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# Relationship of Diabetes-specific Knowledge, Self-care Practices with Glycaemic Control: Urban and Rural Distinction in India

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## ABSTRACT

**Introduction:** Quintessential information on knowledge and self-care practices about diabetes is rare in India and is critical to design general wellbeing strategies planned for forestalling and controlling diabetes.

**Aim:** The present study was undertaken to assess and compare the knowledge of diabetes and self-care practices and their association with control of blood sugar levels in urban and rural areas in the Pune district, in India.

**Methodology:** A study was conducted at 4 sites from urban and rural areas of the Pune district, in India. One registered private physicians' clinic from each study site i. e. from 2 wards and two villages were randomly selected. Methods and Material: Considering the 69% prevalence of good self-care practices in type 2 diabetics and requiring precision of 10%, the sample size of 200 was calculated. A predesigned, pretested questionnaire was filled by interview technique. Statistical significance between the two variables was tested using the Chi-square test and Fisher's exact test. The correlation was tested by using Pearson's correlation coefficients.

**Results:** The mean total knowledge score of urban diabetics (7.52) was more than the mean total knowledge score (6.62) of the rural diabetic. ( $p < 0.05$ ). A significant difference was found between the urban and rural diabetics about the self-care practices except for compliance to drugs. No correlation of diabetes knowledge score with Glycosylated Haemoglobin was seen in an urban and rural area.

**Conclusion:** Endeavours ought to be made to develop self-care practices of patients in shutting the hole of diabetes knowledge. Health care providers should be empowered for delivering adequate health message regarding diabetic self-care practices.

**Key Words:** Urban-Rural, Type 2 diabetes, Knowledge, Self-care

## INTRODUCTION

Papyrus Ebers was the first name given to diabetes by an Egyptian physician Hey-Ra (1552 BC).<sup>1</sup> Diabetes is the third most common health disorder worldwide and the fourth leading cause of death.<sup>2</sup> The World Health Organization estimates that diabetes mellitus affects at least 285 million people and causes 3.2 million deaths, six deaths every minute and 8700 deaths every day, and this figure will increase by 70% in developed countries, and by 42% in developing countries by 2030.<sup>3</sup>

India with its dubious distinction of being designated, "The Diabetic Capital of the World" is presently estimated to have over 30 million individuals affected by this deadly disease.<sup>4</sup> As per the WHO report 2012 if India doesn't wake

from its slumber, by 2025, each fifth diabetic on earth would be an Indian.<sup>5</sup> The prevalence of diabetics in Indian adults was found to be 2.4% in rural and 4-11% in urban dwellers.<sup>6</sup>

Diabetes is one of the fastest-growing challenges in the 21st century and the stream of the diabetes epidemic is changing at a great rate.<sup>7</sup> Once a disease of the West, diabetes has now spread to each nation on the planet. Once "a disease of affluence," it is now increasingly common among the poor.<sup>8</sup> Very high levels of diabetes have been reported in urban areas of India but little data are available for rural regions where >70% of the population lives.<sup>9</sup> Rural populations are at a high risk of developing diabetes mellitus as a result of the shift in epidemiology from communicable disease to non-communicable disease.<sup>10</sup>

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Diabetes self-care is extremely complex, requires life-long commitment and modification of one's lifestyle. Good self-care practices and adherence to the recommendations have been found to associate with good blood sugar control.<sup>11</sup>

Despite the abundance of studies on diabetes, there is limited information available on the knowledge and self-care practices with comparison in urban and rural areas. To address this demand, the present study was undertaken with the aims and objectives of

1. To assess and compare the knowledge of diabetes and self-care practices in urban and rural areas in Pune district and
2. To determine the association of knowledge and self-care practices of diabetes with control of blood sugar levels.

## MATERIAL AND METHODS

An OPD-based, cross-sectional study was executed amongst type 2 diabetes mellitus inside the urban and rural district, Pune, to evaluate their knowledge regarding the disease and the self-care practices that have been followed by them and those have been correlated with their control of diabetes (HbA1c). Considering the 77%<sup>12</sup> prevalence of self-care practices in type 2 diabetics and requiring precision of 12%, the sample size of 82 was calculated using the formula,  $4pq/l2$ . Thus, the study was conducted among 200 patients (100 from urban and 100 from rural) with a known history of type 2 diabetes, who were 30 years of age and above and residing in that locality for more than a year. The type 2 diabetics excluded those who were pregnant, had steroid-induced hyperglycaemia and were unable to give informed consent.

