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Original Research Paper

General Medicine

ANTHROPOMETRIC ANALYSIS OF PATIENTS FOR TYPE 2 DIABETES MELLITUS AND ITS RELATED COMPLICATIONS IN RURAL AND URBAN COMMUNITY

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ABSTRACT Diabetes mellitus has been described for more than 2000 years for the past 2000 years, it has featured in the history of modern medicine and yet when we have reached the new millennium, our knowledge of the nature of diabetes is still incomplete. Complications from diabetes, such as coronary artery and peripheral vascular disease, stroke, diabetic neuropathy, amputations, renal failure and blindness are resulting in increasing disability, reduced life expectancy and enormous health costs for virtually every society. Diabetes is certain to be one of the most challenging health problems in the 21st century. Because of the differences in the lifestyle of urban and rural population, we evaluated the anthropometric measurements between newly diagnosed cases of T2DM from rural and urban areas. We also uncovered the differences in complications owing to T2DM in two different populations.

KEYWORDS : Type 2 diabetes Mellitus, Body mass index, blood glucose, obesity

INTRODUCTION

Previous studies among urban subjects in Delhi reported on known diabetes and compared this with the diabetes prevalence in Southall, London. Diabetes was more prevalent among Indians living in Delhi and Southall compared to British whites.[1] Two studies from Maharashtra[2] and Andhra Pradesh[3] reported very high prevalence rates similar to those in urban Indian populations. Interestingly a significant correlation of body mass index (BMI) with diabetes has been observed in these studies. It had been hypothesized that although there was a significant increase in diabetes as populations move from rural to semi-urban to urban and cosmopolitan habitats, a reverse migration of culture might already be taking place in Indian rural populations. 4

Łopatyńskiet al (2001)[5] evaluated the prevalence of type 2 diabetes mellitus (T2DM), obesity, hypertension, and lipid disturbances in a representative group of urban and rural population in the Lublin region (Eastern Poland). The prevalence was assessed in 17.6% of rural and in 14.1% of urban population. 75% of diabetics in the rural areas and 56% in the town were the newly diagnosed cases. They found impaired glucose tolerance in 30.3% of rural and in 21.6% of urban population, BMI > or = 30 kg/m^2 in 30.8% and 30.1%, hypertension in 69.4% (29.2% newly diagnosed) and 68.6% (27.7% newly diagnosed), hypercholesterolaemia (total cholesterol > or = 5.2 mmol/l (200 mg/dl)) in 66.4% and 60%, hyper-LDL-cholesterolaemia (> or = 3.5 mmol/l (135 mg/dl)) in 57.3% and 52.6%, hypo-HDL- cholesterolaemia in 21.7% and 31.4%, hypertriglyceridemia (> or = 2.3 mmol/l (200 mg/dl)) in 15.1% and 22% respectively. This finding indicated the urgent need for a program for early diagnosis and prevention of T2DM and concomitant metabolic disturbances.

Jha (2004)[6] presented a prospective study of various coronary and contributory risk factors in urban and rural diabetic population. High total cholesterol was found to be the commonest lipid profile abnormality in the study. Second commonest lipid abnormality was high LDL levels. Low HDL cholesterol was found to be more commonly in patients of age > 60 years than <60 years. More female patients were overweight and obese as compared to male. A Large population of diabetics was found to have a sedentary lifestyle. Rural patients were progressing towards more coronary risk factors as compared to the urban ones, mainly with the lipid profile abnormalities. Although type 2 diabetic patients in this study shared similar coronary risk factors as compared to diabetic patients from different countries, yet in this study type 2 patients have got high prevalence of hypertension. Male diabetics had high prevalence of smoking habits. Zaouiet al (2007)[7] reported the prevalence of diabetes to be 14.2% in a set of 7,656 subjects in urban and rural areas of Tlemcen (in western Algeria), higher among men than women. The prevalence of type 2 diabetes was 10.5% and of type 1 diabetes 3.7%. Overall prevalence was higher in urban than rural areas. More than half of all patients with diabetes had family members with the disease. Estimating the obesity rate according to BMI, 56.7% of all men and more than half of all women in urban areas were found obese. Degenerative complications were found in 60% of diabetes patients. Majgi et al (2012)[8] carried out a study to identify risk factors of T2DM in rural Puducherry. In univariate analysis age, occupation, socio economic status, BMI, physical activity, family history were significant for diabetes mellitus (DM). In multivariate analysis age, BMI, family history of diabetes and occupation were significant for T2DM. The 'diabetes risk score' generated by the study using age, BMI and family history of DM, had specificity, sensitivity and accuracy of 54%, 77% and 76.2% respectively.

