

Impact of Ethnicities on the Risk of Type 2 Diabetes in Women with a History of Gestational Diabetes: Results of a Systematic Review and Meta-Analysis

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BACKGROUND

- Women with gestational diabetes mellitus (GDM) have an elevated life-time risk of developing type 2 diabetes (T2DM), with approximately 50% of them developing overt T2DM within five to ten years following their diagnosis.^{1,2}
- Ethnic disparity has been identified as an independent predictor of GDM, and evidence suggests that ethnicity plays a role in the predisposition to T2DM.³
- Certain ethnicities, such as Asian, African American, Native American, Hispanic, and Pacific Island women, have an increased risk of GDM.^{4,5}
- With the increasing global incidence of T2DM and its long-term complications, healthcare providers and policymakers need to comprehend the risk levels for T2DM development in ethnically diverse women with GDM.

OBJECTIVES

A systematic review and meta-analysis was performed to:

- Estimate the risk of developing T2DM among women with GDM
- Evaluate the effect of ethnicity on the risk of progression to T2DM among women with GDM

METHODS

Systematic Literature Review

- This study (PROSPERO 2022 CRD42022333079) was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines.
- A systematic literature review was performed across MEDLINE and Embase using the following eligibility criteria to identify relevant studies published in English:
 - Study design:** Cohort studies, cross-sectional studies, longitudinal studies, retrospective studies, prospective studies, observational studies, and randomized controlled studies
 - Population:** Women with GDM across different ethnicities, who were diagnosed using standard criterion and followed up for >6 months post-partum
 - Interventions and Control:** None
 - Outcomes:** Women with a history of GDM who progress to develop T2DM
 - Publication years:** 2002 to 2022
- Two reviewers (SP [University of Dundee] and SC [University of Warwick]) used the Covidence® platform to conduct screening, and data extraction for this analysis.
- The Newcastle-Ottawa Scale was used to evaluate the quality of the included studies.⁶

Meta-Analysis

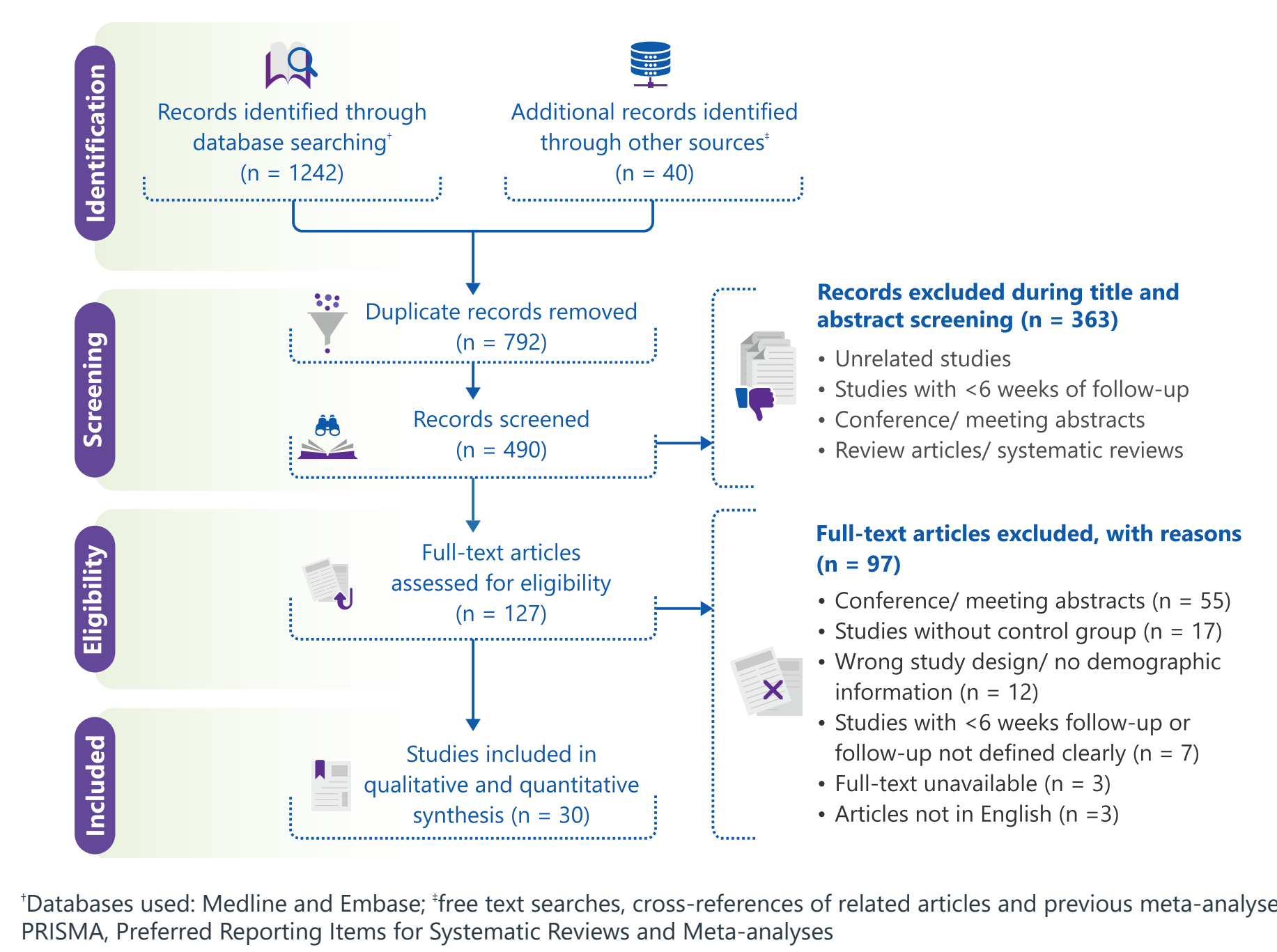
- Based on raw data extracted from published studies, the incidence rate for T2DM among women with GDM and healthy controls was calculated; data were then pooled by random effects meta-analysis models fitted using the DerSimonian and Laird method.⁷
- To evaluate the effect of ethnicity and the risk of T2DM, women with and without GDM were separated for each study and the data were pooled using random effect model.
- For studies in which T2DM did not occur in the control group or in the GDM group, a continuity correction was applied using the default value of 0.5 to avoid any divisions by zero.
- Heterogeneity between the included studies was assessed using I² statistics.
- Pooled relative risk (RR) with 95% confidence interval (CI) for T2DM incidence among those with and without a history of GDM and the absolute risk or risk difference (with 95% CI) for T2DM development across different ethnicities were calculated, and forest plots were generated.
- Other potential sources of anticipated heterogeneity among studies were identified by stratification based on age, body mass index (BMI) and length of follow-up.
- Meta-regression models were fitted to estimate the effect of study heterogeneity and the RR of T2DM based on these stratifications.
- Analyses were performed using IBM SPSS Statistics for Windows, v 28.0. Armonk, NY: IBM Corp. All statistical tests were two-sided, and p values <0.05 were regarded as significant.