### Selection of study population from urban and rural areas

#### Selection of study population from urban areas:

There are 15 regional ward offices under Pune Municipal Corporation.<sup>13</sup> Out of the 2 wards viz. Bibwewadi and Dhankawdi were selected by random sampling technique. A list of registered private physician's clinic/s from each selected ward was obtained. One registered private physician's clinic from each Bibwewadi and Dhankawdi ward was selected purposively.

#### Selection of study population from rural areas:

There are 15 talukas in the Pune district.<sup>14</sup> Out of 15, 1 taluka viz. Bhor was selected by random sampling technique. There are 194 villages under Bhor taluka.<sup>15</sup> Out of the 2 villages viz. Nasrapur and Narhe were selected purposively as they owned a better private medical facility. A list of all registered private physician's clinic/s was obtained from each of these

selected rural villages and one registered private physician's clinic was selected randomly from each village.

After obtaining Institutional Ethics Committee clearance BVDU/MC/61 from Bharati Vidyapeeth Deemed to be University Medical College and Hospital, the permission of consulting physician/in-charge of clinics was obtained. All the known type 2 diabetic patients coming in the selected clinics in the study period were fully informed regarding the purpose of the study. The patient information sheet was explained to each patient and written consent was obtained before data collection. Patients were examined and interviewed at the time of the respective clinic's timings. The Interview was started with a general discussion to build rapport with the subjects and to gain confidence. A predesigned, pretested questionnaire was filled by interview technique to collect socio-demographic information, personal history, general examination, diabetes-related information, knowledge regarding diabetes, and the self-care practices that were followed by them. Anthropometry included measurement of height and weight. The questionnaire was reviewed by three experts before being utilized – a public health expert, a diabetologist, and a statistician and their proposals were used for improving the questionnaire thus ensuring consensus validity of the instrument. Initially, a pilot study was done on 10% of type 2 diabetic patients in urban and rural clinics of the Pune district outside the study area.

Knowledge was assessed using closed-ended questions, and the study subjects were classified as having adequate, inadequate-poor and no knowledge depending on the score obtained. Details regarding self-care practices were also collected.

Biochemical tests were done by organizing a health camp on a predetermined date in selected urban and rural clinics. Blood samples of all selected type 2 diabetics were collected by a trained nurse. For each patient, blood samples were obtained in the morning after 10 hours fast, from the antecubital vein in a sitting position for determination of HbA1c level. Glycosylated haemoglobin was estimated using high-performance liquid chromatography on National Glycohemoglobin Standardisation Program certified instruments<sup>16</sup> from a registered laboratory.

The data were collected and entered in Microsoft Excel Office 2015 and SPSS statistics version 20 was used for statistical analysis. The data were expressed in suitable tabular formats. Percentage, mean and standard deviation were calculated. Statistical significance between the two variables was tested using the Chi square test and Fisher's exact test. The correlation was tested by using Pearson's correlation coefficients. p-value <0.05 was considered as significant.

## RESULTS

The baseline characteristics of diabetics are shown in **Table 1**. Majority i.e. 121 (60.5%) diabetics were male and 79 (39.5%) diabetics were female. The mean age of urban diabetics is 53.67 years as compared to 62.21 years in rural diabetics. The vast majority of people in India belong to Hinduism and current research has led to similar finding (71% were Hindus). Almost three-quarters of diabetics i.e. 152(76%) were currently married followed by 44(22%) were widow/widower. Maximum diabetics i.e. 71 from rural area belonged to either joint or three-generation families and 47 from urban area belonged to nuclear families. Similar to the standard watched these days, nuclearity is expanding and jointness is diminishing in groups of the urban area and the same may have been reflected in the present study. Most of the urban diabetics were either doing service or self-employed and the majority belonged to the upper class as per Modified B. G. Prasad Socio-economic Classification.

The personal history of diabetes of the study population is presented in **Table 2**. More than half of diabetics (53%) were currently addicted to smoking, alcohol consumption and chewing tobacco. Maximum i.e. 29.3% diabetics revealed that they were suffering from genitourinary infections that include balanitis, vaginitis, cervicitis, urinary tract infections. Results indicate that 79% of diabetics had normal weight and 15% were overweight as per National Institute of Nutrition guidelines. Physical activity shows that about one-third (29%) reported having heavy physical activity of which 20% were from rural and 9% from urban area. Among the patients, almost 61.5% accepted having comorbidity in the form of Hypertension.

