A Comparative Study of Coronary Risk Factors Between Urban and Rural Diabetics in Gaza Strip

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Abstract

Background: Diabetes mellitus (DM) is a metabolic disease characterized by hyperglycemia resulting from defects in insulin secretion, insulin action or both. Higher risk of coronary heart disease (CHD) is seen in DM patients who smoke, have lipid abnormalities and hypertension and are obese.

Aim: The aim of this study is to compare the lipid profile levels and other CHD risk factors among DM patients in an urban region (Gaza governorate) with those of the rural region (the eastern region of Khanyounis Governorate) of Gaza Strip. Methods: The study is cross-sectional and included 200 DM patients, aged 10-65 years, whose diabetes was identified for at least two years. The samples of this study were taken from diabetic service units in the Palestinian Medical Relief Society, Gaza governorate and primary healthcare clinics, eastern region of Khanyounis. Personal and clinical data of the study subjects were collected using an interview questionnaire. Anthropometric evaluation were carried out. Serum was used to determine fasting blood glucose and lipid profiles automatically by chemistry spectrophotometer. Results: There was a statistically significant difference among the study population according to physical activity (P=0.004). Moreover, High levels of serum total cholesterol (TC) (≥240mg/dl) were seen in 39.0% of urban group and 23.0% of rural group. High low-density lipoprotein cholesterol (LDL-c) levels (≥160mg/dl) were observed in 15.0% of urban group and 8.0% of rural group. However, there was a statistically significant difference among the study population according to the total cholesterol and LDL levels (P=0.041and 0.002 respectively). On the other hand, there were no statistically significant differences among the study population according to triglycerides and HDL levels (P= 0.153 and 0.594 respectively).

Conclusions: The urban group patients have more coronary risk factors which could lead to an actual coronary heart disease when compared with those in the rural region.

Keywords: *Diabetes mellitus, Lipid profiles, Coronary heart disease, Gaza Strip.*

Introduction

The cardiovascular disease (also called heart disease) is a class of diseases that involve the heart, the blood vessels (arteries, capillaries, and veins) or both (American Diabetes Association (ADA), 2013). CVD were the main (22.4%) leading cause of death in Palestine in 2011(MOH, 2011). According to world health organization (WHO), about 30% of all global deaths is due to coronary heart disease (WHO, 2004). Controllable risk factors for CHD include hypertension, hyperlipidemia, smoking, obesity, physical inactivity and diabetes. On the other hand, uncontrollable risk factors include, gender, age, and family history of CHD. Risk factors modification like reduction of blood pressure, blood cholesterol level, and cigarette smoking decreases the incidence of death associated with CHD (ADA, 2013).

Diabetes mellitus (DM) is a group of metabolic diseases in which there are high blood sugar levels over a prolonged period due to defects in insulin secretion, insulin action, or both. The chronic hyperglycemia of diabetes is associated with long-term damage, dysfunction, and the failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels (Wendy and Jean, 2007). According to Palestinian Ministry of Health (MOH), the prevalence of DM disease in Palestine (Gaza Strip and West Bank) is about 9% (MOH, 2011).

Lipid and Lipoprotein Profiles are blood test that are used to measure serum total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), and Triglycerides (TGs) (ADA, 2013). Higher risk of CHD is seen in diabetics characterized by lipid abnormalities in having decreased HDL-C and hypertriglyceridemia. (Licia et al., 2002). In addition, trends toward sedentary life style and obesity, most DM patients, in fact, have a high serum TC level; a high serum TGs level, a high serum LDL-c level and a low serum HDL-c level. Hyperlipidemia has been incriminated as a risk factor in CHD, atherosclerosis and DM (Krentz, 2003). Hence, the prevention and treatment of the complication of diabetic patients includes treating these highly levels of lipid and other CHD risk factors.

Many studies in the literature were conducted to compare lipid profiles and other CHD risk factors among different population categories (such as : healthy individuals, hypertension patients, DM patients, and both hypertension & DM patients) among different regions of the world countries. The results of these studies were varied and different from one country to the other due to variations in dietary habits, lifestyle behavior, severity & duration of disease, and types & age of target population among them (Tamagno et al., 2001; Jha, 2004; Sumon et al. 2012; Tasneem and Belal, 2012 and Saraswati at el., 2012).

