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Correlation of Baecke's Habitual Physical Activity with Blood Sugar Levels in Type II Diabetes Mellitus

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Abstract: ***Physical exercises is known to improve insulin sensitivity and blood sugar levels. In busy schedule people may find it difficult to dedicate time for exercises. Hence its important to evaluate the routine physical activity and its effect on blood sugar. T he objective of the study was to correlate Baecke's Physical activity with fasting and post prandial blood sugar in Type II Diabetes Mellitus. 60 participants both males and females between 30-60 years were given Baecke's scale and blood sugar levels were noted. The results showed significant correlation of Baecke's total index with fasting(r=-0.4467,p=0.0003) and Post Prandial level (r=-0.4467,p=0.0001).***

Keywords: Type 2 Diabetes Mellitus, Baecke's Habitual physical activity scale, Blood sugar levels

1. Introduction

Prevalence of diabetes is increasing globally. India have the maximum increase during the last few years. India has nearly 33 million diabetic subjects today, which is briefly contributed by the urban population[1]. Its experiencing rapid socioeconomic progress and urbanization, carries a considerable share of the global diabetes burden. Type 2 diabetes mellitus is the commonest form of diabetes [2]. Studies in different parts of India have demonstrated an escalating prevalence of diabetes not only in urban populations, but also in rural populations as a result of the urbanization of lifestyle parameter [3]. Prediabetic conditions like impaired glucose tolerance and impaired fasting glucose are also on the rise, indicating the possibility of further rise in the prevalence of diabetes [2].

Diabetes Mellitus, often simply referred as diabetes is a chronic disease that occurs when the pancreas does not produce enough insulin, or when the body cannot effectively use the insulin it produces. characterized by chronic hyperglycemia as a result of defects in insulin secretion from B-cells of pancreas or peripheral action of insulin (insulin resistance) or both. *Type II Diabetes Mellitus*-It results from insulin resistance, a condition in which cells fail to use insulin properly, sometimes combined with absolute insulin deficiency. Formerly referred as non-insulin dependent diabetes mellitus, NIDDM and adult-onset diabetes- is a metabolic disorder characterized by high blood glucose in the context of insulin resistance and relative insulin deficiency.

This high blood sugar produces the classical symptoms of polyuria, polydipsia and polyphagia. Hyperglycemia or raised blood sugar is a common effect of uncontrolled diabetes and over time leads to serious damage to many of the body's systems, especially the nerves and blood vessels. Diabetes is often initially managed by increasing exercise and dietary modification. If the condition progress, medications may be needed. Long term complication from high blood sugar can include increased risk of heart attack, strokes, diabetic retinopathy and kidney failure.

Age, urban-rural factor, body mass index (BMI), Waist: Hip ratio (WHR), upper body adiposity were positively associated with diabetes[2][4]. Indians have a genetic phenotype characterized by low body mass index, but with high upper body adiposity, high body fat percentage and high level of insulin resistance which may predispose them to type 2 diabetes[2].

It is known that physical exercise helps to maintain blood glucose levels. In today's world due to rapid urbanization, invention of technologies, upgradation of transport system people have inclined more towards sedentary lifestyle. Though it is known fact that regular physical exercises helps in controlling blood sugar levels, people find it difficult to adhere to the routine exercise protocol. So one should modify their Habitual physical activity in such a way that it will help them to remain physically active. Lifestyle modification is an effective tool for the control of diabetes. Hence it is important to correlate habitual physical activities of the diabetic subjects with their blood sugar levels.

2. Methodology

This study is cross-sectional observational correlation study in which 60, both male and female subjects between the age of 30-60 years with Type 2 Diabetes Mellitus for at least 2 years were included.

