ORIGINAL ARTICLE

Prevalence of complications of Type 2 Diabetes Mellitus and its association with different risk factors in Urban Etawah, Uttar Pradesh

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Citation

Sachan N, Srivastava DK, Jain PK, Singh SK, Mahima, Shukla SK. Prevalence of complications of Type 2 Diabetes Mellitus and its association with different risk factors in Urban Etawah, Uttar Pradesh. Indian J Comm Health. 2021;33(4):597-602. https://doi.org/10.47203/IJCH.2021.v33i04.010

Source of Funding: Nil **Conflict of Interest:** None declared

Article Cycle

Received: 29/10/2021; **Revision:** 23/11/2021; **Accepted:** 07/12/2021; **Published:** 31/12/2021

Abstract

Background- India is experiencing a rapid health transition, with large and rising burdens of chronic diseases, which were estimated to account for 53% of all deaths in 2005. Earlier estimates projected that the number of deaths attributable to chronic diseases would rise from 3·78 million in 1990 (40·4% of all deaths) to 7·63 million in 2020 (66·7% of all deaths). **Aims and Objectives-** To find out the prevalence of Complications of Type 2 Diabetes Mellitus and its association with different risk factors in Urban Etawah (U.P.) including tobacco, alcohol, fatty meals and physical activity. **Material and Methods-** The present study is a community-based study performed among 400 participants using cluster sampling technique in the field practice area of Urban health training centre, Department of Community Medicine, UPUMS, Saifai, Etawah. The participants were interviewed using a pre-tested questionnaire using Diabetes Complication Index. **Results-** Among the diabetics, the prevalence of coronary heart disease (CHD), peripheral vascular disease (PVD), cerebrovascular accidents (CVA), cataract, neuropathy and foot problems were 24%, 24%, 7%, 15.4%, 38%, 26% and 2% respectively. A statistically significant association was seen with fatty meals and complications. **Conclusion -** All the diabetic complications observed need to be addressed in prevention and control strategies in the study area. Heath screening camps will be organized for the people for awareness.

Keywords

Diabetes; Complications; Non Communicable Diseases; Diabetes Complication Index

Introduction

Non-communicable diseases (NCDs) are responsible for a high proportion of deaths and disabilities. WHO estimated that by 2020 NCDs are predicted to account for 73% of deaths and 60% of disease burden.(1)

Noncommunicable diseases (NCDs) kill 41 million people each year, equivalent to 71% of all deaths globally.(2) Among NCD-related deaths, 45% are due to CVDs (coronary heart disease, stroke, and HTN), 22% are chronic respiratory diseases, 12% are cancers, and 3% are due to DM.(3)

Diabetes mellitus (DM) is a major public health problem showing a rising prevalence worldwide.(4) According to WHO, Diabetes can be defined as "A serious, chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood glucose), or when the body cannot effectively use the insulin it produces."(5)

Type 2 diabetes mellitus (T2DM) is the most common form of diabetes constituting 90 percent of the diabetic

population.(6) The prevalence of type 2 diabetes mellitus is increasing worldwide and it is projected that the total number of people with diabetes will rise from 366 million in year 2011 to 552 million by year 2030.(7)

According to WHO global report 2016, globally, an estimated 422 million adults were living with diabetes in year 2014, compared to 108 million in year 1980.(8)

Because of epidemiological transition the pattern of the diseases has shifted towards the beginning of certain chronic and life styles ailments such as cardiovascular disorders, COPD, cancer, hypertension, obesity, etc.(9)

Majority of the studies are hospital based, on complications and on estimation of the prevalence of different complications so there is an urgent need to assess the complication of diabetes using field-based study as majority of the cases are left unrecognised and thus correct prevalence cannot be estimated. So, the present study is designed to find out the prevalence of different complications of type 2 diabetes mellitus and its association with different factors in urban Etawah using a field-based approach. (10)

Aims & Objectives

1. To find out the prevalence of Complications of Type 2 Diabetes Mellitus
2. To find out the association of diabetic complications with different risk factors.

Material & Methods

Study Type- community-based cross-sectional study

Study Population- diabetic participants aged above 18 years

Study Area- field practice area of Urban health training centre, Department of Community Medicine, UPUMS, Saifai, Etawah.

Sample Size calculation- The sample size was calculated by using the following formula-***N = 4PQ/L² × design effect***

Where Prevalence (P) = 6.9% (4), Q = 1-P and Absolute Error (L) = 4%.

Since the study was proposed to collect the sample based on two-stage cluster sampling technique. Design effect of 2 was used in the above formula.

