

## **Dyslipidaemia and impaired glucose levels in apparently healthy semi urban population in Pondicherry.**

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### **Abstract**

**Prevalence of non communicable diseases like type 2 Diabetes Mellitus and Coronary Artery Diseases have surpassed that of communicable diseases in India. The general population is unaware of the risk factors associated with these diseases and of ways to prevent them. The present study was undertaken to observe the pattern and prevalence of dyslipidemia and impaired glucose tolerance, as per the revised National Cholesterol Education Plan (NCEP) – Adult Treatment Panel (ATP) III guidelines and American Diabetes Association ADA respectively in people who are apparently healthy and had attended the tertiary care hospital for the purpose of a routine health checkup. Material and Methods: 1621 people were included in the study and were divided into five groups based on their age. The lipid profile and blood glucose was estimated. Result: 21.4% of the population had Diabetes Mellitus, 39.72% had high cholesterol, 36.72% had high triglycerides, 71.68% had high LDL-c and 78.65% had low HDL-c. The mean values of blood glucose (FBG = 113±49.8 mg/dl and PPBG = 159±76.82mg/, total cholesterol (193±50 mg/dl), triglycerides (146±80 mg/dl) and LDL-c (128±47/mg/dl) were high while that of HDL-c (36±6mg/dl) was low in the population These are known risk factors for cardiovascular diseases and Metabolic syndrome was found in 22.4%. Prevalence of abnormal lipid and glucose level was high in the semi urban population which was apparently healthy. People are unaware of the status of their ill health and the risk of developing metabolic diseases .Hence it is essential to create awareness about healthy lifestyle options to reduce morbidity and mortality.**

**Keywords:** Diabetes mellitus, dyslipidaemia, metabolic syndrome, impaired glucose tolerance, prevalence

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### **Introduction**

Non communicable diseases like type 2 Diabetes mellitus (type 2 DM) and Coronary Artery Diseases (CAD) has become commoner than communicable diseases in terms of morbidity and mortality in India.[1] South –east Asians have a genetic predisposition towards development of dyslipidaemia , obesity and Diabetes mellitus.[2] The interplay of these risk factors for CAD, namely dyslipidaemia , central obesity, hypertension and hyperglycemia, when clustered together could explain the risk of CAD in Indians.[1] It is found that most people are not only unaware of these risk factors but also do not know the importance of inculcating healthy habits, early detection and treatment of diseases.[3]

The present study was undertaken to observe the pattern and prevalence of dyslipidaemia and impaired glucose tolerance, as per the revised National Cholesterol Educa-

tion Plan (NCEP) – Adult Treatment Panel (ATP) III guidelines and American Diabetes Association ADA respectively in people who are apparently healthy and had attended the tertiary care hospital for the purpose of a routine health checkup.[4,5] The prevalence of Syndrome X was also found by correlating blood glucose levels with the pattern of dyslipidemia according to revised NCEP ATP III guidelines.[4]

### **Material and Method**

This is a retrospective observational study conducted during a period of one year in a tertiary care hospital in Pondicherry. The study population comprised of apparently healthy people from a semi-urban background from Pondicherry and Tamil Nadu in south India, who had come for a routine health checkup programme and for whom estimation of blood lipid profile and glucose were requested. 1621 such cases were selected for the study.

The cases were divided into five groups according to their age as shown in Table I.

There were 705 men and 917 women in this group. Analyses of blood lipid profile parameters (total cholesterol, HDL-c and triglycerides) and fasting and 2hour post prandial blood glucose were performed in a fully automated random access blood chemistry analyzer using IFCC approved procedures. LDL-c values were calculated using Friedwald's formula.

For blood lipid levels, revised NCEP-ATP III guidelines were referred to. According to these standards, abnormal values are defined as Total Cholesterol > 200 mg%, LDL-c >100 mg%, TGL > 150 mg%, HDL-c <40 mg% in men and <50 mg% in women.[4] Dyslipidaemia was defined by presence of one or more than one abnormal serum lipid concentration. [6]

Recent ADA Guidelines were referred to for glucose levels. According to this, hyperglycemia was defined when fasting blood glucose was > 100mg/dl, impaired glucose tolerance as 2 hr after OGTT plasma glucose was between 140 and 200 mg%. Those patients whose fasting blood glucose was  $\geq$ 126 mg% and 2 hr post prandial glucose level was  $\geq$  200 mg% were labeled as diabetics.[5]

The proportion of patients with abnormal serum lipid and glucose values was found out and expressed in terms of percentage. The mean values of all these parameters were calculated. Comparison of mean and proportions are the statistical analyses used in the study.