In our study, we evaluated and compared anthropometric measurements between newly diagnosed cases of T2DM from rural and urban areas. We also uncovered the difference in complications owing to T2DM between newly diagnosed cases of T2DM in two different populations

MATERIAL AND METHODS

The present study was conducted on newly diagnosed cases of T2 DM attending the Medical OPD or IPD wards in the Department of Medicine, Era's Lucknow Medical College and Hospital, Lucknow. 100 patients (50 urban and 50 rural) were included in the study. The permission was granted from Institutional Ethical Committee. Patients with Diagnosis of T2DM according to ADA criteria were selected and patients with diabetes diagnosed >3 months ago, critically ill patients and pregnant women were excluded from the study. Fasting, Post prandial blood sugar level, HBA1c and blood pressure were measured for all patients. An informed consent was obtained from patients. A detailed medical, personal, family history, socioeconomic status, profession with clinical examination and investigations of the patients was recorded. Following parameters were measured.

- Anthropometry including Weight, height, Body Mass Index (BMI) using formula = weight in kg / height in m, waist circumference (WC), hip circumference (HC), waist-Hip Ratio (WHR)
- Hypertension: Systolic blood pressure more than 140mm Hg, Diastolic blood pressure more than 90mm Hg or increase in

either systolic or diastolic blood pressure was considered as hypertension
- Dyslipidaemia: Fasting lipid profile was done
- HbA1c
- Nephropathy: Serum creatinine and blood urea measurement was done.
- Neuropathy: Complete nervous system examination was done, 10gm monofilament was used to assess sensory neuropathy.
- Retinopathy: Fundoscopy was performed
- Cardiovascular Disease:

Symptoms of ischemic heart disease were enquired about. ECG was performed and Stress ECG and 2D Echo-cardiography was done if required.

- Peripheral Vascular Disease: Examination of peripheral pulses was performed,
- Ankle-brachial pressure index was calculated.
- Cerebro-Vascular Disease: History of stroke and transient ischemic attack was asked, CT and MRI head if required. Data so collected was subjected to statistical analysis using SPSS (Statistical Package for Social Sciences) Version 15.

Table 1: Comparison of Anthropometric Variables in Study Population (Overall)

	Group I		Group II		Significance	
Anthropometric Variables	**Mean**	**SD**	**Mean**	**SD**	**'t'**	**'p'**
Weight (kg)	55.30	9.58	65.10	15.38	-3.825	<0.001
Height (cm)	157.28	9.99	158.16	10.60	-0.427	0.670
WC(cm)	91.18	10.47	99.66	9.18	-4.305	<0.001
HC(cm)	93.04	7.35	99.28	8.82	-3.843	<0.001
WHR	0.98	0.07	1.00	0.06	-1.903	0.060
BMI	22.16	3.11	25.77	4.34	-4.781	<0.001

Weight of Group II (65.10±15.38 kg) was found to be higher than that of Group I (55.30±9.58 kg) and this difference was found to be statistically significant (p<0.001). Though Height of Group II (158.16±10.60 cm) was found to be higher than that of Group I (157.28±9.99 cm) but this difference was not found to be statistically significant (p=0.670). A statistically significant difference in WC of Group I (91.18±10.47 cm) and Group II (99.66±9.18 cm) was observed (p<0.001). HC of Group II (99.28±8.82 cm) was found to be higher than that of Group I (93.04±7.35 cm) and this difference was found to be statistically significant (p<0.001). WHR of Group I (0.98±0.07) was found to be lower than that of Group II (1.00±0.06) and this difference was also found to be statistically significant. (p<0.060) A statistically significant difference (p<0.001) in BMI of Group I (22.16±3.11 kg/m^2) and Group II (25.77±4.34 kg/m^2) was found. All the above anthropometric variables were found to be higher in Group II as compared to Group I, which indicate that patients of Group II were more prone towards obesity. (Table:1)

Table 1a: Comparison of Anthropometric Variables in Study Population (Males)

