

## Assessment of Carotid Intima-Media Thickness and Infra-Renal Abdominal Aorta Diameter in Women with and Without Gestational Diabetes Mellitus-A case Control Study

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### Abstract

**Objective:** Gestational diabetes mellitus occurs during pregnancy is associated with increased cardiovascular risk. Carotid intima media thickness (CIMT) is a surrogate maker of subclinical atherosclerosis. The aim of this study is assessment of relationship between CIMT and infra-renal abdominal aorta diameter in women with and without Gestational Diabetes Mellitus.

**Materials and Methods:** The current case-control study was conducted in department of radiology of Shahid Sadoghi hospital in Yazd medical science university 2012 to 2013. Forty women between 20-40 years old with at least 6 months after pregnancy were enrolled, 20 participants with GDM in last pregnancy and 20 participants without history of GDM. All participants underwent physical exam and laboratory findings. Finally Carotid intima-media thickness and infra abdominal aorta diameter were obtained.

**Results:** over all comparison between GDM and non GDM groups revealed no significant difference in mean CIMT and infra-renal abdominal aorta diameter. FBS between two groups reveal significant statistically difference ( $P$ -value<0.05). Also Pearson correlation analysis shows association between infera-renal abdominal aorta diameter and cholesterol and LDL in non GDM participate.

**Conclusion:** Our study suggested GDM may not relate to CIMT and infera-renal abdominal aorta diameter. Also current study revealed women with history of GDM are prone to having impaired fasting glucose.

**Keywords:** Carotid intima-media thickness, Gestational diabetes mellitus, Infra-renal abdominal aorta diameter

### Introduction

Gestational diabetes mellitus (GDM) is a sub type of diabetes mellitus which occurred during pregnancy {Ku, 2011 #1}. GDM is carbohydrate intolerance with

incidence rate approximately 1-14%. Woman with GDM are prone to type2 diabetes mellitus hypertension, dyslipidemia, metabolic syndrome and cardiovascular disease.

{Harreiter, 2014 #2; Krzyzanowska, 2008 #3; Kautzky-Willer, 2008 #4; Maple-Brown, 2009 #5; de CB Giuliano, 2008 #6} Carotid intima media thickness (CIMT) is a maker of subclinical atherosclerosis. {Bonora, 2000 #7} Associated between increased CIMT and type2 diabetes mellitus and cardiovascular disease is approved. Ultrasonographic CIMT is non-invasive and not expensive test for assessment sub clinical atherosclerosis. {Bauer, 2012 #8} GDM is a predictor of cardiovascular atherosclerosis. {Rademaker, 2013 #9} Some studies suggest relationship between abdominal aorta aneurysm and atherosclerosis. Although it may be confounded by other atherosclerotic risk factors. {Wilmink, 1999 #10; Wong, 2007 #11; Wanhainen, 2005 #12; Cornuz, 2004 #13; Iribarren, 2007 #14; Pleumeekers, 1995 #15; Singh, 2001 #16; Forsdahl, 2009 #17}

Across-sectional study revealed no significant correlative between carotid plaque and infera-renal abdominal aorta diameter less than 27mm but diameter more than 27mm was associated with increased Carotid plaque burden and coronary atherosclerosis. {Johnsen, 2010 #18}

The aim of this study is assessment of relationship between CIMT and infra-renal abdominal aorta diameter with GDM.

## Materials and Methods

The study was conducted in department of radiology of Shahid Sadoghi hospital 2012 to 2013. Current case-control study included 40 participant. Including criteria were: women 20-40 years old with at least 6 months after pregnancy were enrolled 20 participants with GDM in last pregnancy and 20 participants without history of GDM. The exclusion criteria were diabetes mellitus, hyperlipidemia, hypotension, familial history of coronary artery disease, chronic disease (Hepatic, liver or history of cancer), FBS>126, smoking and BMI>35. GDM is defined as American diabetes association (ADA criteria).