RESULTS

- A total of 1282 articles were identified in the initial literature search; of these, 30 studies across ethnicities (Asian: n=9, White: n=16, mixed: n=4, Black: n=1) were deemed eligible and included.
- Data from 30 studies assessing a total of 462,026 women (52,097 women with a history of GDM and 409,929 healthy control women) were included in the meta-analysis.

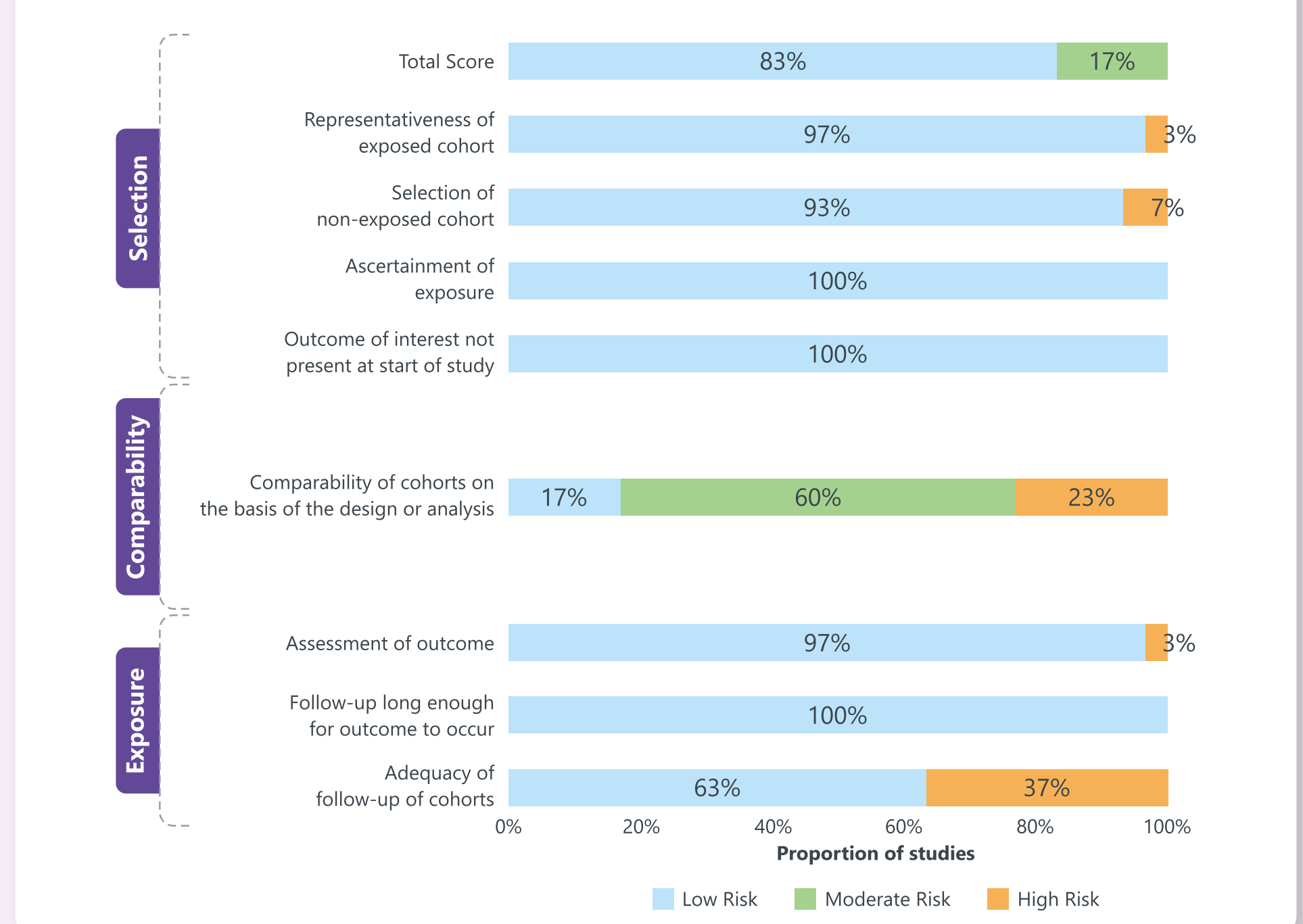
