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REVIEW ARTICLE

# RSSDI endorses the IDF Position Statement on 1 h post load plasma glucose for diagnosis of intermediate hyperglycemia and type 2 diabetes

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**Abstract**
The Oral Glucose Tolerance Test (OGTT) remains a gold standard for diagnosis of diabetes and prediabetes all over the world and also in India. The original OGTT was a five sample test which included fasting, 30, 60, 90, and 120 min. Later, the test was modified in the US to two sample test 0 and 120 min, i.e., fasting and 2 h after 75 g glucose and this has been in practice all over the world. Traditional diabetologists continue to measure some of the intermediate samples, particularly the 60 min or 1 h value which identifies individuals even before the fasting or 2 h value becomes abnormal. Thus, even before the stage of prediabetes when one has a normal fasting and 2 h value, a raised 1 h value above 155 mg/dl has been shown to predict who will progress to diabetes. A group of 22 international experts recently got together and the IDF Position Statement on the 1 h value was published which shows why the 1 h value in the OGTT should be reintroduced in the routine lab testing of OGTT. This article is an endorsement of the IDF Position Statement on the 1 h value. Introducing the 1 h value in the OGTT is particularly relevant to India which has one of the fastest conversions of prediabetes to diabetes and also a very rapid loss of beta cell function. Identifying early stages of intermediate hyperglycemia can help to prevent diabetes and also reverse the condition.

**Keywords** Prediabetes · Type 2 diabetes · Position Statement · IDF · RSSDI · 1 hour value · OGTT

## Introcuction

The Oral Glucose Tolerance Test (OGTT) first introduced in 1923 by Jerome Conn [1] continues to be the "gold standard" for diagnosis of diabetes and prediabetes in most parts of the world [2]. There is a concerted move in the United States and more recently in the UK and some parts of Europe to dispense with the OGTT altogether and to replace it with the fasting plasma glucose (FPG) and HbA1c test. However, many organizations like the World Health Organization (WHO) and the International Diabetes Federation (IDF) continue to recommend the OGTT for diagnosis of diabetes and prediabetes. Over the years, the diagnostic cut points for diagnosis of diabetes and prediabetes using an OGTT have changed. The glucose load used also used to differ between different countries with 50 g being used in the UK and 100 g used in the US, a few decades ago. All these changed in 1979 when the National Diabetes Data Group (NDDG) standardized the OGTT and recommended using 75 g as the glucose load as a compromise and the diagnostic criteria for diabetes and prediabetes were laid down [3].

The original OGTT was a five sample test which had fasting, 30, 60, 90, and 120 min samples. However, the NDDG simplified the OGTT and three of the intermediate values, i.e., 30, 60, and 90 min, were removed, leaving only the fasting and the 2 h value. The cut points for fasting were later modified and the fasting of 126 mg/dl (7 mmol/l) and 2 h value of 200 mg/dl (11.1 mmol/l) became the gold standard cut points used for diagnosis of diabetes. There was some disagreement with regard to the diagnostic values for prediabetes, particularly impaired fasting glucose (IFG), as the Americans used a cut point of $\geq 100$ and $\leq 125$ mg/dl for diagnosis of IFG while the WHO and the IDF recommended the use of $\geq 110$ and $< 125$ mg/dl to diagnose IFG. For the

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diagnosis of impaired glucose tolerance (IGT), there was no controversy, as values between 140 and 199 mg/dl were used for diagnosis of IGT worldwide. The Research Society for Study of Diabetes in India (RSSDI) has also supported the IDF and WHO with respect to these cut points [4].

## Review of Literature

Despite dropping the intermediate values in the OGTT, conventional diabetologists in many countries including India continued to do a 3 sample OGTT including the 1 h (or 60 min) value also in the OGTT. Several studies including the San Antonio Heart Study [5], Botnia Study, and the Malmo Preventive Project (MPP) [6] showed that if the 1 h value exceeded 155 mg/dl or more, even in those with normal fasting and 2 h values, it predicted progression to prediabetes or diabetes in the future [7, 8]. Indian data also supported the exact same cut point of 155 mg/dl [7–10]. In a commentary published in Lancet Diabetes and Endocrinology [11], the case for retaining or reintroducing the 1 h value in the OGTT was made. Recently, the IDF has published a Position Statement on the need for reintroducing the 1 h value in the OGTT and presents all the evidence for this [12]. The basic argument is that in people who have normal fasting and 2 h values in the OGTT (which means that technically they do not have diabetes or prediabetes), an elevated 1 h in the OGTT (> 155 mg/dl) could serve as an earlier marker in for development of diabetes or prediabetes in the future. Loss of beta cell function occurs very early in the natural history of diabetes and even by the stage of prediabetes, a considerable amount of beta cell function is lost [13, 14]. It therefore makes sense to identify people earlier in the natural history of diabetes. This will help to start preventive lifestyle measures earlier and this may help to slow down or postpone the loss of pancreatic beta cell function, although admittedly, we need RCTs to prove this.

