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Original Article

Prevalence of pre diabetes in adults below 40 years with special reference to modifiable risk factors

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Abstract
Introduction: *Diabetes is the major concern of today's world and its chronic complications have become a serious public health issue. Diabetes getting detected in the pre diabetic phase will be of great help in decreasing the morbidity and mortality arising due to the complications*
Methodology: *We studied a total sample of 528 patients coming to the medicine outpatient department, age group from 18-40 years, who underwent a series of investigations of fasting, post prandial and HbA1c tests and were grouped according to the newer definition of American Diabetic Association in the pre diabetic groups. The modifiable risk factors were compared amongst them.*
Results: *The data was analysed and compared in relation with age, sex, type of family, maritalstatus, occupation, education, Body mass index, waist hip ratio, alcoholic status, smoking and diastolic blood pressure and systolic blood pressure and physical activity to the prediabetic status.*
Conclusion : *An effort to establish the association of modifiable risk factors with prediabetic condition was made in order to effectively target and tackle these factors so as to successfully manage, predict and prevent or slow the progression of prediabetic condition from converting into overt diabetes.*
Keywords: *Prediabetes, modifiable risk factors.*

Introduction

Prediabetes, also known as impaired glucose regulation (IGR), refers to the condition where blood glucose is not as high as in diabetes but is higher than normal. It includes the condition of impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) and IFG combined with IGT.

According to American Diabetes Association (ADA), although applying the same thresholds for IGT(levels of 140 -199 mg/ dl after 2 hours of 75 gm glucose), uses a lower cut-off value for IFG

(FPG 5.6–6.9 mmol/L, 100 to 125mg/ dl) and has additionally introduced haemoglobin A1c levels of 5.7–6.4% as a new category of high diabetes risk.

The purpose of this study is to investigate the prevalence of pre-diabetes in young adults between 18-40 years of age and explore its modifiable risk factors in young adults.

Methodology

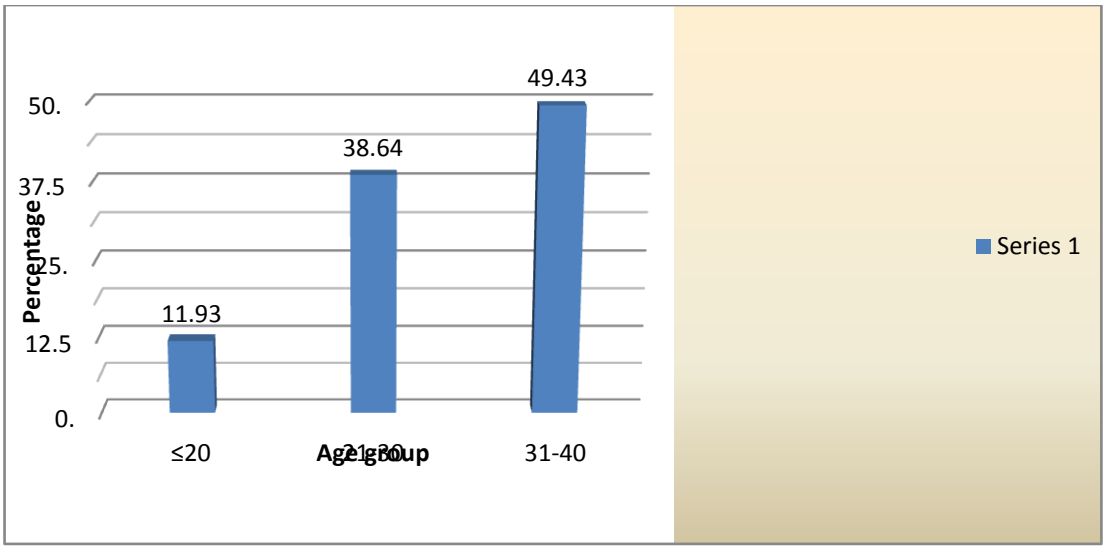
This study conducted by us was a cross sectional study to evaluate the prevalence of the Prediabetes in the adults between age group of 18 to 40 years. This study included 528 patients between 18 to 40 years of age who presented to the out patients department of Internal medicine of Bharati Hospital and Research centre, Dhanakwadi from September 2015 to March 2017.

Prediabetic condition was defined according to the ADA definition as stated above. Patient between age group of 18 to 40 years who came with more than 10 hours of fasting, male or female, having co morbidities of hypertension, obesity, dyslipidemia or the patients who came for regular health checkup or for medical fitness certificate were all included in the study. Patients below 18 years of age, on steroid therapy for some reason, proven cases of type 1 and 2 diabetes mellitus on treatment with a blood sugar level of 100 - 126 mg/dl or patients with any endocrine disorder like adrenal, thyroid, pituitary involvement were excluded from the study.

