

Clinicians' Perspectives on Glucose Tolerance Test Practices at a Tertiary Care Hospital in Coimbatore, Tamil Nadu, India

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ABSTRACT

Introduction: The overuse of laboratory investigations is prevalent in hospital settings, with a major contributing factor being ignorance of test characteristics. The utilisation of laboratory tests depends on clinicians' perspectives.

Aim: Present study aimed to assess clinicians' perspectives on Glucose Tolerance Test (GTT) practices in a tertiary care hospital in Coimbatore and identify any process deviations.

Materials and Methods: A descriptive study was conducted in the Department of Biochemistry at PSG IMSR, Coimbatore, Tamil Nadu, India, involving 27 clinicians. Structured interviews were conducted in March 2019, covering indications for GTT, preferred glucose loads, fasting duration, blood sample collection time intervals, cut-off levels for glucose values at different time intervals (0, 1, 2, 3, 4 hours), and reference criteria used for interpretation {World Health Organisation (WHO), American Diabetes Association (ADA), The International Association of

Diabetes and Pregnancy Study Groups (IADPSG)}. Test Request Forms (TRFs) for GTT over a one-month period were also analysed. Quantitative data was expressed as mean \pm SD, and qualitative data was expressed as frequency and percentage.

Results: The structured interviews were conducted with 27 clinicians, predominantly from the Department of Obstetrics and Gynaecology. GTT usage was rare in other departments. A total of 217 TRFs were received for the one-month duration, with 94.9% indicating a glucose load of 75 grams (g).

Conclusion: GTT is influenced by various factors throughout the testing process, that can have an impact on results and patient care. This study revealed differences between end-users' requirements and the laboratory's procedures. By revising the TRF and sample collection manual according to clinicians' needs, better optimisation between the laboratory and end-users of the test can be achieved.

Keywords: Gestational diabetes mellitus, Glucose load, Screening

INTRODUCTION

Overuse of laboratory investigations is prevalent in the hospital setting. A major factor contributing to laboratory overutilisation is ignorance of test characteristics [1]. The inappropriate use of diagnostic testing causes unnecessary patient discomfort, generates false-positive results, overloads diagnostic services, wastes valuable healthcare resources, and undermines the quality of health services [2]. Several strategies have been proposed for rationalising laboratory utilisation, including remodeling of request forms [2].

GTT has been used in the medical field for over the past 100 years since its first description by Conn in 1940. The test measures the body's ability to metabolise glucose or clear it out of the bloodstream. It has been widely used in clinics to diagnose Impaired Glucose Tolerance (IGT) and/or Type 2 Diabetes Mellitus (T2DM) [3]. Many variations of the GTT have been devised over the years for various purposes, with different standard doses of glucose, routes of administration, intervals and durations of sampling, and various substances measured in addition to blood glucose. The main concerns raised in using the GTT were the diagnostic values at each time point, the timing of samples, diet, exercise, age, gastrointestinal factors (e.g., gastric emptying time or gastrointestinal absorption rates), and stress prior to the test that may influence the values of the test [4,5].

Diabetes complicating pregnancy is associated with adverse maternal and perinatal outcomes. However, a clear definition of glucose intolerance in pregnancy has been an issue of considerable controversy, complicating clinical practice and research over the last few decades. The main reason for this diagnostic dilemma is the large number of procedures and glucose cut-offs proposed for the diagnosis of glucose intolerance in pregnancy [6]. The criteria used for diagnosing diabetes mellitus are also diverse. The International Association of Diabetes

and Pregnancy Study Groups (IADPSG) criteria were embraced by many international organisations, including ADA, WHO, International Federation of Gynaecology and Obstetrics (FIGO), and European Board and College of Obstetrics and Gynaecology (EBCOG) [7,8].

The GTT is used not only to diagnose diabetes mellitus but also provides additional information on the body's ability to metabolise blood glucose. The plasma glucose levels obtained during the GTT are related to both insulin sensitivity and secretion [9]. Higher GTT values are likely to reflect diet, lifestyle problems, and insulin dysfunction. Information on the reliability of GTT is important, as some conditions (common cold), or food (caffeine), or lifestyle habits (smoking) may alter the results [5]. Laboratory utilisation of the test is dependent on the clinician's perspective. In the present study, the clinician's perspective of GTT was collected with the intent to optimise utilisation of laboratory services. The main aim of the present study was to assess the different GTT procedures practiced in the hospital and identify any process deviations.

MATERIALS AND METHODS

A descriptive study was conducted in the Department of Biochemistry at PSG IMSR, a Tertiary Care Hospital in Coimbatore, Tamil Nadu, India. Clinicians who ordered Glucose Tolerance Tests (GTT) in March 2019 were interviewed using a structured interview guide that was validated by experts in the department. The study obtained ethical clearance from the Institutional Ethics Committee (18/395). A structured interview guide was prepared and the same was subjected to expert validation among a panel of experts in the department.

