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Urban and Rural differences of Macrovascular complications Prevalence among Diabetic Patients in Sohag Governorate

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Abstract:

Background: Diabetes is associated with increased risk of a large number of complications including microvascular and macrovascular diseases, blindness, some cancers, gallstones and all-cause mortality. **Objective:** The aim of the research is to study the prevalence of macrovascular complications among rural and urban diabetic patients in Sohag Governorate, Upper Egypt. **Methods:** This Study was conducted in Sohag Governorate as cross sectional study on diabetes mellitus in Upper Egypt. The study included 500 diabetic patients randomly selected from various cities and villages (rural and urban) of Sohag Governorate. all patients were subjected to: history taking, clinical examination, blood pressure and pulse evaluation, ECG, echocardiography and laboratory investigations including blood glucose and HbA1c estimation. **Results:** 500 diabetics patients included in then study, 239 from rural areas and 261 from urban areas. No statistically significant difference between patients from urban and rural areas as regard age, gender and smoking while body mass index was higher in patients from urban areas. Both groups were badly controlled on anti-diabetic medications. The prevalence of HTN was higher in rural than urban. The prevalence of IHD and diastolic dysfunction were higher in urban than rural areas with significant difference. The prevalence of stroke was nearly equal and the prevalence of PAD was higher in rural with no significant difference. Conclusion: Macrovascular complications are prevalent among diabetic patients either from rural or urban residence. Ischemic heart disease and diastolic dysfunction is significantly prevalent among urban diabetic patients than rural ones.

Running title: Diabetic macrovascular complications: urban and rural difference

Key words: Urban, rural, macrovascular, diabetes

Introduction:

The global incidence and prevalence of type 2 diabetes has been increased fourfold between 1980 and 2004. **(1)**. It is expected that the diabetic population will increase from 415 million in 2015 to 642 million by 2040. **(2)**. The increasing trend is particularly prominent in the developing countries **(3).**

Diabetes is associated with increased risk of a large number of complications including microvascular and macrovascular diseases, some cancers, gallstones and all-cause mortality. **(4, 5).** Atherosclerotic cardiovascular disease (ASCVD) is a major cause of death and disability in patients with type 2 diabetes **(6)**

Therefore, assessing risk for cardiac events in diabetics has a relevant clinical issue **(7).**

Patients and methods:

This Study was conducted in Sohag Governorate as cross sectional study on diabetes mellitus in Upper Egypt. The study included 500 diabetic patients randomly selected from various cities and villages (rural and urban) of Sohag Governorate as following: 120 patients from Sohag City (Randomly selected patients from Sohag University Hospital and Sohag General Hospital), 100 patients from Elmaraga City and Bany hellal village (north of Sohag Governorate), 120 patients from Akhmeem City and Arab Mahros village (east of Sohag Governorate), 100 patients from Elmenshah City and El bawareek village (south of Sohag Governorate) and, 60 patients from Edpha village (west of Sohag Governorate). After ethical committee approval and obtaining an informed written consent from all participants, all patients were subjected to:

1-History taking including: Age, sex, Smoking (past or current), Family history of diabetes mellitus, hypertension, family history of any cardiac disease or sudden death, History of diabetes mellitus (duration, compliance with treatment, type of treatment (oral, insulin, or both), any recognized complication of diabetes) History of dyslipidemia, type of treatment, History of hypertension (duration, compliance with treatment, controlled or not), History of cardiovascular disease, Any associated co morbidities.

2-Anthropometric measurements to assess: Weight, height, and waist circumference.

3-Blood Pressure Measurement: Hypertension: is defined as BP values ≥ 140 mmHg SBP and/or ≥ 90 mmHg DBP on 2 separate occasions and or on antihypertensive treatment regularly *(ESH/ESC Guidelines for the management of arterial hypertension, 2013).*

4- Assessment of Pulse (with special emphasis on rate, rhythm, volume, equality on both sides and special characters).

5- Detailed cardiovascular clinical examination.

6- Peripheral arterial disease (either intermittent claudication or past history of peripheral vascular surgery).

7-Laboratory investigations: Fasting and 2h post prandial blood sugar, Complete Lipogram, HbA1c.

8- Resting 12 ECG recording.