Subjects with Type 1 Diabetes, diabetes complications eg. amputation, psychiatric disorder, acute PIVDs, recent fractures, inflammatory conditions like Rheumatoid Arthritis,ankylosing spondylitis, recent surgeries, acute medical illness, pulmonary kochs, pregnancy and lactating mothers were excluded from the study. The study procedure was explained to the subjects and written consent was taken. The participants were explained and given the Baecke's habitual physical activity scale to fill it. Baecke's habitual physical activity scale consists of total 16 questions regarding daily activities .There were 3 different categories in it Work index consisting of 8 questions. Work index=([score for sitting]-4+sum of all other questions)/8. Sports index consisting of 4 questions and 2 separate

questions regarding specific sport activity. Sports index=(sum of all 4 questions)/4. Leisure activity index of 4 questions. Leisure Index=([score for television watching-4]+sum of all other questions)/4. Total of all 3 index was done to find total score.

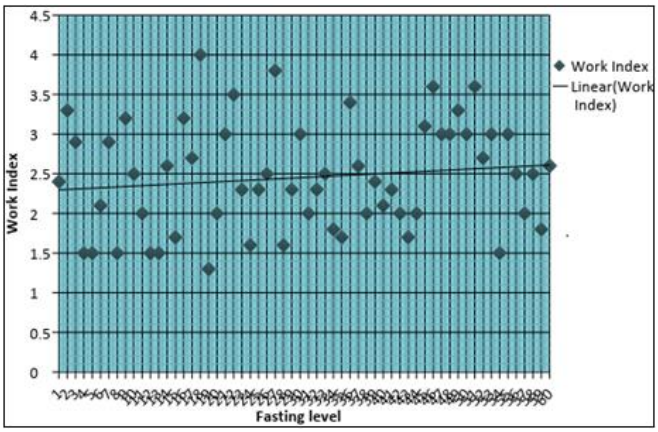
Fasting blood sugar i.e. fasting for at least 10- 12 hours and Post Prandial blood sugar levels i.e.2 hours after lunch were taken from the pathology lab with the subject's consent.

3. Results and Analysis

The statistical analysis of the data was done using Instat Graphpad version 3 using Pearson's correlation test for values passing normality test and Spearman's correlation test for values not passing normality test.

Table 1: Work Index v/s fasting sugar levels

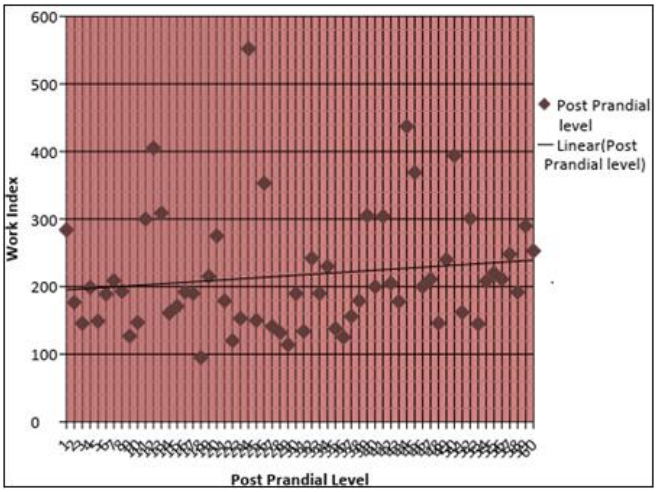
	Mean	*SD*	*r value*	*p value*
Work Index	2.4533	±0.6776	-0.3022	0.0189
Fasting levels	151.8333	±44.077		



Graph 1

Table 2: Work Index v/s Post Prandial sugar level

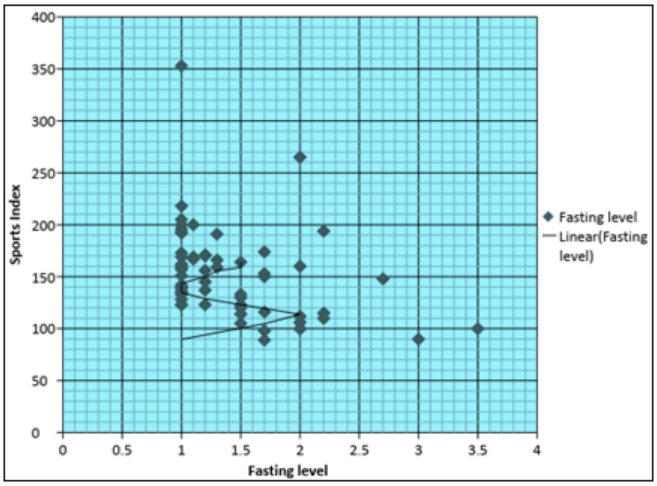
	Mean	*SD*	*r value*	*p value*
Work Index	2.4533	±0.6776	-0.2741	0.0341
Post Prandial level	217.1666	±88.148		



