

Correlation of First Trimester Metabolic Parameters & Maternal Body Fat Indices with Development of Gestational Diabetes Mellitus



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Introduction

- Gestational diabetes mellitus (GDM) is glucose intolerance diagnosed during pregnancy that is not clearly overt diabetes. High prevalence of GDM in Indians, estimated around 16.5%.
- Early detection and timely management is paramount in reducing GDM related adverse maternal, fetal and neonatal outcomes.
- Recently, studies have found correlation of
 - Abdominal subcutaneous fat thickness (ASFT) in 1st trimester
 - Visceral adipose tissue (VAT), total adipose tissue (TAT), hepatic fat
 - Fetal anterior abdominal wall thickness (measured between 20-32 weeks), which is a reliable marker of fetal abdominal adiposity..With occurrence of GDM later in pregnancy
- Approximately 21% women developing GDM are overweight or obese; OR for developing GDM in overweight/obese is 1.7 & 3.6 respectively.
- Obesity itself is highly correlates to ASFT, VAT, TAT
- Apart from routine screening for GDM by OGTT between 24-28 weeks or earlier in high risk , there have been efforts by various researchers to assess associations of other markers of metabolic derangement in early pregnancy with subsequent risk of GDM.

Objective

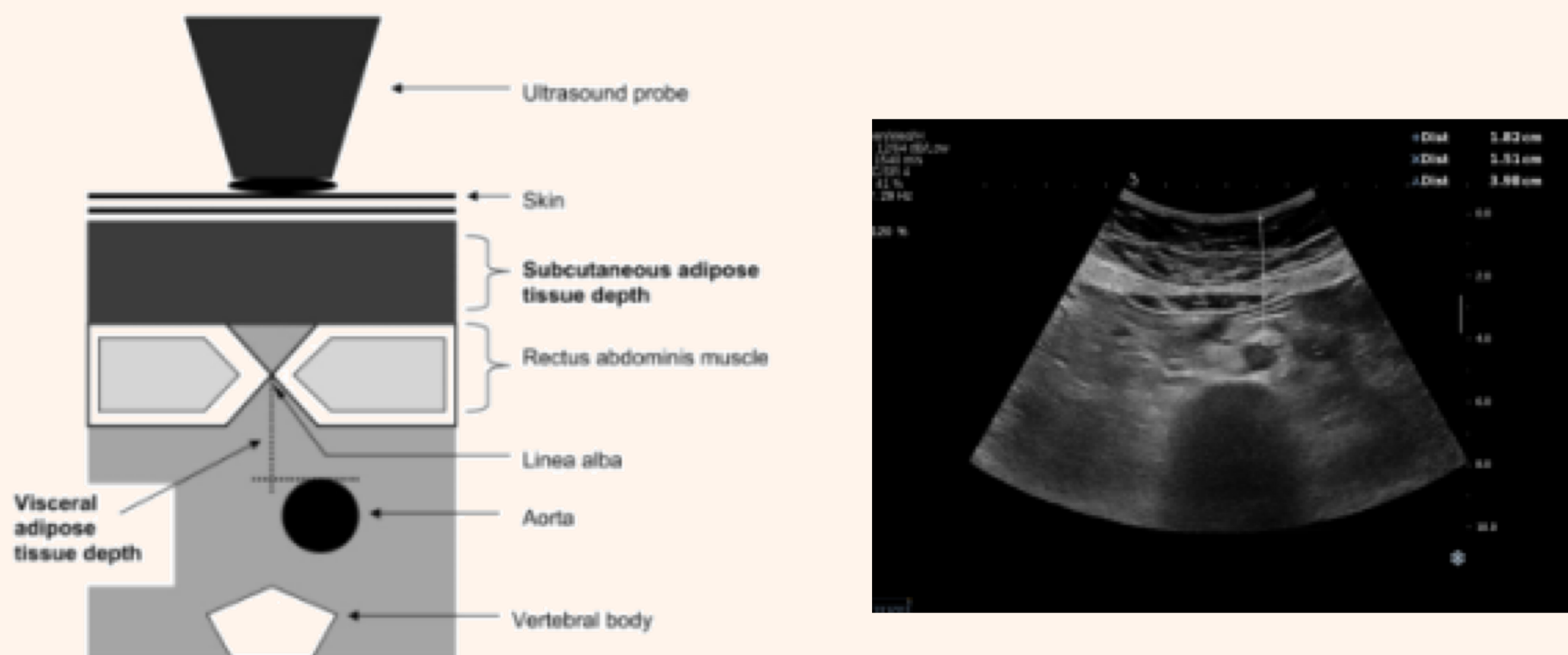
- To correlate metabolic parameters* and maternal body fat indices** in first trimester with development of GDM later in pregnancy

