

ORIGINAL ARTICLE

Comparison of efficacy of one-step versus two-step oral glucose tolerance test in pregnant women and its impact on obstetrical outcomes.

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ABSTRACT... Objective: To compare the effectiveness of the one-step and two-step OGTT in diagnosing GDM among high-risk pregnant women and to evaluate the impact of each screening strategy on obstetrical outcomes. **Study Design:** Prospective Comparative Cohort study. **Setting:** Department of Obstetrics and Gynecology, Dr. Faisal Masood Teaching Hospital, Sargodha, Pakistan. **Period:** May 2025 to October 2025. **Methods:** One hundred and ten high-risk pregnant women at 24–28 weeks of gestation were enrolled using non-probability consecutive sampling and allocated equally to Group A (one-step 75 g 2-hour OGTT) and Group B (two-step 50 g GCT followed by 100 g OGTT if indicated) after approval from institutional ethical review committee (number smc/prin/5754 dated 17-4-2025). Primary outcome was GDM diagnosis rate; secondary outcomes included gestational age at delivery, birth weight, neonatal glucose, and maternal and neonatal complications. **Results:** The mean age of participants was 27.23 ± 4.33 years, with a mean gestational age of 26.91 ± 3.86 weeks. GDM was diagnosed in 30 (54.5%) women in Group A compared with 18 (32.7%) in Group B ($p=0.021$). Women screened by the one-step approach had significantly higher gestational age at delivery (38.00 ± 1.42 vs. 37.40 ± 1.56 weeks; $p=0.038$) and higher neonatal blood glucose levels (71.02 ± 14.84 vs. 53.18 ± 20.67 mg/dL; $p<0.001$). Rates of preterm birth, operative delivery, shoulder dystocia, and polyhydramnios were significantly lower in Group A ($p<0.05$). No significant differences were observed between the groups regarding large-for-gestational-age infants, perineal injury, postpartum hemorrhage, respiratory distress, neonatal intensive care unit admission, or neonatal hypoglycemia. **Conclusion:** The one-step OGTT demonstrates higher diagnostic yield in diagnosing GDM and is associated with improved key obstetrical outcomes including lower rates of preterm birth, operative delivery, shoulder dystocia, and polyhydramnios. These findings support the use of the one-step OGTT as an effective screening strategy for high-risk pregnancies.

Key words: Gestational Diabetes Mellitus, High-risk Pregnancy, Oral Glucose Tolerance Test, One-Step OGTT, Obstetrical Outcomes, Two-Step OGTT.

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INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as a state of carbohydrate intolerance of variable severity, with onset or first recognition during pregnancy. GDM is one of the most prevalent complications of pregnancy, and poses significant risks to both mother and developing foetus, including preterm birth, large for gestational age (LGA) infants, shoulder dystocia, operative delivery, preeclampsia, neonatal hypoglycaemia, and increased risk of type 2 diabetes mellitus in later life.^{1,2} Untreated GDM is associated with perinatal mortality rates approximately four times higher than those observed in uncomplicated pregnancies.³

The global prevalence of GDM is rising, mirroring the

epidemic of type 2 diabetes. In Pakistan, a country bearing a high burden of diabetes, the prevalence of GDM is estimated at approximately 6.5%, though this figure varies considerably by population and diagnostic criteria employed.⁴ The importance of timely diagnosis cannot be overstated, as prompt treatment through lifestyle modification and, where necessary, pharmacotherapy can significantly mitigate adverse maternal and perinatal outcomes.⁵

Two principal screening strategies are currently in clinical use. The one-step approach, endorsed by the International Association of Diabetes in Pregnancy Study Groups (IADPSG) and the World Health Organization (WHO) involves a 75 g 2-hour OGTT administered in the fasting state.

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Diagnosis is made if any single value meets or exceeds pre-specified thresholds: fasting plasma glucose ≥ 5.6 mmol/L (100 mg/dL) or 2-hour glucose ≥ 7.8 mmol/L (140 mg/dL). The two-step approach, historically preferred by the American College of Obstetricians and Gynecologists (ACOG), begins with a non-fasting 50 g 1-hour glucose challenge test (GCT). Only women exceeding the GCT threshold proceed to a diagnostic 3-hour 100 g OGTT, requiring two or more abnormal values for a positive diagnosis.^{6,7}

The debate between these two screening paradigms has important clinical implications. The one-step method offers greater convenience, improved patient compliance, and potentially higher sensitivity. The two-step approach avoids unnecessary OGTT in low-risk women but may lead to significant under-diagnosis, particularly in high-burden settings. Evidence comparing these strategies regarding not only diagnostic yield but also downstream obstetrical outcomes is limited and inconsistent in the literature, especially from low- and middle-income countries (LMICs) such as Pakistan.^{8,9}

The present study was designed to prospectively compare the efficacy of the one-step versus two-step OGTT in diagnosing GDM and to evaluate their respective impact on obstetrical outcomes in a tertiary care setting in Sargodha, Pakistan.

