnic qualitative cross-sectional observational study	86 women with a history of GDM, on average, divided into 12 focus groups
A16	BATTARBEE et al. [34]	Barriers to Postpartum Follow-Up and Glucose Tolerance Testing in Women with Gestational Diabetes Mellitus	2018	American Journal of Perinatology	USA	Retrospective longitudinal observational study	683 women with a history of GDM
A17	CAMPBELL et al. [35]	Paths to improving care of Australian Aboriginal and Torres Strait Islander women following gestational diabetes	2017	Primary Health Care Research and Development	Australia	Qualitative cross-sectional observational study	7 women with a history of GDM and 44 healthcare professionals
A18	MARTINEZ et al. [36]	Optimizing postpartum care for the patient with gestational diabetes mellitus	2017	American Journal of Obstetrics and Gynecology	USA	Narrative review	Does not apply
A19	RAFII et al. [37]	Procrastination as a Key Factor in Postpartum Screening for Diabetes: A Qualitative Study of Iranian Women with Recent Gestational Diabetes	2017	Iranian Red Crescent Medical Journal	Iran	Qualitative cross-sectional observational study	22 women with a history of GDM
A20	BERNSTEIN et al. [38]	Lost opportunities to prevent early onset type 2 diabetes mellitus after a pregnancy complicated by gestational diabetes	2016	BMJ Open Diabetes Research and Care	USA	Qualitative cross-sectional observational study	27 women with a history of GDM e 25 healthcare professionals
A21	VAN RYSWYK et al. [39]	Women's views on postpartum testing for type 2 diabetes after gestational diabetes: Six month follow-up to the DIAMIND randomised controlled trial	2016	Primary Care Diabetes	Australia and New Zealand	Quantitative cross-sectional observational study	276 women with a history of GDM

Table 1 (continued)

Article	Author	Title	Year	Journal	Country	Study design	Population and sample
A22	KHORSHIDI et al.	[40] Effects of telephone follow-up on blood glucose levels and postpartum screening in mothers with Gestational Diabetes Mellitus	2015	Medical Journal of the Islamic Republic of Iran	Iran	Prospective longitudinal interventional study	80 women with GDM
A23	YARRINGTON et al.	[41] Health Systems Approaches to Diabetes Screening and Prevention in Women with a History of Gestational Diabetes	2015	Current Diabetes Reports	USA	Narrative review	Does not apply
A24	MENDEZ-FIGUEROA et al.	[42] Impact of an intensive follow-up program on the postpartum glucose tolerance testing rate	2014	Archives of Gynecology and Obstetrics	USA	Retrospective longitudinal interventional study	388 women with GDM
A25	VAN RYSWYK et al.	[43] Clinician views and knowledge regarding healthcare provision in the postpartum period for women with recent gestational diabetes: A systematic review of qualitative/survey studies	2014	Diabetes Research and Clinical Practice	Australia	Systematic review	Does not apply
A26	POWER et al.	[44] Patterns of preconception, prenatal and postnatal care for diabetic women by obstetrician-gynecologists	2013	Journal of Reproductive Medicine	USA	Quantitative cross-sectional observational study	510 gynecologists-obstetricians
A27	FERRARA et al.	[45] Referral to telephonic nurse management improves outcomes in women with gestational diabetes	2012	American Journal of Obstetrics and Gynecology	USA	Retrospective quasi-interventional study	11435 women with a history of GDM
A28	KORPI-HYÖVÄLTI et al.	[46] How Can We Increase Postpartum Glucose Screening in Women at High Risk for Gestational Diabetes Mellitus?	2012	International Journal of Endocrinology	Finland	Multicenter prospective longitudinal observational study	266 women at high risk of GDM
A29	OWENS-GARY, WARE	[47] Interventions to increase access to care and quality of care for women with gestational diabetes	2012	Diabetes Spectrum	USA	Experience report	2 healthcare teams in different hospitals
A30	BENNETT et al.	[48] Barriers to and facilitators of postpartum follow-up care in women with recent gestational diabetes mellitus: A qualitative study	2011	Journal of Women's Health	USA	Qualitative cross-sectional observational study	22 women with a history of GDM
A31	STERNE et al.	[49] Factors affecting attendance at postpartum diabetes screening in women with gestational diabetes mellitus	2011	Practical Diabetes International	Australia	Qualitative cross-sectional observational study	88 women with a history of GDM
A32	STUEBE et al.	[50] Barriers to Follow-up for Women with a History of Gestational Diabetes	2010	American Journal of Perinatology	USA	Qualitative cross-sectional observational study	207 healthcare professionals

