

Relationship between ABO blood group and gestational diabetes mellitus

A protocol for systematic review and meta-analysis

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Abstract

Background: Gestational diabetes mellitus (GDM) is a common metabolic disorder syndrome in women during pregnancy. If effective measures are not taken to intervene in the early stage of GDM, severe effects will damage maternal and infant health. ABO is the most important human blood group system. A large number of studies have displayed that ABO blood group is associated with many diseases. At present, the risk relationship between ABO blood group and GDM is controversial. The purpose of this study is to explore the risk relationship between ABO blood group and GDM by meta-analysis, thus providing basis for the prevention and treatment of GDM.

Methods: An electronic database, including Embase, Cochrane Library, Pubmed, Chinese databases SinoMed, Chinese National Knowledge Infrastructure, Chinese Scientific Journals Database and Wanfang Data, will be used to search for studies of ABO blood group and GDM. The language will be limited to Chinese and English. The two reviewers will be responsible for the selection of the study, the extraction of data and the evaluation of the quality of the research. All statistical analyses will be carried out using Review Manager 5.3.

Results: The results of this meta-analysis will be published in peer-reviewed journals.

Conclusion: This study will provide evidence to support the relationship between ABO blood group and the risk of GDM

Ethics and dissemination: The private information from individuals will not be published. This systematic review also will not involve endangering participant rights. Ethical approval is not required. The results may be published in a peer-reviewed journal or disseminated in relevant conferences.

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Abbreviations: CI = Confidence interval, GDM = Gestational diabetes mellitus, NOS = Newcastle-Ottawa scale, OR = odds ratio, OSF = open science framework, PRISMA-P = preferred reporting items for systematic reviews and meta-analyses.

Keywords: ABO blood group, gestational diabetes mellitus, meta-analysis, protocol

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The authors have no conflicts of interest to disclose.

Patient consent: Not required.

Ethics: Not required.

The datasets generated during and/or analyzed during the present study are available from the corresponding author on reasonable request.

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1. Introduction

In addition to type 1 diabetes and type 2 diabetes, gestational diabetes mellitus (GDM) is another kind of diabetes.^[1] It is a common metabolic disorder syndrome in women during pregnancy.^[2] The diagnosis is generally based on the results of oral glucose tolerance test in the second trimester of pregnancy. If effective measures are not taken to intervene in the early stage of GDM, severe effects will damage maternal and infant health. GDM increases various risks, such as preeclampsia, fetal death, fetal malformation, macrosomia, dystocia and cesarean section.^[3–6] Women suffering from GDM also had a higher risk of diabetes within 10 years after delivery.^[5] The incidence of GDM in women of childbearing age has increased due to the continuous prevalence of obesity and diabetes in the past decade.^[7] Therefore, early monitoring of the risk of GDM is of great significance to maternal and infant health.

ABO is the most important human blood group system.^[8] In general, human blood type does not change from the time of embryo formation. Many studies have revealed that ABO blood group is related to infection, cancer, cardiovascular disease, nervous system disease, and so on.^[9–13] Previous studies have also explored the relationship between ABO blood group and

pregnancy complications.^[14] However, the potential link between ABO blood type and adverse pregnancy outcomes is controversial, including preeclampsia and related diseases, venous thromboembolism, postpartum hemorrhage, and GDM.

ABO antigens influence several biomarkers and is closely related to insulin resistance and the development of type 2 diabetes, such as E-selectin, P-selectin, tumor necrosis factor- α , soluble intercellular adhesion molecule-1 and interleukin-6.^[15,16] Some studies have explored the relationship between ABO blood type and diabetes, but the findings are mostly inconsistent.^[14,17,18] However, most of the studies on ABO blood group and its relationship with GDM are also inconsistent.^[14]

Although it has been reported that AB blood type is a protective risk factor of GDM,^[19] some studies have reported that AB blood type increases the risk of GDM.^[20,21] On the other hand, in a study carried out in Thailand, there was no relationship between ABO blood group and GDM.^[22] To date, the evidence for the relationship between ABO blood group and GDM is still limited and inconsistent. We conducted a meta-analysis to further confirm the relationship between ABO blood group and GDM.

2. Methods

2.1. Study registration

The protocol was registered in Open Science Framework (OSF) (registration number: DOI 10.17605/OSF.IO/W6Q5X). It was reported that this systematic review and meta-analysis are in conformed with the preferred reporting items for systematic reviews and meta-analysis protocols (PRISMA-P) 2015.^[23]

2.2. Ethic

The review does not involve the assessment of patients' individual information or rights, so there is no need to obtain approval from an ethical institution.

2.3. Inclusion criteria

Studies would be included in this meta-analysis based on following criteria:

- 1) Study types: All studies related to ABO blood type and GDM susceptibility should be included.
- 2) Participant type: GDM should be included in the meta-analysis.
- 3) Outcome: GDM risk comparisons.

2.4. Exclusion criteria

According to the following criteria, studies should be excluded from the meta-analysis: conference summaries, incomplete data studies, repeated published studies, and case series.

