Lipid Accumulation Product as a Novel Index to Predict Diabetes in Women.

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ABSTRACT

Diabetes is a serious health condition that affects women in all stages of life. The transition to diabetes (i.e., loss of adequate insulin response) may be linked more closely to lipid accumulation. Lipid Accumulation Product (LAP) is an index of lipid accumulation. It is calculated using waist circumference and fasting serum triglycerides. A total of 1,067 women were included in the study. LAP was calculated and compared between women with normal blood glucose, impaired glucose tolerance and those with diabetes mellitus. It was found that LAP was significantly raised in women with impaired glucose tolerance and diabetes when compared to women with normal blood glucose. We conclude that LAP is a simple tool for predicting glucometabolic variables and identifying women with diabetes. Hence we suggest that LAP, based on two measurements, which are safe and inexpensive, can serve as a marker for predicting diabetes.
Keywords: lipid, diabetes, LAP

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INTRODUCTION

Diabetes mellitus is an iceberg disease. Prevalence of diabetes increased over 50% in past ten years and according to CDC report projected to increase by another 165% over next 50 years. Gaining weight is associated with risk of diabetes. When available fuels exceed adipose tissue's capacity for storage, lipid will be ectopically deposited in tissues like liver, skeletal muscle and β-cell of pancreas [1]. Ectopic lipid deposits are associated with lipotoxicities that in turn lead to insulin resistance, decline of β - cell function and diabetes mellitus [2]. To simplify the recognition of lipid over accumulation, researchers have devised dichotomous risk markers based on waist circumference and fasting triglyceride (TGL) concentration [3]. The following simple definitions attempt to describe total-body lipid accumulation:

LAP for men: (waist circumference [cm] - 65) X (triglyceride concentration [mmol/l])
LAP for women: (waist circumference [cm]- 58) X (triglyceride concentration[mmol/l]) [4].

The simple index described was developed to express a continuous risk function, based on two measurements that are safe and inexpensive to obtain [5]. One is waist circumference a measure of truncal fat that includes visceral deposits (intra-abdominal fat) and other fasting triglycerides (TGL) which measures circulating fat. Hence the present study was taken up to find out if LAP can serve as predictor of diabetes mellitus in women.

MATERIALS AND METHODS

Women in age group of 16- 70 years were studied. Brief history and anthropometric measurements were taken. Mini glucose tolerance and fasting triglycerides were estimated. Glucose was measured by GOD-POD method and triglycerides by GPO-Trinder method using an auto analyzer. LAP was calculated using the formula.

LAP= (WC-58) cms X TGL in mmol/L

Statistical analysis was done using Microsoft excel 2007. Descriptive statistics and ANOVA was used for testing significance between groups.

RESULTS

A total of 1,067 women were studied. Women were grouped into those with normal blood glucose (598), impaired glucose tolerance (263) and diabetes (206) [Graph 1].

Mean LAP values in women with normal blood glucose is 22.74, in women with impaired glucose tolerance it is 48.18 and that in women with Diabetes Mellitus is 66.84.Mean LAP values are found to be high in impaired glucose tolerance group and significantly higher in diabetic group compared to normal group. Increase in LAP between groups is found to be statistically highly significant [Graph 2].

Graph 1: Distribution of study groups based on Blood Glucose Levels
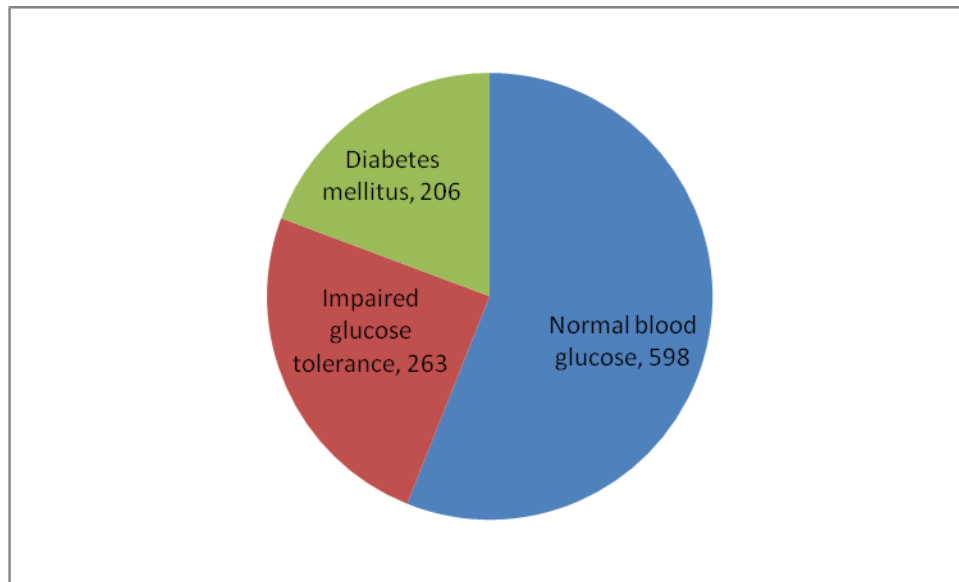
Graph 2: Showing mean LAP values in women with normal blood glucose, impaired glucose tolerance and with diabetes mellitus