- On the Newcastle-Ottawa Scale, nearly 25 (83%) studies had a score of ≥7 and 5 (17%) had a score between 4-6, suggesting that the quality of included studies was moderate to high.
- The mean age of women developing T2DM across ethnic groups was lower than 35 years.

Figure 1. PRISMA flow chart of literature search



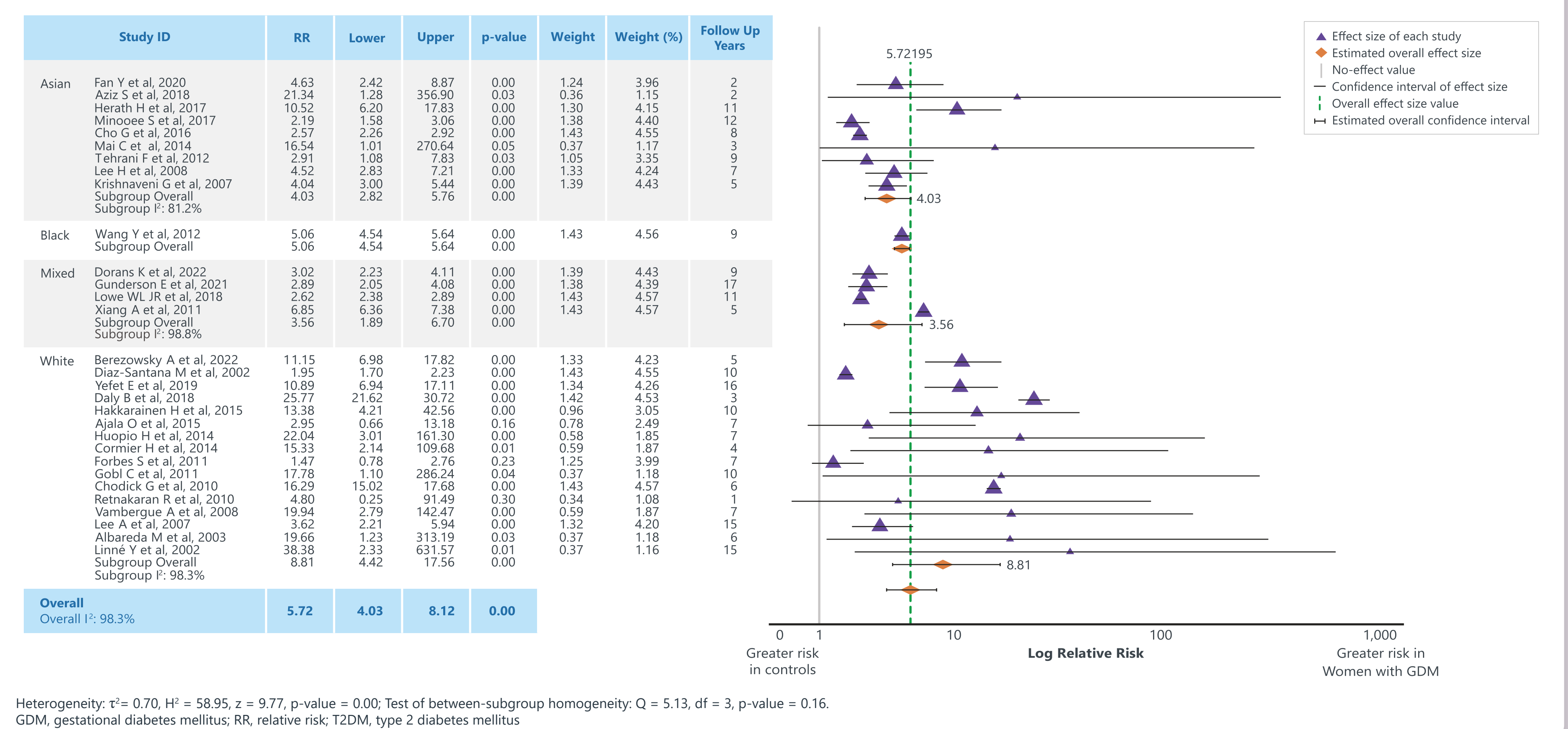
*Databases used: Medline and Embase; *free text searches, cross-references of related articles and previous meta-analyses
PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-analyses