Results

The prevalence of prediabetics in general population was 10.04 %. It was observed that majority of the patients in our study were in the age group of 31-40years (49.43%) whereas 38.64% were in age group of 21-40 years. The study showed that 55.30% study subjects were female and 44.70% were male.

Fig 1 Association of age with pre diabetic status



Nuclear families had more prevalence for prediabetes than joint families and married population was having more prevalence as compared to the unmarried ones. 78.79% subjects were belonging from nuclear family and 21.21% were from joint family.

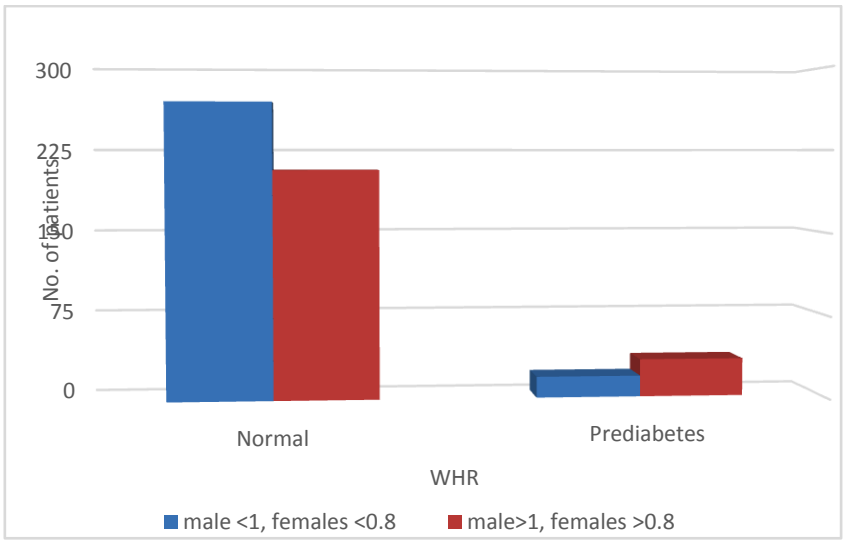
The study revealed that 43.79% subjects having BMI more than 25 were found in normal group whereas 60.38% subject in prediabetic group were having BMI >25(P=0.02). This shows that patients with BMI greater than 25 were more in number in prediabetic group and the association was statistically significant.

Table 1 Association between BMI and Prediabetes

BMI (kg/m2)	Normal (n = 475)	Percentage	Prediabetic (n = 53)	Percentage	X^2	P value
<24.9	267	56.21	21	39.62	5.292	0.02*
>25	208	43.79	32	60.38		

It was observed that 43.58% normal subjects and 64.15% prediabetic subjects were having increased WHR (Men>1, women >0.8) as compared to 56.42% normal individual and 35.85 % prediabetic who had normal WHR(P=0.004). The association between WHR and prediabetic status was statistically significant.

Fig. 2 Association of waist hip ratio and prediabetic status



The study showed that association of alcoholism and smoking were not significant with the prevalence of Prediabetes.

The study showed that 81.26% among normal individual and 69.81% prediabetic subjects were having DBP less than 90mm of Hg. Also 18.74% of normal subjects and 30.19% among Prediabetes were having DBP more than 90mmHg. 39.62% prediabetic subjects were having SBP more than 140 mm of Hg and 26.74% of normal subjects were having SBP more than 140 mm of Hg. The association between SBP and DBP with prediabetic status was statistically significant. (p = 0.04; p= 0.04, respectively)

Table 2 Association of SBP and DBP with prediabetic status

DBP (in mmHg)	Normal (n = 475)	Percentage	Prediabetic (n = 53)	Percentage	X^2	P value
<90	386	81.26	37	69.81	3.925	0.04*
>90	89	18.74	16	30.19		
SBP (in mmHg)	Normal (n = 475)	Percentage	Prediabetic (n = 53)	Percentage	X^2	P value
<140	348	73.26	32	60.38	3.924	0.04*
>140	127	26.74	21	39.62		

While studying the physical activity it was seen that 32.08% prediabetic subjects were involved in light work, while 67.92 % of prediabetics were involved in Moderate/heavy work activity. 22.95% of normal subjects were involved in light work whereas 77.05% of normal individuals were involved in moderate to heavy work and association between physical activity and Prediabetes was statistically not significant

Discussions

ADA defines prediabetes as a stage of intermediate hyperglycemia between normal glucose tolerance and type 2 diabetes which encompasses IFG, IGT and now HbA1C 5.7–6.4%.[1] Epidemiological studies show that development of type 2 diabetes takes place over a long time before type 2 diabetes manifests. This is the time when insulin resistance develops and in the end β-cell function deteriorates.[2] WHO`s diabetes task force suggested in 2008 the use of the term intermediate hyperglycemia instead of prediabetes to cover IFG and IGT.[3]

