Preconception care for diabetic women for improving maternal and fetal outcomes: a systematic review and meta-analysis
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CRD summary
The review concluded that preconception care for women with pre-existing type 1 or 2 diabetes mellitus was effective in reducing diabetes-related congenital malformations, pre-term delivery and maternal hyperglycaemia in the first trimester of pregnancy. The review was well conducted, but differences in study results and the small number of studies in some analyses limits the reliability of the authors’ conclusions.

Authors’ objectives
To evaluate the effectiveness and safety of preconception care in improving maternal and foetal outcomes in women with pre-existing type 1 or 2 diabetes mellitus.

Searching
MEDLINE, EMBASE, Web of Science, The Cochrane Library and CINAHL were searched to December 2009 for articles published in any language. Search terms were reported. Reference lists of relevant studies were searched.

Study selection
Randomised controlled trials, cohort studies and case-control studies in women of reproductive age with pre-existing type 1 or 2 diabetes mellitus (who were not pregnant at the time of intervention) who received preconception care compared with those who did not receive preconception care were eligible for inclusion. Definitions were provided in the review. Types of outcomes included maternal and foetal outcomes (such as caesarean delivery, maternal hypoglycaemia, congenital malformations, macrosomia, pre-term delivery, neonatal death and HbA1C level in first trimester). Conference proceedings and abstracts without a complete study description were excluded.

The included studies considered preconception care education, counselling, glycaemic control, self-monitoring, assessment of complications, dietary advice, vitamin supplementation, smoking cessation and contraception. Control interventions were no preconception care or no pre-pregnancy care. Most studies were undertaken in UK/Europe; some studies were conducted in USA and Israel. Studies were published between 1983 and 2006.

At least two authors independently performed study selection. Disagreements were resolved by discussion or consultation with a third reviewer.

Assessment of study quality
Study quality was assessed using the Newcastle Ottawa Scale (NOS) of selection of participants, ascertainment of exposure and outcome assessment.

The authors did not state how many reviewers were involved in validity assessment.

Data extraction
Data were extracted (using a pre-defined form) on maternal and foetal outcomes, and used to calculate risk ratios (RR) and 95% confidence intervals (CI).

Three reviewers extracted data and two reviewers checked for accuracy.

Methods of synthesis
A fixed-effect meta-analysis was undertaken to obtain pooled risk ratios for dichotomous outcomes and mean differences for continuous outcomes, together with 95% CIs. Statistical heterogeneity was assessed with $I^2$. The number
needed to treat was calculated. Only similar studies with low or medium risk of bias were pooled.

**Results of the review**

Twenty studies were included in the review (one trial, 11 prospective cohorts, seven retrospective cohorts and one case control study). Twelve cohort studies were included in the meta-analysis (n=2,502 participants). Study quality was reported as low to medium risk of bias.

Compared with no such care, preconception care was associated with a statistically significantly lower rate of congenital malformation (RR 0.25, 95% CI 0.15 to 0.42, NNT=17; 11 studies), pre-term delivery (RR 0.70, 95% CI 0.55 to 0.90, NNT=8; four studies) and perinatal mortality (RR 0.35, 95% CI 0.15 to 0.82, NNT=32; five studies). There was no evidence of statistical heterogeneity.

A statistically significant difference in the level of hbA1C favoured preconception care (OR 2.43%, 95% CI 2.27 to 2.58; four studies). There was a high level of statistical heterogeneity ($I^2=97\%$).

There was evidence that preconception care statistically significantly reduced the mean gestational age at the time of the first antenatal visit (OR -1.32 weeks, 95% CI -1.40 to -1.23; three studies). There was significant statistical heterogeneity ($I^2=85\%$).

There was evidence of a reduction in maternal hyperglycemia with no preconception care (RR 1.51, 95% CI 1.15 to 1.99; two trials). This result was associated with significant heterogeneity ($I^2=85\%$).

There was no statistical difference in risks of spontaneous abortions, pre-eclampsia, caesarean delivery, macrosomia, neonatal hypoglycaemia, respiratory distress syndrome and small for gestational age.

**Cost information**

Preconception care was associated with considerable saving and reduced resource utilisation.

**Authors’ conclusions**

Preconception care for women with pre-existing type 1 or 2 diabetes mellitus was effective in reducing diabetes-related congenital malformations, pre-term delivery and maternal hyperglycaemia in the first trimester of pregnancy.

**CRD commentary**

Inclusion criteria for the review were defined. Several relevant data sources were searched without language restrictions. Publication bias was not assessed and could not be ruled out as the authors did not specifically search for unpublished studies. Attempts were made to reduce reviewer error and bias during study selection and data extraction; it was unclear whether similar attempts were made during quality assessment. Quality assessment was based on standard criteria and indicated the variable quality of the included data (acknowledged by the authors). Only studies with a low or medium risk of bias were pooled.

A fixed-effect meta-analysis was undertaken. Statistical heterogeneity was assessed. High levels of statistical heterogeneity were found in some analyses and this was not fully explored. There was a discrepancy between the text and figures in the reporting of results for maternal hypoglycaemia.

The review was generally well conducted, but potential heterogeneity and the small number of studies in some of the analyses limits the reliability of the authors’ conclusions.

**Implications of the review for practice and research**

**Research:** The authors stated that further larger studies of preconception care on outcomes such as pre-eclampsia, caesarean delivery and macrosomia were needed. Research was needed on methods to encourage diabetic women to utilise preconception care.

**Practice:** The authors stated that the research highlighted the importance of the integration of preconception care in routine care of diabetic women during their reproductive age.
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