9-Transthoracic Baseline Resting Echocardiography:

Results:

The study included 500 diabetic patients randomly selected from various cities and villages (urban and rural) of Sohag Governorate as following: 120 patients from Sohag City (Randomly selected patients from Sohag University Hospital and Sohag General Hospital), 100 patients from Elmaraga City and Bany hellal village (north of Sohag Governorate), 120 patients from Akhmeem City and Arab Mahros village (east of Sohag Governorate), 100 patients from Elmenshah City and El bawareek village (south of Sohag Governorate) and, 60 patients from Edpha village (west of Sohag Governorate).

The mean age of our study population was 52.8 ± 10.9 years with a very wide range from 18-80 years. 44.2% of them were males while 55.8% were females.

Also, a little more than half of our cases were from urban areas (52.2%). Around one third of them were smokers (29.6%) (either current or past smokers).

Nearly most of the participants were Overweight or obese with the mean of BMI around 31.7 ± 3.5 KG/M2, 21.6% were overweight (42% Obesity class I, 17.8% Obesity class II and 8.6% Obesity class III).

The Waist circumference in Females was high with mean 111.0±16.0 and in males was 116.6 ± 15.9.

Variable	Rural N=239	Urban N=261	P value
Age/year			
Mean ± SD	52.7±12.4	53.0±9.4	0.80
Median (range)	54 (18-80)	53 (29-78)	
Gender			
Females	131 (54.8%)	148 (56.7%)	0.67
Males	108 (45.2%)	113 (43.3%)	
Smoking			
Non-smoker	167 (69.9%)	185 (70.9%)	0.81
Smoker	72 (30.1%)	76 (29.1%)	
BMI			
Mean ± SD	31.0±5.5	32.3±5.5	0.01
Median (range)	31 (18-46)	32 (17-47.8)	
BMI Group			
Underweight	2 (0.8%)	4 (1.5%)	
Normal	34 (14.3%)	10 (3.8%)	
Overweight	50 (20.9%)	58 (22.2%)	0.004
Obesity class I	95 (39.8%)	115 (44.1%)	
Obesity class II	40 (16.7%)	49 (18.8%)	
Obesity class III	18 (7.5%)	25 (9.6%)	
Waist circumference in Females			
Mean ± SD	113.6±14.2	118.0±17.3	
Median (range)	116 (77-154)	111 (71-154)	0.003
Waist circumference in Males			
Mean ± SD	102.4±15.7	108.4±16.1	
Median (range)	114 (71-150)	112 (73-152)	0.29

Table :(1) Relation between residence and personal characteristics:

SD: Standard deviation, **BMI**: Body mass index

Table (1) showed statistically significant difference between diabetic patients in urban and rural areas as regard BMI and waist circumference while no difference as regard age, sex and smoking.

Variable	Rural N=239	Urban N=261	P value
Types of DM			
Type I	**12 (5.0%)**	**5 (1.9%)**	**0.06**
Type II	**227 (95.0%)**	**256 (98.0%)**	
Duration of DM/years			
Mean ± SD	**5.6±5.0**	**5.8±4.2**	**0.09**
Median (range)	**4 (0.5-30)**	**5 (0.5-25)**	
Type of treatment			
Oral	**184 (77.0%)**	**204 (78.2%)**	**0.13**
Insulin	**55 (23.0%)**	**53 (20.3%)**	
Oral & insulin	**0**	**4 (1.5%)**	
Family history of DM			
No	**43 (18.0%)**	**15 (5.8%)**	**<0.0001**
Yes	**196 (82.0%)**	**246 (94.2%)**	
Hypertension			
No hypertension	**95 (39.8%)**	**126 (48.3%)**	**0.054**
Controlled	**49 (20.4%)**	**35 (13.4%)**	
uncontrolled	**95 (39.8%)**	**100 (38.3%)**	
Duration of hypertension / years			
Mean ± SD	**4.3±2.8**	**3.7±2.2**	**0.07**
Median (range)	**4 (0-20)**	**3 (0-12)**	

Table (2): Relation between residence and clinical features:

SD: Standard deviation, **DM**: Diabetes Mellitus.