### Laboratory measurements

Fasting blood glucose, triglyceride, total cholesterol, low density lipoprotein cholesterol and high density lipoprotein cholesterol and high density lipoprotein were measured in same day which ultrasonography examination was done.

### Ultrasonography

Carotid intima-media thickness and infra abdominal aorta diameter were assessment by a Bi-mode ultrasound (simens G40) scanner with linear high frequency transducer (7.5 MHZ). CIMT examination was done in supine position according the American echocardiography recommendation. {Stein, 2008 #19} Three segment were selected; proximal internal carotid 1cm lower the flow driver, 1cm upper the follow driver as bifurcation and 2cm or more in common carotid above the flow driver and measurements was done bilaterally. At the end CIMT was considered as average of the mean CIMT of the 3left and 3 right segments. For assessment of infera-renal abdominal aorta minimum and maximal transverse as well as anterior-posterior diameters were measured in supine position. The ultrasonography study was done by an expert radiologist blinded to the clinical data.

## Results

The clinical characteristics, Laboratory test findings of the study groups were reveled in table 1.

Mean participant age BMI, systolic blood pressure, diastolic blood pressure, TG, cholesterol, LDL and HDL are not shown significant statistically difference. FBS between tow group reveal significant statistically difference ( $P$ -value <0.05). In comparison with control group GDM group revealed no significant difference in mean CIMT and infra-renal abdominal aorta diameter.

Control group had a lower infera-renal abdominal aorta than the GDM group significantly also Pearson correlation analysis shows association between infera-renal abdominal aorta diameter and cholesterol and

**Table 1. Clinical characteristics, Laboratory test findings of The GDM and non GDM participant**

Characteristics	GDM group (N=20)	Non GDM group (N=20)	P-value
Age (Y)	26.35± 3.10	25.6± 3.113	0.452
Body mass index(kg/m 2)	25.53± 2.37	26.61± 4.58	0.429
Systolic BP (mm Hg)	115.35±10.4	114.50±6.37	0.751
Diastolic BP (mm Hg)	78.75±7.20	74.35±6.99	0.57
Serum HDL (mg/dL)	54.90±8.22	65.15±7.45	0.618
Serum LDL(mg/dl)	83.05±13.86	89.45±15.42	0.176
Serum triglyceride (mg/dl)	113.45±67.23	94.85±26.65	0.261
Serum cholesterol (mg/dl)	161.05±21.48	161.8±18.72	0.907
Fasting blood sugar(mg/dl)	98.15±12.10	86/70±4.15	0.001

**Table 2. CIMT and infra-renal abdominal aorta diameter (IAAD) in GDM and non GDM participant**

	GDM	Non GDM	P-Value
CIMT (cm)	0.63±0.06	0.64±0.06	0.816
IAAD (mm)	12.43 ± 2.57	12.21±1.37	0.738

LDL in non GDM participate but other factors (HDL, TG, FBS) is not associated with IAAD.

## Discussion

Pregnancy is related to increase insulin resistance. GDM patients are prone to type 2 diabetes mellitus that leads to coronary atherosclerosis. {Sullivan, 2012 #20} Although most of the studies reveal association between ITM and GDM {Akinci, 2014 #21; Atay, 2014 #22; Bo, 2007 #23; Caliskan, 2014 #24; Freire, 2012 #26; Gunderson, 2012 #27}, in current study no significant difference was detected. Corresponding to the results of Yun Hyiki (1) study which may be resulting from study in Asian population compared to the western study.

Obesity is a major factor affecting CIMT. Although BMI in current study is not

significantly difference between two groups. Women with lower BMI in control group had lower infra-renal abdominal aorta diameter. Also criteria used for diagnosis GDM may affected the influence of GDM on CIMT. (27,28)

The infra-renal abdominal aorta diameter is associated with cholesterol and LDL in non GDM participant. The major limitation of this study was not enough sample size.

## Conclusion

Our study suggested GDM may not relate to CIMT and infra-renal abdominal aorta diameter. Also current study revealed Women with history of GDM are prone to having impaired fasting glucose.

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