Figure 2: Newcastle–Ottawa Scale scores for included studies



- The pooled relative risk of developing T2DM in women with a history of GDM was approximately 6 times greater than that of healthy women (RR: 5.72, 95% CI: 4.03 to 8.12, p<0.001).

Figure 3. Relative risk of developing T2DM among women with a history of GDM compared with healthy controls



- Although the pooled RR of developing T2DM was higher in White women than in Asian and mixed ethnicities women, the absolute risk of developing T2DM was higher in Asian versus White women.
- The risk of developing T2DM was the highest between 1-5 years of post-partum follow-up period (pooled RR: 9.056 [95% CI: 4.761 to 17.224]) as compared with studies with a follow-up period between 5 to 10 years and long-term follow-up period of >10 years.
- No significant association was observed between the risk of developing T2DM and the length of follow-up, baseline BMI, and mean age.
- There was no evidence of publication bias among the included studies, and the results were confirmed by the Egger's (p=0.7236) and Beggs tests (p=0.1724).

Table 1. Comparison of effect size based on ethnicity

	Pooled relative risk (95% CI)	Pooled risk difference % (95% CI)
Asians	4.033 (2.824 to 5.759)	14.7% (12% to 28.3%)
White	8.808 (4.416 to 17.562)	11.4% (5.6% to 17.1%)
Mixed	3.560 (1.891 to 6.702)	16.6% (-0.6% to 33.9%)

CI, confidence interval

CONCLUSIONS

- Women with a history of gestational diabetes had a 6-fold higher likelihood of developing T2DM than healthy women.
- The risk of developing T2DM was highest within 1 to 5 years post-partum and these women may develop T2DM at a younger age (<40 years).
- Asian women with GDM are more likely to develop T2DM than White women.
- As comprehensive ethnicity-specific studies are lacking, the notable impact of ethnicity on T2DM risk among predisposed women warrants further attention.

References

- Gestational diabetes The International Diabetes Federation 2020 Brussels, Belgium [Accessed: September 30, 2023]. Available from: <https://www.idf.org/our-activities/care-prevention/gdm>.
- Herath H, et al. *PLoS One*. 2017;12(6):e0179647.
- Jenum AK, et al. *Eur J Endocrinol*. 2012;166(2):317-24.
- Kim SY, et al. *Am J Public Health*. 2013;103(10):e65-72.

- Chamberlain C, et al. *Diabetes Metab Res Rev*. 2013;29(4):241-56.
- Stang A. *Eur J Epidemiol*. 2010; 25, 603-605.
- George BJ, et al. *J Nucl Cardiol*. 2016;23(4):690-2.

Disclosures

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