However, to date no study has been reported to estimate and compare CHD risk factor among DM patients in rural and urban areas in Palestine. Therefore, the main aim of this study is to compare the lipid profiles levels and

other CHD risk factors among patients with DM in Gaza governorate (the urban region) and the eastern region of Khan Younis governorate (the rural region) to show their predisposition to emergence CHD.

Literature Review

A comparative study is carried out by Sumon et al. (2012). In Bangladesh, they analyzed sera from 132 individuals of both sexes to describe the serum lipid profile and other CHD risk factors among urban and rural Bangladeshi population, and the findings of the study demonstrated a significant increase in levels of serum lipid profile and other CHD risk factors in the urban population when compared with the rural population. Another study, which was implemented to estimate the various coronary and contributory risk factors in the urban and rural diabetic population, showed that high TC levels (57%), and low levels of HDL cholesterol (17%) were comparatively greater in urban diabetics. High LDL levels were observed in (20%) of the rural subjects and (47%) of the urban diabetics. High TG levels (34%) were seen in rural diabetics. 54% of urban diabetics were centrally obese and 57% were obese from the rural study site (Jha, 2004). Tasneem and Belal, (2012) did research to investigate the risk of CHD in urban and rural diabetic population and they reported that significant differences were observed between the groups under study. Lipid profiles and other CHD risk factors were significantly different in diabetic urban and rural patients when compared to controls. In addition, a study was designed to evaluate lipid profiles as risk factors for CHD in DM in urban and rural population. The results of the study demonstrated an increased level of oxidative stress markers and altered lipid profiles in urban diabetics and healthy controls corresponding to respective rural population suggesting the effect of urbanization and impact of different life styles on the people health (Saraswati at el., 2012).

Hypothesis

1. There is a statistically significant difference between BMI and PA of diabetic patients in the urban region when compared with the patients in the rural region.
2. There is a statistically significant difference between means ± SDs of lipid profiles and other CHD risk factors of diabetic patients in the urban region when compared with the patients in the rural region.

Methodology

Study population

The study population was comprised of 200 DM patients; 100 from Gaza governorate (the urban region) and 100 DM patients from the eastern region of Khan Younis governorate (the rural region), aged between 10-65 years.

Sampling method and sampling sites

The subjects of this study were interviewed from two sites; diabetic services unit in the Palestinian Medical Relief Society, Gaza governorate and primary health care clinics in the eastern region of Khan Younis. The systematic random sampling method was used to select the DM patients who are attending to the clinics.

Questionnaire interview

A face to face interview was used for filling in a questionnaire (Annex 1). The questionnaire consisted of four sections: sociodemographic data, clinical, physical activity (PA) situation and anthropometric indices.

Anthropometric measurements

The body weight was measured in kilogram using professional weighing scale, and height in meter (SECA type), The BMI was calculated by dividing the weight (in kg) by the square of height (in m) (WHO, 2012).

Clinical sample

Around 3 ml of fasting (14-16 hours) blood sample was collected from each patient in a plain tube. The serum was separated by centrifugation the tube at 4000 round/minute for 10 minutes. Serum samples were stored at -18°C until analyzed.

Biochemical tests

Each serum was used to be tested for FBG, TC, TGs, and HDL using Chemistry Autoanalyzer (BS-120, Guangdong, China (Mainland)) using ElITech clinical kit, France (Burstein et al., 1970). HDL-c was measured by spectrophotomer using ElITech clinical kit, France, LDL-c was calculated using Friedewald formula (Friedewald et al., 1972).

Statistical analysis

Data obtained were analyzed using Statistical Package of Social Sciences (SPSS) system (Version 18.0). Descriptive statistics (Frequencies and cross tabulation), Chi-Square Test and T-Test were applied. A significant

result means that the P-value for the hypothesis tests is less than 0.05. The confidence intervals (CI) were reported as 95%.

Results

Demographic data

The finding showed that the mean ± standard deviation (SD) of age among the urban group was 54.8±11.2 years, whereas the mean ± SD of age was 53.52±13.8 the among rural group.

