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Research Article

Risk factors associated with poorly controlled diabetes in a rural population of Karnataka: a case-control study

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ABSTRACT

Background: The worldwide prevalence of diabetes has risen dramatically over the past two decades. India with the highest absolute number of cases has become the diabetes capital of the world. The aim of the study was to identify the factors associated with poorly controlled diabetes and comparing them between poorly controlled and well controlled subjects.
Methods: This is a case-control study carried out in a rural population of villages in Devanahalli Taluk, Karnataka. Study population included adults above 20 years having type II diabetes for a minimum of one year currently under treatment. 50 poorly controlled and 50 well controlled patients willing to participate were enrolled for the study. A pre-determined questionnaire was used after taking a verbal consent from each participant.
Results: Long duration of diabetes, presence of co-morbidities, irregular visit to physicians and skipping medicines were the factors associated with poorly controlled diabetes.
Conclusion: The study emphasizes that regular follow up and control of co-morbidities are important factors in optimal control of disease.

Keywords: Poorly controlled diabetes, Risk factors, Rural population

INTRODUCTION

India is currently experiencing an epidemic of diabetes mellitus. Nowhere is the diabetic epidemic more pronounced than in India. The World Health Organization (WHO) reports that 32 million people had diabetes in the year 2000.[2] Currently, India is home to 40.9 million people with diabetes. By 2025, this number is estimated to rise to 70 million.[3] With the largest number of diabetic patients, India leads the world with earning the dubious distinction of being termed as the "Diabetes Capital of the World".[4]

Prevention, early identification and systematic follow up of treatment are the basic strategies for controlling the disease. In spite of a well-defined treatment for type 2 diabetes, the disease is poorly controlled with existing therapies.[3]

There are few studies which have attempted to address the question. Hence this study was undertaken with the main objective of identifying the factors that are associated with poorly controlled diabetes.

METHODS

Study Setting and Design

A community based case- control study was carried out in a rural population of Devanahalli taluk, Karnataka. Devanahalli is located 40 kilometres to the north east of Bangalore. Adults aged 20 years and above, diagnosed with type 2 diabetes for at least one year prior to the initiation of the study and were under treatment, who were willing to participate were included in the study. Diabetic patients who had other co-morbidities in addition to diabetes were not excluded.

Case: Patients aged 20 years and above who had been living with poorly glycemic control [*FBS- 126-150mg/dL, PPBS- >200mg/dL*] for at least three months and currently under treatment.

Control: Patients who were above 20 years whose diabetes condition have been poorlyder good control [*FBS- 80-126 mg/dL, PPBS- 180-200mg/dL]* for a period of at least three months.

Adults who were diagnosed with diabetes or hyperglycemia for the first time, mentally challenged people and pregnant women were excluded from the study.

Study Size

A pilot study conducted earlier found that irregularity in visiting the physician was a common risk factor. 20% of the controls were irregular in visiting the physician for check-ups and 50% of the cases were not visiting the physician regularly. Assuming that 20% of controls and 50% cases were having irregular follow up in pilot study, the sample size was estimated as 50 cases and 50 controls. Thus, a total of 100 diabetic patients were selected for the study.

Study Instrument

A semi constructed questionnaire was used for interviewing the patients. The questionnaire was made after in depth literature review and discussion with medicine, family medicine and community medicine specialists. Questions contained the demographic profile, details of personal habits, personal and family history of diabetes, knowledge on diabetes, attitude, access and finance. The questionnaire was further modified based on pilot study.

Methodology

The survey was conducted over a period of two months. The patients with diabetes along with other conditions also who were under treatment were being followed up once a month in their own villages by the health team of doctors, nurses and field workers via the mobile clinics. The diabetes patients would get their blood glucose checked during their visit to the clinic. Depending upon the value of the blood glucose obtained they were enrolled for the study as well controlled and poorly controlled subjects. The interview was taken with the assistance of a translator (nurses or field workers) into the local language.

Ethics

The study was approved by the IRB committee of the hospital. There were no identified risks from participating in this research. The survey data was kept confidential; participating in this research was kept completely voluntary. Informed consents were taken before enrolling into the study. Each survey form took approximately 15 minutes to complete.

Statistical Analysis

Data entry was done in an excel sheet. The analysis was done using SPSS version 20. Descriptive analysis was done for all the variables. Frequencies, percentages were calculated for categorical variables and mean and standard deviation was calculated for continuous variables. Chi square test was done to find the association of poorly controlled with variables like presence of co-morbidities, duration of diabetes, missing of medication doses, etc. the strength of association was evaluated using univariate logistic regression analysis. A multivariate logistic regression model was made using all significant variables (p-value <0.05) except the presence of co-morbidities as it was collinear with hypertension (Variance Inflation Factor >5).

RESULTS

Mean age of the population studied was 58.62 ± 12.84 years and almost half (55%) were females. Majority (95%) belonged to Hindu religion. Almost half (45%) were illiterate and 82% had a family income below 5000 rupees. The main occupation was agriculture (34%), however it was observed that 56% of the study population were not working.

The proportion of females (62%) were higher than males (38%) in poorly controlled diabetic group, however this was not statistically significant. Smoking, alcohol consumption, family history of diabetes and physical activity were not associated with poor control. (Table 1 and 2).

Table 1: Association of variables with poorly controlled diabetes (N=100).