***Metabolic parameters:** MAP, HbA1c, OGTT(75gm), Lipid profile

****Maternal body fat indices:** ASFT, VAT, TAT, Hepatic fat grading on USG

Methods

- Prospective study, conducted after ethical approval
- Subjects: 120 women with singleton pregnancy attending High Risk Pregnancy Clinic in first trimester (between 11-13+6 weeks)
- Exclusion criteria: Overt diabetes, chronic medical diseases, multiple pregnancy
- Recruited women were subjected to routine antenatal investigations and metabolic parameters: MAP, HbA1c, OGTT(75gm), Lipid profile
- Maternal body fat indices were measured in 1st T on USG as follows:
 - ASFT - Maximum depth from skin to rectus abdominis muscle measured one cm above umbilicus using a longitudinal scan at the end of expiration
 - VAT - measured from inner border of rectus abdominis to anterior wall of abdominal aorta
 - Visceral adipose tissue (TAT) - measured from skin to anterior wall of abdominal aorta



Cross-sectional representation of subcutaneous and visceral fat compartments as measured by ultrasound

Women were screened for GDM with OGTT(75gm) using IADPSG cut-offs between 24-28 weeks gestation

Results

GDM diagnosed in: 18 /120 women on screening

Out of all metabolic and ultrasound parameters:
Only mean HbA1c value was significantly higher in women who developed GDM

Parameters	GDM diagnosed (n=18)	GDM not diagnosed (n=102)	P Value
HbA1c, %	5.38±0.43	5.06±0.40	0.004
Total cholesterol, mg/dL	173.67±20.86	171.85±27.81	0.748
TG, mg/dL	118.50±21.18	125.13±28.49	0.249
VLDL, mg/dL	16.91±3.79	17.54±6.29	0.684
LDL, mg/dL	107.16±17.17	109.25±11.66	0.519
HDL, mg/dL	50.78±12.50	52.45±12.41	0.601
TG/HDL	2.44±0.85	2.52±0.78	0.712
LDL/HDL	2.46±0.71	2.25±0.44	0.750

A cutoff value of 5.15% for HbA1c was determined after ROC analysis.

Parameters	Cut off points	GDM Diagnosed (%)	P value	OR (95% CI)
HbA1c	Bottom three quartiles: <5.5% (n= 83)	7 /83 (8.4%)	0.003	0.22 (0.06-0.70)
	Upper quartile: ≥5.5% (n=37)	11/37 (29.7%)		

Mean values of ASFT, VAT and TAT were comparable in both the groups.

Mean ASFT was 1.57±0.49 vs. 1.45±0.62 cm (P=0.470); mean VAT was 2.89±1.33 vs. 2.48±1.26 cm (P=0.205) and mean TAT was 5.03±1.18 vs.

4.51±1.42 cm (P=0.142) in GDM and normoglycemic women respectively.

Fatty liver was present in approximately 66.7% patient in GDM diagnosed and 54.9% patient in GDM not diagnosed, which was comparable in two groups (P= 0.387).

Discussion

- In our study, there was a statistically significant difference in the HbA1c levels between those diagnosed with GDM and those who were normoglycemic.
- Similar results were found in study conducted by Berggren et al.

Study	Mean HbA1c ± SD(%)		
	GDM diagnosed	GDM not diagnosed	P Value
Berggren et al (2013) [54] GDM diagnosed (n= 14) Normoglycemic (n=231)	5.4±0.4	5.2±0.3	<0.05
Present study GDM diagnosed (n= 18) Normoglycemic (n=102)	5.38±0.43	5.06±0.40	0.004

- In a study conducted by Kulshrestha et al, it was also observed that higher baseline HbA1c correlated with severity of GDM.
- None of the other metabolic and radiological parameters were found to be significantly different between the two groups in our study as found in some pervious studies. This could be due to different diagnostic criteria taken for diagnosing GDM in different studies

Conclusion

- Baseline 1st trimester HbA1c was significantly higher in those normal-weight women who developed GDM later in pregnancy.
- None of the maternal body fat indices were found to be significantly different between GDM vs. non GDM group
- Hence Baseline 1st trimester HbA1c can identify risk of developing GDM in those normal- weight women who are otherwise considered low risk
- An early intervention could be offered to these women in terms of lifestyle modification, dietary modification.

References

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