## Results

The study population comprised of 1621 cases. As depicted in Table 2, nearly 80% of the study population had at least one abnormal parameter viz serum glucose, fasting and 2 hour post prandial and complete lipid profile as

per the recent NCEP-ATP III and ADA guidelines.

The mean values of blood glucose (FBG=113 $\pm$ 49.8 mg/dl and PPBG=159 $\pm$ 76.82mg/dl) and LDL-c (128 $\pm$ 47/mg/dl) were high while that of HDL-c (36 $\pm$ 6mg/dl) was low in the population. Total cholesterol (193 $\pm$ 50 mg/dl) and triglycerides (146 $\pm$ 80 mg/dl) though within normal limits were in the higher range of normal.

21.4% of the population had Diabetes Mellitus, 39.72% had high cholesterol, 36.72% had high triglycerides, 71.68% had high LDL-c and 78.65% had low HDL-c.

Incidence of diabetes mellitus is found to increase with age. 32% of the diabetics belonged to the age group of 51-60 years. Increased levels of total cholesterol, triglycerides and LDL and low levels of HDL were found to be more between 41-60 years.

As compared to 55% males having low HDL-c, as many as 96% women had low levels of HDL-c with a value between 40 and 50 mg/dl in most. Metabolic syndrome was found to exist in 22.4% of cases which was elucidated according to the recent NCEP ATP III guidelines, where the raised triglyceride and fasting blood glucose levels and low HDL-c were taken into account.

**Table 1.** Age distribution of cases

Groups	Age (in years)	Number of subjects (n=1621)
I	20-30	191(12%)
II	31-40	357 (22%)
III	41-50	455 (28%)
IV	51-60	380 (23%)
V	61 & Above	238 (15%)

**Table 2 .** Pattern of abnormalities in the study group

Groups	Diabetic n	Cholesterol (>200mg/dl) n	Triglycerides (>150mg/dl) n	HDL-C		LDL-C (>100mg/dl) n
				(<40mg/dl) Males n	(<50mg/dl) Females n	
I	13	47	51	52	86	115
II	53	137	120	104	158	261
III	109	202	172	100	271	348
IV	110	163	173	75	230	267
V	62	95	75	57	142	171
Total No.	347	644	591	388	887	1162
Percentage	21.4	39.72	36.45	78.65		71.68

Where 'n' = No. of cases

## Discussion

This study was conducted with the aim to evaluate the glucose and lipid levels in the semi urban population

around Pondicherry, who were apparently healthy. The results obtained from the 1621 patients revealed that the mean values of blood glucose and LDL-c were high while that of HDL-c was low in the population. These are

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known risk factors for cardiovascular diseases and the metabolic syndrome [6]. Total cholesterol and triglycerides though within normal limits were in the higher range of normal.

In a study conducted at Chennai where a comparison was drawn between young physicians and the general population in terms of prevalence of cardio metabolic risk factors, it was found that physicians had a significantly higher prevalence of all abnormalities with respect to the general population except DM. [3] On comparing the proportion and mean values in our study with that of the general population in the Chennai study, a greater degree of abnormalities was seen in our study as compared to the general population at Chennai.[3] The mean and proportion respectively of abnormal values in the Chennai study were total cholesterol:172±37mg/dl and 21.2% , LDL-c:101±32 mg/dl and 46.8%,Triglycerides:140±88 mg/dl and 31% , HDL-c:42±10 mg/dl and 44.6%in men and 46±7 mg/dl and 67.1% in women.14.8% of the general population had DM as compared to 21.4% in the current study.

In a similar study conducted at Bombay [6], the HDL-c values were higher while all other parameters were lower than those in the population in our study. They found that these abnormalities were more common in men than women in the age group between 31 and 40 years, while in our study it was seen in the older age groups and mainly in women. 80% of their cases had some abnormality or the other with respect to these parameters, similar to our study.