Graph 2

Table 3: Sports Index v/s Fasting sugar levels

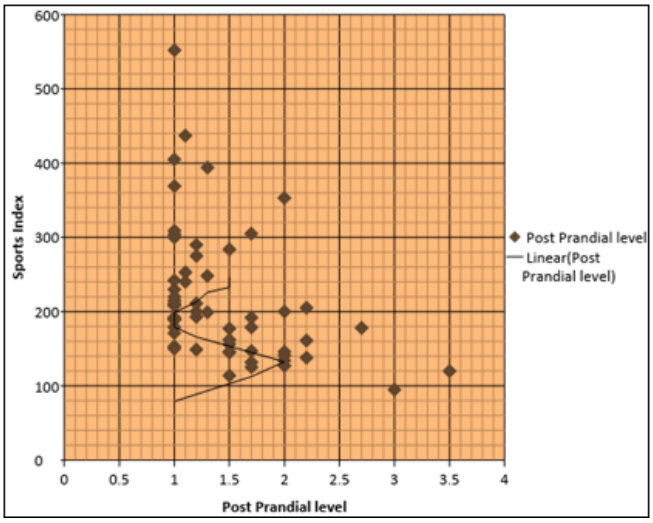
	Mean	*SD*	*r value*	*P value*
Sports Index	1.4316	±0.5448	-0.4528	0.0003
Fasting level	151.8333	±44.077		



Graph 3

Table 4: Sports Index v/s Post Prandial sugar levels

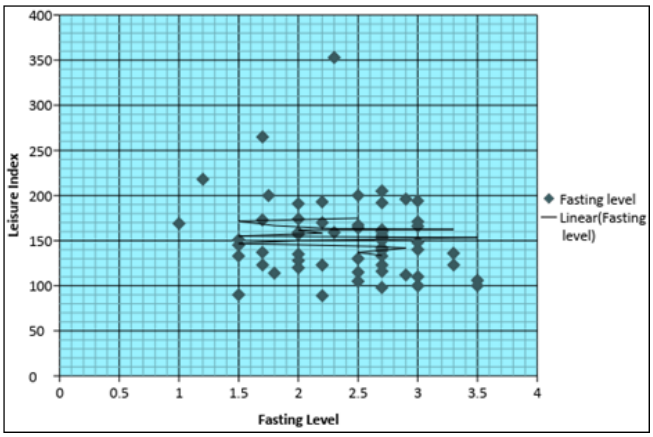
	Mean	*SD*	*r value*	*p value*
Sports index	1.4316	±0.5448	-0.5046	0.0001
Post Prandial level	217.1666	±88.148		



Graph 4

Table 5: Leisure Index v/s Fasting sugar levels

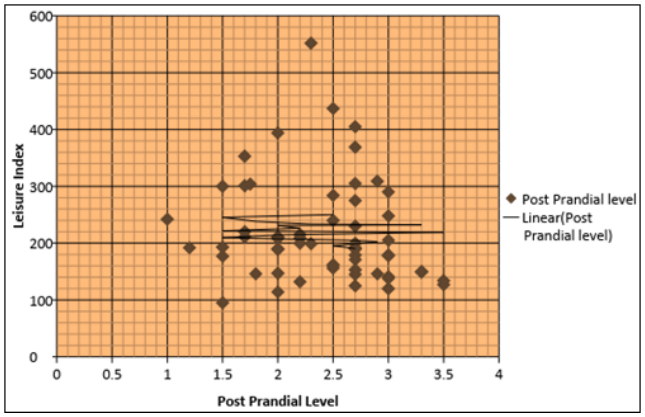
	Mean	*SD*	*r value*	*p value*
Leisure index	2.4158	± 0.5759	-0.194	0.1346
Fasting level	151.8333	±44.077		