In the above table our study shows that the patients with T1DM were higher in rural than urban with no significant difference. Patients on oral and combined (oral plus insulin) treatment were higher in urban than rural and those on insulin higher in rural with no significant difference between all. Non hypertensive were higher in urban, controlled hypertensive higher in rural and uncontrolled hypertensive were nearly equal in both with no significant difference.

Variable	Rural N=239	Urban N=261	P value
HBA1c			
Mean ± SD	**9±2.1**	**8.9±2.2**	**0.58**
Median (range)	**8.7 (5.1-14)**	**8.7 (5-15)**	
Diabetic control			
Controlled	**47 (19.7%)**	**60 (23.0%)**	**0.37**
Uncontrolled	**192 (80.3%)**	**201 (77.0%)**	
Cholesterol			
Mean ± SD	**194.6±34.7**	**186.8±46.2**	**0.03**
Median (range)	**189 (125-289)**	**202 (89-420)**	
Triglyceride			
Mean ± SD	**218.6±75.7**	**218.0±103.3**	**0.38**
Median (range)	**200 (70-380)**	**213 (60-790)**	
HDL			
Mean ± SD	**41.6±6.1**	**43.1±10.8**	**0.054**
Median (range)	**42 (31-58)**	**41 (23-112)**	
LDL			
Mean ± SD	**109.7±27.4**	**115.4±34.5**	**0.01**
Median (range)	**107 (42-192)**	**112 (32-248)**	

Table (3) :Relation between residence and Lab investigation:

SD: Standard deviation, **HBA_1c**: Hemoglobin A_1C, **HDL**: High density lipoprotein, **LDL**: Low density lipoprotein

Diabetic patients living in urban regions showed significant difference with those living in rural regions as regard total cholesterol and LDL levels.

Variable	Rural N=239	Urban N=261	P value
Hypertension	**144 (60.3%)**	**135 (51.7%)**	**0.06**
IHD	**31 (13.0%)**	**52 (19.9%)**	**0.04**
HFrEF	**10 (4.2%)**	**18 (6.9%)**	**0.19**
HFpEF	**5 (2.1%)**	**8 (3.1%)**	**0.50**
Diastolic dysfunction	**79 (33.1%)**	**120 (46.0%)**	**0.003**
LVH (left ventricular hypertrophy)	**79 (33.1%)**	**100 (38.3%)**	**0.22**
History of Stroke	**19 (8.0%)**	**21 (8.1%)**	**0.97**
History of PAD	**25 (10.5%)**	**23 (8.8%)**	**0.53**

Table (4): Relation between residence and prevalence of hypertension and cardiac abnormalities

IHD: Ischemic heart disease, **HF**: Herat failure, **EF**: Ejection fraction, **LVH**: left ventricular hypertrophy, PAD: Peripheral arterial disease**. HFrEF:** Heart failure with reduced EF**. HFpEF:** Hear failure with preserved EF

As the above table our study shows that the prevalence of HTN was higher in rural than urban but with no significant difference. The prevalence of IHD and Diastolic dysfunction were higher in urban with significant difference. The prevalence of stroke was nearly equal

and the prevalence of PAD Higher in rural with no significant difference.

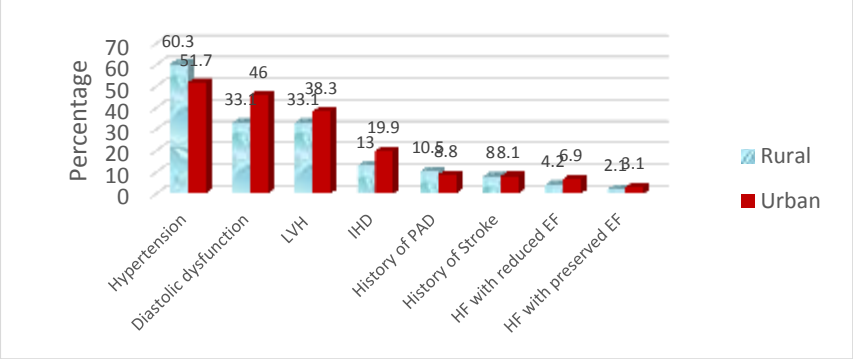

Figure 1 Relation between residence and prevalence of hypertension and cardiac abnormalities

Discussion

About half of the patients included in the study were from urban areas (52.2%) and the remaining from rural areas (47.8%). The study revealed that there is no difference between the patients in the rural and urban areas as regard age, gender and smoking while patients in the rural areas were more obese.

