Original Research Article

A community based cross sectional study to assess the prevalence and pattern of co- morbidities among known type 2 diabetic patients of urban slum of North Karnataka, India

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ABSTRACT

Background: India is the second largest home for type 2 diabetes mellitus patients. The chronic nature of disease along with high prevalence of "co morbidities" make its management tricky. Hence this multiple health conditions lead to faster decline in quality of health, which poses a great concern on the health-care delivery system as well as on patients' pocket. The objective of the study was to assess the prevalence of co-morbidities among known type 2 diabetic patients residing in urban slums of the field practice area of a Medical College in North Karnataka.
Methods: It was a cross-sectional study done in urban slums among type 2 diabetics, sample size was calculated to be 155. Semi-structured questionnaire was used to collect information regarding socio-demographic data and history of co-morbidities; height, weight and blood-pressure were measured using standard criteria. HbA1C level was checked using single use HbA1C Now+ kit by BHR diagnostics.
Results: Out of 158 type 2 diabetics in our study, 86.7% had presence of one or the other co-morbidity. 61.9% and 51.5% of male and female participants had HbA1c levels >7.0 respectively, this was statistically significant. HbA1c level and BMI were significantly associated with presence of co-morbidities in our study population.
Conclusions: Results show high prevalence of co-morbidities among type 2 diabetics. Hypertension, obesity, depression and neuropathy are the commonest co-morbidities. So, prevention of such co-existing diseases improves the quality of life of the sufferers.

Keywords: Type 2 diabetic mellitus, Co-morbidities, Hypertension, HbA1c

INTRODUCTION

Diabetes mellitus (DM) is one of the oldest disease known by man.[1] In 1988, type 2 DM was described as a element of metabolic syndrome.[2] Type 2 DM (formerly known as non-insulin dependent DM) is the most common type of DM characterized by body's ineffective use of insulin. It is an outcome of interaction between environmental, genetic, and behavioral risk factors.[3] People living with type 2 DM are exposed to various forms of short- term and long-term complications, which

frequently lead to early onset death. This increased tendency of morbidity and mortality is because of uniqueness of type of DM which is ice berg phenomenon, characterized by insidious onset and late recognition, especially in resource-poor developing countries like India.[4]

Prevalence of diabetes mellitus has dramatically increased since last decade. The World Health Organization (WHO) had estimated that 9% of the world's population was diabetics in 2014, and around

90% of them were having type 2 diabetes mellitus. It is estimated that, type 2 diabetes leads to 5 million deaths every year, usually from cardiovascular diseases (CVD). It is expected to rise to 7th cause of death globally by 2030.[5] Type 2 DM is the disease associated with life style changes; therefore its load is raising in low and middle income countries, as a result of influence of recent urbanization and industrialization.

India is the epicenter for diabetes mellitus epidemic in the world.[6] It has second highest number of population with diabetes mellitus i.e., ~69 million individuals as of 2015.[6] India has topped the world with the highest number of people living with type 2 diabetes mellitus in 2000, followed by China and United States in second and third place respectively.[7] Hence it is called Capital of diabetes mellitus. Apart from being a chronic debilitating disease the high prevalence of co-existing chronic medical conditions or "co morbidities" make diabetes management a grueling task for the patient as well as for treating physicians.[8] Preceding studies have established that most adults with diabetes have at least one co morbid state and 40% have three or more co morbid states, but still the perspective of the physicians and treatment strategies are more focused on management of diabetes alone.[9,10] For best health care delivery and for developing strategies that support self-management among the diabetes patients, we need to realize how the number, type, and severity of co morbidities influence these patients' management. In an overburdened health care system like India co morbid conditions may transform the providers' attention away from diabetes.[8] Co morbidities may also serve as competing demands on patients' resources, and possibly reduce the amount of time and energy left for diabetes self-care. Even conditions not straight away related to diabetes, such as pain and depression, are more prevalent in diabetics, thus stressing the need to take into account both diabetes-related and non-diabetes related co morbidities. Prior studies done in various parts of India have mostly concentrated on single co morbidities like either hypertension or depression or retinopathy etc. So, we conducted this study in the urban slum to emphasize on all the important co-morbidities that may be present in the type 2 diabetic patients.