Graph 5

Table 6: Leisure Index v/s Post Prandial sugar levels

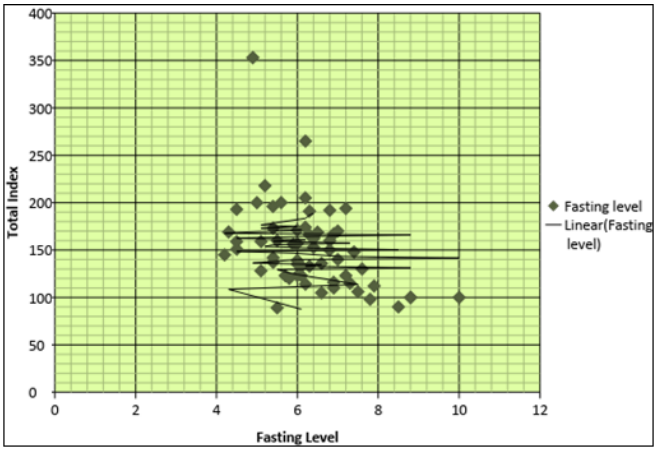
	Mean	*SD*	*r value*	*p value*
Leisure Index	2.4158	±0.5759	0.0698	-0.2358
Post prandial level	217.1666	±88.148		



Graph 6

Table 7: Total Index v/s Fasting sugar levels

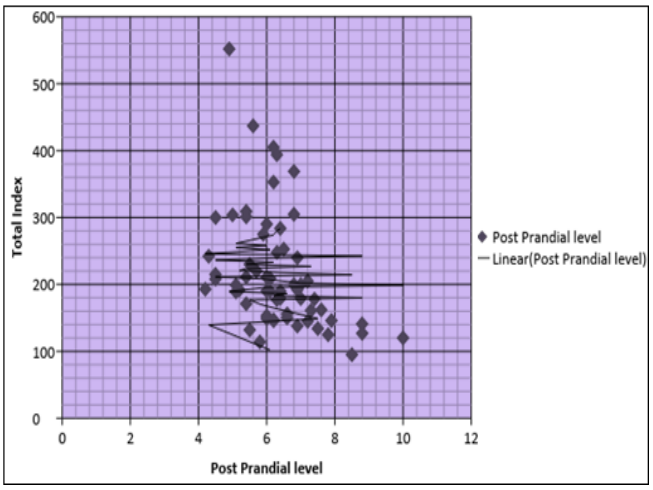
	Mean	*SD*	*r value*	*p value*
Total Index	6.3133	±1.150	-0.4467	0.0003
Fasting level	151.8333	±44.077		



Graph 7

Table 8: Total Index v/s Post Prandial sugar levels

	Mean	*SD*	*r value*	*p value*
Total index	6.3133	±1.150	-0.4766	0.0001
Post Prandial	217.1666	±88.148		



Graph 8

4. Discussion

This study was done to find out the correlation between Habitual physical activity and Blood sugar levels. Out of 60 subjects participated in the study 50% were males and 50% were females. Out of total participants 15% were from the age group of 31-40 years, 40% were 41-50 years age group and 45% were from the age group of 51-60 years.

Physical activity ameliorates insulin sensitivity and blood sugar levels. Hence helps to sustain glucose tolerance. This study was done to correlate Habitual physical activity with blood sugar levels.

