Original Article

BMI, Physical Activity and Diabetes- A Case Control Study in a Rural Area of Kancheepuram district of Tamil Nadu.

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Abstract:

AIMS & OBJECTIVES: To assess the association between physical activity, BMI and diabetes mellitus in a study population. METHODS: A community based case control study to associate BMI, physical activity, and diabetes was conducted in the rural area of Chunampet, Cheyyurtaluk of Kancheepuram district in Tamilnadu, which is under PIMS field practicing area, Rural Health Training Centre under Department of Community Medicine, Pondicherry Institute of Medical Sciences, and Chunampet. Study participants: Adult population aged 35 - 50 years of age. Sample size: 150 cases and 150 controls. Definition of cases: Known diabetics and persons with FBS> 126 mg/dl or

PPBS>200mg/dl. **Definition of controls**: Persons who are not a known a case of Diabetes and with FBS<126 and PPBS<200. **Exclusion criteria**: Critically ill person and Persons with other co morbidities. **Questionnaire**: A pre-designed and pre-tested questionnaire was used. Details regarding their duration of disease, physical activity are collected by house to house survey. Pulse, blood pressure, height in cms, weight in kgs is recorded. Revised BMI Scale was used to grade overweight and obesity. Intensity of physical activity was graded using British Heart Association grading system. **Results:** The study was conducted with 150 Diabetics (Cases) and 150 Non-Diabetics (Controls). Among the 150 Diabetics (Cases), 124 were males and 26 females. And, among the 150 Non-Diabetics (Controls), 124 were males and 26 were females. Cases and controls are matched for sex and age (+/- 5 years). No physical activity was positively associated with diabetes (OR= 1.9, CI= 1.3-4.8, p value<0.05). Overweight (OR=1.7, CI=0.8-2.7, p value<0.05) and obese person (OR=2.9, CI= 1.8-4.1) had higher risk for diabetes. **Conclusion:** The following factors (sedentary life style, obesity) were found to associated with diabetes mellitus and found to be statistically significant (p<0.05)

Key words: Diabetes mellitus, BMI, Case control, Physical activity.

Introduction:

Diabetes is one of the major public health problems in our country. Due to improved curative services and vaccination coverage infectious diseases had been controlled to a great extent. So now there is a shift in disease pattern from communicable to non communicable diseases. Among this diabetes stands first which causes both health and economic burden to the patients as well as country.

There were 62.4 million diabetics in India according to International Diabetes Federation in 2011and the number of deaths due to diabetes in the year 2011 was 983,000[1]. India has the second largest number of diabetics next to China. The nationwide prevalence of diabetes is 9% and in southern cities it is as high as 20% [1]. In western countries the onset of diabetes is at the age of 40's and 50's, but in our country the disease strikes much

earlier. This will affect the economic growth and productivity of India.

The various known risk factors for diabetes such as family history, sedentary life style, age, gender, obesity, dietary habits, decreased physical activity. Several lifestyle factors affect the incidence of type 2 diabetes. Obesity and weight gain dramatically increase the risk [2,3] and physical inactivity further elevates the risk, independently of obesity [2,3,4,5,6,7]. Overweight or obesity was the single most important predictor of diabetes [8]. Lifetime diabetes risk at 18 years of age increased from 7.6 to 70.3% between underweight and very obese men and from 12.2 to 74.4% for women. The lifetime risk difference is lower at older ages [9]. The effect of BMI on diabetes risk is different for black and white Americans, with a larger risk for blacks than whites at low BMI and an equivalent risk for both groups at high BMI [10]. For each 500-kcal increment in energy expenditure, the age-adjusted risk of NIDDM was reduced by 6 percent [11]. Regular physical activity provides health benefits in individuals who have already expressed clinical Diabetes [12]. Thus physical activity and BMI of an individual determines the occurrence of diabetes to a certain extent.

AIMS & OBJECTIVE:

To assess the association between physical activity, BMI and diabetes mellitus in a study population

METHODOLOGY:

Study Setting: A community based age (±5 years) and sex matched case control study to association between physical activity, BMI and diabetes was conducted in the rural area of Chunampet, Cheyyur Thaluk of Kanchipuram district in Tamil Nadu, which is under field practice area, Rural Health Training Centre under Department of Community Medicine, Pondicherry Institute of Medical Sciences. **Study period**: September 2012 to October 2012. **Study participants**: Adult population above 30 years of age. **Sample size**: Based on previous studies sample size was calculated using Epi info software and was found to be 123 for 95% CI. We selected 150 cases and 150 controls. **Definition of cases:** Known diabetics and persons with FBS>126mg/dl or RBS> 140 mg/dl. **Definition of controls:** Persons who are not a known a case of Diabetes and with FBS<126mg/dl or RBS<140mg/dl.