METHODS

A prospective comparative cohort study was conducted at the Department of Obstetrics and Gynecology, Dr. Faisal Masood Teaching Hospital, Sargodha, Pakistan, over a period of six months from May 2025 to October 2025 following ethical approval by the institutional review committee on 17-4-2025(Smc/prin/5754) The sample size was calculated using the reported sensitivity of the one-step and two-step oral glucose tolerance test (OGTT) from a previous study by Saranya et al.¹⁰, with a power of 80% and a level of significance of 5%, yielding a total sample of 110 participants. A non-probability consecutive sampling technique was employed to recruit eligible participants.

Pregnant women aged 18–40 years with singleton pregnancies between 24 and 28 weeks of gestation

who were considered at high risk for gestational diabetes mellitus (GDM) were included in the study. Women with previously diagnosed gestational diabetes mellitus, pre-existing diabetes mellitus, a family history of diabetes mellitus, or a previous history of fetal macrosomia were excluded.

After obtaining written informed consent, eligible participants were enrolled and allocated equally into two study groups. Participants in Group-A underwent the one-step screening strategy using a 75-g oral glucose tolerance test (OGTT), whereas those in Group-B underwent the conventional two-step screening strategy consisting of a non-fasting 50-g glucose challenge test (GCT), followed by a diagnostic 100-g OGTT in women with abnormal screening results. Gestational diabetes mellitus was diagnosed according to the respective diagnostic criteria for each screening method. Women diagnosed with GDM received standard antenatal management, including dietary modification, exercise, and pharmacological therapy whenever indicated, while participants with normal glucose tolerance continued routine antenatal care.

All participants were followed until delivery. The primary outcome measure was the proportion of women diagnosed with GDM by each screening strategy. Secondary outcome measures included gestational age at delivery, birth weight, neonatal blood glucose level, preterm birth, large-for-gestational-age infant, operative delivery, shoulder dystocia, polyhydramnios, postpartum haemorrhage, perineal injury, neonatal respiratory distress, neonatal intensive care unit admission, and neonatal hypoglycaemia.

Data were entered and analysed using IBM SPSS Statistics version 25.0. Continuous variables were expressed as mean $\pm$ standard deviation, whereas categorical variables were presented as frequencies and percentages. The normality of continuous data was assessed using the Shapiro–Wilk and Kolmogorov–Smirnov tests. Comparisons between the two groups were performed using the independent samples t-test for continuous variables and the Chi-square test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 110 participants were enrolled, with 55 in each group. The mean age of the total cohort was 27.23 ± 4.33 years (range: 18-40 years) while the mean gestational age at the time of testing was 26.91 ± 3.86 weeks. The maternal BMI, pre-pregnancy weight and fasting blood glucose are given in the Table-I. Baseline characteristics were comparable between groups, with no statistically significant differences observed for any variable (all $p > 0.05$).

GDM was diagnosed in 30 participants (54.5%) in Group-A compared with 18 participants (32.7%) in Group-B. This difference was statistically significant ($p=0.021$), indicating a substantially higher diagnostic yield with the one-step OGTT approach. These findings are presented in Table-II alongside the continuous obstetrical outcomes. The mean gestational age at delivery was significantly higher in Group-A compared with Group-B (38.00 ± 1.42 weeks vs. 37.40 ± 1.56 weeks; $p=0.038$), suggesting more consistent term delivery in women

managed under the one-step protocol. Birth weight did not differ significantly between groups (3.29 ± 0.61 kg vs. 3.32 ± 0.80 kg; $p=0.852$). Neonatal glucose levels were significantly higher in Group A (71.02 ± 14.84 mg/dL vs. 53.18 ± 20.67 mg/dL; $p<0.001$), reflecting better neonatal glycemic status in the one-step group.