In a population study on 475 Asian Indian adults between age 20 and 75 years, raised levels of triglycerides were found in 45.6%, FBG in 26.7%. HDL-c levels were low in 65.5%. Metabolic syndrome was found in as many 41.1% while it was 22.4% in our study. [7] In the current study, 36.4% had a raised triglyceride level and 35.7% had impaired glucose levels while 78.65% had low HDL-c levels. Dyslipidemia and impaired glucose levels is not limited to our country. Similar studies conducted on Mexican adolescents [5] and Spanish adults [8] revealed dyslipidaemia in the population in considerable proportions.

In another study involving diabetic urban Indian population, prevalence of Metabolic syndrome was high at 77.2% and it was significantly higher in women than in men. This study reiterates the importance of regular screening in individuals from the general population to avert or delay the onset of type 2 DM and its complications.[9]

The adjusted global prevalence of Metabolic syndrome according to the NCEP ATP III criteria was 12.39% in a study on Spanish adult workers between the age group 20 and 65 years. [10] 11.21% had premorbid Metabolic syndrome where they had high blood glucose and triglycerides but their HDL-c was low as compared to normal. This study concluded that identifying people with premorbid Metabolic syndrome may in turn help in identifying apparently healthy people who have a risk of developing Cardiovascular diseases and type2 DM.[10] The current study also brings out

the importance of screening people for the metabolic derangements as early as possible in order to delay or prevent cardiovascular disorders and type 2 DM.

The Thrombosis Research Institute-India had conducted a cohort study to investigate the genetic factors and risk factors associated with CAD. According to NCEP ATP III criteria, 40.3% had the Metabolic syndrome. The risk factors for Metabolic syndrome such as age, hypertension, DM, cardiovascular diseases, waist circumference and BMI were significantly higher in the group with Metabolic syndrome than in the group without it.[11]

In another recent study in Chennai, a significant increase in the risk of DM was found with ascending social class which was explained by obesity.[12] High social class assures better living conditions and in turn leads to obesity which is an independent risk factor for development of DM.[12,13] Although our study population belonged to semi urban middle class population where level of affluence is not high, the prevalence of dyslipidaemia and impaired glucose levels was found to be quite high. In an earlier study by us with 109 different patients, higher prevalence of hyperglycemia, hypertriglyceridemia and low HDL-c levels were found in overweight and obese cases compared to those with normal BMI. The Metabolic syndrome was detected in 13.7% cases using the NCEP ATP III criteria.[14] In the present study BMI was not measured and the population studied belonged to the middle class, the abnormal values could reflect a shift in the change of lifestyle as reported in a study on the Metabolic syndrome in south Asians [ 2].

The body composition of south Asians is such that they have a high percent of body fat, abdominal obesity, insulin resistance, hyperinsulinemia and low muscle mass which predisposes them towards Metabolic syndrome.[2] A diet rich in calories and fat and little physical exercise are the major cause of dyslipidemia in our population.[6] Moreover, deep frying, refrying in the same oil and overcooking of food gives rise to trans fatty acids which contributes to dyslipidaemia [15].

Hence the current study corroborates that hyperglycemia and dyslipidaemia are on the rise in south Asian population. It has also been seen that most people are not even aware of their metabolic derangements and that these can be prevented to a large extent by adoption of a healthy lifestyle. Here lies the importance of educating the public about healthy eating and cooking processes and regular exercise. The importance of regular screening for these disorders has to be emphasized. These measures would certainly help reduce the prevalence of these metabolic disorders.

## **Conclusion**

The present study with 1621 apparently healthy cases showed that majority of the study population was affected by the presence of dyslipidaemia and/or hyperglycemia 22.4% had the Metabolic syndrome too and many people were not even aware of the abnormality .Similar results have been

shown in studies conducted in India and abroad. Sincere efforts must be taken to create awareness about the importance of a healthier lifestyle in order to reduce the risk of type 2 DM and CAD in the population.