2.5. Search strategy

Embase, Cochrane Library, Pubmed, Chinese databases SinoMed, Chinese National Knowledge Infrastructure (CNKI), Chinese Scientific Journals Database (VIP) and Wanfang Data were searched. The details of PubMed's search strategy are illustrated in Table 1, including all search terms, while similar search strategies are applied to other electronic databases.

Table 1

Search strategy in PubMed database.

Number	Search terms
#1	Diabetes, Gestational [MeSH]
#2	Diabetes Mellitus, Gestational [Title/Abstract]
#3	Diabetes, Pregnancy-Induced [Title/Abstract]
#4	Gestational Diabetes [Title/Abstract]
#5	Diabetes, Pregnancy Induced [Title/Abstract]
#6	Gestational Diabetes Mellitus [Title/Abstract]
#7	Pregnancy-Induced Diabetes [Title/Abstract]
#8	or/1–7
#9	ABO Blood-Group System [MeSH]
#10	ABH Blood Group [Title/Abstract]
#11	ABO Factors [Title/Abstract]
#12	Blood Group H Type 1 Antigen [Title/Abstract]
#13	H Blood Group [Title/Abstract]
#14	H Blood Group System [Title/Abstract]
#15	ABH Blood Groups [Title/Abstract]
#16	ABO Blood Group System [Title/Abstract]
#17	ABO Blood-Group Systems [Title/Abstract]
#18	ABO Factor [Title/Abstract]
#19	Blood Group, ABH [Title/Abstract]
#20	Blood Group, H [Title/Abstract]
#21	Blood Groups, ABH [Title/Abstract]
#22	Blood Groups, H [Title/Abstract]
#23	Blood-Group System, ABO [Title/Abstract]
#24	Blood-Group Systems, ABO [Title/Abstract]
#25	Factor, ABO [Title/Abstract]
#26	Factors, ABO [Title/Abstract]
#27	H Blood Groups [Title/Abstract]
#28	System, ABO Blood-Group [Title/Abstract]
#29	Systems, ABO Blood-Group [Title/Abstract]
#30	or/9–29
#31	#8 and #30

2.6. Data collection and analysis

2.6.1. Selection of studies. Two researchers independently complete the literature screening, exclude the studies that obviously do not meet the inclusion criteria, and further read the abstracts and the full texts, to determine whether they meet the inclusion criteria. The data included in the literature will be extracted and cross-checked. Disagreement should be solved by consulting a third researcher, thus reaching a consensus. The screening flow chart of this study is displayed in Figure 1.

2.6.2. Data extraction. We extracted data from literatures that are conformed to the meta-analysis. The data include the first author, year of publication, country, race of each study population, number of cases and controls, average age, ABO blood type and number of cases of GDM, etc.

2.6.3. Study quality assessment. Two researchers independently applied Newcastle-Ottawa scale (NOS) to evaluate literatures included in the analysis, and adopted third-party opinions if there exist any differences.^[24,25] Literatures with a total score of more than 6 are considered to be high quality.

2.6.4. Dealing with missing data. The research focuses on the defects of the original data. We contacted the author by email to ask for the original data. If the original data is not available, then we would analyze the existing data.

