Prevalence and risk factors associated with diabetes mellitus in local Population of Muzaffarpur, Bihar

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Abstract:

Background: Nowadays Diabetes has become major problem in our society. There were over 72,946,400 cases of diabetes in India in 2017 and number is still arising. Different Risk factors associated with diabetes are- Positive family history, Tobacco and alcohol consumption, Hypertension, Psychological stress, stagnant life style, obesity etc.

Aim: To find out the prevalence and association of various risk factors with diabetes mellitus in Muzaffarpur.

Methods and material: The study consists of 600 people randomly selected from Muzaffarpur region. Demographic data of participants were collected with the help of glucometer, questionnaires and sphygmomanometer, Weighing machine and also statistical analysis was done.

Statistical analysis: Chi-square and t-test was done. P value less than 0.05 was significant.

Result: Overall prevalence of diabetes mellitus was found 5%. Male was more prone (6.35%) to diabetes than female (4.02%). Most of the subjects with diabetes (36.67%) belonged to the age group 41-50 years and maximum prevalence was seen in age group of 51-60 year (12.5%). Most significant risk factors were psychological stress (40%) followed by tobacco consumption (27%), positive family history (30%), Hypertension (24.24%) and obesity (23.53%). Diabetes Mellitus is more prone in those have these risk factors than those without risk factors. Persons with heavy physical activity were least prone (3.34%) to this disease.

Conclusion: Main risk factor of diabetes mellitus is psychological stress and middle age male group were more prone to this disease. Improved lifestyle and awareness of risk factors can decrease prevalence of diabetes.

Keywords: diabetes mellitus; risk factor; psychological stress

INTRODUCTION

Diabetes mellitus (DM) is a disease in which the ability of the body to produce or respond to the hormone insulin is impaired, resulting in abnormal metabolism of carbohydrates and elevated levels of glucose in the blood. Persistent exposure to excessive glucose could be a dominant reason for cardiovascular disease, nephropathies, retinopathies, neuropathies and a variety of different sorts of tissue injury.[1]

Diabetes mellitus additionally leads to vascular disease, hypertension, dyslipidemia, and obesity. The most common type of diabetes is Type 2 (95%), while Type 1 only contributes 4-5%.[2]

International Federation of Diabetes (IDF) reported that approximately 415 million people had diabetes in 2015 (*IDF Diabetes Atlas*, 2017) and almost 1.5 million deaths are directly attributed to diabetes each year (World Health, 2016).

India currently represents 49 percent of the world's diabetes burden, with an estimated 72 million cases in 2017, a figure expected to almost double to 134 million by 2025.[3]

As per the IDF estimates India would gallop to the first position with a diabetes population of 151 million by 2045 and 4352 million people were risk of developing type 2 diabetes.[4]

Waist circumferences (WC), body mass index, smoking habit, hypertension, and total cholesterol level were significantly associated with the diabetes. These factors associated with DM were potentially modifiable. Therefore, targeting the prevention strategy to such modifiable risk factors might reduce the prevalence of diabetes mellitus in the area.[5]

Objective of the study was to find out prevalence rate and associated risk factors of diabetes mellitus in Muzaffarpur.

METHODS

Study setting: The study was conducted in urban area of Muzaffarpur town. It is a city present in state of Bihar, India.

Sample size: A community based cross sectional study was done on 600 persons randomly selected from different areas of Muzaffarpur.

Sample collection: All the subjects included in this study, blood sugar level was calculated with the help of glucometer. Demographic data of subjects was recorded by filling a questionnaire which include following parts: age; family history of diabetes, smoking and tobacco consumption etc. Weights of subjects were calculated with the help of weighing machine. To find out the subject is hypertensive, sphygmomanometer is used. Body Mass Index (BMI) was calculated by BMI = Weight (kg)/height(m^2).

Statistical Analysis: chi-square test was performed to determine the degree of deviation of the experimental results from the expected results. t-test was done to know the significance of difference between two means of diabetic and non-diabetic subjects. P value less than 0.05 was considered significant.

RESULTS

This study was done from August 2018 to September 2019 on 600 people in which number of male and female subjects were 252 and 348 respectively. All the subjects were taken from different urban area of Muzaffarpur city.

Table 1: Most of the subjects suffering from diabetes (36.67%) belonged to the age group 41-50 years followed by age groups 51-60 years (26.67%) and 31-40 years (20%).