N = 2 × 4 × (6.9) × (93.1) / 4 × 4 = 322

Hence, the minimum required sample size calculated was 322. So for the convenience, it was rounded off to **400** participants.

Sampling technique: cluster sampling

Inclusion Criteria:

1. Age 18 years and above.
2. Residents of urban Etawah.
3. Patients who were known diabetics (type 2).
4. Including risk factors are tobacco, alcohol, fatty meals and physical activity (adequate means 35 minutes/day exercise for 5 days).

Exclusion Criteria:

1. Persons not willing to participate in the study.
2. Patients who were severely ill, mentally challenged or unable to communicate.
3. Recently diagnosed for type 2 diabetes (≤ 2 months).

Study Tool - Diabetes Complications Index (DCI)

It is a 17-item questionnaire to identify prior diagnoses and current symptoms of 6 common complications of type 2 diabetes.(11)

Each complication is ascertained by 2 or more questions. For example, coronary artery disease is present if the patient reports having had a myocardial infarction, symptoms of angina pectoris, or having been given the diagnosis by a physician. The specific questions, structure, and scoring of the DCI was done. It is calculated as the simple unweighted sum of any of the 6 complications that are present, resulting in scores ranging from 0 to 6

Strategy for collection-

Two-stage cluster sampling technique was used. Initially the list of all the wards of urban Etawah was obtained from the office of municipal co-operation Etawah. There were total 36 municipal wards. Out of them, 10 municipal wards were selected by using cluster sampling technique. Then selection of mohalla was done from each ward by using simple random sampling. The required sample size was 400 and we had 10 wards. So, we had to take 40 subjects from each village to get the desired sample. Hence, on reaching to the selected mohalla, started from a fixed point which was a school, temple or any structure of public importance, we moved on to the left-hand direction to interview 40 participants through house to house survey method. If eligible candidate was available (using inclusion/exclusion criteria), then data was collected by using pre tested semi-structured questionnaire. If more than one participants were available, we included the person who have longest history of diabetes mellitus type 2 provided he/she gave the consent to participate in the study. If he/she did not give the consent then the participant available in the next house was approached. (Figure 1)

Data Analysis: The Data thus collected were entered in Micro-Soft Excel work sheet which was analysed using SPSS V- 24.0, IBM Inc. Chicago, USA software. Chi square test and univariate logistic regression analysis were applied for analysis and interpretation of data.

Pretesting of questionnaire: After defining and finalizing the methodology and designing the study tools, a pilot study was conducted among 100 participants in the wards other than study area and preliminary analysis had been done. Those participants were not included in the study. The questionnaire was pretested for ambiguity, clarity, sequencing and understanding of the instructional questions. Questionnaire was translated into local language Hindi.

Ethical approval: Ethical clearance was obtained from Institutional Ethical Committee, Uttar Pradesh University of Medical Sciences, Saifai, Etawah.

Consent- Informed written consent was taken from all study subjects, no pressure or coercion was exerted on subjects for participation in the study. Confidentiality and privacy was ensured at all stages.

Results

Table 1 shows the sociodemographic profile of the study subjects. Among age group majority of the subjects belonged to 50-59 years (40.5%) followed by 40-49 years. Minimum subjects were in the age group more than 70 years (5.0%). There was statistically significant association seen between age group and complications of type 2 diabetes mellitus. Similar findings were observed in the study done by Bhalerao SD et al.(12)

There were total 400 participants, out of them 247 (61.8%) were males, 90.8% were hindus, 43.3% were OBCs, majority of them were housewives (35.5%). It was may be due to more number of housewives were included as study participants. Occupation was found to be statistically significant. Maximum subjects were graduate (22.1%) and maximum belonged to lower middle socioeconomic status according to modified B.G. Prasad's Classification.(13)

Table 1. shows that 45.3% subjects had diabetes mellitus complications (DMC) were from age group 50-59 years with odds ratio OR-0.15 (0.06-0.34). it was observed that more DMC was found in males (65.0%), Hindus (90.6%), OBC (43.9%), housewife (32.7%) with OR 2.9 (1.3-6.4), lower middle class socioeconomic status (61.4%) with OR 0.22 (0.04-1.10) respectively.

Table 2 illustrates that maximum study subjects 41.7% were diabetics from 5-10 years. A rising trend of most of the diabetic complications was seen as the duration of diabetes increases. A statistically significant association was observed between duration of diabetes and CAD (p=0.001), PVD (p=0.026) and eye problems (p=0.001) respectively. This means as the duration increases, these complications also tends to increase.