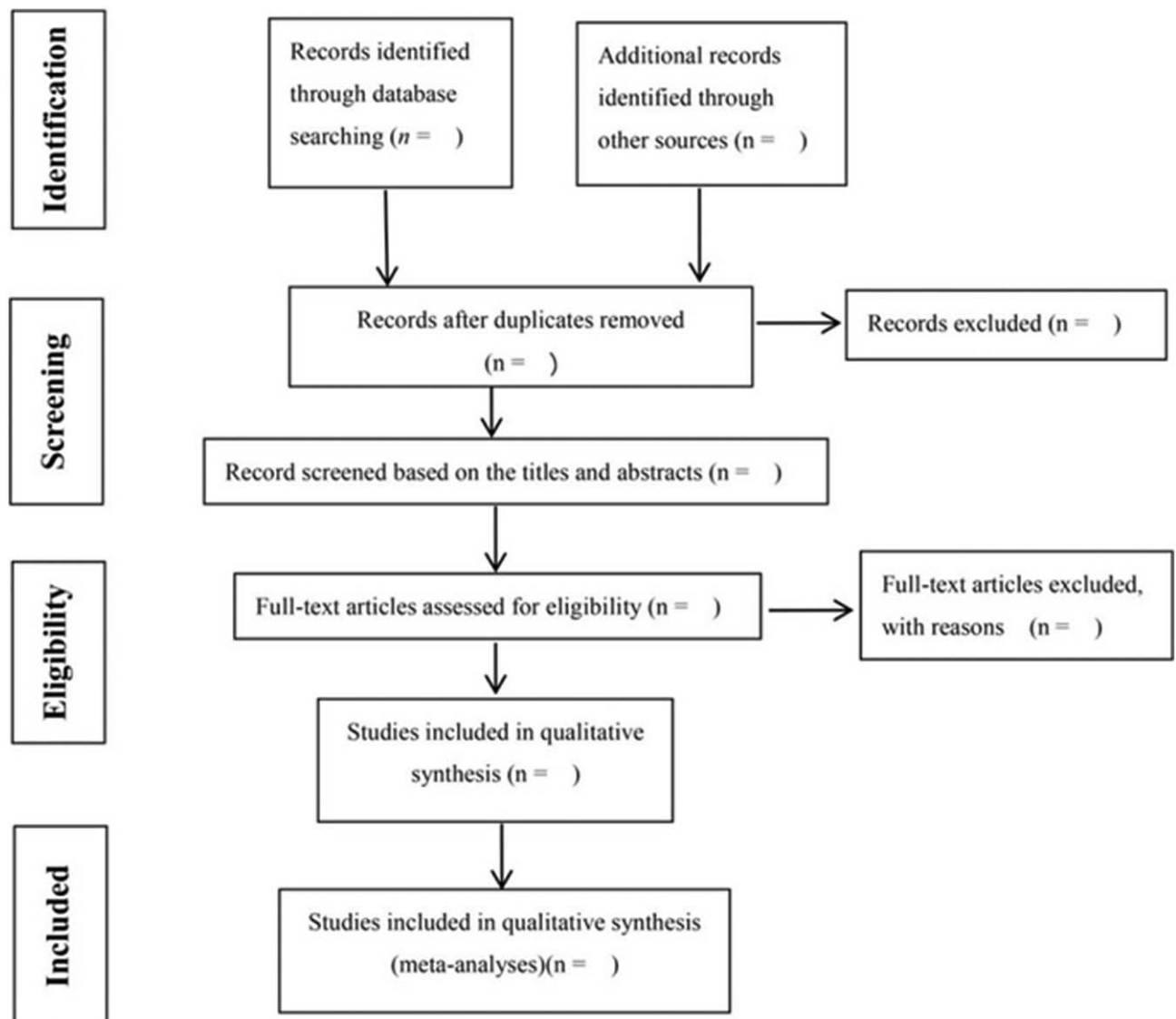


Figure 1. Flow diagram of study selection process.

2.7. Statistical analysis

A meta-analysis was performed using RevMan 5.3 (provided by Cochrane Collaboration). Odds ratio (OR) is the statistic of effect analysis, and each effect dose provides 95% of confidence interval (CI). Heterogeneity was ascertained using I^2 . $I^2 < 50\%$ revealed that the studies exhibited homogeneity, so fixed effects model was adopted. Otherwise, the random effects model was adopted. In the presence of heterogeneity, sensitivity analyses and subgroup analysis would be conducted to investigate the heterogeneity sources.

2.8. Subgroup analysis

According to patient race, sample size, history of diabetes, and so on, we carried out subgroup analysis.

2.9. Sensitivity analysis

In order to test the stability of meta-analysis results of indicators, a one-by-one elimination method will be adopted for sensitivity analysis.

2.10. Assessment of publication biases

If more than 10 studies are included, a funnel chart would be applied to assess the report bias.^[26,27]

3. Discussion

As a common disease, GDM is defined as various degrees of impaired glucose tolerance due to seizures or first recognition during pregnancy, thus affecting about 5 per cent of pregnancies worldwide. GDM is not only associated with adverse pregnancy outcomes, such as macrosomia, dystocia, birth trauma and neonatal metabolic complications, but also with a powerful predictor of postpartum transition to obvious diabetes.^[21] The incidence of GDM ranges from 2% to 14%, and the incidence is as high as 40% among obese people. With the increase of the obesity rate of women of childbearing age at this stage, the incidence of GDM is increasing day by day.^[28]

The association between ABO blood group and DM has been observed in a number of epidemiological and genetic studies, thereby resulting in inconsistent findings. However, in the

literature, the researches on the relationship between ABO blood group and GDM^[5] are still insufficient. The red blood cell count of pregnant women with AB blood group was significantly higher than that of pregnant women with A and O blood groups, and the levels of fasting blood glucose, urea and serum creatinine of pregnant women with AB blood group were remarkably higher than those of pregnant women with A blood group.^[29] These results indicated that ABO blood type may be associated with some adverse pregnancy outcomes. Karagoz et al discovered that patients with AB and O blood groups had a higher risk of gestational diabetes.^[21] Shimodaira proposed that AB blood type is a risk factor for GDM.^[30] Zhang et al put forward that women with type B or O blood groups were associated with the increased risk of GDM, and type AB blood was a protective factor for GDM in pregnant women.^[19] Therefore, in view of the inconsistency of the above results. In this study, we systematically evaluate the risk relationship between ABO blood group and GDM, to provide evidence-based medicine for future clinical guidance.

Author contributions

Conceptualization: Xiaohong Li, Dongyun Chen.

Data curation: Dongyun Chen.

Funding acquisition: Xiaohong Li.

Investigation: Dongyun Chen.

Project administration: Xiaohong Li.

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Validation: Lili Lin, Qiong Hong.

Visualization: Lili Lin, Qiong Hong.

Writing – original draft: Xiaohong Li, Dongyun Chen.

Writing – review & editing: Xiaohong Li, Dongyun Chen.

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