Table 1: Age distribution of subjects

Age-group (years)	Total	male	female	Diabetic male (%)	Diabetic female (%)	Total-diabetic (%)
20-30	136	60	76	0 (0)	0 (0)	0 (0)
31-40	124	40	84	2 (12.5)	4 (28.57)	6 (20)
41-50	142	72	70	7 (43.75)	4 (28.57)	11 (36.67)
51-60	64	20	44	3 (18.75)	5 (35.71)	8 (26.67)
61-70	100	44	56	3 (18.75)	1 (7.15)	4 (13.33)
71-80	28	14	14	1 (6.25)	0 (0)	1 (3.33)
81-90	6	2	4	0 (0)	0 (0)	0 (0)
Total	600	252	348	16 (100)	14 (100)	30 (100)

Table 2: Overall prevalence of diabetes in the study population was found to be 5% and prevalence of diabetes among male and female population was found 6.35% and 4.02% respectively. Maximum prevalence was seen in age group 51-60 years (12.5%) followed by age group 41-50 years (7.77%).

Table 2: Prevalence of diabetes in different age group (%)

Age group	Male	Female	Total
21-30	0%	0%	0%
31-40	5%	4.76%	4.84%
41-50	9.72%	5.71%	7.775%
51-60	15%	11.36%	12.5%
61-70	6.82%	1.78%	4%
71-80	7.14%	0%	3.57%
81-90	0%	0%	0%
Total	6.35%	4.02%	5%

Table 3: Among the various risk factors present in this area, a high prevalence of diabetes was seen among those with high level of psychological stress (20%) followed by those with positive family history (15%) consume tobacco (13.57%), hypertensive (12.12%), and obese (11.79%). Although Alcohol consumption is also a major risk factor for diabetes but in Bihar liquor consumption has been diminished due to ban of alcohol, as implemented through the Bihar government Prohibition and Excise act that came into effect on April 1, 2016; therefore presently it is not a significant risk factor in this area.

Table 3: Prevalence % of risk factors among all subjects

Risk Factors	Male% (n)	Female% (n)	Prevalence of risk factors in all subject% (n)	Prevalence of diabetes in factors% (n)
Positive family history	11.9 (30)	20.11(70)	16.67 (100)	15 (15)
Tobacco Consumption	45.24 (114)	7.47 (26)	23.33 (140)	13.57 (19)
Non-vegetarian	19.04 (48)	7.47 (26)	12.33 (74)	8.11 (6)
Obesity — BMI	11.9 (30)	10.92 (38)	11.33 (68)	11.79 (8)
Obesity — Waist circumference	23.81 (60)	21.84 (76)	22.67 (136)	8.83 (12)
Hypertension	19.84 (50)	23.56 (82)	22 (132)	12.12 (16)
Psychological Stress	8.73 (22)	16.67 (58)	13.33 (80)	20 (16)

Table 4: It was observed that the prevalence of diabetes was found to be comparatively more in any risk factors category than in those not having risk factors.

Table 4: Prevalence of Diabetes compared in those with the Risk Factors and those not having the risk factors %

Risk Factors	Prevalence of diabetes in those with risk factors % (n)	Prevalence of Diabetes without risk factors % (n)
Positive family history	15 (15)	3 (15)
Tobacco Consumption	13.57 (19)	2.39(11)
Non-vegetarian	8.11 (6)	4.57 (24)
Obesity—BMI	11.79 (8)	4.14(22)
Obesity—Waist circumference	8.83 (12)	3.88(18)
Hypertension	12.12 (16)	2.99 (14)
Psychological Stress	20 (16)	2.69 (14)

Table 5: Diabetes was comparatively more prevalent in subjects with light activities (7.96%) than moderate (3.95%) and severe (3.34%) activities, both in male and female.

Table 5: Prevalence of Diabetes among subjects with Light, Moderate and Heavy Physical Activity % (n)

Physical-activity	Male	Female	Total
Light	7.40 (4)	8.2(10)	7.96(14)
Moderate	7.85(8)	1.98(4)	3.95(12)
Heavy	4(4)	0(0)	3.34(4)
Total	6.35 (16)	4.02(14)	5(30)

Table 6: Result of this study showed that most significant risk factor for diabetes mellitus is psychological stress (p=0.000). Non- vegetarian diet (p= 0.1245) did not show any statistical significance, so it was not a significant risk factor for diabetes mellitus.

Table 6: significance of association of diabetes with the risk factors

Risk factors	occurrence	Diabetics (n)	Non-diabetics (n)	Chi-square value	P-value
Obesity (BMI)	Present absent	8 22	52 518	9.747	0.0018
Tobacco consumption	Present absent	19 11	102 468	36.549	0.000
Non-vegetarian diet	Present absent	6 24	62 508	2.360	0.1245
Hypertension	Present absent	16 14	100 470	23.407	0.000
Positive family history	Present absent	15 15	70 500	33.346	0.000
Psychological stress	Present absent	16 14	48 522	60.330	0.000
Obesity(WC)	Present absent	12 18	112 458	7.199	0.0073