Anthropometric Variables	Group I (n=27)		Group II (n=28)		Statistical Significance	
	Mean	**SD**	**Mean**	**SD**	**'t'**	**'p'**
Weight (kg)	61.07	8.76	71.36	14.71	-3.135	0.003
Height (cm)	164.70	6.00	163.14	8.05	0.813	0.420
WC (cm)	93.19	11.07	100.54	10.94	-2.476	0.017
HC (cm)	91.74	7.99	98.00	7.17	-3.060	0.003
WHR	1.01	0.06	1.03	0.06	-0.763	0.449
BMI	22.20	3.21	26.77	4.96	-4.042	<0.001

Mean body weight, waist circumference, HC and BMI of male patients of Group II was significantly higher as compared to that of male patients of Group I. Statistically no significant difference between two groups was observed with respect to height and waist-hip ratio (p>0.05). (Fig: 4) (Table: 1a)

Table 1b: Comparison of Anthropometric Variables in Study Population (Females)

Anthropometric Variables	Group I (n=23)		Group II (n=22)		Statistical Significance	
	Mean	**SD**	**Mean**	**SD**	**'t'**	**'p'**
Weight (kg)	48.52	4.96	57.14	12.45	-3.074	0.004
Height (cm)	148.57	5.73	151.82	10.19	-1.328	0.191
WC (cm)	88.83	9.41	98.55	6.37	-4.038	<0.001
HC (cm)	94.57	6.35	100.91	10.51	-2.462	0.018
WHR	0.94	0.06	0.98	0.06	-2.208	0.033
BMI	22.10	3.06	24.48	3.04	-2.618	0.012

For all the parameters mean value of Group II females was higher as compared to Group I females and the difference between two groups was also significant statistically for all the parameters except height. (Table: 1b)

Table 2: Comparison of Blood Sugar Levels in Study Population

Blood Sugar levels	Group I		Group II		Statistical Significance	
	Mean	SD	Mean	SD	't'	'p'
Fasting (mg/dl)	197.60	82.32	185.88	58.10	0.822	0.413
Post prandial (mg/dl)	287.32	82.97	281.62	53.52	0.408	0.684
HbA1c (%)	7.58	0.99	7.86	1.08	-1.364	0.176

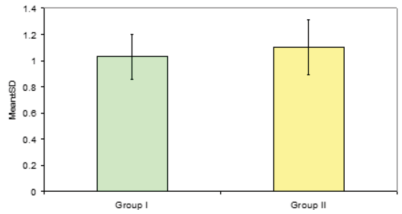
Though, fasting and post-prandial blood sugar levels of Group I (197.60±82.32 & 287.32±82.97 mg/dl) were found to be raised as compared to Group II (185.88±58.10 mg/dl & 281.62±53.52 mg/dl) but these differences were not found to be statistically significant (p=0.413; p=0.684). Though HbA1c of Group II (7.86±1.08%) was found to be higher than that of Group I (7.58±0.99 %) but this difference was not found to be statistically significant (p=0.176). (Table: 2)

Table 3: Comparison of other Hematological/Biochemical Parameters

Parameters	Group I		Group II		Statistical Significance	
	Mean	**SD**	**Mean**	**SD**	**'t'**	**'p'**
Serum Urea (mg/dl)	27.96	6.95	34.13	14.26	-2.751	**0.007**
Spot Urine for Microalbumin (mg/L)	32.84	47.80	44.48	63.33	-1.037	0.302
Serum Creatnine (mg/dl)	1.03	0.17	1.10	0.21	-1.947	**0.054**
Serum Cholesterol(mg/dl)	189.32	72.93	204.68	54	1.197	0.241
Serum Triglycerides(mg/dl)	182.32	131.28	226.82	70.34	2.113	**0.043**
Serum HDL(mg/dl)	38.17	8.17	37.54	10.51	0.335	0.740
Serum LDL(mg/dl)	116.67	45.56	122.53	48.43	0.623	0.538
Serum VLDL(mg/dl)	36.46	26.26	45.36	14.07	2.113	**0.043**