Several categorical outcomes were significantly better in Group-A (Table-III). Preterm birth was observed in 3 participants (5.5%) in Group A versus 10 (18.2%) in Group-B ($p=0.039$). Operative delivery rates were similarly 5.5% ($n=3$) versus 18.2% ($n=10$; $p=0.039$). Shoulder dystocia occurred in 5.5% of Group-A versus 18.2% of Group-B ($p=0.039$). Polyhydramnios was present in 27.3% of Group A versus 45.5% of Group-B ($p=0.047$). No statistically significant between-group differences were observed for LGA, perineal injury, PPH, neonatal respiratory distress, NICU admission, or neonatal hypoglycaemia.

TABLE-I

Baseline characteristics of the study sample

Characteristic	Participants under study (n=110) Mean $\pm$ SD	Group-A: One-Step OGTT (n=55) Mean $\pm$ SD	Group-B: Two-Step OGTT (n=55) Mean $\pm$ SD	P-Value
Age (years)	27.23 ± 4.33	27.56 ± 4.08	26.89 ± 4.58	0.418
Gestational age at testing (weeks)	26.91 ± 3.86	27.44 ± 4.24	26.38 ± 3.40	0.153
Maternal BMI (kg/m ²)	24.81 ± 2.12	25.02 ± 1.96	24.59 ± 2.26	0.285
Pre-pregnancy weight (kg)	64.25 ± 7.07	64.64 ± 6.86	63.87 ± 7.33	0.574
Fasting blood glucose (mg/dL)	109.51 ± 20.32	108.16 ± 17.91	110.85 ± 21.21	0.202

Values are mean $\pm$ SD. Independent samples t-test applied. All p-values >0.05 indicate comparable groups at baseline.

TABLE-II

Primary Outcome and Continuous Obstetrical Outcomes by Study Group

Outcome	Group-A: One-Step OGTT (n=55)	Group-B: Two-Step OGTT (n=55)	P-Value
GDM diagnosed, n (%)	30 (54.5%)	18 (32.7%)	0.021*
Gestational age at delivery (weeks)	38.00 ± 1.42	37.40 ± 1.56	0.038*
Birth weight (kg)	3.29 ± 0.61	3.32 ± 0.80	0.852
Neonatal glucose (mg/dL)	71.02 ± 14.84	53.18 ± 20.67	$<0.001^*$

*Statistically significant ($p \leq 0.05$). Values for continuous outcomes are mean $\pm$ SD; independent samples t-test used.

TABLE-III

Categorical obstetrical and neonatal outcomes by study group

Outcome	Group A – One-Step OGTT n (%)	Group B – Two-Step OGTT n (%)	P-Value
Large for gestational age	7 (12.7%)	14 (25.5%)	0.089
Preterm birth	3 (5.5%)	10 (18.2%)	0.039*
Operative delivery	3 (5.5%)	10 (18.2%)	0.039*
Shoulder dystocia	3 (5.5%)	10 (18.2%)	0.039*
Polyhydramnios	15 (27.3%)	25 (45.5%)	0.047*
Perineal injury	3 (5.5%)	5 (9.1%)	0.463
Post Partum Haemorrhage (PPH)	3 (5.5%)	5 (9.1%)	0.463
Respiratory distress	3 (5.5%)	8 (14.5%)	0.112
NICU admission	7 (12.7%)	8 (16.4%)	0.589
Neonatal hypoglycaemia	6 (10.9%)	11 (20.0%)	0.187

*Statistically significant ($p \leq 0.05$). Chi-square test or Fisher's exact test applied, as appropriate.

DISCUSSION

Gestational diabetes mellitus (GDM) poses significant risks, including preterm birth, large for gestational age infants, and operative deliveries.¹¹ The one-step and two-step OGTT methods are commonly used to diagnose GDM, but their comparative efficacy remains unclear⁹, necessitating this study to determine which method more accurately identifies GDM and better predicts obstetrical outcomes, ultimately aiming to enhance clinical guidelines and improve maternal and neonatal health.

This prospective comparative study demonstrates that the one-step 75g 2-hour OGTT identifies a significantly higher proportion of GDM cases compared to the two-step 50g GCT / 100g OGTT protocol (54.5% vs. 32.7%; $p=0.021$). Furthermore, the one-step approach was associated with superior outcomes in several clinically meaningful endpoints, including gestational age at delivery, neonatal glucose levels, preterm birth, operative delivery, shoulder dystocia, and polyhydramnios, supporting its value not merely as a diagnostic instrument but as a strategy that facilitates earlier intervention and potentially better pregnancy outcomes.

