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ORIGINAL ARTICLE

STUDY OF DIABETES CARE IN URBAN AND RURAL DIABETICS

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ABSTRACT: BACKGROUND: The proportion of diabetes is increasing in rural areas due to rapid urbanization and change in life style occurring in these areas. The knowledge about difference in risk factors, prevalence of complications, glycemic outcome in rural and urban diabetics helps in better management and prevention of early complications. **AIMS AND OBJECTIVES**: To study and compare the clinical profile and glycemic outcome in diabetic cases from urban and rural areas. **METHODOLOGY:** Details were collected from 100 diabetic patients (50 urban and 50 rural) attending R. L. Jalappa Hospital outpatient department. Detailed history was taken and physical examination was done. History of complications were noted. Clinical profile, prevalence of complications, glycemic outcome were studied and compared between patients form urban and rural areas. **RESULTS:** In the study 100 diabetics [50 from urban and 50 from rural] were studied and there was no significant difference between urban and rural diabetics with respect to age, duration of diabetes, BMI, Waist circumference, blood pressure. Hence the study population is matched and comparable. In this study the prevalence of complications was higher in both rural diabetics (78%) and urban diabetic subjects (64%)**.** But there was no statistical significance between complications and the location of the subjects. In urban diabetics, the most common complication in decreasing order was retinopathy (56%), neuropathy (32%), nephropathy (20%) and IHD (12%). Whereas most common complication in rural diabetics were retinopathy (46%), neuropathy (26%), IHD (24%) and nephropathy (20%). Most of the diabetics in both rural (72%) and urban (62%) areas were not screened for associated complications. **CONCLUSIONS:** There was no much difference in glycemic outcome and prevalence of all complications between urban and rural study groups. Both urban and rural diabetics did not have optimal glycemic control. This may be due to the low rates of awareness of diabetes and its complications in both rural and urban subjects.

KEYWORDS: diabetes mellitus, urban, rural.

INTRODUCTION: Diabetes mellitus is a major epidemic of this century. WHO projects that diabetes will be the 7th leading cause of death in 2030.[1] India has more than 62 million diabetic individuals currently diagnosed with the disease. The prevalence of diabetes is predicted to double globally from 171 million in 2000 to 366 million in 2030 with a maximum increase in India. It is predicted that by 2030 diabetes mellitus may afflict up to 79.4 million individuals in India.[2, 3,4]

Etiology of diabetes in India is multifactorial and includes genetic factors, coupled with environmental influences such as obesity associated with rising living standards, steady urban migration, and lifestyle changes.[5]

Always there are urban, rural differences in the prevalence of diabetes in India. Rough estimates show that the prevalence of diabetes in rural populations is one-quarter that of the urban population.[6]

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The Indian Council of Medical Research (ICMR) study, done in the 1970's reported a prevalence of 2.3% in urban areas, which has risen to 12-19 % in 2000's. Correspondingly, in rural areas, prevalence rates have increased from around 1% to 4-10 % The prevalence of diabetes in 1970, was 2.3% in urban areas and 1% in rural areas. It has increased to 12-19% in urban areas and 10 % in rural areas in 2000's.[7, 8]

The prevalence of diabetes is now rapidly increasing in India among the poor in the urban slum dwellers, the middle class and even in the rural areas. This is due to changes in lifestyle, associated with urbanization and globalization. In India, the prevalence of diabetes is increasing among poor and rural population as a result of changes in lifestyle and dietary habits associated with urbanization.[9,10]

The burden of diabetes is due to its micro and macrovascular complications which lead to increased morbidity and mortality. Increased mortality and morbidity due to complications of diabetes can result in health care burden in India.[11] Effective management of diabetes requires sustained glycemic control over many years to lower the risk of macrovascular and microvascular complications.[12] This study was carried out to know the prevalence of diabetes related complications and compare the clinical profile and glycemic status of T2DM patients in rural and urban population of Kolar.

MATERIALS AND METHODS: This study was done in medicine department of a rural tertiary center attached to Sri Devaraj Urs Medical College in Kolar, Karnataka. In this study 100 patients were included. 50 patients were from rural areas and 50 patients were from urban areas.