Diabetes-related information is given in **Table 3**. Family history of diabetes was revealed by the higher number of diabetics in an urban area (47%) than in rural area (20%). Nearly 41% of patients developed symptoms like weakness, polyuria, etc which subsequently led to the diagnosis of diabetes. The majority of diabetics i.e. 75% revealed that they were suffering some form of diabetic complications like retinopathy, neuropathy, nephropathy, diabetic foot, etc. Out of 33 insulin users, 54% administered insulin by themselves. Maximum diabetics i.e. 89.5% done their blood sugar tests at the pathology laboratory.

Knowledge deficit was noted in eight questions, in descending order these were related to symptoms of diabetes, nature of diabetes, measures to control blood sugar, lifestyle modifications, diabetes complications, bodily changes in diabetes and foot care. Results are shown in **Table 4**.

The mean total knowledge score of urban diabetics (7.52) was more than the mean total knowledge score (6.62) of the rural diabetic. ( $p < 0.05$ ).

The correlation of self-care practices with HbA1c in urban

and rural areas are shown in Table 5 and Table 6. No statistically significant association was found between almost all self-care practices except compliance to drugs with good control of blood sugar level in the urban area. No correlation was seen for any of the self-care practices with HbA1c levels in the rural area including compliance to drugs.

A correlation was evaluated between diabetes knowledge score with Glycosylated Haemoglobin (HbA1c) in an urban area and rural area which on analysis revealed Pearson correlation value of 0.055 for urban and 0.022 for rural diabetics. The p-value was 0.029 for urban diabetics and 0.105 for rural diabetics which were statistically non-significant indicating that diabetes knowledge score and glycosylated haemoglobin did not correlate both in urban and rural areas.

## DISCUSSION

The present study was done to assess the knowledge and self-care practices in regards to diabetes and their association with control of blood sugar levels in 100 urban and 100 rural diabetics in the Pune district.

A large portion of the study participants from the urban area was underneath 40 years of age than in rural area. Young urban diabetics in the present study might be expected on account of the stationary way of life and absence of physical activity and more intake of cheap and high-calorie food and detection rate is early a direct result of higher awareness among urban people. In contrast to our study, Muninarayana C et al.<sup>17</sup> reported that diabetes in young adults was common in less than 45 years of age. The likely purpose behind finding the more young rural diabetics was that this<sup>17</sup> study was finished by the house to house screening and they may have been discovered undiagnosed diabetes.

In the present study, the majority of diabetics were males both from urban and rural areas. Men seem more susceptible than women to the consequences of indolence and obesity, possibly due to differences in insulin sensitivity and regional fat deposition. Men are more prone to type 2 diabetes because men develop the disease at a lower body mass index than women.<sup>18</sup>

The present study shows more than half, 52% of diabetics belonged to socio-economic class I. However urban diabetics (94%) are significantly more than rural diabetics (10%) in the same class. None of the patients was found in class V. The probable reason may be the non-affordability of the diabetic patients for taking treatment in private clinics. However, Nitendra Cet al.<sup>19</sup>, Nikhil P H et al.<sup>20</sup>, found the majority of urban diabetics in class IV and class V as their studies were done in urban slum area.

It should be noted that we found, though the farmers and labourers are engaged in physical activity they still have diabe-

tes. This observation is in line with other study conducted in rural Maharashtra.<sup>21</sup> Diabetes is estimated to increase the risk of TB from 1.5 to 7.8 fold<sup>22</sup> and this is observed in our study, as almost 15% suffered from T.B after the diagnosis of diabetes. The majority of them, i.e. 20 were from the rural area.

Addiction is always a dangerous disease, but it can be especially life-threatening for diabetics. In the present study, it is revealed that 9% of patients stopped addictions permanently after they were diagnosed with diabetes and this number was found to be double in urban diabetics (12%) as compared to rural diabetics (6%). The inducement and will strength of quitting addictions visible double in urban diabetics is may be due to the extra time given by their medical doctor and more interactive counselling sessions.

In our study, we exposed that out of 30 overweight diabetics, 25 were from urban and only 5 were from the rural area. This may be due to rural diabetics might be consuming less refined or energy-dense food and being more physically active and less sedentary than urban diabetics.

Awareness of one of the major risk factors for diabetes was poor as the majority of rural diabetics (58%) didn't know about their diabetes family history.

It is observed that 30% of urban diabetics were diagnosed with diabetes during routine health check-up than 4% of rural diabetics, since greater awareness as well as the practice of recurring health check-up at regular intervals in the urban area leading to the detection of diabetes.

