DOES SEX INFLUENCE DYSLIPEDEMIA IN NON OBESE HYPERTENSIVETYPE 2 DIABETES MELLITUS?

Arati R[*1], B Prashanthmohan[2], Ganaraja B[3], Ramesh Bhat M[3]

[*1]Dept of Physiology, Srinivas Institute Of Medical Science And Research Centre, Mukka,Surathkal.
[2]Dept of Orthopaedics, Srinivas Institute Of Medical Science And Research Centre, Mukka,Surathkal.
[3]Dept of Physiology, Kasturba Medical College, Mangalore (Manipal University)
E-mail of Corresponding Author: arati.p.rao@gmail.com

Abstract
Various studies have shown that diabetic dyslipidemia is common in females than in males. High body mass index is also responsible for dyslipidemia. We tried to see if there was any influence of sex on diabetic dyslipidemia in BMI matched diabetic males and females. A cross sectional study was done on 49 type 2 diabetic patients(22 males and 27 females) on oral hypoglycemics with a duration of more than 10 years of diabetes. Their age, BMI and blood pressure was taken after informed consent. FBS, HbA1c, LDL, HDL, T G and TC were taken. The mean age ±SD of males and females was 64.5±3.2 years and 58.3 ±2.6 years respectively. The BMI of males and females (24.62±3.47 vs 24.13±3.14) was statistically non significant. The mean value of HbA1c was more in females (7.71±0.89 vs.7.69±1.87) but not statistically significant. Fasting blood glucose is more in males (140.9±46.24) than females (130.37±27.89) but again not statistically significant. In females the mean values of total cholesterol (229.14 ±29.97 vs 225.13±26.9) and LDL (148.66±16.26 vs 144.31±18.32) is more than males but not significant. The mean value of HDL (40.76±4.09 vs 49.36±5.02) and triglycerides (153.8±36.44 vs 157.3±24.99) was low in female than in male with no statistical significance. In conclusion, the results of the present study shows that gender does not play a significant role in diabetic dyslipidemia.
Keywords: Gender, Diabetes, Dyslipidemia, BMI

1. Introduction

Type 2 Diabetes Mellitus also known as Non Insulin - Dependant Diabetes Mellitus (NIDDM) is characterised by either insufficient insulin production or insulin resistance. It has a gradual onset occurring above 40 years of age[1]. Dyslipidemia is a common feature of NIDDM[2]. It is a modifiable risk factor for cardiovascular diseases[3] which is the major cause of death in type 2 diabetes[4]. Dyslipedemia is characterised by high total cholesterol, high serum triglycerides, high LDL and low values of HDL[5]. Lipoprotein lipase, the main enzyme for metabolism of lipids is insulin dependent and hence insulin resistance leads to increased amount of circulating lipids[3].

Gender plays a very important role in NIDDM. Although female predominance was seen in the first half of last century, now males and females are equal affected[6]. A consequence of obesity is seen more in men than in women due to differences in insulin sensitivity and regional fat distribution[6]. Male diabetics show unfavourable variables like higher BMI, WHR, WC, SBP, DBP[7]. . Diabetic females have been reported to have significantly low level of HDL by Gilani *et al*[8] while in other studies females had higher triglycerides and Blood P compared to their male diabetic counterpart [9]. There is a 2- 4 times increase in the risk of cardiovascular diseases in women compared to men[10, 11, 12].

BMI also plays an important role in dyslipedemia. It is positively correlated with TG and negatively with HDL. There was no correlation with LDL[13]. Baral *et al* showed direct association of BMI with TG, TC, LDL and VLDL[14].

Hence both sex and BMI influence dyslipidemia. Previous studies in which gender differences in dyslipedemia was significant showed BMI of the patients as more than 25[8,15].This study was done to see if there is a sex bias in dyslipidemia in non obese type 2 diabetics.

2. Experimental

2.1 Material and Methods: This study was carried out in diabetic camp held by ASHRAYA GROUP, KASTURBA MEDICAL COLLEGE. Ethical clearance was obtained from Institute ethics committee. Written informed consent was taken from all the participants. 49 type 2 diabetes mellitus patients (22 males and 27 females), on oral hypoglycemics with 10 years duration of disease were included in the study.

2.2 Exclusion Criteria:

1) Patients with history of myocardial infarction, congestive cardiac failure.
2) Patient with respiratory ailments.

BODY MASS INDEX: Height and weight measured and BMI was calculated as:

BMI= Body Wt (Kgs)/Height (cms).

BP was measured in the sitting posture as per the recommendations of JNC 7 report

Venous blood samples were collected from all the patients after 12 hours of overnight fasting. The serum lipids were measured by enzymatic methods and LDL-Cholesterol was calculated by Friedewald formula as shown below.

LDL-Cholesterol = Total Cholesterol - HDL Cholesterol – (Tri Glycerides/5).