There was significant negative correlation between Work Index in Baecke's habitual physical activity with fasting blood sugar level (r=-0.3022,p=0.0189) and Post Prandial level (r=-0.2741,p=0.0341). There is significant negative correlation between Sports Index in Baecke's habitual physical activity with fasting blood sugar level (r=-0.4528,p=0.0003) and Post Prandial level (r=-0.5046,p=0.0001). There is no significant correlation between Leisure Index in Baecke's habitual physical activity with fasting blood sugar level (r=-0.1954,p=0.1346) and Post Prandial level (r=-0.2358,p=0.0698).

There is significant negative correlation between Total Index in Baecke's habitual physical activity with fasting blood sugar level (r=-0.4467,p=0.0003) and Post Prandial level (r=-0.4467,p=0.0001).

Many research article suggest that urbanization of lifestyle i.e. dietary modification and physical inactivity is the primary reason for glucose intolerance and type 2 diabetes mellitus[1][2][3][4][5]. According to the study done by Frank B hu and Tricia Y Li , data provided a strong evidence that sedentary behaviors, especially prolonged TV watching, are directly related to obesity and diabetes risk[6].

According to Edith J.M. Feskens, Gerard Loebes, men with highest physical activity had inverse relation with insulin levels in glucose tolerance test. It is independent of body mass index, age, energy intake, cigarette smoking and ratio of subscapular to triceps skinfold thickness[7]. Also, the study done by Andrea Kriska, Anthony Henly found fasting

insulin concentrations have independent association with physical activity and fitness which is beneficial on insulin sensitivity[8]. Similarly, Susan Helmrich, David Ragland had inferred that physically active societies have less NIDDM than less active societies[10], and as populations have become more sedentary the incidence of NIDDM has increased[9]. Second, physical activity increases sensitivity to insulin[11], and regular endurance exercise induces weight loss and improves glucose tolerance[9][12]. Thus results of our study also confirm the inverse correlation between physical activities and blood sugar level in Type 2 Diabetes.

Increase in the intensity and duration in leisure-time physical activity shows reduced risk of type II diabetes as well good glycemic control. Walking is a physical activity that is highly accessible, readily adopted and rarely associated with physical activity related injury. In diabetic patients, daily walking along with dietary therapy improves insulin sensitivity and helps in reducing body weight [13][14]. Moderate intensity activity when compared to structured aerobic activity shows similar aid in cardiorespiratory fitness and cardiovascular risk factors including blood pressure and lipid levels[13][15][16][17]. The risk of type 2 diabetes was shown to decrease with increasing amounts of physical activity[13][18][19][20][21].. Non Leisure energy expenditure like work and sports are also important factors in the prevention of chronic diseases [13][22].

A single bout of physical activity increases insulin-mediated glucose uptake for more than 24 hours [13][23]. The increased insulin sensitivity occurs because of increased number and activity of glucose transporters (especially the GLUT4 isoform), both in muscle and in adipose tissues[13][24][25]. Glycogen synthase activity is also increased, resulting in increased glycogen synthesis and increased nonoxidative disposal of glucose [13][24][25]. In addition to this direct effect on glucose disposal, physical activity results in decreased adipose tissue mass and preserved or increased lean body mass [13][26] which also lead to increased insulin sensitivity. Consistent with these metabolic effects, small clinical trials had demonstrated a benefit of physical activity in the prevention of diabetes among people with impaired glucose tolerance [13][27][28]. Exercise training is known to improve glucose tolerance and insulin action [9][29].

Since physical activity influences glucose metabolism even short periods of exercise can lower plasma glucose levels by enhancing the effect of insuline [9][30][31]. The results of our study also shows strong inverse correlation between physical activities and blood sugar levels. Hence the above discussion shows that it is important to incorporate active lifestyle in daily activities in order to maintain good glycemic control.

5. Conclusion

There is significant negative correlation of work index, sports index , leisure index and total index of Baecke's habitual physical activity scale with fasting and post prandial blood sugar levels in type II diabetes mellitus. Hence it is necessary to increase the physical activity in daily life to improve insulin sensitivity and maintain normal blood sugar levels.

6. Future Scope

Effect of life style modifications in terms of physical activity and its effect on glycemic control in type II diabetes mellitus should be done.

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