	Variable	Cases No. (%)	Controls No. (%)	Chi-square value	p-value
Gender	Male	19(38)	26(52)	1.98	0.159
	Female	31(62)	24(48)		
Smoking	Yes	6(12)	5(10)	0.102	0.75
	No	44(88)	45(90)		
Alcohol consumption	yes	6(12)	5(10)	0.102	0.75
	No	44(88)	45(90)		
Tobacco use	Yes	10(20)	11(22)	0.060	0.80
	No	40(80)	39(78)		
Physical activity	No	9(18)	13(26)	0.932	0.33
	Yes	41(82)	37(74)		
Family history	Yes	15(30)	16(32)	0.047	0.83
	No	35(70)	34(68)		

Table 2: Association of variables with poorly controlled diabetes (N=100).

	Variable	Cases No.(%)	Controls No. (%)	Chi-square value	p-value
Diabetes duration	>=5 years	21 (42)	9 (18)	6.85	0.009
	<5 years	29 (58)	41(82)		
Irregular checkup	Yes	8 (16)	1 (2)	5.9	0.014
	No	42 (84)	49 (98)		
Missed doses	Yes	19 (38)	8 (16)	6.13	0.013
	No	31 (62)	42 (84)		
Co-morbidities	Yes	26(52)	12(24)	8.3	0.004
	No	24(48)	38(76)		
Hypertension	Yes	17(34)	7(14)	5.5	0.019
	No	33(66)	43(86)		

The mean age was 58.3 ± 14.8 years and 58.9 ± 10.6 years in the poorly controlled group and in the well controlled group respectively; the mean weight in both the groups were similar , 61.5 kg in the poorly controlled group and 60.4kg in the well controlled group. Mean BMI was 24.3 in both the poorly controlled and controlled groups. The age, height, weight and BMI of cases and controls were comparable (Table 3).

Table 3: Table showing mean and standard deviation of different variables.

	Cases		Control		
Variables	**Mean**	**Standard Deviation**	**Mean**	**Standard Deviation**	**P-value**
Age	58.30	14.822	58.94	10.661	0.805
Weight	61.50	11.101	60.42	13.071	0.65
BMI	24.322	3.9695	24.334	4.9681	0.99

All the variables were analyzed to study their association with poorly controlled diabetes. (Table 4) Presence of co-morbidities, hypertension, duration of diabetes, missed doses, skipped visits to the doctor were found to be significantly associated ($p< 0.05$).

Table 4: Factors associated with poorly controlled diabetes.

Variables	Unadjusted OR, p-value	95% Confidence Interval	Adjusted OR, P-value	95% Confidence Interval
Hypertension	3.16, 0.034	1.17 to 8.5	3.48, 0.04	1.05 to 11.27
Duration of diabetes	3.299, 0.009	1.3 to 8.23	2.83, 0.049	1.04 to 8.05
Irregular visit to physician	9.3, 0.03	1.1 to 77.7	12.95, 0.025	1.31 to 121.6
History of missed doses	3.2, 0.016	1.2 to 8.2	3.25, 0.039	1.06 to 9.7

Multivariate logistic regression was done to find the risk factors associated with poorly controlled diabetes. Presence of co- morbidities, hypertension, increased duration of diabetes, irregular visit to physician and history of missed doses were significantly associated with poorly controlled diabetes (p-value < .05). Multivariate logistic regression model was made using all these variables except the presence of co- morbidities as it was coherent with hypertension (VIF >5).

DISCUSSION

A community based case-control study was carried out with the aim to identify factors associated with poorly controlled diabetes. Both male and female participants aged 20 years and above who had been diagnosed with type II diabetes for a minimum of 1 year and under treatment were enrolled for the study.

C. Moorthi et al. conducted a descriptive observational study in a multi-speciality hospital in Tamil Nadu. This study has shown 60% of the poorly controlled diabetic population and 47.3% of the controlled patients were males.[5] On the contrary the present study shows that 62% of the cases and 48% of the control subjects were females. Although, the values were not significant. (p value = 0.16).

A study carried out by Gopinath B et al. in Karnataka shows that 60.2% of the diabetic population had been having diabetes for more than 5 years.[6] In the current study, 60% of the diabetic population (425 cases and 185 controls) was having diabetes for more than 5 years. There is a significant association of increased duration of diabetes with poorly controlled diabetes (OR 2.8, p value=0.009).

According to Moorthi et al[5] about 73% of the poorly controlled patients were also having hypertension while only 27% controls had hypertension and it was significant. (p value <0.001).[5] Though, the current study showed a lesser proportion (34%) of the cases that were having hypertension as co-morbidity but there was a significant association of having co-morbid hypertension with poorly controlled diabetes and 3.5 times higher risk of having poorly controlled diabetes in the hypertensive patients. (p value=0.034).

Another Indian study found that that 39% of the diabetic population visited the physician on an irregular basis.[5] The current study shows that 18% of the participants do not visit the physician on a regular basis (89% cases). There was a significant association of irregular visit to physician with poorly controlled diabetes (p=0.03).

Our study findings were congruent with Moorthi et al[5] showing that missing of doses of medication was more in poorly controlled diabetic patients (p value <0.01). Our study found a significant association between missing

doses and poorly controlled diabetes (OR 3.2, p value=0.04).

The main limitations of our study were the selection of cases and controls was restricted only to those patients who were attending the clinics. We used random blood sugar levels for assessing the status of diabetics while measurement of Hb1ac levels could have been a better assessment tool for the same.

CONCLUSION

This study has collectively identified the factors most responsible for the patients' control of diabetes. Factors such as duration of diabetes, co-morbidities, mainly hypertension, missed dose, lack of exercise and irregularity of patients' visit to physician were found to be associated with poorly controlled diabetes. This study highlights the need to educate the patients regarding measures of prevention and to encourage them to make an effort in adopting a healthy life style. The study warrants the need to shift the focus of diabetes management in maintaining the sugar levels under control so as to early complications can be avoided.

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