Fasting blood glucose was determined by enzymatic method.

HbA1c was determined by Immunoturbidimetric Method. Values of HbA1c are given as % of total hemoglobin and values of all other parameters are given in mg/dl.

3. Statistical Analysis

Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS 12.0 for windows). Independent t test was used to compare quantitative data in groups. $p < 0.05$ was considered as significant. All values are expressed as mean ± SD.

4. Results

Table 1: Anthropometric and Blood Pressure Measurements In Diabetic Males And Females. Data Presented As Mean ±SD.

Parameters	Males(N=22)	Females(N=27)	P value
Age(Years)	64.5±3.2	58.3±2.6	0.21
BMI	24.62±3.47	24.13±3.14	0.122
SBP(mm/Hg)	140.54±19.48	139.11±14.82	0.771
DBP(mm/Hg)	86.36±6.12	87.92±7.19	0.45

A total of 49 Type 2 diabetic patients of which 22 were males and 27 females were included in the present study. The mean age of males and females was 64.5±3.2 years and 58.3 ±2.6 years respectively. The BMI of males and females (24.62±3.47 vs 24.13±3.14) was also not statistically significant (Table I)

Table 2: Biochemical Parameters In Diabetic Males and Females. Data Presented As Mean± SD.

Parameters	Males(n=22)	Females(n=27)	p value
HbA1c	7.69±1.87	7.71±0.89	0.92
FBS	140.9±46.24	130.37±27.89	0.77
CHOLESTEROL	225.13±26.99	229.14±29.97	0.62
LDL	144.31±18.32	148.66±16.26	0.38
TRIGLYCERIDE	157.3±24.99	153.8±36.44	0.52
HDL	49.36±5.02	40.76±4.09	0.51

Table 2 deals with the biochemical parameters. The mean value of HbA1c was more in females (7.71±0.89 vs 7.69±1.87) but not statistically significant. Fasting blood glucose is more in males (140.9±46.24) than females (130.37±27.89) but again not statistically significant. In females the mean values of total cholesterol (229.14±29.97 vs 225.13±26.9) and LDL (148.66±16.26 vs 144.31±18.32) is more than males but not significant. The mean value of HDL (40.76±4.09 vs 49.36±5.02) and triglycerides (153.8±36.44 vs 157.3±24.99) was low in female than in male with no statistical significance.

5. Discussion:

49 age matched, non-obese, diabetic male and females participated in our study .The various risk factors for CVD were compared in male and female diabetic patients. Although the patients were on oral hypoglycaemic drugs their glycemic status (HbA1c > 7)[16] reflects a poor control of diabetes with their lipid profile deranged. Previous studies show that females are more prone to develop cardiovascular complications of diabetes mellitus due to dyslipidemia[8,9,15]. According to syed *et al*; low levels of HDL in diabetic female plays an important role in development of CHD[8]. Although the HDL in our study was low compared to males it was not statistically significant. This is in agreement by a study done by sivaprabhodh P *et al*[17] where the decrease in HDL was not significant in diabetic females. Lorenzo *et al* showed that in hypertensive diabetic females LDL and triglycerides was more than their male counterparts but not significant[18]. This is reflected in our study where females showed higher levels of triglycerides and LDL but the increase was not statistically significant. The rise in total cholesterol was also not significant in diabetic females in accordance to syed *et al*[8], Sapna *et al*; reported high serum levels of lipids

in diabetic males compared to females which is not in lines with our study[1].

Many studies have shown that increase in the body mass index is associated with increase in lipid profile[13,14]. According to Nakhjavani *et al* higher prevalence of hyper triglyceridemia in females was due to their higher BMI, and sex was not an independent risk factor for hypertriglyceridemia[15]. In another study BMI correlated with total cholesterol and LDL, but no correlation was found with HDL and triglycerides[19]. Hardevsingh *et al* reported that of the 4 lipid components only triglycerides was adversely correlated with BMI in males and females[20].

Conclusion

Our study reflects that it is probably the BMI of the patient that plays an important role in dyslipidemia rather than sex. As the BMI of the subjects were matched in our study the influence of sex on dyslipidemia was not seen. As BMI of the patient can be modified by exercise and diet, the risk for CVD can also be reduced. Further studies have to be done by categorising diabetic male and female in different BMI group and correlating with their lipid profile.