Table 3 shows association of different risk factors with DMC. 39.8% study subjects were consuming tobacco. DMC were present in 43.5% tobacco users. Similarly, 20.5% study subjects were consuming alcohol and DMC were present in 22.8% alcoholics. Approximately half of the study subjects were taking fatty meals. Out of them, DMC were present in 44.4% who take fatty meals **(p=0.001)**. This shows a statistically significant association. Nearly 20% study subjects were doing adequate physical activity while 18.8% subjects were having DMC.

Figure 2 depicts the prevalence of complications of type 2 diabetes mellitus. In the present study, eye problems had maximum prevalence of 45.7% followed by peripheral vascular disease (40.8%) neuropathy (39.4%), coronary artery disease (22.8%), cerebrovascular accidents (12.6%) respectively. Minimum prevalence was seen in foot problems (4.0%).

Figure 3 shows the frequency distribution of diabetes complication index (DCI) score. The number denotes the combination of DMCs. That is 44.3% subjects were having diabetes with no complications, 26.3% had at least one complication, 18.8% had two complications, 8.5% had three, 1.3% had four, 1% had 5 complications and so on while none of them were having all six complications.

Discussion

In the present study, eye problems had maximum prevalence of 45.7% followed by peripheral vascular disease (40.8%) neuropathy (39.4%), coronary artery disease (22.8%), cerebrovascular accidents (12.6%) respectively. Minimum prevalence was seen in foot problems (4.0%). it was observed that more DMC was found in males (65.0%), Hindus (90.6%), OBC (43.9%), housewife (32.7%) with OR 2.9 (1.3-6.4), lower middle class socioeconomic status (61.4%) with OR 0.22 (0.04-1.10) respectively. Maximum study subjects 41.7% were diabetics from 5-10 years. A rising trend of most of the diabetic complications was seen as the duration of diabetes increases. A statistically significant association was observed between duration of diabetes and CAD, PVD and eye problems respectively. 39.8% study subjects were consuming tobacco and 20.5% study subjects were consuming alcohol. Approximately half of the study subjects were taking fatty meals. This shows a statistically significant association. Nearly 20% study subjects were doing adequate physical activity.

44.3% subjects were having diabetes with no complications, 26.3% had at least one complication, 18.8% had two complications, 8.5% had three, 1.3% had four, 1% had 5 complications and so on while none of them were having all six complications.

In a study done by Abejew AA *et al* (14), he found that 129 (59.7%) patients were suffering from at least one complication of diabetes. Hypertension (43.3%), visual disturbance (28.9%), and neuropathy (14.4%) were found to be the three most common chronic complications.(14) In univariate analysis done by Maniarasu K *et al* (15), with risk factors for diabetic complications he had seen that elderly subjects had two times the odds ratio of having at least one complication of diabetes, similarly those with increased duration of diabetes (more than 36 months) had twice the odds ratio and those who did not get any advice on life style modification also had observed two times the odds of getting at least one complication of diabetes.(15)

Conclusion

Eye problems had the maximum prevalence in our study so there is urgent need to be addressed in prevention and control strategies for that in the study area. Heath screening camps will be organized for the people for awareness.

Recommendation

For better health of the people we have to reduce these complications and avoid risk factors. Health camps are needed. So that, there should be regular screening of eyes,

blood sugar, blood pressure and lipid profile as majority of the complications can be screened by using these measures. Diabetics should be motivated for healthy diet, exercise, lifestyle modifications and regular screening using different IEC methods- posters, television, radio etc. regarding regular screening of these complications as majority of the study participants were unaware.

Limitation of the study

All population of Etawah is not included so the result may not be generalized to all the population. The sample size was not very large.

Relevance of the study

This study reveals that how much is the prevalence of complications of diabetes and risk factors which contributes to chronic disease burden. It has important public health implication. By the end of the study we came to know that which complication has more prevalence so that it can be reduced early.

Authors Contribution

All author has contributed in the study in the form of study proposal, data collection and cleaning, data analysis and interpretation, paper writing etc.

Acknowledgement

I am grateful to all the study participants and staff who have participated in the study and all the authors for their cooperation in the conduct of this study.