The majority of diabetics i.e. 150 (75%) revealed that they were suffering some form of diabetic complications like retinopathy, neuropathy, nephropathy, diabetic foot, erectile dysfunctions, etc. Significantly more rural diabetic (81%) with complications were found as compared to urban (69%)

It is worrisome that only 8% of urban diabetics had adequate knowledge about diabetes being a non-communicable disease. Nearly 93 urban diabetics reported that they knew what diabetes is and the remaining were unaware of it ( $p < 0.05$ ).

An encouraging part of the study is that although there was, quite low diabetic score in rural area, nearly 83 rural diabetics knew that diabetes required lifelong treatment and this implies that they were ready to change if motivated or educated properly.

Lifestyle modifications like weight reduction, quitting of smoking and alcohol were essential for the control of disease was agreed by most of the urban diabetics as compared to rural ( $p < 0.05$ )

It was surprising to see that rural diabetics were having inadequate knowledge of complications. It partly reflects that patients are not sensitized about the complications of diabetes which can have dreadful consequences in terms of mortality

and morbidity. Several reasons have been cited for this including lack of time, an inappropriate way of providing information, lack of trained support staff like diabetic educators.

Regarding foot care, 76% of rural diabetics who wear open footwear checked their feet and inspected the inside of their shoes daily. None of them wore footwear inside their houses, both in urban and rural areas. The practices that were best followed were checking of blood sugars at least once in 3 months and as advised by the doctor which accounted for 100% of the urban diabetics.

Among all self-care practices, the patient's compliance was found to be better despite poor educational status in rural diabetics. The old rural areas ancient thinking of considering a doctor as a God has been seen here.

In our study, the higher the education of urban diabetics, the higher was the knowledge but the lesser the blood sugar control. Despite their adequate knowledge, due to their work and other commitments, they might not be able to implement treatment or spend a long time on non-therapeutic measures.

## CONCLUSION

Thus it is to conclude that the present study reflects the poor knowledge and self-care practices in rural as compare to urban diabetics but compliance is better with medical aspects of the regime than with lifestyle aspects in rural diabetics. This predisposes them to the risk of development of complications in later life. This study also demonstrated that knowledge of diabetes alone does not necessarily affect glycaemic control in urban areas.

The findings of present study were restricted to patients attending the physician's clinic in a selected hospital and hence may not be generalized to patients from different socioeconomic backgrounds. Additional research in a larger sample size in the general study population was needed to replicate and extend these findings.

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**Table 1: Socio-demographic profile**

Characteristics	Urban (n=100)	Rural (n=100)	p value
<b>Sex</b>			
Male	62	59	p>0.05
Female	38	41	
<b>Age</b>			
≤40	11	1	
41-60	59	46	
61-80	30	51	p<0.05
>80	00	02	
<b>Religion</b>			
Hindu	73	69	
Muslim	01	04	
Buddha	26	26	p>0.05
Christian	00	01	
<b>Marital status</b>			
Married	78	74	
Divorced/Separated	02	02	p>0.05
Widow/widower	20	24	

Table 1: (Continued)

Characteristics	Urban (n=100)	Rural (n=100)	p value
<b>Type of family</b>			
Joint#	53	71	p>0.05
Nuclear	47	29	
<b>Socio-economic status</b>			
Class I	94	10	
Class II	04	64	
Class III	02	22	p<0.05
Class IV	00	04	
Class V	00	00	
<b>Educational status</b>			
Illiterate	02	23	
Primary	01	26	
Secondary	12	29	
Higher secondary	35	11	p<0.05
Graduate	38	11	
Post graduate	12	00	
<b>Occupational status</b>			
Farmer	00	11	
Labourer	00	10	
Employed	42	19	p<0.05
Self-employed	25	17	
Unpaid *	33	43	

# Included three-generation family

\* Included housewives and retired non-pensioners

Table 2: Personal history of diabetics

Characteristics	Urban (n=100)	Rural (n=100)	p value
<b>History</b>			
TB	62	59	p<0.05
IHD	38	41	
<b>Addiction status</b>			
Current	52	54	
Never	36	40	p>0.05
Former	12	06	
<b>Existing current infection in the body (n=126)</b>			
Respiratory	07	16	
Gastrointestinal	06	06	
Gastroureinary	21	16	
ENT (Otomycosis)	03	06	p>0.05
Skin infections	14	22	
Malaria/Dengue	02	05	
Dental	01	01	