Table 2
Barriers mentioned in descending order of frequency for carrying out the postpartum reclassification of glycemic status.

Barriers	Articles	Fr
Patient-related barriers		
Test inconvenience (oral glucose tolerance test)	A5, A7, A13, A15, A16, A19, A22, A23, A25, A33	10
Baby care (difficulties finding caregiver, worries about the baby's health, psychological stress)	A5, A7, A13, A15, A16, A22, A23, A25, A32, A33	10
Other priorities (work, home, family, child)	A4, A5, A7, A17, A19, A20, A21, A23, A27, A32	10
Fear of having Type 2 Diabetes diagnosis	A7, A19, A20, A21, A22, A23, A27, A32, A33	9
Difficulty in transportation or access to health service	A4, A17, A19, A23, A25, A27, A32, A33	8
Financial/economic difficulties	A5, A8, A11, A17, A19, A20, A22, A25	8
Belonging to minority groups (ethnic, social)	A8, A10, A12, A18, A20	5
Lack of attention by health professionals towards women without other risk factors	A4, A8, A17, A28	4
Higher parity (>1)	A11, A14, A18, A20	4
Forgetting the test appointment	A5, A19, A33	3
Younger age	A11, A18, A20	3
Negative experiences with the health service	A5, A19, A32	3
Living far from the health service	A4, A5, A7	3
Absence of health care insurance	A10, A17, A20	3
Absence of previous diagnosis of Gestational Diabetes Mellitus	A8, A14	2
Cultural and language barriers	A11, A13	2
Lack of family support	A5, A19	2
Lower education level	A20, A25	2
Sadness, discouragement	A27, A32	2
No family history of Gestational Diabetes Mellitus	A8	1
No breastfeeding	A11	1
Non-commitment to treatment during pregnancy (physical activities, diet, medication)	A8	1
Procrastination	A21	1
Health care service-related barriers		
Suboptimal health education and awareness (about health risks, need to get tested, not knowing where to get tested)	A5, A7, A8, A13, A14, A16, A17, A19, A20, A21, A22, A25, A27, A28, A32, A33, A34	17
Service fragmentation	A13, A15, A20, A22, A25, A30, A31, A34	8
Lack of communication between patients and the health care service (lack of a tool for patients active search)	A15, A17, A19, A21, A22	5
Long waiting time and schedule inconvenience	A5, A20, A22, A23, A33	5
Little training to deal with postpartum reclassification for women with Gestational Diabetes Mellitus	A9, A13, A28	3
Need to schedule appointment	A5, A27	2
Health service overload	A9, A16	2
Medical records underreporting Gestational Diabetes Mellitus (loss of medical records, reports of diagnosis and postpartum screening)	A31, A34	2

Table 3
Interventions used to improve adherence to postpartum reclassification of glycemic status.

