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Prevalence of gestational diabetes mellitus in Europe: A meta-analysis

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ABSTRACT

Aims: Estimates of the prevalence of gestational diabetes vary widely. It is important to have a clear understanding of the prevalence of this condition to be able to plan interventions and health care provision. This paper describes a meta-analysis of primary research data reporting the prevalence of gestational diabetes mellitus in the general pregnant population of developed countries in Europe.

Methods: Four electronic databases were systematically searched in May 2016. English language articles reporting gestational diabetes mellitus prevalence using universal screening in general pregnant population samples from developed countries in Europe were included. All papers identified by the search were screened by one author, and then half screened independently by a second author and half by a third author. Data were extracted by one author. Values for the measures of interest were combined using a random effects model and analysis of the effects of moderator variables was carried out.

Results: A total of 3258 abstracts were screened, with 40 studies included in the review. Overall prevalence of gestational diabetes mellitus was 5.4% (3.8–7.8). Maternal age, year of data collection, country, area of Europe, week of gestation at testing, and diagnostic criteria were found to have a significant univariate effect on GDM prevalence, and area, week of gestation at testing and year of data collection remained statistically significant in multivariate analysis. Quality category was significant in multivariate but not univariate analysis.

Conclusions: This meta-analysis shows prevalence of GDM that is at the upper end of previous estimates in Europe.

1. Introduction

Gestational Diabetes Mellitus (GDM) is defined as glucose intolerance that is first diagnosed in pregnancy and increases the risk of complications for both mother and baby during pregnancy [1]. It is estimated that GDM affects around 7% of all pregnancies worldwide although prevalence is difficult to estimate as rates vary from study to study because of a lack of accepted diagnostic criteria and differences in screening procedures [2]. Some earlier diagnostic criteria were based on the criteria used in non-pregnant individuals and in others thresholds were created based on the predictive value of future type 2 diabetes in the mother. In recent years, there has been an increasing focus on diagnostic thresholds that

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predict the likelihood of adverse outcomes in pregnancy (HAPO) [3]. Adverse outcomes include macrosomia, shoulder dystocia and birth injury, primary caesarean delivery, preeclampsia, preterm delivery and foetal and neonatal mortality [4].

In addition to adverse outcomes during pregnancy and birth, the consequences of GDM extend beyond pregnancy with affected women having a seven fold increased risk of type 2 diabetes mellitus compared to women who have not had GDM. Rates of type 2 diabetes mellitus after a diagnosis of GDM vary depending on the population and length of follow up, but have been reported to be as high as 70% [5,6]. Women are thought to be at the greatest risk of developing type 2 diabetes mellitus in the first five years following a pregnancy with GDM, with incidence of type 2 diabetes mellitus plateauing at around 10 years [6].

Although women who have had GDM are at an increased risk of type 2 diabetes mellitus, research has shown that by making lifestyle changes they can prevent or delay progression to type 2 diabetes mellitus [7]. With prevalence of type 2 diabetes mellitus increasing rapidly, a diagnosis of GDM represents an opportunity for intervention to reduce the burden of type 2 diabetes mellitus [8]. This is why it is so important to have a full and clear understanding of the prevalence of this condition in order to be able to plan such interventions and health care provision. We have therefore conducted a meta-analysis of observational primary research studies that have assessed the prevalence of GDM in the general population of pregnant women in developed countries in Europe, regardless of the specific diagnostic criteria used. We have derived an overall prevalence estimate for GDM and examined moderator variables that potentially influenced this estimate. Although narrative reviews exist on this topic, this is the first systematic review and meta-analysis to bring together and synthesise all the evidence.

2. Material and methods

2.1. *Literature search and study selection*

A meta-analysis of primary research studies reporting prevalence of GDM was undertaken in accordance with the Meta-analysis of Observational Studies in Epidemiology (MOOSE) guidelines for reviews [9]. A search was conducted in MEDLINE, CINAHL, Health Source and PsycInfo for articles published before June 2016. The following combination of search terms were used with each database: (prevalence or incidence) and (gestational diabetes or diabetes in pregnancy or gestational diabetes mellitus). Reference lists and citations of included papers were checked to identify any other potentially relevant papers but key authors and experts in the field were not contacted due to the time consuming nature of this process with no guarantee of obtaining relevant information.

After removing duplicates, the title and abstract of all papers were screened by one author (CE). Independent screening of records was split between the two other authors, with JE screening half and DC screening the other half. The full texts of papers were retrieved for studies that were considered relevant, but also for those that contained insufficient information to allow judgement of relevance. These were checked against the inclusion criteria by CE and independently by JE. Reference lists of included articles were reviewed to identify any additional relevant articles. In cases of disagreement between authors about the inclusion of a paper, the full text of the paper was accessed and consensus was reached through discussion.

Papers were screened against the following inclusion criteria:

(1) Population: general population of pregnant women, living in a developed country in Europe (as defined by the Financial Times Stock Exchange).
(2) Outcome measure: prevalence of GDM diagnosed using universal screening carried out in the second or third trimester, using either a GTT alone or two step screening with glucose challenge test (GCT) followed by a GTT.
(3) Study design: observational study, published in English.

The review was limited to developed countries in Europe because of the wide differences in prevalence of type 2 diabetes mellitus and GDM between developed and developing countries [5,10]. This removed one potential source of heterogeneity in the review and also ensured its relevance for informing care and development of interventions in the context of developed health care systems. Studies were defined as having a sample drawn from the general population of pregnant women if it was drawn from a source that covered the majority of the population, such as population registers, general practice registers or registers of clinics for pregnant women (in countries where registration at general practices and clinics for pregnancy women is near to universal). If this information was not reported, studies were only included if the paper explicitly stated that the sample was drawn from a general population. Studies that selected people who were at high risk of GDM (due to family history of type 2 diabetes mellitus, or lifestyle and medical factors) were excluded. Studies were excluded if the majority of the sample were immigrants and did not originate from an included developed country.

2.2. *Data extraction and coding*

Data were extracted and summarised from potentially relevant studies by one author (CE) using a standardised data extraction form based on the example provided by the Centre for Reviews and Dissemination [11]. Confidence intervals were calculated where possible for studies that did not report these for prevalence figures. Where there were multiple papers published that were based upon the same sample, only the paper reporting the most complete and definitive results was included. However, more than one paper from the same sample was included in the review if each paper reported on a unique aspect of the findings.

The following information was extracted from each included study: first author, journal name and year of publication, country of study population, study period, study sample type, study design, age range, response rate, sample size, type of screening/testing carried out and diagnostic criteria for