Inclusion Criteria:

1. All known patients of Type2 diabetes mellitus from urban areas attending medicine department of R L Jalappa Hospital, Kolar.
2. All known patients of Type 2 Diabetes mellitus from rural areas attending medicine department of R L Jalappa Hospital, Kolar.

Exclusion Criteria:

1. Patients with Type 1 Diabetes.
2. Patients with gestational diabetes.
3. Patients with secondary diabetes.
4. Critically ill T2DM patients admitted to ICU.

Demographic characteristics such as age and sex were recorded. The history regarding the presence of hypertension, IHD and stroke was documented. Family history of diabetes was recorded. Body mass index was calculated as BMI = weight in kg/height in metres^2 (kg/m^2).

Overweight is defined as BMI ≥23 and obesity as BMI ≥ 25.

Blood pressure was recorded using a mercury sphygmomanometer in the right arm in the supine position after rest and an average of two readings was taken. Hypertension is defined as blood pressure ≥ 140/90 mmHg.

Systemic examination was carried out in all patients. Presence of sensory neuropathy was defined by symptoms of tingling and numbness over the extremities (bilaterally symmetrical) with or

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without impaired touch, vibration sense or joint position sense. Presence of motor neuropathy was noted.

A modified neuropathy disability score (NDS) was used to diagnose and quantify the severity of diabetic neuropathy on clinical examination.

Modified Neuropathy Disability Scoring:[13]

1. Achilles tendon reflexes graded 0-2 for each side (normal = 0, present with reinforcement = 1 and absent = 2), giving a maximum score of 4 if both sides were affected.
2. Vibration sensation by a 128 Hz vibration fork at the hallux, graded 0-1 for each side (normal = 0, absent = 1) giving a maximum score of 2.
3. Sensory perception by a 10 g Semmes-Weinstein monofilament at three sites on each foot, graded 0 -2 for each side (normal = 0, absent on one site = 1, absent on 2 or 3 sites 2) giving a maximum score of 4.[9]

The maximum score for the clinical examination was 10. A score of 3-5 was regarded as evidence for mild signs, a score of 6-8 for moderate signs and a score of 9-10 for severe signs of distal neuropathy. The clinical examination was performed by one examiner.

Dilated fundoscopy was carried out in all patients.

Five ml of blood was collected after 10 hrs fasting and glucose, cholesterol, triglycerides and HbA1c were measured. Diabetes was diagnosed according to ADA criteria if FBS ≥ 126 mg%. Renal function tests included blood urea, serum creatinine and urine analysis.

Urine was analyzed for sugars, ketone bodies and protein. Urinary spot protein creatinine ratio was estimated. A protein creatinine ratio of more than 0.2 gram protein per gram creatinine was taken as significant.

The patient was termed to have dyslipidemia if LDL was more than 100mg/dl, serum cholesterol>200 mg/dl, serum HDL<40 or serum triglycerides >150mg/dl.

A 12- Lead electrocardiogram to note the presence of ischemia or infarction was done. CAD was defined as the use of nitroglycerine or typical chest pain or a history of previous myocardial infarction.

Statistical Analysis: Data analysis was done by using the Epi info 7version software. Frequencies and proportions were computed. Chi square test and Student 't' test were used as tests of significance for qualitative and quantitative data respectively. P<0.05 was considered as statistically significant.

RESULTS:

	Urban		Rural		T value	p value
	Mean	SD	Mean	SD		
AGE	53.58	9.223	52.10	9.692	0.782	0.436
DURATION	6.52	5.661	4.86	3.839	1.716	0.089
BMI	24.68	3.966	23.32	3.667	1.780	0.078
WC	86.18	16.413	81.68	14.236	1.465	0.146
SBP	130.40	19.894	126.20	15.635	1.174	0.243
DBP	83.40	12.056	80.80	10.069	1.170	0.245

Table 1: Quantitative analysis of study subjects using independent t test

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In the study 100 diabetics [50 from urban and 50 from rural] were studied and majority of them were males (61%) and 39% were females. Family history of diabetes was observed in 35% of subjects. The mean BMI was 24.68 ± 3.96 in urban and 23.32 ± 2.66 rural diabetics.

There was no significant difference between urban and rural diabetics with respect to age, duration of diabetes, BMI, Waist circumference, Systolic blood pressure and Diastolic blood pressure. Hence the study population is matched and comparable. Prevalence of obesity was more in urban diabetics (42%) when compared to rural diabetics (26%). Overall 34 diabetics had a BMI of 25 and above.