Interventions proposals	Articles	Fr
Service-related strategies		
Raise awareness and educate patients and health professionals	A4, A7, A15, A19, A20, A23, A25, A30, A31, A32, A33	11
Use reminder systems (messages, e-mails, calls, apps, electronic medical records)	A4, A14, A20, A23, A25, A26, A27, A29, A30, A32	10
Improve communication between segments (e.g. through electronic medical records)	A4, A15, A19A20, A22, A25, A31, A34	8
Restructuring the service according to the socioeconomic conditions and demands of the neighborhood	A4, A19, A20, A25	4
Implement care transfer systems	A20, A26, A31	3
Checklist with the medical record for monitoring diabetes	A25, A26	2
Develop tools for family support (in domestic services and child care)	A19, A32	2
Protocol for screening in all services	A25, A31	2
Protocol to use the child's appointments to check on the mother's health	A19	1
Patient-related strategies		
Perform patient-centered multidisciplinary work	A7, A15, A19, A20, A26, A30, A32	7
Encourage interaction between patients with Gestational Diabetes Mellitus	A3, A15, A18	3
Adapt spaces to care for the child while the mother is testing	A13, A23, A32, A33	4
Actively search of women who did not attend the reclassification	A22, A25, A26, A31	4
Use of alternative screening methods	A19, A20, A23, A27	4
Capacitation of professionals from a cultural and linguistic point of view for improving contact	A4, A19, A32, A33	4
Perform oral glucose tolerance test (OGTT) immediately after delivery	A6, A20, A27	3
Associate screening with family planning appointments and check-ups	A4, A32	2
Perform oral glucose tolerance test (OGTT) at home	A22	1

obstetric and gynecological care settings [46]. In fact, a study conducted in England indicated that many professionals fail to register the diagnosis of GDM in patients' medical records, resulting in only 60% of prenatal professionals having access to postpartum information, evidencing the break in the longitudinality of care [50]. In this way, communication difficulties are observed among professionals involved in women's care, and many health workers report that communication technologies cannot close the gap between different sectors of health services [38], which makes a service not knowing what was performed in another or even what needs to be performed, leaving patients with no information or even conflicting information [31]. Some studies also pointed out that many women received superficial information, as a way of not causing stress in the postpartum period, which ends up with patients not understanding the severity of the disease, as well as not returning for testing because they were not booked for the test when looking for health care units [33].

Finally, health care services logistics present problems that impair adequate care; among them, the lack of trained professionals, high turnover of workers and insufficient funding. Thus, many women consider screening for postpartum reclassification of glycemic status to be a negative experience, with long waiting time and overcrowded services [21].

Regarding the barriers related to patients, the OGTT was considered to be inconvenient, with reports of vomiting, in addition to the need for several venous punctures, as well as complaints about the need to fast and wait 2–3 h for testing [21,23,41,49]. In this sense, 33% of women with a history of GDM from Oceania reported that a faster test would contribute to greater adherence [39].

In addition to this issue, concerns with the baby's health and the lack of time for having other priorities were the causes for the non-adherence to follow-up appointments. A North American study pointed out that many women face difficulties in adapting their daily lives to the arrival of a child, which causes emotional distress, unpredictable care schedules and, consequently, less time for self-care [48]. In fact, health professionals state that mothers are always attending consultations for their children, but not for themselves, due to lack of time, also caused by the need of extra working to improve the family income and even also to excessive domestic work [29].

Another important issue is the fear of being diagnosed with DM,

as they may consider this an incurable disease, causing insecurity and even changing the coverage of their insurance and health care plans, for example [23]. However, this fear can be a barrier, and also an incentive to carry out screening as a way of certifying that there is not a major problem, such as DM and/or other diabetes-related complications [49].

As socioeconomic obstacles, several patients from minorities, reported financial difficulties and issues accessing health services. Thus, a study carried out in the United Kingdom observed that non-commitment to screening was associated with living in peripheral areas, generally with deprived neighborhood, being very young, with greater parity and not being breastfeeding [27]. This findings make the need for interventions to increase the adherence of socially vulnerable women more relevant, since the highest probability of developing T2D after a history of GDM occurs mostly in racial minority groups, such as Black (30.8%) and Hispanic women (31.0%), compared to the average of 24.4% in the background group [26].

4.2. Intervention strategies

It is known that GDM indicates the presence of metabolic dysfunction even outside the gestational period and, consequently, health risks not only during pregnancy, but also in the future life of women having this diagnosis [5,10,11]. In this way, care for women with GDM is not restricted to prenatal care and goes through transition periods of care throughout these patients' lives. Therefore, without effective and well-structured actions, there is a great risk of losing contact with them after childbirth.