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Tables

TABLE 1 UNIVARIATE LOGISTIC REGRESSION ANALYSIS OF SOCIO-DEMOGRAPHIC PROFILE FOR STUDY SUBJECTS

	Variables	Diabetes complications present (N=223) (n,%)	Diabetes complications absent (N=177) (n,%)	Total (N=400) (n,%)	OR (95%CI)	p-value
Age (years)						
a.	**≤39**	8 (3.6)	32 (18.1)	40 (10.1)	1	
b.	**40-49**	36 (16.1)	56 (31.6)	92 (23.0)	0.39 (0.16-0.93)	**0.03**
c.	**50-59**	101 (45.3)	61 (34.5)	162 (40.5)	0.15 (0.06-0.34)	**0.001**
d.	**60-69**	64 (28.7)	22 (12.4)	86 (21.5)	0.08 (0.03-0.21)	**0.001**
e.	**≥ 70**	14 (6.3)	6 (3.4)	20 (5.0)	0.01 (0.03-0.36)	**0.001**
Gender						
a.	**Male**	145 (65.0)	102 (57.6)	247 (61.8)	1	
b.	**Female**	78 (35.0)	75 (42.4)	153 (38.3)	1.36 (0.91-2.05)	0.13
Religion						
a.	**Hindu**	202 (90.6)	161 (91.0)	363 (90.8)	1	
b.	**Muslim and others**	21 (9.4)	16 (9.0)	37 (9.2)	0.95 (0.48-1.89)	0.89
Caste						
a.	**General**	76 (34.1)	71 (40.1)	147 (36.8)	1	

b.	**OBC**	98 (43.9)	75 (42.4)	173 (43.3)	0.81 (0.52-1.27)	0.37
c.	**SC/ST**	49 (22.0)	31 (17.5)	80 (20.0)	0.67 (0.38-1.17)	0.16
Occupation						
a.	**Unemployed**	31 (13.9)	10 (5.6)	41 (10.3)	1	
b.	**Unskilled**	35 (15.7)	24 (13.6)	59 (14.8)	2.12 (0.88-5.13)	0.09
c.	**Semi-skilled**	8 (3.6)	3 (1.7)	11 (2.8)	1.32 (0.28-6.12)	0.71
d.	**Skilled**	14 (6.3)	7 (4.0)	21 (5.3)	1.5 (0.48-4.9)	0.45
e.	**Clerk/shop owner/farm owner**	33 (14.8)	41 (23.2)	74 (18.5)	3.8 (1.6-8.9)	**0.001**
f.	**Professional**	14 (6.3)	19 (10.7)	34 (8.3)	3.8 (1.3-10.5)	**0.01**
g.	**Housewife**	73 (32.7)	69 (39.0)	142 (35.5)	2.9 (1.3-6.4)	**0.007**
h.	**Retired**	15 (6.7)	4 (2.3)	19 (4.8)	0.82 (0.22-3.07)	0.77
Education						
a.	**Illiterate**	29 (13.0)	16 (9.0)	45 (11.3)	1	
b.	**Primary**	35 (15.7)	29 (16.4)	64 (16.0)	1.5 (0.68-3.28)	0.3
c.	**Middle**	34 (15.2)	29 (16.4)	63 (15.8)	1.54 (0.70-3.39)	0.27
d.	**High School**	34 (15.2)	34 (19.2)	68 (17.0)	1.8 (0.83-3.92)	0.13
e.	**Intermediate**	46 (20.6)	26 (14.7)	72 (18.0)	1.02 (0.47-2.22)	0.95
f.	**Graduate and above**	45 (20.1)	43 (24.3)	88 (22.1)	1.73 (0.82-3.62)	0.14
Socio-economic status						
a.	**Upper**	2 (0.9)	7 (4.0)	9 (2.3)	1	
b.	**Upper Middle**	27 (12.1)	16 (9.0)	43 (10.8)	0.16 (0.03-0.91)	**0.03**
c.	**Middle**	48 (21.5)	40 (22.6)	88 (22.0)	0.23 (0.04-1.2)	0.08
d.	**Lower Middle**	137 (61.4)	108 (61.0)	245 (61.3)	0.22(0.04-1.10)	0.06
e.	**Lower**	9 (4.0)	6 (3.4)	15 (3.8)	0.19 (0.02-1.2)	0.08

TABLE 2 ASSOCIATION OF DURATION OF DIABETES MELLITUS AND PREVALENCE OF VARIOUS COMPLICATIONS AMONG STUDY SUBJECTS

Duration of DM (years)		Total	CAD	PVD	CVA	Neuropathy	Eye problem	Foot problem
		N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
a.	**< 5**	**133 (33.3)**	8 (12.7)	20 (22.0)	7 (25.0)	22 (25.0)	21 (20.6)	2 (22.3)
b.	**5-10**	**167 (41.7)**	24 (38.1)	42 (46.2)	10 (35.7)	43 (48.9)	42 (41.2)	3 (33.3)
c.	**> 10**	**100 (25.0)**	31 (49.2)	29 (31.9)	11 (39.3)	23 (26.1)	39 (38.2)	4 (44.4)
Total		**400 (100.0)**	**63 (100.0)**	91 (**100.0**)	28 (**100.0**)	88 (**100.0**)	102 (**100.0**)	9 (**100.0**)
χ^2 (df=2)			27.6	7.27	3.33	3.73	16.2	1.7
p-value			**0.001**	**0.026**	0.189	0.154	**0.001**	0.472*