Exclusion criteria: Critically ill person and Persons with other co morbidities. **Sampling:** All eligible participants were selected by doing house to house survey. 3 house visits were made in case eligible subjects were not available on first visit. Subjects who refused and those who were not available despite 3 visits were excluded. **Questionnaire**: A pre-designed and pre-tested questionnaire was used. All subjects were interviewed in local language. Information about socio demographic profile, diabetic status and physical activities was collected. Weight in kgs and height in cms were measured. Blood sugar was estimated using Accu-chek glucometer which uses dependent glucose oxidoreductase mediator reaction. Diabetes was diagnosed if FBS>126mg/dl or PPBS>200mg/dl. All interviews and tests were conducted by interns and post graduates under the supervision of faculties. **Ethical Considerations**: Informed verbal consent was obtained from the study participants before obtaining the data. Provision for referral and service were made for participants who were diagnosed newly as diabetics. **Data Analysis and Statistical Methods**:. The data were entered in the MS excel and analysis was done using SPSS 16. Proportions and Odd's ratio were calculated, Chisquare test was done. Statistical significance were referred to as p<0.05.

RESULTS:

Out of the 300 study subjects 248(82.7%) were men and 52(17.3%) were women. Out of these subjects cases and controls are equally distributed in both sexes.

Maximum number of participants was in the age group of 41-50 years followed by 51-60 years. (Table.1)

Table 1: Association between age and Diabetes

	Cases	Controls	Total	Odd ratio	p value
Gender					
Males	124	124	248(82.7%)	1	1
Females	26	26	52(17.3%)		
Age					

30-40	30(48.4%)	32(51.6%)	62(100%)	Ref	
41-50	79(51%)	76(49%)	155(100%)	1.1	0.9
51-60	35(50.7%)	34(49.3%)	69(100%)	1.1	
61-70	6(42.9%)	8(57.1%)	14(100%)	0.8	

Out of the total study participants most of the participants (81%) do regular physical activities. Among the study participants 34% belong to overweight category and around 7% were obese. (Table.2)

Around 48% of the participants who do regular physical activity are diabetic while 64.2% of the participants who does not do regular physical activity are diabetic. Among the participants in overweight category 57% are diabetic and 73% of the participants in obese category were diabetic. (Table.2)

Table 2: Association between physical activity, BMI and Diabetes

Characteristics	Cases	Controls	Total	Odd's ratio	p value
Regular Physical activity					
No	36(64.2%)	20(35.8%)	56(100%)	2.05	<0.05
Yes	114(46.7%)	130(53.3%)	244(100%)		
BMI					
Normal	76(46.2%)	100(56.8%)	176(100%)		
Overweight	58(56.9%)	44(43.1%)	102(100%)	1.7	<0.05
Obese	16(72.8%)	6(27.2%)	22(100%)	2.9	

Discussion:

From our study we have found out that most of the diabetic cases are in the age group of 41-50(51%), this finding might be due to the fact that majority of the study population belongs to this age group (51.66%). Prevalence of type 2 DM was 46.2% and 56.9%, among subjects who are with normal BMI and overweight respectively. The Odds of developing type 2 Diabetes was 2.9 times among obese people compared to those with normal BMI.

Our findings are similar to other studies which also states that the risk of diabetes is higher among obese and overweight people compared to people normal BMI.[13] Several studies reported independent predictor nature of BMI for development of diabetes.[14,15,16,17,18]

Another study done at U.S shows that the chance of developing diabetes in early ages is more for obese people compared to others, hence early identification of high BMI is necessary for the early diagnosis of Diabetes and thereby Primary prevention [18]. Our study shows that there is an association between physical activity and Diabetes. People not doing any physical activity are affected more by diabetes (64.2%). And the Odds of developing diabetes were 2.05 times more compared to those doing physical activities. Similar findings of significance of association of DM with physical activity were reported by some studies [19].

All these results were obtained after adjusting for age and sex and found to be statistically significant. Our study result shows clearly that there is an association between BMI, physical activity and diabetes. Lack of exercise, a poor diet, were all associated with a significantly increased risk of diabetes. The majority of cases of type 2 diabetes could be prevented by the adoption of a healthier lifestyle. The public generally does not recognize the connection between overweight or obesity and diabetes. Weight control would be the most effective way to reduce the risk of type 2 diabetes. Hence proper Health education targeting all groups is essential. Similar type of community based studies should be done with large sample size.

Conflict of interest: None

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