## References

1. Mohan V, Venkatraman JV, Pradeepa R. Epidemiology of Cardiovascular Disease in Type 2 Diabetes: The Indian scenario. *J Diabetes Sci Technol.* 2010; 4: 158-170.
2. Misra A, Misra R, Wijesuriya M, Banerjee D. The Metabolic syndrome in South Asians: Continuing escalation and possible solutions. *Indian J Med Res* 2007; 125: 345-354.
3. Ramachandran A, Snehalatha C, Yamuna A, Murugesan N. High prevalence of Cardiometabolic risk factors among young physicians in India. *J Assoc Physicians India* 2008; 56: 17-20.
4. Slagter SN, van Vliet-Ostaptchouk JV, Vonk JM, Boezen HM, Dullaart RP, Kobold AC, Feskens EJ, van Beek AP, van der Klauw MM, Wolffenbuttel BH. Associations between smoking, components of metabolic syndrome and lipoprotein particle size. *BMC Med.* 2013; 11: 195. doi: 10.1186/1741-7015-11-195.
5. Evia-Viscarra ML, Rodea-Montero ER, Apolinar-Jime'nez E, Quintana-Vargas S. Metabolic syndrome and its components among obese (BMI  $\geq$ 95th) Mexican adolescents. *Endocr Connect.* 2013; 2: 208-215.
6. Sawant AM, Shetty D, Mankeshwar R, Ashavaid T F. Prevalence of dyslipidemia in young adult Indian population. *J Assoc Physicians India*, 2008; 56: 99-102.
7. Ramachandran A, Snehalatha C, Satyavani K, Sivankari S, Vijay V. Metabolic syndrome in urban Asian Indian adults - a population study using modified ATP III criteria. *Diabetes Res Clin Pract.* 2003; 3: 199-204.
8. Martinez-Hervas S, Carmena R, Ascaso JF, Real JT, Masana L, Catalá M, Vendrell J, Vázquez JA, Valdés S, Urrutia I, Soriguer F, Serrano-Rios M, Rojo-Martínez G, Pascual-Manich G, Ortega E, Mora-Peces I, Menéndez E, Martínez-Larrad MT, López-Alba A, Gomis R, Goday A, Girbés J, Gaztambide S, Franch J, Delgado E, Castell C, Castaño L, Casamitjana R, Calle-Pascual A, Bordiú E. Prevalence of plasma lipid abnormalities and its association with glucose metabolism in Spain: The di@bet.es study. *Clin Investig Arterioscler.* 2014; 26: 107-114.
9. Surana SP, Shah DB, Gala K, Susheja S, Hoskote SS, Gill N, Joshi SR, Panikar V. Prevalence of metabolic syndrome in an urban Indian diabetic population using the NCEP ATP III guidelines. *J Assoc Physicians India* 2008; 56: 865-868.
10. Tauler P, Bennasar-Veny M, Morales-Asencio JM, Lopez-Gonzalez AA, Vicente-Herrero T, De Pedro-Gomez J et al. (2014) Prevalence of Premorbid Metabolic Syndrome in Spanish Adult Workers Using IDF and ATP III Diagnostic Criteria: Relationship with Cardiovascular Risk Factors. *PLoS One* 2014; 9(2): e89281. doi:10.1371/journal.pone.0089281.
11. Kanjilal S, Shanker J, Rao VS, Khadrinarasimhaiah NB, Mukherjee M, Iyengar SS, Kakkar VV. Prevalence and component analysis of metabolic syndrome: An Indian atherosclerosis research study perspective. *Vascular Health and Risk Management* 2008; 4: 189-197
12. Skar M, Villumsen AB, Christensen DL, Petersen JH, Deepa M, Anjana RM, Pradeepa R, Mohan V. Increased risk of type 2 diabetes with ascending social class in urban South Indians is explained by obesity: The Chennai urban rural epidemiology study (CURES-116) *Indian J Endocrinol Metab.* 2013; 17: 1084-1089.
13. Haffner SM. Epidemiology of type 2 diabetes: Risk factors. *Diabetes Care* 1998; 21: C3-C6.
14. Basu S. A study of body mass index in the population and its association with blood pressure and serum levels of glucose and triacylglycerol. *Int J Pharm Bio Sci* 2013; 4: 111-116.
15. Enas AE, Senthilkumar A, Hancy C, Marc AB. Prudent diet and preventive nutrition from pediatrics to geriatrics: current knowledge and practical recommendations. *Indian Heart J* 2003; 55: 310-338.

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