DISCUSSION

The present study is a cross sectional community based screening of people aged 20 years or more residing in the urban areas of Muzaffarpur. The study verifies the prevalence of diabetes, its rising prevalence, increasing development at lower ages and its association with obesity and hypertension and other risk factors, as has been found in other studies/ screening world-wide including those by International Diabetes Federation (IFD) and the Indian Council of Medical Research (ICMR).Diabetes is most prevalent in the age group 51-60 years (12.5%). The prevalence of diabetes gradually peaks in this age group followed by a rapid decline towards the older age groups. Both females and males show similar trend in the prevalence of diabetes in the different age groups. According to *National Public Health Institute, Helsinki, Finland,* the prevalence of diabetes increased with age, peaked at 60–69 years of age followed by a decline at the 70 years of age in Indian subjects.[6] The prevalence of diabetes is higher in the younger age group of 31-50 years. The S. Birhanu also emphasis the development of diabetes at younger ages in his studied population.[7] Here also, this same trend is observed among both males and females.

Among the study subjects, there is a prevalence of positive family history of diabetes- 16.67% and the prevalence of diabetes among those with a positive family history of diabetes is 15%. Among the subjects with a negative family history of diabetes, 3% have diabetes. Genetic predisposition has a proven role in etiology of diabetes mellitus leading to familial aggregation of diabetes. The result of this study underscores the relevance of this association in the studied population.[8]

The prevalence of tobacco consumption is 23.33% among the participants and the prevalence of diabetes is quite high at 13.57% among those who consume tobacco in any form, chewing or smoking and relatively less prevalence of diabetes is seen in those who do not take tobacco- 2.39%. A study by Ito H et al showed prevalence of current smoking among type-2 diabetic patients being 35%.[9] Another study revealed that approximately 20% of adults aged 18 years or older with type-2 diabetes were current smokers.[10]

In the current study, 12.33% of the participants are non-vegetarians and diabetes prevalence among them is 8.11%. While among the vegetarians (87.67%), it is 4.72%. The difference, however, is not significant (p value=0.1245). It has been proposed in some studies that vegetarian diet reduces the risk of diabetes.[11,12]

The prevalence of diabetes among subjects with light , moderate and heavy grade physical activities is (7.96%), (3.95%) and (3.34%) respectively, which indicates a significantly higher prevalence of diabetes among subjects with light grade of physical activity compared to moderate and heavy grade. In Akula Sanjeevaiah's study, People are more likely to be diagnosed with diabetes with a decreasing level of physical activity and similar observations were prevailing in the present study.[13]

Obesity was identified by two different anthropometric indices, BMI and Waist circumference (WC). As per criteria of BMI 11.33% of the subjects are obese whereas as per criteria of waist circumference, 22.67% of the subjects are obese. Diabetes is seen to be widely prevalent in both the classification of obesity i.e. as per criteria of BMI and WC. 11.79% of the BMI obese have diabetes. Those obese as per WC criteria have 8.83% diabetes prevalence. The non-obese have significantly much lower prevalence of diabetes (4.24%). Obesity has a proven causative role in diabetes.[14] The association in the present study is significant as per Chi square test (p=0.0018). Most of previous studies underscore this association.[15]

The prevalence of diabetes among the hypertensives is significantly higher, with a four-fold prevalence in this study. Similar figures have been quoted by Mullican et al. (2009) and Gress et al. (2000).[16, 17] In the present study 22% 0f the subjects have hypertension. Diabetes is found in 12.12% of the hypertensives.

The prevalence of Psychological stress among the subjects is 13.33% and the prevalence of diabetes is quite high at 20% among those living with some kind of psychological stress and relatively less prevalence of diabetes is seen in those subjects not living a stressful life – 2.69%.The association between Psychological stress and diabetes is very significant (p=0.00). Chida *et al* reported association of psychosocial factor with the prognosis of diabetes and as etiological effect was inclusive.[18] Another study on working women reported psychosocial work stress as independent predictor of type 2 diabetes among women after a 15-year follow-up.[19]

CONCLUSION

The investigation showed a 5% prevalence of diabetes mellitus which was to some degree higher than the report of ICMR-INDIAB population based examination in which prevalence of diabetes was observed 4.3% in Bihar in 2017. This outcome is a disturbing condition, as just in two years the prevalence rate expanded by 0.8%. Diabetes is more prone in males as compare to females. Because of ignorance of individuals, stale way of life, high pace of absence of education (37%), high pace of tobacco utilization (25.9%) and a lot more factors are answerable for an expansion in the prevalence of diabetes. Among these psychological stresses is one of the most significant factor related with diabetes followed by positive family history, tobacco utilization, hypertension, obesity. Numerous elements related with diabetes were modifiable. So by spreading awareness among individuals the predominance of diabetes can be diminished around there.

ABBREVIATIONS: DM- diabetes mellitus

CONFLICT OF INTEREST:
Authors declared that there is no conflict of interest.

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