The results of this review suggest that health services should seek training health professionals regarding the management and awareness of these patients [36,41]. With regard to patients' education, which was the most cited item in the studies, it was observed that those who participated in support groups were more likely to return for postpartum reclassification [19].

With regard to interventions related to health services, effective and coordinated communication by the team and the active search for patients have also been identified as good strategies for improving adherence to postpartum reclassification [31,38,41,45]. Some authors also suggest the creation of methods and electronic medical records, based on integrated records, that offer support to

professionals, generating reminders in the medical record when the reclassification should be performed [31,36,38,43,47,49,50]. However, the effectiveness of implementing these reminders is not yet a consensus among researchers [36,41], and many believe that direct contact between health professionals and patients would be more effective (especially if performed by nurses, either personally or by phone) [41,42]. For better communication between health services, pre, peri and postpartum, mnemonics strategies such as SBAR (Situation, Background, Assessment and Recommendation) are suggested. Mnemonics are adopted in order to ensure that relevant information about patients is transmitted between professionals at different points of care. Therefore, the use of this tool within the health network can prevent patients with GDM from losing continuity of care during the postpartum period [36].

It is suggested as a form of intervention, to carry out a patient centered care assistance, which implies humanization of care and shared decision in health [23]. This allows health professionals and patients to verify the accessibility and feasibility of OGTT, explore balanced perspectives in postpartum screening, and directly manage individual barriers, which, combined with support groups for mothers and families, can increase adherence to the test. The possibility of performing the OGTT at home has already been suggested by some authors, which would solve the issues of transport and care for the child [35,38]; other researchers propose that alternative screening tests should be performed, according to the socioeconomic demand of the neighborhood and the patient's needs; or even that the tests should have a shorter duration [36,39,43]. Another alternative would be performing the OGTT immediately after delivery, as demonstrated in Brazilian prospective study which observed that this strategy may be useful to identify high-risk women who should undergo rescreening 6 weeks after delivery [18].

As it is a complex condition, which requires the interplay between professionals from different areas working on different aspects of care, patients with GDM are often the target of excessive and conflicting information. With this in mind, other authors cited the proposal of the medical home (Patient Centered Medical Home), a model whose principles are: prevention, collaboration between the team and patient involvement, as a form of focused, longitudinal and interprofessional care for the reclassification of these patients [31].

It is important to note that, in our review, many authors proposed these interventions without actually testing and implementing them. It is necessary, therefore, that more studies should be carried out, in order to evaluate the effectiveness of these intervention proposals. Furthermore, considering that the loss of follow-up in the postpartum period is a consequence of multiple factors, such as those mentioned above, it is likely that an effective solution involves the joint consolidation of various interventions [20].

4.3. Limitations

Although we have followed an established methodology in the search and identification of published literature, this review has some limitations that must be mentioned, since we may have omitted some information because we did not include articles written in languages other than English, Spanish and Portuguese; for not accessing the gray literature and having only evaluated the time span from 2010 to 2020. New studies should be carried out to better understand the main barriers both on the part of health services and on the part of patients, as well as to find the best interventions to be implemented, aiming to improve the postpartum reclassification of the glycemic status of women diagnosed with GDM.

5. Conclusions

There are several factors that make it difficult to properly reclassify the postpartum glycemic status of women with a history of GDM. This review found barriers related to health services, such as poor communication and lack of knowledge on the part of health professionals regarding the importance of reclassifying these patients, as well as barriers related to patients, such as the inconvenience of performing the OGTT, prioritization of the baby's health over their own health or existence of other priorities. It is essential to examine these barriers regarding the follow-up of these patients, especially when there is a transition of care, to establish effective interventions. In this sense, since the barriers are multiple, interventions must also be multifaceted and include the education of health professionals and patients, as well as improvements in the organization of the services and in the way of dealing with these women.

