
Accuracy of the random glucose test as screening test for gestational diabetes mellitus: a systematic review

van Leeuwen M, Opmeer BC, Yilmaz Y, Limpens J, Serlie MJ, Mol BW

CRD summary

This review concluded that available evidence on the accuracy of the random glucose tolerance test for gestational diabetes mellitus was limited. These conclusions should be interpreted with caution due to the possibility of missing studies.

Authors' objectives

To evaluate the accuracy of random glucose testing as a screening test for gestational diabetes mellitus.

Searching

MEDLINE and EMBASE were searched from inception to April 2008 with no language restrictions. Details of the search were reported, but exact terms were not listed. A cited reference search was conducted in Web of Science and related articles functions in PubMed and EMBASE were used to find additional studies. Reference lists were screened. Authors were contacted. The review was restricted to published studies.

Study selection

Studies that assessed the accuracy of random glucose testing (index test) against 75g or 100g oral glucose tolerance test (reference standard) in pregnant women before 32 weeks gestation were eligible for inclusion. Studies had to report sufficient data to construct a 2x2 table of test performance; authors were contacted to obtain additional data if these were not reported in the article. Some studies were excluded as only selected patients received the reference standard and one was excluded as it assessed repeated measurement of the random glucose testing.

Included studies were conducted in UK, Kuwait, India, China, Japan and the Netherlands. Prevalence of gestational diabetes mellitus ranged from 3.8% to 45%. Four studies performed random glucose testing once during pregnancy. Two studies performed multiple random glucose tests. Most studies enrolled all pregnant women; one enrolled only women with risk factors for gestational diabetes mellitus. Gestational age at screening ranged from 24 to 32 weeks. Most studies used the 75g oral glucose tolerance test and one used 100g. The threshold on the oral glucose tolerance test ranged from 5.3 to 8.3. Time between random glucose testing and oral glucose tolerance test ranged from the same day to four weeks. Random glucose testing was performed on venous plasma in all studies and a threshold of 4.4 to 6.9mmol/L was used to define a positive random glucose test.

Two reviewers independently selected studies for inclusion. Disagreements were resolved through discussion or referral to a third reviewer, where necessary.

Assessment of study quality

Two reviewers independently assessed study quality using the 14-item QUADAS tool and an additional item was added to assess whether there was any intervention between the index test and reference standard. Studies were also classified according to whether patients were enrolled prospectively and whether consecutive patients were enrolled. A study was considered to be of high quality if it fulfilled criteria for prospective recruitment, consecutive enrolment, adequate description of inclusion criteria and 100% verification of the index test.

Data extraction

Two reviewers independently extracted data to populate 2x2 tables of test performance. Sensitivity and specificity with 95% confidence intervals (CIs) were calculated. Disagreements were resolved through discussion or referral to a third reviewer. Studies that classed women as having impaired glucose tolerance; these patients were reclassified as being normoglycaemic or as having gestational diabetes mellitus.

Methods of synthesis

The authors intended to pool results using the bivariate random-effects model. Heterogeneity was assessed visually by plotting estimates of sensitivity and specificity in receiver operating characteristic (ROC) plot.

Due to the small number of studies and substantial heterogeneity a narrative synthesis was presented.

Results of the review

Six studies were included (n=3,563). All were prospective cohort studies and five enrolled consecutive patients. Studies generally scored well on the QUADAS assessment. Items rated as no or unclear by more than one study were blinding of the index test to the reference standard results and vice versa, availability of clinical information to the person interpreting the test result and reporting of uninterpretable results and withdrawals. None of the studies were considered to be of high quality.

Four studies assessed random glucose testing performed once during pregnancy. Sensitivity ranged from 15% (95% CI 8 to 25%) to 100% (95% CI 75% to 100%). Corresponding specificities ranged were 98% (95% CI 97% to 98%) to 37% (95% CI 35% to 37%).

One study assessed screening in the first and second trimesters. In the first trimester sensitivity was 71% (95% CI 46% to 88%) and specificity was 80% (95% CI 80% to 81%) In the second trimester sensitivity was 38% (95% CI 14% to 69%) and specificity was 82% (95% CI 82% to 83%).

One study included patients with risk factors for gestational diabetes mellitus who received five plasma glucose measurements in 24 hours during the second trimester. The lowest sensitivity was 25% (95% CI 18% to 27%) and the highest sensitivity was 47% (95% CI 37% to 56%). Corresponding specificities were 97% (95% CI 91% to 99%) and 74% (95% CI 66% to 81%).

Authors' conclusions

Available evidence on the accuracy of random glucose testing to test for gestational diabetes mellitus was limited. Based on the results, single random glucose measurement was inadequate to screen for gestational diabetes mellitus.

CRD commentary

The review addressed a focused question. Inclusion criteria were defined. Several studies were excluded as they did not have complete verification; this was not specified as an exclusion criteria. The literature search was adequate for published studies. Exclusion of unpublished data risked publication bias. Appropriate steps were taken at all stages of the review to minimise bias and errors. Study quality was assessed using appropriate criteria and the results were clearly presented. However, a post-hoc definition of high quality was adopted and appeared to be applied inconsistently. Given the differences between studies a narrative synthesis was appropriate.

The authors conclusions were supported by the results, but should be interpreted with some caution due to the possibility of missing studies.

Implications of the review for practice and research

Practice: The authors stated that single random glucose measurement was inadequate to screen for gestational diabetes mellitus.

Research: The authors stated that decision analysis models could be used to assess the potential value of random glucose testing in screening strategies in which individual pre-test probabilities were combined with test accuracy measures.

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