	Urban		Rural		T value	p value
	Mean	**SD**	**Mean**	**SD**		
FBS	163.00	81.823	164.04	68.126	-0.069	0.945
PPBS	281.67	104.125	249.00	77.564	1.773	0.079
HbA_{1c}	8.46	2.092	8.84	2.216	-0.882	0.380

Table 2: Glycemic Profile of Diabetic patients

In the study it was observed that Mean FBS levels and HbA1c levels was higher among rural subjects and PPBS levels was higher in Urban subjects.

The mean HbA1c level was higher in rural subjects (8.84) when compared to urban subjects (8.46) suggesting glycemic control was poor among rural diabetics when compared to urban subjects. Mean FBS levels in rural and urban diabetics was 164 mg/dl and 163 mg/dl. Both urban and rural diabetics did not have optimal glycemic control.

		Diabetic subjects		Total	X^2, dfp value
		Rural	**Urban**		
HbA_{1c}	<7	15	23	38	2.769, 2, 0.250
	7 to 8.5	10	7	17	
	>8.5	25	20	45	
Total		**50**	**50**	**100**	

Table 3: Glycemic control of diabetics

The control of diabetes was very poor, i.e. HbA1c >8.5 among rural diabetics compared to urban. Among 100 subjects included in this study, 57 % of diabetics had poor glycemic control. Glycemic control was poor in 70 % of rural diabetics and 54 % of urban diabetics. But there was no statistically significant difference between glycemic control among urban and rural diabetics.

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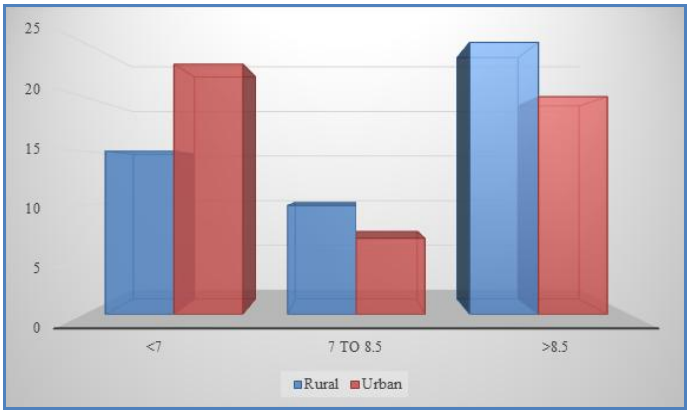

Fig. 1: Bar diagram showing Glycemic control among the study group

Twenty nine percent of subjects were addicted to smoking. History of smoking was more among urban diabetics (35%) when compared to rural diabetics (24%). In this study, the prevalence of overweight and abdominal obesity was more in urban diabetics (42%) than rural diabetics (26%). In urban areas, the prevalence was more than 42%.

		DOMICILE		Total	X^2, df p value
		Rural	Urban		
Complications	Absent	11	18	29	2.380, 1, 0.123
	Present	39	32	71	
Total		50	50	100	

Table 4: Complications with Domicile

Among 100 diabetic patients included in this study, 71 % had one of the complications. Prevalence of complications was higher in rural diabetics (78%) when compared to urban diabetics (64%). However, there was no statistical significance between complications and the location of the subjects.

