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RISK FACTORS OF TYPE 2 DIABETES IN UNION TERRITORY OF PUDUCHERRY

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ABSTRACT

The Union Territory of Puducherry is estimated to have around 60,000 population with diabetes. The study aims to highlight the prevalence of Diabetes Mellitus (DM) in Puducherry district. A cross sectional study was conducted among the 4000 individuals both male and female between the age group of 30 to 80 years attending the rural and urban Primary Health Centers of the Puducherry district. Out of 4000 individuals, 1140 were found to be diabetic. Statistical methods such as chi-square test and Binary logistic regression analysis (odds ratio) were applied to meet the study objectives. The p-value < 0.05 reflects that there is a statistical association between the gender, physical exercise, diabetes and HbA1c with respect to RBS group category. The odds ratio reveals that the subjects having HbA1c >7 are highly susceptible to have above 200 RBS, which means that the subjects of who has HbA1c>7 (Glycosylated Hemoglobin) are prone to have 7.042 times risk when compared to their HbA1c < 7. The study finds that the age, gender, physical activity, body composition and biochemical analysis of the individuals were significant predictors of diabetes. This study helps to prelude for further research in the field of non-communicable disease.

Key Words: Diabetes mellitus, Type 2 diabetes, Random Blood Sugar (RBS), HbA1c.

INTRODUCTION

Diabetes mellitus is an endocrine disorder, which affects nearly 382 million of people worldwide [1]. India is the second largest number of diabetic population in the world [2]. Nearly 90 percent of the population in India had type 2diabetes [3]. The National Urban Diabetes Survey (NUDS) population study conducted in the six metropolitan cities across India revealed that the prevalence in the southern part of India to be higher in eastern part of India and than in northern India and than in western India, The prevalence of diabetes was the highest in the urban areas, followed by the midland highland and coastal division [4].

More than 80 percent of diabetes death occur in low and middle income countries and also it will be 7^{th}

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leading cause of death in future 2030 [5]. In past two decades the diabetes is a mild disorder of elderly now it is one of the pandemic disorders of young and middle aged people [6]. Prevalence of type 2 diabetes (T2D) increase due to the age [7], sex, distribution of fat, family history of diabetes [8]. Apart from these factors, lifestyle changes, migrations and improper food intake leads to main causes of diabetes, obesity [9,10], maternal diabetes [11], fetal malnutrition [12], excessive intake of calorie dense processed foods as well as physical inactivity were the most important modifiable risk factors. It exhibits an assortment of multisystem complications involving the blood vessels, skin, eye, kidney, and the nervous system during the course of diseases such as diabetic retinopathy, renal failure, heart disease, diabetic neuropathy and foot ulceration and amputation. Proper understanding of disease and its treatment will increase the life expectancy, quality of life and economic terms of both the patient and care givers.

Hence, the aim of the present study is to find out the risk factor of type 2 diabetes with respect to blood glucose level (HbA1c).

MATERIALS AND METHODS

A cross sectional study was conducted among 4000 individuals from both genders between the age group of 30 to 80 years who attended the diabetic screening camp conducted in ten different urban and rural locations of Puducherry region. The age group of 30 - 80 years is more prevalent for diabetic; hence this age group was targeted. Necessary permission was obtained from the Health Department, Govt. of Puducherry to conduct the study. The samples were informed about the camp through the field staff of the neighbouring Primary Health Centre one day before screening. The samples were screened for diabeties with the help of paramedical staff of Primary Health Centres twice in a week. Based on the results obtained for diabetic test, the samples were divided into two categories, viz. Pre-diabetic(160-200mg/dl) and Diabetic (>200mg/dl) with respect to RBS. The sub-samples (n = 400) was drawn from the category-2 viz. the diabetic individual on random basis for analysing the essential body composition parameters viz. Height, Weight, Body Mass index, Age, Visceral fat, Muscle Mass, Total Body Water, Basal Metabolic Rate, Total Body Water %, Bone Mass, Total Fat Percentage.

Accordingly, a total of 4000 samples screened, 1140 are type 2 diabetic patients enrolled at the time of this study were picked with the help of Primary Health Centre paramedical staff to conduct the present study. For seeking data, a self administered questionnaire was designed encomprising all the related questions relevant to the study like socio-demographic pattern of the individuals and health profile.

To assess the core parameters of the study, instruments like Body Composition Analyzer is used for analyzing the body composition, Stadiometer and flexible tape are used to measure the height, weight, and waist circumference of the selected samples were used. Biochemical tests such as HbA1c and RBS were performed. The period of study was for 10 months from March 2013 to December 2013.Prior permission was obtained from the Health Department, Govt. of Puducherry to carry out the study. On ethical consideration, consent letter was obtained from the samples, after explaining the need, scope and the nature of the study. On an average, 15 minutes was spent for each sample for seeking all the required data. Statistical analysis has been performed to analyze the data. Statistical tools such as Chi-square test, Binary logistic regression analysis, Odds Ratio are applied to meet the study objectives.

RESULTS

From the table 1, it can be inferred that gender, physical exercise, diabetes and HbA1c are associated

significantly to RBS group category (p-value < 0.05). With respect to gender, more number of female subjects (56.3%) were found in 160 to 200 mg/dl RBS group and almost equal number of male and female subjects were observed in above 200mg/dl RBS group. Odds ratio (OR) reveals that females are having 1.32 times more risk than the males. The subjects who are doing physical exercises were found to be lesser in number in both RBS categories, whereas the subjects, who had sedentary life style, were observed to be in higher number. More number of subjects (68%) were observed in above 200 mg/dl RBS category with HbA1c as a variable it was observed that about 88 % had more than 200 mg/dl RBS and HbA1c with >7. The odds ratio reveals that the subjects having HbA1c >7 are highly susceptible to have above 200 mg/dl RBS, which means that the subjects of above 7 HbA1c are prone to have 7.042 times risk when compare to their counter parts.