Objectives

The objective of the study was to assess the prevalence of co-morbidities among known type 2 diabetic patients residing in the Urban slums of the field practice area of a Medical College in North Karnataka.

METHODS

It was a community based cross sectional study, conducted in the urban field practice area (Slum population) of BLDEU's Sri B M Patil Medical College, Vijayapur which is situated in North Karnataka. The study was conducted between January 2016 and December 2016. The study population was known type 2

diabetic patients, they were identified by house to house survey of the area. The sample size was obtained by taking prevalence of self-reported type 2 diabetes mellitus as 10.22%, in Karnataka at 95% confidence interval and 5% absolute allowable error.[11] The formula used for calculation was $n=4pq/l^2$, sample size came to be 141, after taking 10% of non-compliance rate, final sample size calculated was around 155. People with known history of type 2 diabetes mellitus aged between 30-65 years were included in the study and diabetics patients aged <30 years and >65 years; people with gestational DM and type -1 diabetes mellitus patients and those who are not willing to participate in study were excluded from the study.

After obtaining ethical clearance from the Institutional ethical committee, the study was carried out. The purpose and nature of the study and confidentiality of the data were explained to the participants and their consent was taken, total 1260 houses were included for house to house survey covering the population of 10000, and enumeration of all the known type 2 diabetics in the age group of 30–65 yrs residing in the area was done. Participants who fulfilled the inclusion criteria were then interviewed using semi structured questionnaire to assess the socio-demographic characters and history of diabetic complications and co-morbidities, PHQ-9 was used to assess the depression.

Height was measured by using non stretchable measuring tape to the nearest of 0.1 cm. Weight was recorded using a standardized Bathroom weighing scale to the nearest of 0.1kg. Body mass index was then calculated. Two readings of blood pressure was recorded 5 minutes apart using a mercury sphygmomanometer on right arm in sitting posture. Average of two readings was used for analysis. Blood HbA1c levels were measured by using HbA1c Now+ Single use Kit.

Statistical analysis

The data was compiled in Microsoft (MS) Excel sheet and analyzed using SPSS (Statistical Package for Social Sciences) software version 16.0. All characteristics were summarized descriptively as numbers, percentage, and graphs wherever necessary. Chi square test (χ^2) was employed to determine the significance of associations between C-morbidities and socio-demographic data.

RESULTS

158 people with type 2 diabetes mellitus participated in the study. A majority of 36.7% of the participants belonged to age group of 30–40 yrs, followed by 26.6% belonging to age group of 51–60 yrs. Gender distribution of the study participants showed that 60.1% were females and 39.9% were males. Distribution of marital status revealed that a majority of 90% were currently married, 8.9% were either widow, widower or separated. 66.5% belonged to Hindu religion and remaining 33.5%

belonged to Muslim religion. Distribution of study population as per their education showed that, majority of 36.7% never had any formal schooling. More than ≈ 66% of the study participants were in Class IV and V of modified B. G. Prasad classification. In our study 45% of the participants resided in nuclear family, followed by 34.8% in joint family and 20.3% in three generation family.

Table 1: Socio - demographic profile of study population.

Background variables		N	%
Age (in years)	30-40	58	36.7
	41-50	36	22.8
	51-60	42	26.6
	>60	22	13.9
Sex	Male	63	39.9
	Female	95	60.1
Marital status	Married	142	89.9
	Unmarried	2	1.3
	Widow/widower/ separated	14	8.9
Religion	Hindu	105	66.5
	Muslim	53	33.5
Education	No formal education	58	36.7
	Primary school	56	35.4
	High school	34	21.5
	Pre university	10	6.3
Occupation	Government	50	31.6
	Private	51	32.3
	Self employed	36	22.8
	Home maker	21	13.3
SES	I (>6528)	2	1.3
	II (3264 - 6527)	17	10.8
	III (1959 - 3263)	35	22.2
	IV (979 - 1958)	56	35.4
	V (<978)	48	30.4
Type of family	Nuclear	71	44.9
	Joint	55	34.8
	Extended	32	20.3
Total		158	100

Table 2: Prevalence of comorbidities among the known type 2 diabetic patients.