Table 2: (Continued)

Characteristics	Urban (n=100)	Rural (n=100)	p value
<b>Weight</b>			
Underweight	02	10	
Normal	73	85	p<0.05
Overweight	25	05	
<b>Physical activity</b>			
Sedentary	35	20	
Mild	42	30	p<0.05
Moderate	14	30	
Heavy	09	20	
<b>Known case of hypertension (n=123)</b>	65	58	

Table 3: Diabetes related information

Characteristics	Urban (n=100)	Rural (n=100)	p value
<b>Family members in diabetes</b>			
Present	47	20	
Absent	22	22	p<0.05
Don't know	31	58	
<b>Reasons leading to detection of diabetes</b>			
Symptoms	40	43	
Routine health check-up	30	04	p<0.05
Complications	30	53	
<b>Diabetic complication/s</b>			
Present	69	81	
Absent	31	19	p<0.05
<b>Diabetic medication</b>			
Insulin	06	06	
combination	13	08	p>0.05
Oral Antidiabetic drugs	81	86	
<b>Administration of Insulin</b>			
Self	16	02	
Nurse	03	09	p<0.05
Family members	00	03	
<b>Place of checking blood sugar</b>			
Laboratory	81	98	
At home (Glucometer)	19	02	p<0.05

**Table 4: Knowledge regarding diabetes of type 2 diabetes patients**

Sr. No.	Questions regarding knowledge on diabetes	Adequate		Inadequate – Poor		No knowledge at all		p value
		U	R	U	R	U	R	
1	Nature of diabetes	12	01	80	64	08	35	<0.05
2	Bodily changes in diabetes	93	71	03	11	04	18	<0.05
3	Eyes should be checked	45	28	56	72	00	00	>0.05
4	On control of diabetes, medicines should take or not	85	83	12	09	03	08	>0.05
5	Symptoms of diabetes	94	61	06	38	00	01	<0.05
6	Diabetes complications	65	36	35	62	00	02	<0.05
7	Lifestyle modifications	54	25	44	69	02	06	<0.05
08	Measures to control blood sugar	43	12	56	88	01	00	<0.05
09	Regular exercise help in	22	01	65	55	13	14	<0.05
10	Well balanced diet includes	57	45	43	55	00	00	>0.05
11	Foot care	35	14	65	86	00	00	<0.05

**Table 5: Correlation of self-care practices with HbA1c in Urban area**

Self-care practices	HbA1c		Total (n=100)	p-value
	≤7	>7		
<b>Type of footwear</b>				
Open	10	34	44	>0.05
Close	09	39	48	
Special	05	04	08	
<b>Keeping feet clean and dry regularly</b>				
Yes	22	72	94	>0.05
No	00	06	06	
<b>Taking care of minor cracks/wounds</b>				
Yes	20	63	83	>0.05
no	03	14	17	
<b>Regular ophthalmic examination</b>				
Yes	19	58	77	>0.05
No	04	19	23	
<b>Regular blood examination</b>				
Yes	21	68	89	<0.05
No	02	09	19	
<b>Compliance to drugs</b>				
Regular	23	58	81	<0.05
Irrregular	00	19	19	
<b>Carrying diabetic card</b>				
Yes	13	42	54	>0.05
No	04	18	22	
Not always	06	18	24	
<b>Frequency of checking blood sugar level</b>	22	78	100	



**Table 6: Correlation of self-care practices with HbA1c in Rural area**

Self-care practices	HbA1c		Total (n=100)	p value
	≤7	>7		
<b>Type of footwear</b>				
Open	10	61	71	>0.05
Close	06	15	21	
Special	00	07	07	
<b>Keeping feet clean and dry regularly</b>				
Yes	13	63	76	>0.05
No	03	21	24	
<b>Taking care of minor cracks/wounds</b>				
Yes	12	43	55	>0.05
no	04	41	45	
<b>Regular ophthalmic examination</b>				
Yes	11	47	58	>0.05
No	05	37	42	
<b>Regular blood examination</b>				
Yes	08	23	31	>0.05
No	08	61	69	
<b>Compliance to drugs</b>				
Regular	16	61	77	>0.05
Irrregular	00	23	23	
<b>Carrying diabetic card</b>				
Yes	04	32	36	>0.05
No	12	50	62	
Not always	00	02	02	
<b>Frequency of checking blood sugar level</b>				
≤1 to 3 months	09	26	35	>0.05
3.1 to 5 months	05	41	46	
>5 months	02	17	19	