According to ADA among those with prediabetes, 60% converted to diabetes. Predictors of progression to dysglycemia were advancing age, family history of diabetes, 2-h plasma glucose, raised glycated hemoglobin (HbA_{1c}), low HDL cholesterol, and physical inactivity.[4]

The overall prevalence of diabetes in India was 7·3% (95% CI 7·0–7·5). The prevalence of diabetes varied from 4·3% in Bihar to 10·0% (8·7–11·2) in Punjab and was higher in urban areas (11·2%, 10·6–11·8) than in rural areas (5·2%, 4·9–5·4%) and higher in mainland states (8·3%, 7·9–8·7) than in the northeast (5·9%, 5·5–6·2%). States with higher per-capita GDP seemed to have a higher prevalence of diabetes. In rural areas of all states, diabetes was more prevalent in individuals of higher socioeconomic strata. However, in urban areas of some of the more affluent states, diabetes prevalence was higher in people with lower socio economic status. The overall prevalence of prediabetes was 10·3% (10 – 10·6%). Age, male sex, obesity, hypertension, and family history of diabetes were independent risk factors for diabetes in both urban and rural areas.[5]

Normal control of fasting glucose depends on adequate insulin secretion from the pancreas and insulin sensitivity in the liver to control the hepatic glucose output; abnormalities in these characterise IFG. In contrast, IGT is due to decreased insulin secretion and peripheral insulin resistance, especially in skeletal muscle. Insulin resistance associated with prediabetes is known to be an important risk factor for cardiovascular mortality and cardiovascular disease (CVD).[6,7,8]

Large epidemiological studies have shown that subjects with non-diabetic hyperglycaemia such as impaired fasting glucose (IFG) and impaired glucose tolerance (IGT) are at high risk for developing T2DM and for CVD and mortality. Many studies have found IGT to be stronger than IFG in predicting CVD. However, in the recent review, Ford summarised only moderately increased risk for CVD in subjects with IFG and/or IGT.[9,10]

Obesity, defined by a body mass index (BMI) ≥ 30 kg/m2, affects about 5% of Indian population in 2013 and it has a predicted prevalence of 12% by 2050, if it still continues to increase. Obesity is the most important single risk factor for type2 diabetes.

It was seen that 43.79% subjects were having BMI more than 25 in normal group whereas 60.38% subject in prediabetic group were having BMI >25. Thus higher prevalence of prediabetics was noted in persons with BMI > 25 compared to respondents with BMI <25.and the association was statistically significant. Similar findings were reported by Muthunarayanan, et al[11], Anjana et al.[12]. Balagopal et aland Snehalatha et al [13] reported significant and positive association of prediabetes with high body weight among adults.

Physical inactivity together with high caloric intake causes obesity and insulin resistance, increasing the risk of Prediabetes. Lakka et al.in their prospective study reported that higher levels of physical activity protected against the development of Prediabetes, Type 2 Diabetes and cardiovascular disease.[14] Lifestyle interventions, including regular physical activity, have been shown to decrease the incidence of type 2 diabetes by as much as 58% in patients with IGT. There is evidence that high total caloric intake, low fibre intake, high glycemic load, and a low

polyunsaturated/saturated fat ratio intake may predispose to type 2 diabetes.

However, in our study it was seen that 32.08% prediabetic subjects were involved in light work activities whereas 22.95% of normal subjects were involved in light work activities and association between physical activity and prediabetes was not statistically significant.

It was observed that majority of the patients were in the age group of 31-40 years (49.43%). It was seen that 78.79% subjects were belonging from nuclear family and 21.21% were from joint family. Similar findings were also reported by Anjana *et al*, Shamima Akter et al[15], Muthunarayanan, et al and MA Al-Shafaee [16] in their study.

43.58% normal subjects and 64.15% prediabetic subjects were having WHR (Men>1, women >0.8). The association between WHR and prediabetic status was statistically significant (X^2=8.133, df=1, p=0.004). Similar findings were also reported by Anjana *et al* Muthunarayanan, et al.

Conclusions

In this study we tried to establish association between modifiable Risk factors with Prediabetes and although sample size was small, few things such as age above 30 years, higher BMI, high WHR, diastolic BP above 90mmHg and systolic BP above 140 mmHg shows strong association with Prediabetes as shown by other studies also.

This underlines the need to effectively target and tackle these factors so as to successfully manage, predict and prevent or to slow the progression from Prediabetes to Diabetes mellitus or its complications.

Life style interventions remain an essential part of management of prediabetes. The use of pharmacotherapy should be on an individual case based approach. Health education should be strengthened to encourage people to change unhealthy dietary habits, and regular screening should be performed to reduce the occurrence of new cases of diabetes.

As it is very rightly said,

"A stitch in time saves nine".

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