Sl.no	Comorbidities	Male(63)		Female (95)		Total (158)	
		N	%	N	%	N	%
1	Hypoglycemia/Hyperglycemia	33	52.4	46	48.4	79	49.7
2	Visual problems	03	4.7	04	4.2	07	4.4
3	Renal disease	02	3.2	01	1.0	03	1.9
4	Neuropathy	13	20.6	07	7.4	20	12.6
5	Hypertension	29	46.0	46	48.4	75	47.2
6	Urinary tract infection	17	26.9	15	15.8	32	20.1
7	Depression	21	33.3	09	9.5	30	18.8
8	Obesity	33	52.4	56	58.9	89	55.9
9	Heart disease	04	6.3	02	2.1	06	3.7
10	Nil	10	15.9	11	11.6	21	13.2

Distribution of pattern of co-morbidities among diabetics showed that 86.8% of the participants had either one or more co-morbidities along with type 2 diabetes mellitus. Obesity was most commonest with 55.9% of patients suffering, followed by hyper/hypoglycemia (49.7%), hypertension (47.2%), urinary tract infection (20.1%), depression (18.2%), neuropathy, heart disease and renal disease. Both among male and female participants hypertension was commonest co-morbidity with 46% and 48.4% respectively and also hypo/hyperglycemia which

was seen among 52.4% of males and 48.4% females. Co - morbidities like depression and heart disease was seen most commonly in males than in female participants whereas glycemic control was poor in both male and females with 61.9% and 51.5% respectively having HbA1c levels >7.0.

Table 3: Distribution of glycemic control (HbA1C levels) among male and female participants.

HBA1C levels		Excellent (4.5-6.4) (n=13)		Good (6.5-7.0) (n=57)		Acceptable (7.1-8.0) (n=69)		Poor (>8.0) (n=19)		Total (n=158)	P value
		N	%	N	%	N	%	N	%	N	
Gender	Male	5	7.9	19	30.1	26	41.3	13	20.7	63	0.037*
	Female	8	8.4	38	40.0	43	45.3	6	6.3	95	

Table 4: Distribution of socio-demographic characteristics of type 2 diabetes patients by presence of comorbidity status.

Sl. No.	Characteristics	Total (n=158)		Comorbidity present (n=137)		Comorbidity absent (n=21)		Chi square test
		N	%	N	%	N	%	
1	HbA1C levels							χ²=59.45 p<0.0001
	Excellent (4.5-6.4)	13	8.2	2	1.5	11	52.4	
	Good (6.5-7.0)	57	36.1	52	37.9	5	23.8	
	Acceptable (7.1-8.0)	69	43.6	65	47.4	4	19.0	
	Poor (>8.0)	19	12.1	18	13.2	1	4.8	
2	Age in yrs							χ²=1.756 p=0.624
	30-40	58	36.7	49	35.7	9	42.8	
	41-50	36	22.8	31	22.6	5	23.8	
	51-60	42	26.6	36	26.3	6	28.6	
	>60	22	13.9	21	15.4	1	4.8	
3	Gender							χ²=3.0127 p=0.082
	Male	63	39.9	51	37.2	12	57.1	
	Female	95	60.1	86	62.8	9	42.9	
4	Marital status							χ²=2.397 p=0.3016
	Married	142	89.9	124	90.5	18	85.7	
	Unmarried	2	1.3	1	0.7	1	4.8	
	Widow/widower	14	8.9	12	8.8	2	9.5	
5	Religion							χ²=0.225 p=0.635
	Hindu	105	66.5	92	67.1	13	61.9	
	Muslim	53	33.5	45	32.9	8	38.1	
6	Socio economic status							χ²=2.585 p=0.629
	Class I	2	1.3	1	0.7	1	4.8	
	Class II	17	10.8	15	10.9	2	9.5	
	Class III	35	22.2	31	22.6	4	19.0	
	Class IV	56	35.4	49	35.7	7	33.3	
	Class V	48	30.4	41	29.9	7	33.3	
7	Family h/o diabetes							χ²=0.0132 p=0.905
	Yes	14	8.8	12	8.7	2	9.5	
	No	144	91.2	125	91.3	19	90.5	
8	BMI							χ²=26.77 p<0.0001
	Underweight	11	6.9	4	2.9	7	33.3	
	Normal	28	17.7	24	17.5	4	19.0	
	Overweight	89	56.4	82	59.8	7	33.3	
	obese	30	19.0	27	19.7	3	14.3	