Most of the patients included in the study were uncontrolled on anti-diabetic treatment. The study revealed that there was no difference between patients in the urban and rural areas as regard control of diabetes. This can be explained by the physical inactivity, lower intake of fruits and vegetables, increased prevalence of obesity plus the inappropriate available medical care including follow up investigations and medical therapy and all of these factors, now; seem to be nearly equal in rural and urban areas in Upper Egypt locality.

There is no statistically significant difference between the two groups as regard hypertension and cardiovascular abnormalities except for IHD and diastolic dysfunction which is more prevalent in urban than rural areas. The similarity between the two groups can be explained in our locality by the fact that most of rural areas are now urbanized in life style behavior and are mostly similar as regard lack of exercise, obesity, smoking, stressful life and consumption of junk food. So, when we compared the controlled diabetic patients in the two groups, we found no difference between them as regard age, sex, smoking, BMI; type of DM and even in the type of diabetes treatment and most of lipid parameters. So, it is not surprising to found no statistically significant difference between controlled diabetic patients in the urban and rural areas as regard hypertension and cardiovascular abnormalities including IHD, heart failure, stroke and PAD.

The uncontrolled diabetic patients in the urban and rural areas were nearly the same as regard age, sex, and smoking while patients in the urban areas were more obese. Diastolic dysfunction, IHD and LVH were more prevalent in uncontrolled diabetic patients in the urban than in rural areas. This may be explained by the relatively more prevalence of obesity, more stressful life in the urban than rural areas.

This was not in agreement with a cross-sectional study of more than 214,000 respondents using data from the US Centers for Disease Control and Prevention's (CDC's) 2008 Behavioral Risk Factor Surveillance System, the crude prevalence rates of diabetes and coronary heart disease were 8.6% and 38.8% higher among respondents living in rural areas compared with urban areas,

respectively. The higher prevalence in rural areas of many of the common risk factors for these conditions, including poverty ($P < 0.001$), obesity ($P < 0.001$) and tobacco use ($P < 0.001$), may contribute to these findings. After controlling for these and other risk factors, the prevalence of diabetes was lower among respondents living in rural areas but the prevalence of coronary heart disease was higher **(8).**

References:

1. **Collaboration NCDRF.** Worldwide trends in diabetes since 1980: a pooled analysis of 751 population-based studies with 4$4 million participants. Lancet. 2016 Apr 9;387(10027):1513-1530.
2. **Chatterjee S, Khunti K, Davies MJ**. Type 2 diabetes. Lancet 2017; 389: 2239e51
3. **Xu Y, Wang L, He J, Li YF, Li M, Wang TG, et al.** Prevalence and control of diabetes in Chinese adults. JAMA 2013; 310:948e59.
4. **Campbell PT, Newton CC, Patel AV, Jacobs EJ, Gapstur SM**. Diabetes and cause-specific mortality in a prospective cohort of one million U.S. adults. Diabetes Care. 2012 Sep;35(9):1835-44.
5. **Aune D, Vatten LJ.** Diabetes mellitus and the risk of gallbladder disease: a systematic review and meta-analysis of prospective studies. J Diabetes Complications. 2016 Mar;30(2):368-73.
6. **Low Wang CC, Hess CN, Hiatt WR and Goldfine AB.** Clinical update: cardiovascular disease in diabetes mellitus: atherosclerotic cardiovascular disease and heart failure in type 2 diabetes mellitus mechanisms, management, and clinical considerations. Circulation 2016; 133:2459e502.
7. **Yaméogo NV, Mbaye A, Diack B, Ndour M, Kane M, Diagne-Sow D, Diallo A, Diop SN, Kane A**. Study of echocardiographic parameters of type 2 black African diabetics at high cardiovascular risk. Ann Cardiol Angeiol (Paris). 2013 Feb;62(1):3-7.
8. **O'Connor A and Wellenius G.** Rural-urban disparities in the prevalence of diabetes and coronary heart disease. Public Health. 2012 Oct;126(10):813-20.