References

1. Sapna Smith, Alok M Lall.A Study on Lipid Profile Levels of Diabetics and Non- Diabetics AmongNaini Region of Allahabad, India. *Turk J Biochem* 2008; 33(4); 138–141.
2. Otieno CF, Mwendwa FW, Vaghela V, Ogola EN, Amayo EO. Lipid profile of ambulatory patients with type 2 diabetes mellitus at Kenyatta National Hospital, Nairobi. *East Afr Med J*. 2005; 82(12):173-9.
3. Jimoh Ahmed Kayode, Adediran Olufemi Sola, Agboola Segun Matthew, Busari Olusegun Adesola, Idowu Ademola, Adeoye T. Adedeji and Adebisi Simeon Adelani. Lipid profile of type 2 diabetic patients at a rural tertiary hospital in Nigeria. *Journal of Diabetes and Endocrinology*. 2010; 1(4):46-51.
4. Kreyenbuhl J, Dickerson FB, Medoff DR, Brown CH, Goldberg RW, Fang L *et al*. Extent and management of cardiovascular risk factors in patients with type 2 diabetes and serious mental illness. *J Nerv Ment Dis*.2006; 194(6):404-410.
5. Grundy SM, Cleeman JI, Merz CN, Brewer HB Jr, Clark LT, Hunninghake DB. Implications of recent clinical trials for the National Cholesterol Education Program Adult Treatment Panel III guidelines. Circulation 2004; 110(2):227–239.
6. Gale EA,Gillespie KM.Diabetes and gender. *Diabetologia*. 2001; 44(1):3-15.
7. TanveenKaur, DivyaBishnoi and Badaruddoza. Effect of sex on prevalence of type 2 diabetes mellitus (T2DM) with respect to blood pressure, BMI and W H Ramong Punjabi population. *International Journal of Medicine and Medical Sciences*. 2010;2(9):263-270
8. Syed Yasir Hussain Gilani, Saima Bibi, Nazir Ahmed, Syed Raza Ali Shah. Gender differences of dyslipidemia in type 2 diabetics. *J Ayub Med Coll* Abbottabad 2010; 22(3)146-148.
9. Auni Juutilainen, ,Saara Kortelainen, , Seppo Lehto,Tapani Rönnemaa, M D, Kalevi Pyörälä, M D and Markku Laakso, MD .Gender Difference in the Impact of Type 2 Diabetes on Coronary Heart Disease Risk *Diabetes Care*. 2004; 27(12): 2898-2904.
10. Kanaya Am, Grady D, Barrett-Connor E. Explaining the sex difference in coronary heart disease mortality among patients with type 2 diabetes mellitus: a meta-analysis. *Arch Intern Med* 2002; 162:1737–1745.
11. Barrett-Connor E, Giardina EG, Gitt AK, Gudat U, Steinberg HO, Tshoepe D. Women and heart disease: the role of diabetes and hyperglycemia. *Arch Intern Med* 2004; 164:934–942.
12. Lee WL, Cheung AM, Cape D, Zimman B. Impact of diabetes on coronary artery disease in women and men: a meta-analysis of prospective studies. *Diabetes Care* 2000; 23:962–968.
13. Shamai L, Lurix E, Shen M, Novaro GM, Szomstein S, Rosenthal R, Hernandez AV, Asher CR.Association of body mass index and lipid profiles: evaluation of a broad spectrum of body mass index patients including the morbidly obese. *Obes Surg*. 2011; 21(1):42-47.
14. Baral N, Jha P, Sridhar MG, Karki P, Sharma SK, Khambu B .Association of lipid profile and body mass index (bmi) in hypertensive patients of Eastern Nepal. *B JNMA J Nepal Med Assoc*. 2006; 45(163):306-309.
15. M. Nakhjavani, A. R. Esteghamati , F. Esfahanian and A. R. Heshmat. Dyslipidemia in type 2 diabetes mellitus: More atherogenic lipid profile in women. *Acta Medica Iranica*.2006; 44(2):111-118.
16. Rohlfing C L, Weidmeyer H M, Little R R, England J D, Tennil A, Gloldstein D E. Defining the relationship between plasma glucose and HbA1c: Analysis of plasma glucose and HbA1c in diabetes control and complication trials.Diabetes care 2002;25:275-78.
17. Samatha P, Siva Prabhod V, Chowdhary NVS, Ravi Shekhar. Glycated haemoglobin and serum lipid profile association in type 2 diabetes mellitus patients. *JPBMS*. 2012; 17 (12):
18. Lorenzo Gordon, Dalip Ragoobirsingh, St Errol Y A Morrison, Eric Choo-Kang, Donovan McGrowder and E Martorell. Lipid Profile of Type 2 Diabetic and Hypertensive Patients in the Jamaican Population. *J Lab Physicians*. 2010; 2(1): 25–30.
19. Mahapatra S, Padhiary K, Mishra TK, Nayak N, Satpathy M.Study on body mass index, lipid profile and lipid peroxidation status in coronary artery disease. *J Indian Med Assoc*. 1998; 96(2):39-42.
20. Hardev Singh Sandhu, Shyamal Koley and Karanjit Singh Sandhu. A Study of Correlation between Lipid Profile and Body Mass Index (BMI) in Patients with Diabetes Mellitus. *J. Hum. Ecol*.2008; 24(3): 227-229.