Table 1. Demographic and socioeconomic characteristics of the study sample

Item	Urban group		Rural group		Chi-Square	P-Value
	Frequency (No.=100)	%	Frequency (No.=100)	%		
Gender						
Male	46	46.0	52	52.0	0.72	0.240
Female	54	54.0	48	48.0		
Level of education						
Illiterate	8	8.0	19	19.0		
Primary	41	41.0	28	28.0		
Preparatory	20	20.0	10	10.0	12.50	0.014*
Secondary	20	20.0	25	25.0		
Undergraduate or more	11	11.0	18	18.0		
Monthly income (NIS)						
Less 1000	54	54.0	80	80.0		
1000 -2000	31	31.0	17	17.0	17.12	0.000**
> 2000	15	15.0	3	3.0		

P < 0.05: Significant, * Statistically significant, ** Highly statistically significant

As shown in table 1, both the monthly income and the level of education showed significant differences between the urban and the rural population (P=0.000 and 0.014 respectively).

Clinical history data

Table 2. Clinical history of the study sample

Item	Urban group		Rural group		Chi-Square	P-Value
	Frequency (No.=100)	%	Frequency (No.=100)	%		
Family history of diabetes						
Yes	64	64.0	54	54.0	2.06	0.098
No	36	36.0	46	46.0		
Age at diagnosis						
≤ 40 years	44	44.0	16	16.0	18.86	0.000**
41-43years	4	4.0	6	6.0		
≥ 44 years	52	52.0	78	78.0		
Having hypertension						
Yes	49	49.0	41	41.0	1.29	0.160
No	51	51.0	59	59.0		
Type of hypoglycemic drugs						
Oral	53	53.0	69	69.0	9.22	0.002*
Injection	47	47.0	31	31.0		
Smoking status						
Smokers	11	11.0	16	16.0	1.07	0.204
Non Smokers	89	89.0	84	84.0		

P < 0.05: Significant, * Statistically significant, ** Highly statistically significant

The table above (2) indicates the clinical history of the study sample. However, there was a statistically difference among the study population according to age at diagnosis and type of hypoglycemic drugs (P=0.000** & P=0.002 respectively) (table 2).

PA and BMI data

Table 3. PA and BMI situation of the study sample

Item	Urban group		Rural group		Chi-Square	P-Value
	Frequency (No.=100)	%	Frequency (No.=100)	%		
PA situation						
Sedentary PA	60	60.0	37	37.0	13.39	0.004*
Light PA	7	7.0	13	13.0		
Moderate PA	33	33.0	46	46.0		
Vigorous PA	0	0.0	4	4.0		
BMI situation						
Normal weight	9	9.0	8	8.0	0.809	0.425
Overweight	25	25.0	29	29.0		
Obesity	66	66.0	63	63.0		

P < 0.05: Significant, * Statistically significant, ** Highly statistically significant

As shown in table 3, sixty percent of the urban group individuals vs. 37.5% of the rural group individuals exerted no effort at work (sedentary PA). However, there was a statistically significant difference among the study population according to PA (P=0.004) (table 3). The mean of BMI was 34.15 ± 14.93 and 33.07 ± 7.15 for urban and rural population respectively. according to the international classification of the BMI (WHO, 2012), therefore 66% and 63% of urban and rural are obese respectively (table 3).

Biochemical tests data

Table 4: Lipid profiles of both urban and rural population

Item	Urban group		Rural group		Chi-Square	P-Value
	Frequency (No.=100)	%	Frequency (No.=100)	%		
Total cholesterol (mg/dL)						
Less than 200	49	49.0	65	65.0	6.37	0.041*
200-239	12	12.0	12	12.0		
240 or more	39	39.0	23	23.0		
LDL (mg/dL)						
Less than 100	24	24.0	45	45.0	14.52	0.002*
100-129	43	43.0	24	24.0		

130-159	18	18.0	23	23.0		
160 or more	15	15.0	8	8.0		
HDL (mg/dL)						
Less than 40	11	11.0	9	9.0	1.04	0.594
40-59	67	67.0	63	63.0		
60 or more	22	22.0	28	28.0		
Triglycerides (mg/dL)						
Less than 150	43	43.0	35	35.0	3.74	0.153
150-199	16	16.0	27	27.0		
200 or more	41	41.0	38	38.0		

As shown in table 4, TC and LDL levels showed a significant differences between the study group (p=0.041 & 0.002 respectively).