The IDF Position Statement lists several other advantages of the 1 h OGTT test and these are summarized in Table 1.

## Reproduced from the IDF Position Statement [12]

The IDF Position Statement also recommends a screening algorithm for diagnosis of prediabetes (intermediate hyperglycemia) in type 2 diabetes using a diabetes risk score. To identify the high-risk population in India, the Madras Diabetes Research Foundation – Indian Diabetes Risk Score (MDRF – IDRS) which has been extensively validated can be used for this purpose [15–20]; all those who are at high risk can then undergo the three sample OGTT, fasting, 1 h and 2 h samples; the IDF Position Statement says that those who have a 1 h value of more than 209 mg/dl can then be called back for a second OGTT using the 2 h values. While this has some advantages in terms of restricting the tests to 1 h and thereby saving time in a busy clinic and also waiting time for the person being screened, it would mean that the individual has to come to the clinic twice which is impractical especially in lower- and middle-income countries including India. Therefore, it may be more practical to do only one OGTT adding the 1 h sample while doing the OGTT. This will have several advantages. Firstly, the present diagnostic fasting and 2 h cut points for diagnosis of diabetes and prediabetes can remain the same as before, but additionally we will have the 1 h cut point also. Those whose 1 h value is > 155 mg/dl but have normal fasting and 2 h can be considered to have an earlier stage of intermediate hyperglycemia and can be prescribed lifestyle intervention and referred to a diabetes prevention program [12].

A recent review of the global prevalence of prediabetes showed that while in most parts of the world IGT is more common, in South Asia and South East Asia, impaired fasting glucose (IFG) is more common [21, 22]. The recent

**Table 1** Advantages of using 1 h value in OGTT [12]

| |
|---|
| 1. Defines high risk of T2D in adults, children, and youth |
| 2. Associated with worsened metabolic and atherogenic profiles |
| 3. Identifies risk for micro- and macrovascular complications and mortality |
| 4. Identifies risk for OSA, CFRD, MASLD, and severity of hepatic fibrosis |
| 5. Occurs *before* the onset of IGT |
| 6. Merits identification *before* IGT occurs |
| 7. Cost-effective for high-risk screening |
| 8. Provides opportunity for earlier detection and intervention in high-risk populations identified with primary screening tools (FINDRISC, ADA) |
| 9. May benefit from lifestyle and pharmacologic interventions to reduce progression to T2D |
| 10. Reduces diagnostic complexity and confusion with current diagnostic criteria for IH |
| 11. Shortens OGTT from 2 to 1 h making it more practical and clinically acceptable |
| 12. Threshold ≥ 209 mg/dl (11.6 mmol/L) defines T2D |

*OSA* Obstructive sleep apnoea, *CFRD* Cystic fibrosis-related diabetes mellitus, *MASLD* Metabolic dysfunction-associated steatotic liver disease

ICMR – INDIAB Study showed that there are 101 million people with diabetes and 136 million people with prediabetes and moreover the majority of those with prediabetes in India have impaired fasting glucose [23]. This means that the 2 h value in OGTT is often normal. Therefore, the 1 h value in the OGTT becomes even more important in India. There is also evidence that progression from prediabetes to diabetes occurs faster in South Asians living in the UK [24] as well as Indians in India [25].

## Conclusions

The subtypes of type 2 diabetes in Indians are also slightly different from that reported in Caucasians by Alquist et al. [26]. In India, the severe insulin-deficient diabetes variety (SIDD) appears to be common and diabetes occurs at much lower BMI [27]. Lean type 2 diabetes is also common in India [28–31]. Given these variations in the phenotype of type 2 diabetes and the rapid progression to type 2 diabetes in Indians, the move by the IDF introducing the 1 h value in the OGTT for earlier identification of individuals is to be welcomed and the Research Society for the Study of Diabetes in India (RSSDI) supports and endorses the Position Statement of the IDF on the 1 h post load plasma glucose for the diagnosis of intermediate hyperglycemia and type 2 diabetes [12].

### Declarations

**Consent to participate** Not relevant as it is a review article.

**Conflict of interest** The authors declare no competing interests.

**Research involving human participants and/or animals** Not relevant.

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