References

- [1] Metzger BE, Gabbe SG, Persson B, Buchanan TA, Catalano PA, Damm P, et al. International association of diabetes and pregnancy study groups recommendations on the diagnosis and classification of hyperglycemia in pregnancy. *Diabetes Care* 2010;33(3):676–82. <https://doi.org/10.2337/dc09-1848>.
- [2] Organização Pan-Americana da Saúde (OPAS). Ministério da Saúde; Federação Brasileira das Associações de Ginecologia e Obstetrícia (FEBRASGO); Sociedade Brasileira de Diabetes (SBD). Rastreamento e diagnóstico de Diabetes Mellitus Gestacional no Brasil. OPAS Brasília, DF 2017:32. il. ISBN: 978-85-7967-118-0, https://www.febrasgo.org.br/images/pec/CNE_pdfs/Rastreamento-Diabetes.pdf.
- [3] Organização Pan-Americana da Saúde (OPAS). Ministério da Saúde; Federação Brasileira das Associações de Ginecologia e Obstetrícia (FEBRASGO); Sociedade Brasileira de Diabetes (SBD). Tratamento do diabetes mellitus gestacional no Brasil. OPAS Brasília, DF 2019:57. il. ISBN: 978-85-94091-12-3, https://www.febrasgo.org.br/images/pec/CNE_pdfs/Livro-Diabetes_tratamento-com-ISBN.pdf.
- [4] The HAPO Study Cooperative Research Group, Metzger E, Lowe LP, Dyer AR, Trimble ER, Chaovarindr U, Coustan DR, et al. Hyperglycemia and adverse pregnancy outcomes. *N Engl J Med* 2008;358(19):1991–2002. <https://doi.org/10.1056/NEJMoa070794>.
- [5] Trujillo J, Vigo A, Reichelt A, Duncan BB, Schmidt MI. Fasting plasma glucose to avoid a full OGTT in the diagnosis of gestational diabetes. *Diabetes Res Clin Pract* 2014;105(3):322–6. <https://doi.org/10.1016/j.diabres.2014.06.001>.
- [6] Sociedade Brasileira de Diabetes (SBD). Diretrizes da Sociedade Brasileira de Diabetes. *Clannad, sine loco [S.l.]* 2019-2020:491. <https://portaldeboaspraticas.iff.fiocruz.br/biblioteca/diretrizes-da-sociedade-brasileira-de-diabetes-2019-2020/#:%7E:text=A Sociedade Brasileira de Diabetes,para discutir os temas relacionados.>
- [7] World Health Organization (WHO). Diagnostic criteria and classification of hyperglycaemia first detected in pregnancy. *Genebra* 21 May 2020;2013:63. Available from, <https://apps.who.int/iris/handle/10665/85975>.
- [8] Miao Z, Wu H, Ren L, Bu N, Jiang L, Yang H, et al. Long-Term postpartum outcomes of insulin resistance and β -cell function in women with previous gestational diabetes mellitus. *Int J Endocrinol* 2020;2020:1–7. <https://doi.org/10.1155/2020/7417356>.
- [9] Hod M, Kapur A, Sacks DA, Hadar E, Agarwal M, Renzo GCD, et al. The international federation of gynecology and obstetrics (FIGO) initiative on gestational diabetes mellitus: a pragmatic guide for diagnosis, management, and care. *Int J Gynecol Obstet* 2015;131:173–211. [https://doi.org/10.1016/S0020-7292\(15\)30033-3](https://doi.org/10.1016/S0020-7292(15)30033-3).
- [10] Kim C, Newton KM, Knopp RH. Gestational diabetes and the incidence of type 2 diabetes: a systematic review. *Diabetes Care* 2002;25(10):1862–8. <https://doi.org/10.2337/diacare.25.10.1862>.
- [11] Brasil Ministério da Saúde. Portaria nº 569, de 1º de junho de 2000. Institui o Programa de Humanização no Pré-natal e Nascimento, no âmbito do Sistema Único de Saúde. Brasília, DF: Diário Oficial da União; 2000. https://bvsms.saude.gov.br/bvs/saudelegis/gm/2000/prt0569_01_06_2000_rep.html.
- [12] American Diabetes Association (ADA). Standards of medical care in diabetes. Supplement 1 *Diabetes Care* January 2019;42. ISSN 0149–5992 EISSN 1935–5548, https://diabetesjournals.org/care/issue/42/Supplement_1.
- [13] Nielsen KK, Kapur A, Damm P, Courten M, Bygbjerg C. From screening to postpartum follow-up – the determinants and barriers for gestational diabetes mellitus(GDM) services, a systematic review. *BMC Pregnancy Childbirth* 2014;14:14. <https://doi.org/10.1186/1471-2393-14-41>.
- [14] Rafii F, Rahimpour SFV, Mehrdad N, Keramat A. Barriers to postpartum screening for type 2 diabetes: a qualitative study of women with previous gestational diabetes. *Pan Afr Med J* 2017;54:26. <https://doi.org/10.11604/pamj.2017.26.54.11433>.
- [15] Peters M, Godfrey C, McInerney P, Munn Z, Trico A, Khalil H. Chapter 11:

- scoping reviews. In: Aromataris E, Munn Z, editors. JBI manual for evidence synthesis, JBI; 2020. <https://doi.org/10.46658/JBIMES-20-12>.
- [16] Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA extension for scoping reviews (PRISMA-ScR): checklist and explanation. *Ann Intern Med* 2018;169(7):467–73. <https://doi.org/10.7326/M18-0850>.
- [17] Cabizuca CA, Rocha PS, Marques JV, Costa TFLR, Santos ASN, Schröder AL, et al. Postpartum follow up of gestational diabetes in a tertiary care center. *Diabetol Metab Syndrome* 2018;2:10. <https://doi.org/10.1186/s13098-017-0303-4>.
- [18] Nabuco A, Pimentel S, Cabizuca CA, Rodacki M, Finamore D, Oliveira MM, et al. Early diabetes screening in women with previous gestational diabetes: a new insight. *Diabetol Metab Syndrome* 2016;8(1):61. <https://doi.org/10.1186/s13098-016-0172-2>.
- [19] Carter EB, Barbier K, Hill PK, Cahill AG, Colditz GA, Macones GA, et al. Pilot randomized controlled trial of diabetes group prenatal care COMMENT. *Obstet Gynecol Surv* 2020;75(12):715–6. <https://doi.org/10.1055/s-0040-1714209>.
- [20] MacKay D, Kirkham R, Freeman N, Murtha K, Van Dokkum P, Boyle J, et al. Improving systems of care during and after a pregnancy complicated by hyperglycaemia: a protocol for a complex health systems intervention. *BMC Health Serv Res* 2020;814:20. <https://doi.org/10.1186/s12913-020-05680-x>.
- [21] Mathew NP, Rao AP, Narayanan P. Barriers to postpartum follow-up of mothers with gestational diabetes mellitus and its implications: a mixed method study. *Int J Diabetes Dev Ctries* 2020;41:127–35. <https://doi.org/10.1007/s13410-020-00853-0>.
- [22] Paul JC, Fitzpatrick JJ. Postpartum glucose screening among women with gestational diabetes. *Appl Nurs Res* 2020;151341:56. <https://doi.org/10.1016/j.apnr.2020.151341>.
- [23] Sunny SH, Malhotra R, Ang SB, Lim CSD, Tan YSA, Soh YMB, et al. Facilitators and barriers to post-partum diabetes screening among mothers with a history of gestational diabetes mellitus—A qualitative study from Singapore. *Front Endocrinol* 2020;602:11. <https://doi.org/10.3389/fendo.2020.00602>.
- [24] Tang Y, Guo J, Long Q, Yang J, Luo J, Yang S, et al. Factors influencing postpartum blood glucose screening among women with prior gestational diabetes mellitus in a rural community. *J Adv Nurs* 2020. Jan.14440. <https://doi.org/10.1111/jan.14440>.
- [25] Balaji B, Ranjit Mohan A, Rajendra P, Mohan D, Ram U, Viswanathan M. Gestational diabetes mellitus postpartum follow-up testing: challenges and solutions. *Canadian. J Diabetes* 2019;43:641–6. <https://doi.org/10.1016/j.cjcd.2019.04.011>.
- [26] Bower JK, Butler BN, Bose-Brill S, Kue J, Wassel CL. Racial/ethnic differences in diabetes screening and hyperglycemia among US women after gestational diabetes. *Prev Chronic Dis* 2019;190144:16. <https://doi.org/10.5888/pcd16.190144>.
- [27] Castling ZA, Farrell T. An analysis of demographic and pregnancy outcome data to explain non-attendance for postpartum glucose testing in women with gestational diabetes mellitus: why are patients missing follow-up? *Obstet Med* 2019;12:85–9. <https://doi.org/10.1177/1753495X18797201>.