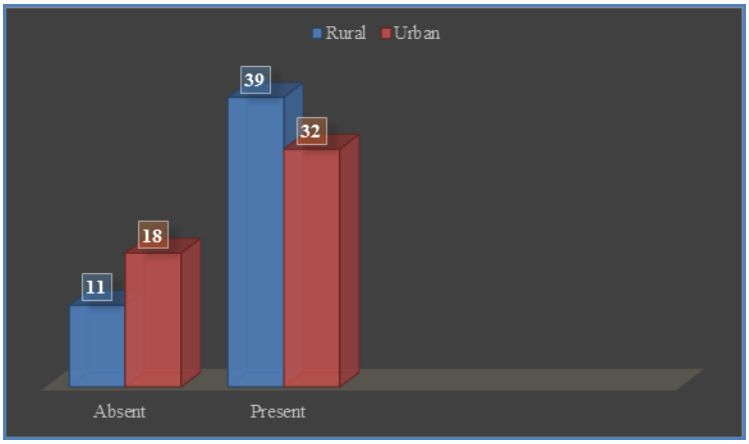

Fig. 2: Bar diagram showing complications with Domicile

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Variables	Total	Urban	Rural
Hypertension	38	22 (44%)	16 (32%)
BMI>25 kg/m2	34	21 (42%)	13 (26%)
Dyslipidemia	25	12 (24%)	13 (26%)
Renal Failure (S.crt>1.5)	21	11 (22%)	10 (20%)
Neuropathy	29	13 (26%)	16 (32%)
IHD	18	6 (12%)	12 (24%)
Retinopathy	51	28 (56%)	23 (46%)
No Previous Screening for complications	67	31 (62%)	36 (72%)

Table 5: Complications of Diabetes mellitus

Hypertension was common in all the areas, 32 % of rural diabetics and 44% of urban diabetics had associated hypertension. Dyslipidemia was found in nearly 25 % of the population in all areas studied. In this study there was no much difference in prevalence of dyslipidemia among urban (24%) and rural (26%) diabetics.

In this study there was no much difference in the prevalence of complications between rural diabetics and urban diabetic subjects. In urban diabetics, most common complications in decreasing order were retinopathy (56%), neuropathy (32%), nephropathy (20%) and IHD (12%). Most common complications in rural diabetics were retinopathy (46%), neuropathy (26%), IHD (24%) and nephropathy (20%).

Prevalence of retinopathy was more in urban study group whereas prevalence of neuropathy and IHD was more in rural diabetics. Prevalence of IHD was two times higher in rural subjects when compared to the urban subjects, but, the difference was not statistically significant. The prevalence of all complications, glycemic outcome was almost similar and comparable in both urban and rural study groups.

DISCUSSION: There are many studies to asses Diabetes care in rural and urban India.[14, 15,16,17] This study was done to assess the quality of diabetes care in rural and urban population of Kolar. In this study 100 diabetic patients (50 from urban and 50 from rural location) were studied. The majority of the patients was in the age group of 50-60 years. Mean duration was 6.52 yrs in urban and 5.42 yrs in rural subjects.

Many studies show that duration of diabetes is often known to be associated with both microvascular and macrovascular complications of diabetes.[18,19] The frequency of complications was higher in patients with longer diabetes duration. In this study, we also observed that duration of diabetes was significantly associated with both microvascular and the macrovascular complications.[14]

Age, BMI, diabetes duration, LDL-C and SBP were positively associated with macrovascular and microvascular complications. Dyslipidemia along with abdominal obesity might contribute to insulin resistance which in turn, results in increased prevalence of T2DM and its complications in India.[20, 21] In this study, 25 % of patients had dyslipidemia. The prevalence of obesity was more in urban population (42%) compared to rural subjects (24%).

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This may be attributed to lifestyle practices which influence urban subjects resulting in an increased tendency to obesity. Higher prevalence of obesity in urban diabetics was also demonstrated in DEDICOM survey.[15,17]

International Diabetes Federation (IDF) and ADA guidance recommend a target HbA1c of <7.0%. [22] The UK Prospective Diabetes Study (UKPDS) found that every 1% reduction in glycated hemoglobin (HbA_{1c}) was associated with a 37% decrease in microvascular disease and a 14% reduction in myocardial infarction (MI).[12]

In Diabcare–Asia study it was observed that approximately half the patients had poor control and mean HbA1c was significantly higher than the levels recommended by the ADA and the ICMR guidelines in India.[14] Diabcare–Asia study showed approximately half the patients had poor glycemic control.

In this study, 57 % of diabetics had poor glycemic control and mean HbA1c level was higher in rural subjects (8.84) when compared to urban (8.46) subjects. Both urban and rural diabetics did not have optimal glycemic control inspite of increased awareness and access to medical care. Glycemic control was poor in 70 % of rural diabetics and 54 % of urban diabetics.