** Fischer's exact test was applied; Multiple responses were recorded thats why total participants may increase; CAD- coronary artery diseases, PVD- peripheral vascular diseases, CVA-cerebrovascular accidents*

TABLE 3 ASSOCIATION OF DIFFERENT RISK FACTORS WITH DM 2 COMPLICATIONS AMONG STUDY SUBJECTS

Variable		Complications present (n=223)	Complications absent (n=177)	Total (N=400)	Chi-square (df=1)
Tobacco	Yes	97 (43.5)	62 (35.0)	159 (39.8)	χ^2 = 2.96
	No	126 (56.5)	115 (65.0)	241 (60.3)	p-value= 0.086
Alcohol	Yes	51 (22.8)	31 (17.5)	82 (20.5)	χ^2 = 1.59
	No	172 (77.2)	146 (82.5)	318 (79.5)	p-value= 0.206
Fatty meals	Yes	99 (44.4)	107 (60.5)	206 (51.5)	χ^2 = 10.18
	No	124 (55.6)	70 (39.5)	194 (48.5)	p-value= **0.001**
Physical activity	Yes	42 (18.8)	44 (24.9)	86 (21.5)	χ^2 = 2.12
	No	181 (81.2)	133 (75.1)	314 (78.5)	p-value= 0.145

Figures

FIGURE 1 FLOW DIAGRAM FOR PARTICIPANTS SELECTION

FIGURE 2 PREVALENCE OF COMPLICATIONS OF DIABETES MELLITUS AMONG STUDY SUBJECTS (N=400)

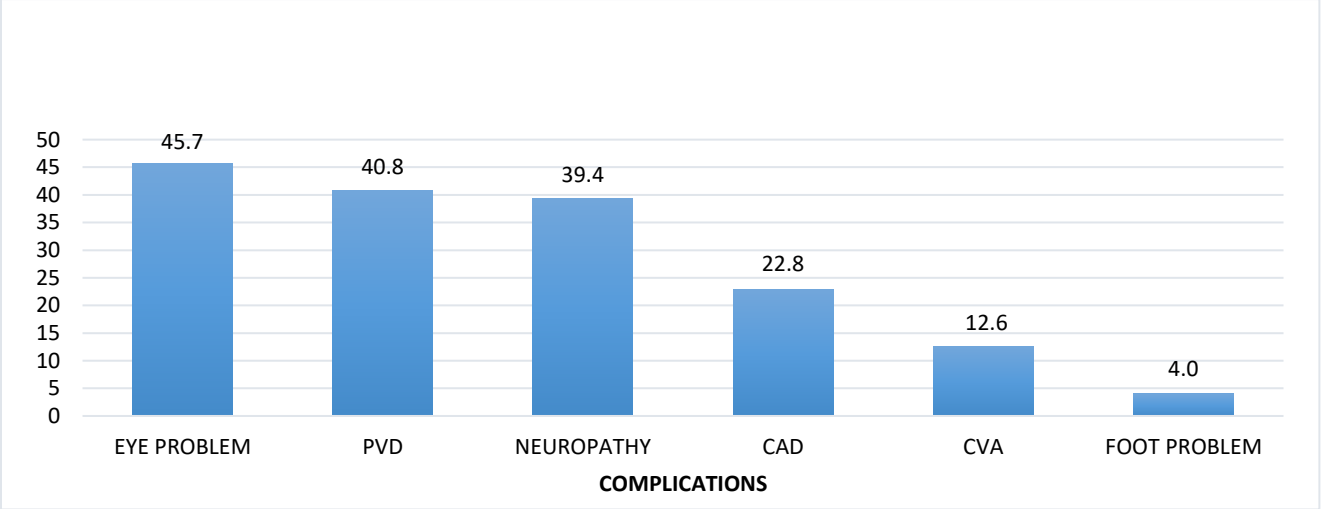

FIGURE 3 FREQUENCY DISTRIBUTION OF DIABETES COMPLICATION INDEX (DCI) SCORES (N=400)