Discussion

Diabetes mellitus is a global problem. The total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030. The coronary heart disease is considered as an important public health problem, not only in developed countries but also in developing countries. According to WHO, about 30% of all global deaths is due to CHD (WHO, 2004) . CHD risk factors modification like reduction of blood pressure, blood cholesterol level, and cigarette smoking decreases the incidence of death associated with it (Engler et al., 1992). Therefore, the present work is the first to compare the lipid profiles levels and other CHD risk factors among patients with DM in rural and urban areas of Gaza stripe to show their predisposition to emergence CHD.

Regarding the association between the monthly income and CHD, the results of the present findings found that, urban group individuals were higher in monthly income than rural group individuals (P=0.00). These findings are in accordance with those obtained by the 12-year prospective study, which was conducted in Turky in 2003, and reported that family income in the Turkish community was strongly predictive of future CHD events independent of age, sex (Keleş et al., 2003). As the world becomes increasingly urban and megacities emerge, traffic related air pollution poses environmental, ecological and human health risks. Rural communities with more traditional life styles exhibit lower rate of diabetic risk factors and diabetes, whereas urban communities and particularly those of a higher socioeconomic status have higher rates of both risk factors and diabetes (William et al., 1997). Presently the data on urban and rural populations and DM risk and its complications are limited.

Coronary risk factors for the urban and rural group of study population were as follows: Hypertension was seen in 49.0% of urban diabetics and 41.0% in rural diabetic population. Smoking prevalence was seen in 11.0% of the patients belonging to the urban site and 16.0% in rural subjects. Sedentary PA was seen in 60.0% of urban diabetics and 37.0% in rural diabetic population. Obesity was found in 66.0% of urban diabetics and 63.0% in rural diabetic population. Moreover, high levels of TC (≥240mg/dl) were seen in 39.0% of urban subjects and 23.0% in rural subjects. Low levels of HDL (≤ 40mg/dl) were seen in 24.0% of urban patients and 45.0% of the rural diabetic patients. High LDL levels (≥160mg/dl) were observed in 15.0% of urban patients and 8.0% of rural diabetic subjects. High TGs levels (≥200mg/dl) were seen in 38.0% of urban study participants and 79.0% of rural subjects. According to the above finding, urban area patients were more progressing towards the coronary risk factors as compared with rural area patients, because they were having higher levels of TC, LDL, TGs, more obese, less physically active and hypertensive. The higher levels of TC, LDL and TGs in urban population may be attributed to high calorie intake, unhealthy diets, lack of exercise, obesity, sedentary life style in the patients of DM (Siddartha et al., 1992 and Analava et al., 2007). The findingof present study is in line with most of previous studies, which found that the urban area patients are more progressing towards the coronary risk factors compared with rural area patients (Jha, 2004; Sumon et al., 2012 and Saraswati at el., 2012).

Nevertheless, this finding was inconsistent with the one study, which reported that the rural area patients were more progressing towards the coronary risk factors as compared to urban area patients (Tamagno et al., 2001). Numerous epidemiological studies have also shown a higher prevalence of DM and CHD in urban areas compared with rural areas (Sobngwi et al., 2004 and Ramachandran et al., 2008). This difference has been observed particularly in the developing countries that have undergone a rapid transition from rural to urban lifestyle. It has been largely attributed to broad shifts in diet, PA, and obesity in urban areas. However, these lifestyle factors fail to completely explain the association with the increased diabetes and CHD risk (Barry, 1999). Exposure of diabetic individuals to exogenous sources of free radicals (traffic, industrial emissions etc.) in urban areas may further enhance the complications associated with diabetes. Whitsel, (2009) reported that insulin and insulin resistance increase susceptibility to the adverse effect of pollution on cardiac autonomic control. Such increases in susceptibility may, in turn, influence the risk of coronary heart disease among persons with CHD (Whitsel et al., 2009).

Conclusion

The mean ± SD of age among the urban group was 54.8±11.2 years, whereas the mean ± SD of age was 53.52±13.8 among the rural group. In addition, the urban group patients were higher in monthly income and educational level than rural group patients, and this difference reached a statistically significant difference level.

Moreover, urban group patients were more progressing towards the coronary risk factors as compared with rural area patients, because they were having higher of TC, LDL-C, TGs, more obese, more physically inactive and hypertensive.

Furthermore, unhealthy lifestyle and dietary habits, physical inactivity, obesity, and lack of awareness to the follow-up health status among urban and rural diabetics may play a major role in coronary artery disease.