The higher GDM detection rate with the one-step approach aligns closely with findings from Satodiya et al. (2017), who reported detection rates of 19.23% vs. 11.81% ($p=0.001$) in an Indian randomized controlled trial, and with the meta-analysis by

Saccone et al. (2019).^{9,12} Our absolute rates are higher, which may reflect differences in population-level GDM prevalence, the pre-selection of high-risk women in this study, and differences in diagnostic thresholds applied. The two-step method's lower detection rate likely reflects the well-documented phenomenon of loss to follow-up between the GCT and OGTT stages, estimated at 21–23% in published cohorts⁶, as well as the inherently lower sensitivity of a two-threshold system.

The significantly higher gestational age at delivery in Group-A (38.00 vs. 37.40 weeks; $p=0.038$) reflects the benefit of earlier GDM diagnosis enabling timely management. In Group B, where a substantial proportion of GDM cases remained undiagnosed or were diagnosed later, suboptimal glycaemic control may have contributed to earlier delivery or obstetric intervention. This is consistent with data from Davis et al. (2021) and Pocobelli et al. (2018), who demonstrated that one-step identified GDM cases managed appropriately achieved better gestational age outcomes compared with two-step diagnosed cohorts.^{13,14}

The markedly higher neonatal glucose levels in Group A (71.02 vs. 53.18 mg/dL; $p<0.001$) is one of the most striking findings of this study. Neonatal hypoglycaemia is a recognized consequence of maternal GDM through foetal hyperinsulinism; the higher neonatal glucose in Group A reflects the beneficial metabolic effect of earlier GDM detection

and treatment on fetal insulin physiology.¹⁵ Although rates of frank neonatal hypoglycaemia did not differ significantly (10.9% vs. 20.0%; $p=0.187$), possibly due to insufficient power, the trend favoured Group-A and the continuous glucose data support a biologically meaningful difference.

Preterm birth, operative delivery, and shoulder dystocia were all significantly lower in Group A (all $p=0.039$). These outcomes are interrelated—undiagnosed or poorly managed GDM leads to fetal overgrowth, increasing the likelihood of dystocia and operative intervention, which in turn increases the risk of preterm iatrogenic delivery. The observation that polyhydramnios was also significantly less frequent in Group A (27.3% vs. 45.5%; $p=0.047$) further supports this mechanistic chain; polyhydramnios in GDM results from foetal polyuria driven by foetal hyperglycaemia, and its reduction reflects better maternal glycaemic control afforded by earlier diagnosis.¹⁶

LGA incidence trended toward significance (12.7% vs. 25.5%; $p=0.089$) but did not reach the significance threshold, possibly due to the study's sample size being powered for the primary outcome rather than individual secondary endpoints. With a larger sample, this difference may achieve statistical significance, a hypothesis supported by the existing systematic review literature.⁹ The absence of significant differences in PPH, perineal injury, respiratory distress, and NICU rates between groups may reflect the relatively small sample size for these individually less frequent events, or genuine equivalence for these endpoints.^{17,18} Compared with international studies, our cohort had broadly comparable baseline BMI (24.81 kg/m²) and gestational age at testing (26.91 weeks) to those reported by Luewan et al. and Nawaz et al.. The mean fasting glucose at enrolment (109.51 mg/dL) was higher than some international comparators, potentially reflecting the high-risk enrolment criterion and a population with elevated metabolic risk—consistent with Pakistan's high background diabetes burden.^{8,11}

The strengths of this study include its prospective design, standardized OGTT protocols, direct comparison of both strategies and their downstream

obstetrical outcomes, and a clinically homogeneous population. Limitations include the single-center design and absence of longer-term follow-up preclude assessment of postpartum maternal metabolic outcomes or childhood sequelae.