Inclusion criteria: Clinicians routinely ordering GTT and willing to participate in the study were included in the study. The TRFs of one month with GTT were included in the study.

Exclusion criteria: Clinicians unwilling to participate were excluded from the study.

Study Procedure

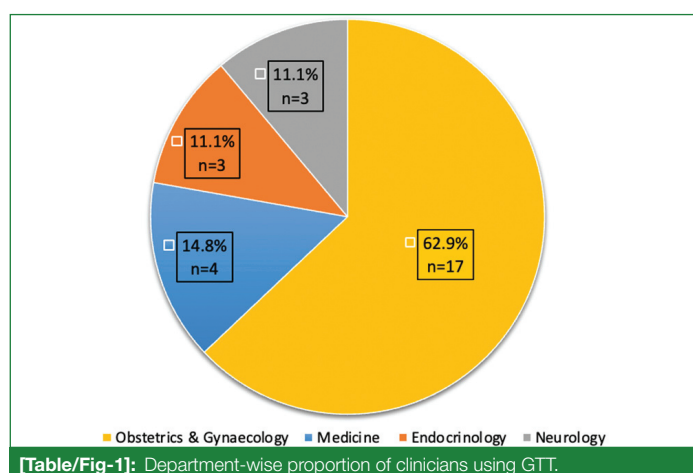
The Convenience sampling method is a non probability sampling technique that draw data respondents that are convenient for researchers to reach. Present study opted this sampling which was used to include willing clinicians as participants. Informed consent was obtained before conducting structured interviews. The interview questions were developed based on expert opinions. The following details were collected: indications for GTT, preferred glucose loads, fasting duration, blood sample collection intervals, cut-off levels for glucose values at different time intervals (0, 1, 2, 3, 4 hours), and reference criteria used {WHO [8], ADA [10], IADPSG [11]} followed for result interpretation. Additionally, GTT Test Request Forms (TRFs) received at the clinical Biochemistry laboratory over one month were analysed. TRF details included the department ordering the test, type of GTT requested, glucose load, and sampling timing.

STATISTICAL ANALYSIS

The data was entered into Microsoft Excel for statistical analysis. Quantitative data was expressed as mean±SD, while qualitative data was expressed as frequency and percentage.

RESULTS

A total of 27 clinicians participated in the interview. The department-wise proportion of clinicians using GTT is given in [Table/Fig-1].



[Table/Fig-1]: Department-wise proportion of clinicians using GTT.

The most common indication for performing GTT was as part of screening for Gestational Diabetes Mellitus (GDM). The preferred glucose load was 75 g. The Department of Obstetrics and Gynaecology predominantly used IADPSG criteria for diagnosis, while other departments relied on WHO guidelines for interpretation [Table/Fig-2].

Data from the review of TRFs for one month (March 2019) were also analysed. A total of 217 GTT request forms were available. The Department of Obstetrics and Gynaecology ordered GTT most frequently (70.9%, n=154). In 94.9% of the TRFs (n=206), the glucose load specified was 75 g. In 5.1% of cases, the load was not mentioned, but the collection centre routinely provided a pre-weighed sachet of 75 g glucose. Out of the 217 tests performed, 56 were Glucose Challenge Tests (GCT), where a 75 g load was given regardless of fasting, and the glucose level was analysed at two hours. The remaining 161 tests were oral GTTs, where after a 10-hour fast, a 75 g glucose load was given, and fasting, one-hour, and two-hour glucose levels were measured [Table/Fig-3].

DISCUSSION

A change in test utilisation requires changes in provider awareness and behaviour. These changes can be achieved through educational interventions and audit feedback [12]. In the present study, an audit was conducted to understand the utilisation of GTT (Glucose Tolerance Test), and the perspectives of clinicians regarding GTT were collected to optimise utilisation of laboratory services. Despite concerns raised by scientists about the reproducibility of GTT for over 50 years, it remains the current “gold standard” for diagnosing T2DM (Type 2 Diabetes Mellitus) and GDM (Gestational Diabetes Mellitus). The Obstetrics and Gynaecology Department was the major department ordering GTT, primarily for screening GDM [7], which aligns with the standard recommendation. The department followed the IADPSG guidelines, preferring a glucose load of 75 grams and sampling at 0, 1, and 2 hours [11]. It is crucial to adhere to standard time points during sampling to avoid inaccurate glucose measurement, which could lead to missed diagnosis or mismanagement of patients, resulting in adverse outcomes and increased healthcare costs [13]. The IADPSG criteria require only one of three values to be met or exceeded for diagnosis [4]. Despite a 3.5-fold increase in the prevalence of GDM, the use of IADPSG criteria was associated with an improvement in the prevalence of maternal and neonatal adverse outcomes, which was