BODY COMPOSITION AANALYSIS

The body composition such as weight, height, total body water, bone mass, muscle mass, visceral fat, metabolic age and BMI was measured using the Body The mean age of the study composition analyzer. population belongs to 55 years (n = 400) and also the mean height and weight of the respondent was 151 cm and 61 kg. From Table 2, it is evident that the mean standard body composition parameters such as BMI, fat percentage, metabolic age, BMR were higher for the diabetic population. In gender wise distribution of fat percentage in diabetic population 69 percent of them were women. Of the total 400 diabetic samples, 62 percent of individual had high and very high BMI value. Nearly 31 percent of diabetic populations were having high visceral fat rating. Majority of respondents i.e. 97 % are having high and very high muscle mass. Binary logistic regression was applied to identify the most significant risk factors. On performing the analysis, results show that weight, fat percentage and Visceral Fat Rating are the key factors to be observed in the female subjects. The table below gives the Binary Logistic Regression model along with the Odds ratio values.93.3% of correct classification was observed from the study results. Odds ratio of visceral fat rating reveals that the risk is 1.456 times more for females rather than males. Similarly, weight is also an important risk factor to be considered.

DISCUSSION

A significant association seen in pre-diabetes incidence and gender was reported in the study. The present study shows that the women (56 %) having more prevalence than men. Other study held at Kerala shows that the gender representation was overwhelmingly in favour of the females (62.1%) were women and (37.9%) were men [13], IDF [14] (*International Diabetic Federation*) also reported that the female have more risk factors than male due to the low economic status of women leads to poor nutrition, cultural and social norms of physical activity and gender inequality to assess the treatment. In this study, prevalence of diabetes decreased significantly (0.05) as the physical activity level increased,

similar findings of significance of association of DM with physical activity were reported by certain Indian studies [15-17]. There was no significant result found between BMI and diabetes.

Parameters	Category	RBS		Total		OD
		160 to 200	Above 200	Totai	Sig. (p-value)	UK
Gender	Female	258 (56.3)	336 (49.3)	594 (52.1)	5.480	1 229
	Male	200 (43.7)	346 (50.7)	546 (47.9)	(0.019*)	1.520
Physical Exercise	Yes	166 (36.2)	290 (42.5)	456 (40.0)	0.024*	0.768
	No	292 (63.8)	392 (57.5)	684 (60.0)	0.034	
Diabetes Self	Yes	128 (27.9)	464 (68.0)	592 (51.9)		
	No	319 (69.7)	211 (30.9)	530 (46.5)	0.000*	
	Unknown	11 (2.4)	7 (1.0)	18 (1.6)		
BMI	18.8 - 25	146 (32.9)	248 (37.0)	394 (35.4)		
	25-30	126 (28.4)	184 (27.5)	310 (27.8)	0.346^{NS}	
	> 30	172 (38.7)	238 (35.5)	410 (36.8)		
HbA ₁ c	< 6	102 (49.5)	61 (12.2)	163 (23.1)	0.000*	7.042
	>= 7	104 (50.5)	438 (87.8)	542 (76.9)	0.000*	7.042

Table 1. Chi-square test and odds ratio for the samples with respect to RBS

** represents significant at 0.05 level, 'NS' represents Not Significant at 0.05 level; OR = Odds Ratio

Table 2. Distribution of body composition analysis

Body Parameters	Male	Female	Total (n=400)
Body Fat%			
< 21 as low	24	2	26
21 – 32.9 as normal	30	132	162
33 – 38.9 as high	11	122	133
>=38.9 as very high	4	75	79
BMI			
<18.8 as low	4	2	6
18.8 – 24.9 as normal	30	116	146
24.9 – 27.9 as high	14	72	86
>28 as very high	21	141	162
Visceral Fat			
<=9 as normal	30	244	274
>9<=15 as high	32	83	115
>15 very high	7	4	11
Muscle Mass			
<24.3 as low	0	2	2
24.4 - 30.3 as normal	0	7	7
30.4 – 35.3 as high	10	100	110
>35.4 as very high	59	222	281

Table 3. Binary logistic regression table for the subsamples with respect to body composition analysis

	Coefficients	S.E.	Odds Ratio (95% Confidence Interval (Lower, Upper)
Weight	0.111	0.022	1.118 (1.071, 1.167)
Fat %	-0.341	0.037	0.711 (0.661, 0.765)
Visceral Fat Rating	0.376	0.062	1.456 (1.290, 1.644)
Constant	-1.510	1.058	0.221

The important results found that around 50 percent (46.7%) of the diabetic population were not aware of prevalence of diabetes in them. Several studies also

revealed that the undiagnosed diabetes is the hidden danger of the both society and nation, the ratio of undiagnosed diabetes was more in the diabetes community than in known diabetes [18,19].

It is necessary to assess the total body fat, abdominal obesity, and abdominal visceral fat contribution to the diabetic population. Further the present study found that the diabetic sub-population had high visceral fat distribution and body mass index. Same results observed in the study of body composition of male diabetic subjects.

CONCLUSION

From all these results, it was observed that the age, gender, Physical activity, body composition and biochemical analysis of the individuals were significant predictors of diabetes. The important results found that

nearly more than 50 percent of the diabetic populations were unaware of the prevalence of diabetes in them. This study helps to prelude for further research in the field of non-communicable disease.

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