Table showing effect of socio demographic characteristics over the presence of co-morbidities revealed that only BMI and HbA1c levels had statistical significant effect over presence of co-morbidities, while other factors like age, gender, marital status, SES, family history of DM had no statistically significant effect in our study.
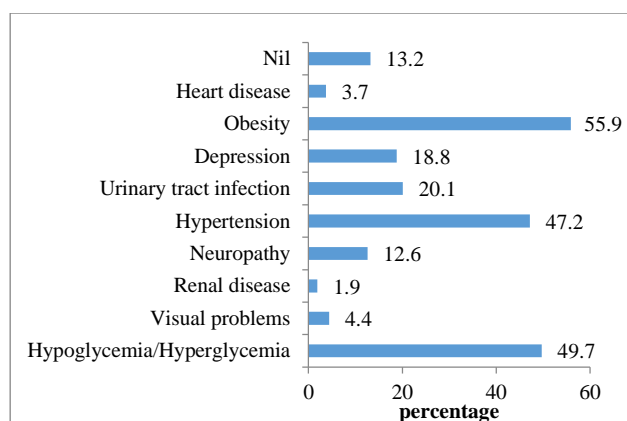
Figure 1: Distribution of comorbidities among known type 2 diabetic patients.

DISCUSSION

Our study highlights the widespread co-existence of chronic medical conditions or "co morbidities" along with presence type 2 diabetes mellitus in the study population. 86.7% of the patients either had one or more co-morbidities along with type 2 diabetes mellitus in our study. This finding is similar to the findings from the study conducted in Bhubaneswar which reported presence of co-morbidities in 84% of type 2 diabetics.[8] The co-morbidities assessed were both either directly related to diabetes like neurapathy, renal disease (nephropathy), visual impairment (retinopathy), heart disease (cardiovascular disease) and hypo/hyperglycemia; or not directly related to diabetes mellitus like obesity, hypertension, depression and urinary tract infection. This was an open ended, multiple answer question and after assessing the reply from the participants, these chronic co-morbid conditions were selected. The most frequent co morbid chronic conditions were hypertension, obesity, hypo/hyperglycemia, urinary tract infection and depression. The prevalence of co morbid conditions was higher among males than females, whereas the number of co morbid conditions was higher among females than males. The number of co morbidities was highest in the age group 30-40 yrs. This finding is different from the similar study done by Pati et al where the number of co morbidities was highest in the age group >60 yrs and increased age was found to be a strong predictor for diabetes co morbidity.[8] Where as in our study HbA1c level >7.0 and BMI was found to be strong indicator of co-morbidities among diabetic patients with 60.6% of the participants with HbA1c levels >7.0 had co-morbidities and 79.5% of the participants with overweight and obesity had presence of co-morbidities.

Obesity in our study was found to be most common co morbid condition with 55.9% of the participants suffering from it, another study done by Akholkar et al also reported high prevalence of obesity of 71% among diabetic patients.[12] This finding propose that incidence of obesity is on momentum and it may be independent of diabetic status, although data do suggest tendency of diabetics towards obesity.[12] But small set of population in our study was major drawback.

We found the prevalence of hypertension among diabetics was as high as 47.2%, which was similar in studies done by Yadav et al, Patel et al and Pati et al.[8,13,14] Hence our study findings are in line with prior studies that found a strong association between diabetes and hypertension. Depression among diabetics was found to be 18.8% in our study, which is much low compared to other study done by Das et al.[15]

Limitations

There are several limitations to this study. Our study population consisted only of diagnosed type 2 diabetics, the absence of undiagnosed diabetics is a limitation, as diabetes is an ice berg disease almost half of the diabetes cases remain undiagnosed till there is manifestation of some complication. Prevalence rates of co morbidity among the undiagnosed diabetes patients will therefore be lower. Secondly, self-reported co morbidity status can be subjected to self-declaration bias.

CONCLUSION

The presence of these co morbidities poses an extra burden on the health care system as well as on the deteriorating health of the diabetic patients as they can lead to various life-threatening complications. This results in extra out of pocket expenditure on the patients. Hence, comorbidities should be taken care of, as and when they develop and their treatment should not be delayed.

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