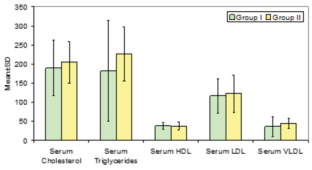
Serum urea levels of Group I (27.96±6.95) were found to be lower than that of Group II (34.13±14.26) and this difference was found to be statistically significant (p=0.007). Microalbumin levels on spot urine test were found to be higher in Group II (44.48±63.33 mg/L) as compared to Group I (32.84±47.80) but this difference was not found to be statistically significant (p=0.302). (Table: 3)

Figure: 1 Serum Creatinine



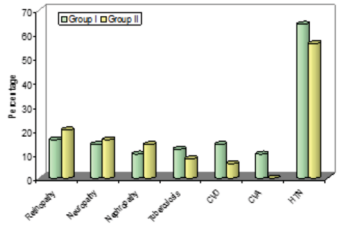
Serum creatinine levels of Group I (1.03±0.17) were found to be lower than that of Group II (1.10±0.21) but this difference was not found to be statistically significant (p=0.054). (Fig: 1)

Figure:2



All the lipid levels (Total cholesterol, TG, HDL, LDL and VLDL) were higher in Group II as compared to Group I. A statistically significant difference between two groups was observed for serum triglyceride and VLDL levels (p=0.043). (Fig: 2)

Figure 3: Comparison of Presence of Complications/ Comorbidities between two groups



Hypertension was the most common complication observed in 64% of Group I and 56% of Group II patients. Diabetic complications like Retinopathy, neuropathy and nephropathy were present in 16%, 14% and 10% respectively of Group I and 20%, 16% and 14% of Group II patients. A total of 6 patients of Group I and 4 of Group II had tuberculosis. CVD was observed in 14% of Group I and 6% of Group II patients while CVA was seen in 10% of Group I and none of the Group II patients. Statistically, there was no significant difference between two groups with respect to any of the complications/ comorbidities except for CVA which was significantly higher in Group I as compared to Group II (p=0.022). (Fig: 3)

LIPID ABNORMALITIES

Serum Total Cholesterol: There were 14 (28%) patients in Group I and 21 (42%) patients in Group II with raised cholesterol levels (≥200 mg/dl), however, the difference between two groups was not significant statistically (p=0.142).

Serum Triglyceride: There were 18 (36%) patients in Group I and 28 (56%) patients in Group II with raised triglyceride levels (≥150 mg/dl), thus showing a statistically significant difference between two groups (p=0.045).

Serum LDL: There were 29 (58%) patients in Group I and 28 (56%) patients in Group II with raised LDL levels (≥100 mg/dl), however, the difference between two groups was not significant statistically (p=0.840).

DISCUSSION

In present study, irrespective of gender as well as in both the genders independently, mean body weight, waist circumference, HC and BMI of urban patients was significantly higher as compared to that of rural patients. In female patients, WHR of urban patients was also found to be significantly higher as compared to that of rural patients. Similar observations with respect to central obesity were also made by Jha et al[6] and with respect to BMI by Zaouiet al [7]. The anthropometric and nutritional status differences between two groups as observed in present study could be explained on the basis of difference in activity levels of two groups as already illustrated.

In the present study, no significant difference between two groups was observed with respect to blood sugar (fasting and PP) and HbA_{1c} levels of two groups. This is an interesting finding keeping in view the heavier activity profile and better anthropometric status of rural patients. Absence of a better glycemic control in rural area despite these favourable conditions (activity level and anthropometry), could probably be attributed to dietary habits. However, this is only one of the probable reasons in the absence of a substantial empirical basis for it and hence is an issue for further exploration.