Variables	Frequency n (%)				
	Indications for OGTT*	GDM (70.3%, n=19)	Reactive hypoglycaemia (7.4%, n=2)	Growth hormone excess (3.7%, n=1)	Neuropathy and retinopathy (3.7%, n=1)
Glucose loads preferred	75 g (81.4%, n=22)		Inconclusive (18.5%, n=5)		
Fasting	Yes (100%, n=27)		No		
Duration of fasting hours	8-10 hours (66.6%, n=18)		10-12 hours (33.3%, n=9)		
Adjustment for hydrous/anhydrous	Yes	No		Inconclusive (100%, n=27)	
Flavoured (Yes/No)	Yes (25.9%, n=7)	No (59.3%, n=16)		Inconclusive (14.8%, n=4)	
Time intervals of blood sample collection	0, 1, 2 hours (66.6%, n=18)	0, 0.5, 1, 1.5, 2 hours (14.8%, n=4)		Inconclusive (18.5%, n=5)	
Cut-off levels used for diagnosis	(Fasting >92 mg/dL, 1 hour >180 mg/dL, 2 hour >153 mg/dL) (51.8% n=14)	(Fasting >126 mg/dL, 2 hour >140 mg/dL) (22.2%, n=6)		Fasting >95 mg/dL, 1 hour >180 mg/dL, 2 hour >155 mg/dL (25.9%, n=7)	
Reference criteria followed	IADPSG (51.8% n=14)	WHO (22.2%, n=6)		ADA (25.9%, n=7)	

[Table/Fig-2]: Analysis of structured interview data.

* One participant from the study had chosen two indications for Oral Glucose Tolerance Tests (OGTT)

Parameters assessed from TRFs	Number and percentage	Number and percentage
Glucose load	75 g (n=206, 94.9%)	Not mentioned (n=11, 5.1%)
Test used	GCT (n=56, 25.8%)	GTT (n=161, 74.2%)

[Table/Fig-3]: Analysis of Total TRFs (N=217).

deemed cost-effective [14]. Other departments such as Medicine, Endocrinology, and Neurology used GTT for various indications, following WHO recommendations. However, it was observed that some consultants in the Neurology Department preferred non-standard time points for sampling, indicating a misconception about current guidelines. Furthermore, the test requests did not specify

the patient's condition (pregnant or non pregnant), which is crucial as sampling time and reference ranges differ between these two groups. Improving the description of GTT in the request form is necessary to address this issue.

Almost all clinicians preferred an 8-10 hour fasting period. The universally used glucose load was 75 g. This aligns with the prevailing standards in our country. However, there were different practices for preparing and delivering the standard glucose load. Glucose powder, known as 'monohydrated', contains one molecule of water per molecule of glucose. Since the molecular weight of glucose is 18 g/mol and the molecular weight of water is 18 g/mol, an additional 10% glucose (82.5 g) needs to be given to achieve the intended load. In the present study procedure, authors used 75 g of anhydrous, non flavoured glucose [15]. These details are specified in the sample collection manual for end-users.

The authors also received requests for Glucose Challenge Tests (GCTs) from the Department of Obstetrics and Gynaecology. These requests specified the glucose load and timing of sample collection. However, after interviewing clinicians, we discovered that the department universally preferred the IADPSG guidelines, which did not recommend GCT. Further exploration revealed that interns or nursing trainees, who were unfamiliar with the tests, filled out these forms and used the terms GCT and Glucose Tolerance Test (GTT) interchangeably.

Upon reviewing the sample collection manual, we found that it described the American College of Obstetricians and Gynaecologists (ACOG) criteria for GTT in pregnant women. Consequently, the glucose load and sampling procedures did not align with the preferences of the clinicians. This discrepancy could be a reason why end-user to selected GCT instead of GTT and specified glucose load and sampling time in the request form. Similarly, for non pregnant patients, sampling was done thrice, whereas only two samples are required according to the WHO recommendations.

In the present study, it was found that there was a lack of communication between clinicians and laboratory physicians regarding the guidelines that are being practiced. This has resulted in inappropriate testing for the patients, increased patient discomfort, increased cost of testing and probable misinterpretation of test results. The sample collection manual was revised based on clinician requirements and retrained the sample collection staff. Authors also noted a lack of knowledge among some end-users regarding the current guidelines, which the authors addressed by discussing the guidelines with them and providing training to interns and nursing trainees on test characteristics. Additionally, authors remodeled the request form to include a clear description of the glucose load and sampling time to avoid ambiguity.

Limitation(s)

The present study only assessed the clinician's perspective on a single test and did not cover the entire scope of the clinical biochemistry laboratory.

CONCLUSION(S)

The GTT is subject to several factors that can influence its results and negatively impact patient care throughout the testing process. The study revealed differences between end-users' requirements and the laboratory's procedures, which can introduce potential errors. Revising the TRF and sample collection manual to align with clinicians' needs may improve coordination between the laboratory and end-users. Obtaining clinicians' perspectives will help define the test characteristics based on the hospital's requirements, optimising laboratory services and ultimately enhancing the quality of patient care.

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