- [28] Knippen KL, Sheu J-J, Oza-Frank R, McBride K, Dake J. Predictors of health-protective behavior and glycemia after gestational diabetes. *NHANES 2007-2014. Diabetes Educat* 2019;45:408–19. <https://doi.org/10.1177/0145721719848447>.
- [29] Kirkham R, Trap-Jensen N, Boyle JA, Barzi F, Barr ELM, et al. Diabetes care in remote Australia: the antenatal, postpartum and inter-pregnancy period. *BMC Pregnancy Childbirth* 2019;389:19. <https://doi.org/10.1186/s12884-019-2562-6>.
- [30] Liu Z, Zhao J, Gao L, Wang AY. Glucose screening within six months postpartum among Chinese mothers with a history of gestational diabetes mellitus: a prospective cohort study. *BMC Pregnancy Childbirth* 2019;134:19. <https://doi.org/10.1186/s12884-019-2276-9>.
- [31] McCloskey L, Sherman ML, St John M, Siegel H, Whyte J, Iverson R, et al. Navigating a 'perfect storm' on the path to prevention of type 2 diabetes mellitus after gestational diabetes: lessons from patient and provider narratives. *Matern Child Health J* 2019;23:603–12. <https://doi.org/10.1007/s10995-018-2649-0>.
- [32] Nagraj S, Hinton L, Praveen D, Kennedy S, Norton R, Hirst J. Women's and healthcare providers' perceptions of long-term complications associated with hypertension and diabetes in pregnancy: a qualitative study. *BJOG An Int J Obstet Gynaecol* 2019;126:34–42. <https://doi.org/10.1111/1471-0528.15847>.
- [33] Oza-Frank R, Conrey E, Bouchard J, Shellhaas C, Weber MB. Healthcare experiences of low-income women with prior gestational diabetes. *Matern Child Health J* 2018;22:1059–66. <https://doi.org/10.1007/s10995-018-2489-y>.
- [34] Battarbee A, Yee L. Barriers to postpartum follow-up and glucose tolerance testing in women with gestational diabetes mellitus. *Am J Perinatol* 2018;35:354–60. <https://doi.org/10.1055/s-0037-1607284>.
- [35] Campbell S, Roux N, Preece C, Raftar E, Davis B, Mein J, et al. Paths to improving care of Australian Aboriginal and Torres Strait Islander women following gestational diabetes. *Prim Health Care Res Dev* 2017;18:549–62. <https://doi.org/10.1017/S1463423617000305>.
- [36] Martinez NG, Niznik CM, Yee LM. Optimizing postpartum care for the patient with gestational diabetes mellitus. *Am J Obstet Gynecol* 2017;217:314–21. <https://doi.org/10.1016/j.ajog.2017.04.033>.
- [37] Rafii F, Vasegh Rahimparvar SF, Keramat A, Mehrdad N. Procrastination as a key factor in postpartum screening for diabetes: a qualitative study of Iranian women with recent gestational diabetes. *Iran Red Crescent Med J* 2017;19(5). <https://doi.org/10.5812/ircmj.44833>.
- [38] Bernstein JA, McCloskey L, Gebel CM, Iverson RE, Lee-Parriz A. Lost opportunities to prevent early onset type 2 diabetes mellitus after a pregnancy complicated by gestational diabetes: table 1. *BMJ Open Diabetes Research and Care* 2016;4. e000250. <https://doi.org/10.1136/bmjdc-2016-000250>.