In the Diabcare–Asia study, Over 54% patients had diabetes related complications and frequency of complications were higher in patients with longer diabetes duration. [14] The Chennai Urban, Rural Epidemiology Study (CURES) Chennai Urban Population Study (CUPS) provided valuable data from India on the complications related to diabetes.[23,24,25]

According to CURES study, the overall prevalence of diabetic retinopathy was 17.6%., nephropathy was 2.2%, while that of microalbuminuria was 26.9%, and peripheral neuropathy was 26.1%. In the CUPS study, coronary artery disease was seen in 21.4% of diabetic subjects. A study by Ramachandran et al, showed prevalence of retinopathy was 23.7 %, neuropathy was 27.5% and IHD was 11.4%.[8]

Among 100 diabetic patients included in this study, 71% had one of the complications of diabetes. Prevalence of complications was higher in rural diabetics (78%) when compared to urban diabetics (64%).

In this study there was no statistical significance in the prevalence of complications between rural diabetics and urban diabetic subjects. In urban diabetics, most common complications in decreasing order were retinopathy (56%), neuropathy (32%), nephropathy (20%) and IHD (12%) whereas, most common complication in rural diabetics were retinopathy (46%), neuropathy (26%), IHD (24%) and nephropathy (20%).

The glycemic outcome was better in the urban diabetics when compared to rural diabetics. It could be related to the better accessibility to medical care, affordability and better knowledge about diabetes and its complications when compared to rural areas which lack easy access to health care services and awareness. Risk factors like smoking, alcohol and obesity worsened the glycemic control in both study groups.

There is clinical inertia in achieving glycemic targets in Indian diabetics. This is due to lack of adequate awareness about disease and its complications, poverty and decreased accessibility to health care facilities in India.[8]

There is a disproportionate allocation of health resources between urban and rural areas. Rural areas report disparity in the diabetes management compared with their urban counterparts,

with these populations more likely to suffer from diabetes complications compared to their urban counterparts. [5]

In this study, most of the diabetics in both rural (72%) and urban (62%) areas were not screened for associated complications.

In this study, most of the diabetics in both rural (72%) and urban (62%) areas were not screened for associated complications. May be they were unaware that they need to undergo regular screening for complications associated with diabetes. According to CURES study, only 40.6 % were aware that diabetes can cause organ damage and 25 % were not even aware of a condition of diabetes. [8,26]

The ICMR-INDIAB study was done to assess the level of awareness and knowledge of diabetes in the general, as well as the diabetic population from urban and rural India.[27] It showed that overall only about 50% of the population in India studied has heard of a condition called diabetes, the awareness and knowledge about diabetes are significantly lower in rural areas when compared to urban areas.

There is also evidence to show that increasing knowledge regarding diabetes and its complications has significant benefits including an increase in compliance to treatment, thereby decreasing the complications associated with diabetes.[27]

Education programs for both patients and clinical practitioners about the importance of glycemic control and early screening for complications may be a major step in achieving target glycemic levels and the prevention of disease complications.[5]

To reduce the disease burden that diabetes is created in India, there is an immediate need to create awareness regarding importance of good glycemic control and early screening for complications for both patients and health care providers. In this study, we observed that the prevalence of all complications, glycemic outcome was almost similar and comparable in both urban and rural study groups.

Also more than 95% of diabetic subjects were about being on regular treatment even among rural subjects. This may be attributed to increasing urbanization in rural areas and increased awareness about the disease in rural population, outreach of medical care to rural areas leading to early diagnosis and better management of diabetes.

CONCLUSION: There was no significant difference between urban and rural diabetics with respect to age, duration of diabetes, BMI, Waist circumference, Systolic blood pressure and Diastolic blood pressure, and dyslipidemia. Both urban and rural diabetics did not have optimal glycemic control and had a high prevalence of complications of diabetes. But there was no much difference in glycemic outcome and prevalence of all complications between urban and rural study groups. This may be attributed to increasing urbanization in rural areas and increasing awareness about the disease in rural population, outreach of medical care in rural areas leading to early diagnosis and better management of diabetes in rural populations in recent years.

Most of the urban and rural subjects were not screened for existing complications previously. This indicates there were low rates of awareness of diabetes and its complications in both rural and urban subjects. All diabetics should be compulsorily screened for existing complications of diabetes when they present to the clinicians.

In both rural and urban areas educational programs have to be undertaken for both health care providers and patients to emphasize the importance of optimal glycemic control and early screening for complications of diabetes.

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