Recommendations

1- Early screening of coronary risk factors and its management are recommended for the overall management of diabetic patients, which in turn reduce the risk of diabetes complications and CHD.

2- Cessation of smoking should be strongly advised to all diabetics.

3- Hypertension can accelerate other complications of diabetes, particularly CVD. Early identification by regular check-up during a hospital visit and treatment is mandatory for all diabetic subjects.

4- Because of additive cardiovascular risk of hyperglycemia and hyperlipidemia, lipid abnormalities should be instantly detected and treated as part of comprehensive diabetic care.

Acknowledgements

We would like to extend our sincere thanks to the Medical Sciences Department at University College of Science and Technology- Khanyounis for allowing us the full access to their facilities. We also express our gratitude to the Ministry of Health and Palestinian Medical Relief Society for their cooperation in sample collection from their clinics.

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دراسة لمقارنة عوامل الخطر المؤدية لمرض شريان القلب التاجي عند مرضى السكري بين المنطقة الحضرية والمنطقة الريفية لقطاع غزة

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الملخص

مقدمة: مرض السكري هو متلازمة تتصف بارتفاع شاذ في تركيز سكر الدم الناجم عن عوز هرمون الأنسولين، أو انخفاض حساسية الأنسجة للأنسولين، أو كلاهما. يزداد معدل انتشار أمراض القلب التاجية بين مرضى السكري، كما تزداد احتمالية حصول أمراض القلب التاجية بين المرضى المدخنين والذين يعانون من خلل في تراكيز الدهون والسمنة وارتفاع ضغط الدم. الهدف: مقارنة عوامل الاختطار المؤدية لمرض شريان القلب التاجي عند مرضى السكري بين المنطقة الحضرية والمنطقة الريفية لقطاع غزة. المنهجية والأساليب: منهجية هذه الدراسة مقطعية وصفية، نُفذت على ما مجموعه 200 متطوعاً من الذكور والإناث المصابين بمرض السكري النوع الثاني، مئة منهم مثلوا المجموعة الحضرية، والمئة الأخرين مثلوا المجموعة الريفية، و تراوحت أعمارهم بين 10- 65 عاماً، وشُخصوا بالمرض منذ عامين على الأقل. تم جمع عينات الدراسة من مكانيين: وحدات خدمات مرضى السكري التابعة لجمعية الإغاثة الطبية بمحافظة غزة (المجموعة الحضرية) وعيادات الرعاية الأولية التابعة لوزارة الصحة بالمنطقة الشرقية لمحافظة خانيونس (المجموعة الريفية). أستخدمت الاستبانات لجمع البيانات الشخصية والسريرية لكلا المجموعتين، كلتا المجموعتين خضعت لتقيم القياسات الجسمية. وقد تم قياس التراكيز البيوكيميائية للشحوم في الدم باستخدام جهاز قياس الطيف الضوئي. النتائج: سجلت الدراسة وجود فروقات ذات دلالة إحصائية بين المجموعتين تبعاً لمعدل النشاط البدني ($p\leq0.05$). إضافة إلى ذلك، لُوحظ ارتفاع في مستويات الكولسترول ($TC\geq240mg/dl$) بين 39.0% من الحضريين بمقابل 23.0% من الريفيين، لكن على النقيض لُوحظ انخفاضٌ في مستويات الكولسترول عالي الكثافة ($HDL-C\leq40mg/dl$) عند 24.0% من الحضريين بمقابل 45.0% من الريفيين. ووجدت الدراسة أن الفروقات بين المجموعتين تبعاً لمستويات الكوليسترول والكوليسترول منخفض الكثافة ذات دلالة إحصائية ($p\leq0.05$). من جهة أخرى، لم تلحظ الدراسة وجود فروقات ذات دلالة إحصائية بين المجموعتين تبعاً لمستويات الدهون الثلاثية والكوليسترول عالي الكثافة. الاستنتاجات: مرضى السكري الحضريون لديهم الاحتمالية لظهور أمراض القلب التاجية أكثر من مرضى السكري الريفيين، ذلك لأنهم يمتلكون مستويات أعلى من الكوليسترول والكوليسترول منخفض الكثافة، كما أنهم أكثر ميلاً إلى الخمول البدني.

الكلمات المفتاحية: *مرض السكري، شحوم الجسم، أمراض القلب التاجية، قطاع غزة.*