- [39] Van Ryswyk EM, Middleton PF, Hague WM, Crowther CA. Women's views on postpartum testing for type 2 diabetes after gestational diabetes: six month follow-up to the DIAMIND randomised controlled trial. *Primary Care Diabetes* 2016;10:91–102. <https://doi.org/10.1016/j.pcd.2015.07.003>.
- [40] Khorshidi Roozbahani R, Geranmayeh M, Hantoushzadeh S, Mehran A. Effects of telephone follow-up on blood glucose levels and postpartum screening in mothers with Gestational Diabetes Mellitus. *Med J Islam Repub Iran* 2015;29:249. PMID: 26793640; PMCID: PMC4715405. <https://pubmed.ncbi.nlm.nih.gov/26793640/>.
- [41] Yarrington C, Zera C. Health systems approaches to diabetes screening and prevention in women with a history of gestational diabetes. *Curr Diabetes Rep* 2015;114:15. <https://doi.org/10.1007/s11892-015-0687-1>.
- [42] Mendez-Figueroa H, Daley J, Breault P, Lopes VV, Paine V, Goldman D, et al. Impact of an intensive follow-up program on the postpartum glucose tolerance testing rate. *Arch Gynecol Obstet* 2014;289:1177–83. <https://doi.org/10.1007/s00404-014-3157-0>.
- [43] Van Ryswyk E, Middleton P, Hague W, Crowther C. Clinician views and knowledge regarding healthcare provision in the postpartum period for women with recent gestational diabetes: a systematic review of qualitative/survey studies. *Diabetes Res Clin Pract* 2014;106:401–11. <https://doi.org/10.1016/j.diabres.2014.09.001>.
- [44] Power ML, Wilson EK, Hogan SO, Loft JD, Williams JL, Mersereau PW, et al. Patterns of preconception, prenatal and postnatal care for diabetic women by obstetrician-gynecologists. *J Reprod Med* 2013;58:7–14. PMID: 23447912; PMCID: PMC4768718. <https://pubmed.ncbi.nlm.nih.gov/23447912/>.
- [45] Ferrara A, Hedderson MM, Ching J, Kim C, Peng T, Crites YM. Referral to telephonic nurse management improves outcomes in women with gestational diabetes. *Am J Obstet Gynecol* 2012;206:491. e1-491.e5. <https://doi.org/10.1016/j.ajog.2012.04.019>.
- [46] Korpi-Hyövähti E, Laaksonen DE, Schwab U, Heinonen S, Niskanen L. How can we increase postpartum glucose screening in women at high risk for gestational diabetes mellitus? *Int J Endocrinol* 2012;2012:1–6. <https://doi.org/10.1155/2012/519267>.
- [47] Owens-Gary MD, Ware J. Interventions to increase access to care and quality of care for women with gestational diabetes. *Diabetes Spectr* 2012;25:26–8. <https://doi.org/10.2337/diaspect.25.1.26>.
- [48] Bennett WL, Ennen CS, Carrese JA, Hill-Briggs F, Levine DM, Nicholson WK, et al. Barriers to and facilitators of postpartum follow-up care in women with recent gestational diabetes mellitus: a qualitative study. *J Wom Health* 2011;20:239–45. <https://doi.org/10.1089/jwh.2010.2233>.
- [49] Sterne V, Logan T, Palmer M. Factors affecting attendance at postpartum diabetes screening in women with gestational diabetes mellitus: barriers and facilitators to postpartum diabetes screening attendance. *Practical Diabetes Int* 2011;28:64–8. <https://doi.org/10.1002/pdi.1559>.
- [50] Stuebe A, Ecker J, Bates D, Zera C, Bentley-Lewis R, Seely E. Barriers to follow-up for women with a history of gestational diabetes. *Am J Perinatol* 2010;27:705–10. <https://doi.org/10.1055/s-0030-1253102>.