In present study, biochemical levels such as serum urea and lipid levels, viz. triglyceride and VLDL of urban patients were found to be significantly higher as compared to that of rural patients. A poor lipid status of patients and diabetic complications was also observed in the study of Jha et al[6]. This difference can again be attributed to the difference in activity profile and can also be related with the nutritional status (anthropometry). In present study, no significant difference between two groups was observed with respect to diabetic complications except for cerebrovascular accidents which were found to be significantly higher in rural group as compared to urban group (p=0.022). The prevalence of diabetic complications like nephropathy and retinopathy was quite high in both the groups. It was surprising to see that a large number of patients irrespective of group had complications like diabetic retinopathy which is generally considered to be associated with chronicity of diabetes and is less common in newly diagnosed cases of type 2 diabetes. In a study by Gross et al (2005)[9] prevalence of less severe form of nephropathy i.e. microalbuminuria was reported to be only 7%. Similarly, in a study by Fowler et al (2008)[10] diabetic retinopathy was reported to be a complication of diabetes that manifestation almost 5 to 10 years after the onset of diabetes. The findings in present study thus indicated a high level of undiagnosed DM among patients in both the groups. It was concerning to note that irrespective of the place of residence patients generally ignored the signs and symptoms of T2DMitself and reported to our facility only when microvascular and macrovascular complications related with diabetes started to manifest. These findings are in accordance with the observations made by Deepa et al (2014)[11] who reported that knowledge about diabetes was far lower in general population not diagnosed as diabetics (29.9%) as compared to diabetic population (74.4%), however, there was no significant rural-urban differences with respect to major issues related with diabetes. These findings were suggestive of the fact that the preventive strategies for creating awareness regarding diabetes and its complications need a review and need a similar handling irrespective of urban and rural residence.

CONCLUSION

Mean body weight, waist circumference, HC and BMI of urban patients was significantly higher as compared to that of rural patients. In female patients, WHR of urban patients was also found to be significantly higher as compared to that of rural patients. No significant difference between two groups was observed with respect to blood sugar (fasting and PP) and HbA_{1c} levels of two groups. Serum urea, triglyceride and VLDL levels of urban patients were found to be significantly higher as compared to that of rural patients. No significant difference between two groups was observed with respect to diabetic complications except for cerebrovascular accidents which were found to be significantly higher in rural group as compared to urban group. The study revealed lower BMI and better lipid profile in rural newly diagnosed diabetics as compared to urban population. These differences highlight the difference of risk-complications relationship between two population groups in view of difference in their demography, and perceived difference in healthcare facilities.

REFERENCES

1. Verma NP, Mehta SP, Madhu S, Mather HM, Keen H. Prevalence of known diabetes in an urban Indian environment: the Darya Ganj diabetes survey. BMJ 1986; 293:423-4.
2. Agrawal RP, Singh G, Nayak KC et al. Prevalence of diabetes in camel-milk consuming Raica rural community of north-west Rajasthan. Int J Diab Dev Countries 2004;24:109-14.
3. Deo SS, Zantye A, Mokal R, Mithbawkar S, Rane S, Thakur K. To identify the risk factors for high prevalence of diabetes and impaired glucose tolerance in Indian rural population. Int J Diab Dev Countries 2006;26:19-23.
4. Gupta R. Burden of coronary heart disease in India. Indian Heart J 2005; 57:632-8.

5. Lopatynski J, Mardarowicz G, Nicer T, Szcześniak G, Król H, Matej A, Szydłowski W, Paszkowski J, Dabek K, Zmurowska B,Szyprowska-Grzegorczyk E. The prevalence of type II diabetes mellitus in rural urban population over 35 years of age in Lublin region (Eastern Poland). Pol Arch Med Wewn. 2001 Sep;106(3):781-6.
6. Jha N. A comparative study of coronary and contributory risk factors in rural and urban type 2 diabetics. Kathmandu Univ Med J (KUMJ). 2004 Jan-Mar;2(1):28-34.
7. Zaoui S, Biémont C, Meguenni K. Epidemiology of diabetes in urban and rural regions of Tlemcen (Western Algeria). Sante. 2007 Jan-Mar;17(1):15-21.
8. Majgi SM, Soudarssanane BM, Roy G, Das AK. Risk Factors of Diabetes Mellitus in Rural Puducherry. Online J Health Allied Scs. 2012;11(1):4.
9. Gross JL, de Azevedo MJ, Silveiro SP, Canani LH, Caramori ML, Zelmanovitz T: Diabetic nephropathy: diagnosis, prevention, and treatment. Diabetes Care 2005; 28: 164-176.
10. Fowler MJ. Microvascular and Macrovascular Complications of Diabetes. Clinical Diabetes 2008; 26(2): 77-82.
11. Deepa M, Bhansali A, Anjana RM, Pradeepa R, Joshi SR, Joshi PP, et al. Knowledge and awareness of diabetes in urban and rural India: The Indian Council of Medical Research India Diabetes Study (Phase I): Indian Council of Medical Research India Diabetes 4. Ind. J. Endocrinol. Metabol. 2014; 18(3): 379-385.