CONCLUSION

In conclusion, this prospective comparative cohort study demonstrates that the one-step 75 g 2-hour OGTT exhibits significantly higher diagnostic yield in diagnosing GDM among high-risk pregnant women compared to the two-step approach, translating into more effective early management and measurably improved obstetrical outcomes.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Choudhury AA, Rajeswari VD. **Gestational diabetes mellitus: A metabolic and reproductive disorder.** *Biomed Pharmacother.* 2021; 143:112183.
2. Nakshine VS, Jogdand SD. **A comprehensive review of gestational diabetes mellitus: impacts on maternal health, fetal development, childhood outcomes, and long-term treatment strategies.** *Cureus.* 2023; 15(10):e46845.
3. Turkmen S, Johansson S, Dahmoun M. **Foetal macrosomia and foetal-maternal outcomes at birth.** *J Pregnancy.* 2018; 2018:4790136.
4. Basit A, Fawwad A, Qureshi H, Shera AS. **Prevalence of diabetes, pre-diabetes and associated risk factors: Second National Diabetes Survey of Pakistan (NDSP), 2016-2017.** *BMJ Open.* 2018; 8(8):e020961.
5. Farrar D, Simmonds M, Bryant M, Sheldon TA, Tuffnell D, Golder S, et al. **Treatments for gestational diabetes: A systematic review and meta-analysis.** *BMJ Open.* 2017; 7(6):e015557.
6. Saccone G, Caissutti C, Khalifeh A, Meltzer S, Scifres C, Simhan HN, et al. **One-step versus two-step approach for gestational diabetes screening: Systematic review and meta-analysis of randomized trials.** *J Matern Fetal Neonatal Med.* 2019; 32(9):1547-55.
7. Coustan DR, Dyer AR, Metzger BE. **One-step or 2-step testing for gestational diabetes: Which is better?** *Am J Obstet Gynecol.* 2021; 225(6):634-44.

8. Luewan S, Bootchaingam P, Tongsong T. **Comparison of the screening tests for gestational diabetes mellitus between one-step and two-step methods among Thai pregnant women.** *Obstet Gynecol Int.* 2018; 2018:1521794.
9. Ramezani TF, Rahmati M, Farzadfar F, Abedini M, Farahmand M, Hosseinpanah F, et al. **One-step versus two-step screening for diagnosis of gestational diabetes mellitus in Iranian population: A randomized community trial.** *Front Endocrinol (Lausanne).* 2023 Feb; 13:1039643.
10. Saranya N, Suganthi M, Dhinakaran S, Navina N. **Comparison of one-step glucose tolerance test (75 g GTT) and two-step glucose tolerance test (100 g GTT) in screening and diagnosis of gestational diabetes mellitus.** *Int J Reprod Contracept Obstet Gynecol.* 2018; 7(12):4814-8.
11. Nawaz R, Yasin I, Hamid I, Asmat A, Qamar MU, Rasheed S. **Diagnosing gestational diabetes mellitus: one-step approach versus two-step approach.** *Pak J Med Health Sci.* 2020; 14(2):332-5.
12. Satodiya M, Takkar N, Goel P, Kaur J. **Comparison of one-step versus two-step screening for diagnosis of gestational diabetes mellitus in Indian population: A randomized controlled trial.** *J Obstet Gynaecol India.* 2017; 67(3):190-5.
13. Davis EM, Abebe KZ, Simhan HN, Catalano P, Costacou T, Comer D, et al. **Perinatal outcomes of two screening strategies for gestational diabetes mellitus: A randomized controlled trial.** *Obstet Gynecol.* 2021 Jul 1; 138(1):6-15.
14. Pocobelli G, Yu O, Fuller S, Fraser JR, Wartko PD, Chen L, et al. **One-Step approach to identifying gestational diabetes mellitus: Association with perinatal outcomes.** *Obstet Gynecol.* 2018 Oct; 132(4):859-867.
15. Chang SH, Hsin PH, Lin JJ, Yang YS, Lo SC, Huang CN, et al. **Evaluating the association between gestational diabetes and neonatal hypoglycemia in Taiwan: A retrospective study of 2,149 pregnancies.** *Front Endocrinol (Lausanne).* 2025 Sep 4; 16:1634074.
16. Sweeting A, Wong J, Murphy HR, Ross GP. **A clinical update on gestational diabetes mellitus.** *Endocr Rev.* 2022; 43(5):763-93.
17. Nazir S, Nazir A, Javed MS, Shahnawaz S, Malik SA, Ali S. **Frequency of maternal morbidity and mortality in women with primary postpartum hemorrhage.** *Pak Euro J Med Life Sci.* 2021; 4(4):353-8.
18. Fieni S, Morganelli G, Valenti A, Formisano D, Celora GM, Mastrandrea B, et al. **Comparative evaluation of prophylactic strategies for postpartum hemorrhage in vaginal delivery.** *Int J Gynaecol Obstet.* 2026 Apr; 173(1):379-85.

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3	Alia Nasir Ud Din: Data analysis, proof reading.
4	Shoaib Ahmad Malik: Critical revisions.