ANOVA Analysis   p value: 0.0001   Interpretation: Highly significant
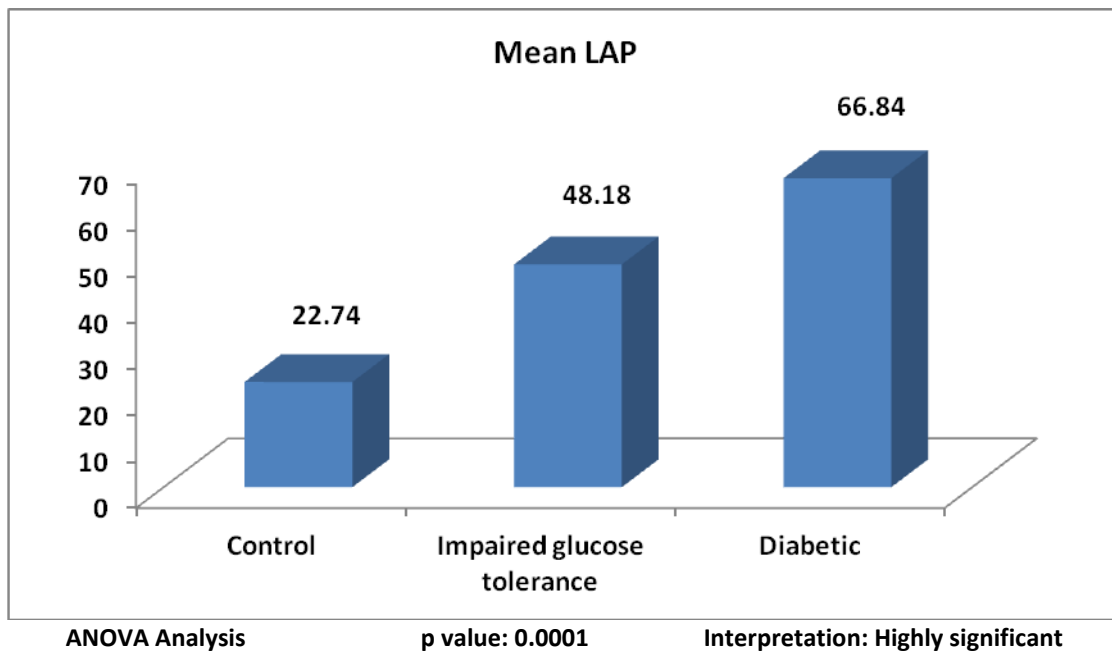
DISCUSSION

Prevalence of diabetes in India is increasing due changes in life style. High prevalence of obesity and cholesterol are risk factors for diabetes. Abdominal adiposity has been shown to be more closely linked in preceding insulin resistance. Risk for diabetes is associated with abdominal adiposity and circulating triglycerides. Quantity of intraabdominal fat being strongly

related to metabolic disorders is basis for suggesting anthropometric measures that describe central fat distribution to general measures of obesity, with respect to prediction of diabetes [6]. Use of triglyceride levels in combination with waist greatest amount of visceral fat and to be associated with increased risk of diabetes [7]. LAP combines these two variables in a single continuous index. According to Yang C et.al study, LAP has been tested in Chinese population for predicting diabetes and results indicated that LAP was able to predict diabetes better than waist to hip ratio, waist circumference or BMI in both men and women [8]. E Wehr et.al demonstrated that high LAP levels were associated with a significantly increased prevalence of impaired glucose tolerance and metabolic disturbances in Polycystic Ovarian syndrome as well as in control women [9]. In the present study also mean LAP values significantly increased from normal group to group with impaired glucose tolerance and further increased in diabetic group. Our results also correlated with other study by J-Y Oh et.al which revealed that lipid accumulation product exhibited higher odds ratio for abnormal glucose regulation than did BMI in young Korean women [10]. LAP thus offers an inexpensive tool to estimate total body lipid accumulation and in turn a strong predictor for diabetes mellitus.

The limitation of our study is that it is conducted only in women and further can be improved by conducting in population including both men and women.

CONCLUSION

Lipid accumulation product is a useful index for identifying abnormal glucose regulation. This simple clinical tool may help, in primary health care set-up, to identify subjects who require further biochemical evaluation and life style modifications. Early diagnosis and initiation of treatment can go a long way in minimizing complications of diabetes.

REFERENCES

[1]   Lewis GF, Carpentier A, Adeli K, Giacca A. Endocr Rev 2002; 23: 201–229
[2]   Unger RH. Endocrinol 2003;144: 5159 – 5165.
[3]   Kahn HS, Valdez R. Am J Clin Nutr 2003 ;78: 928- 934
[4]   Henry S Kahn. Diabetes care 2006;29(1):151- 153
[5]   Kahn HS. BMC Cardiovasc Disord 2005; 5:26
[6]   Mohammadreza Bozorgmanesh et al. Lipid Health Dis 2010;9:45.
[7]   Amini M et al. Diabetes Care 2009;32:1916- 1920.
[8]   Yang C, Guo Z R, Hu X S, Zhru Z Y, Wu M. Chin J Epidemiol 2010;31; 5- 8.
[9]   E Wehr et al. J Clin Endocrinol Metab 2011;96(6):61-65.
[10]   Oh JY, Sung YA, Lee HJ. Diabet Med 2013;30(4);436-42.