

Obesity and Diabetes Type 2-Related Complications

F. Banah¹*, Muteb Aboawja², K. Alsiary³, L. Rammal³, A. Aseeri⁴, D. Mansouri⁵ and A. Almalki⁶

¹Diabetes Center, Southern Region Armed Forces Hospital, Saudi Arabia

²Family Medicine, King Faisal Medical City for Southern Regions, Saudi Arabia

³Family Medicine, King Abdulaziz Medical City Western Region, Saudi Arabia

⁴Family Medicine, King Fahad Military Medical Complex, Saudi Arabia

⁵Al-Zahir Primary Health Care Center, Makkah General Directorate of Health Affairs, Saudi Arabia

⁶Kilo 14 Primary Health Care Center, Jeddah Directorate of Health Affairs, Saudi Arabia

*Corresponding author:

F Banah, Diabetes Center, Southern Region Armed Forces Hospital, Saudi Arabia.

Submitted: 16 July 2017; Accepted: 02 Aug 2017; Published: 14 Aug 2017

Abstract

Background: Obesity and diabetes are common public health problems among Saudis. Among diabetics, weight management is more challenging, because of the weight-promoting effect of most glucose-lowering therapies.

Aim of study: To investigate if central obesity is associated with development of complications among type 2 diabetic patients.

Patients and Methods: During February 2015, a total of 111 (39 males and 72 females) type 2 Saudi diabetics attending the Diabetics Clinic at King Salman North West Armed Forces Hospital, Tabuk City, Saudi Arabia, were included in this study. Collected data included Patients' demographic characteristics, blood pressure, waist and hip circumference as well as microvascular and macrovascular complications of diabetes. Obesity was defined as having waist-to-hip ratio above the acceptable range (i.e., <0.8 among males and <0.9 among females).

Results: Mean age of participants (SD) was 55.4 (12.6) years. According to the waist-to-hip ratio, 89 patients (80.2%) were obese. Two thirds of patients were hypertensive (66.7%), 21.6% had retinopathy, 17.1% had nephropathy, 14.4% had polyneuropathy, 17.1% had diabetic foot, while 19.8% had coronary artery disease. Prevalence rates for all complications among type 2 diabetics were higher among obese than non-obese patients, with significant differences regarding hypertension ($p=0.004$), retinopathy ($p=0.030$) diabetic foot ($p=0.017$); nephropathy ($p=0.015$) and coronary artery disease ($p=0.045$).

Conclusions: Prevalence of obesity is high among type 2 Saudi diabetics. Diabetes related complications are more common among obese diabetics. Weight reduction is an important step toward prevention of diabetes-related microvascular and macrovascular complications.

Keywords: Diabetes, type 2, Saudi, Obesity, Waist-to-hip ratio, Central Obesity, Diabetes complications.

Introduction

Worldwide, there are 300 million obese people and due to this rising trend, and it is anticipated that this figure will be doubled by the year of 2025 [1]. Several studies reported that obesity is associated with increased risk of diabetes mellitus [2,3]. It has been shown that diabetes mellitus increases from 2% among overweight people, to

8% among obese people [4].

Obesity and overweight are the most common chronic health problems in Saudi Arabia, with a high prevalence of overweight (32%) and obesity (37%) among adult population [5,6].

Saudi Arabia has been witnessing extensive changes in lifestyle, which led to major epidemiological changes including an alarming increase in prevalence of non-communicable diseases [7]. Moreover,

the prevalence of diabetes in Saudi Arabia has become one of the highest in the world [8].

The harmful effects of hyperglycemia among diabetics can be classified into macrovascular (coronary artery disease, peripheral arterial disease, and stroke) and microvascular (diabetic nephropathy, polyneuropathy, and retinopathy) complications. Physicians should understand the relationship between diabetes and vascular disease since prevalence of diabetes is increasing worldwide, and strategies for primary and secondary prevention of its complications are also expanding [9].

Since obesity can be managed by lifestyle intervention, the study of its impact as a risk factor for diabetes complications is rewarding and has its benefits. Therefore, this study aimed to investigate whether obesity is associated with development of complications among type 2 diabetic patients.

Patients and Methods

This study was conducted during February 2015. A total of 111 (39 males and 72 females) type 2 Saudi diabetics attending the Diabetics Clinic at King Salman North West Armed Forces Hospital, Tabuk City, Saudi Arabia, were included.

Collected data comprised patients' demographic characteristics, waist and hip circumference, fasting plasma glucose and HbA1c.

Patients' waist to hip ratio was assessed according to the WHO [10]. An unacceptable waist to hip ratio (i.e., abdominal obesity) was considered when >0.8 among females and >0.9 among males.

Collected data were analyzed using the Statistical Package for Social Sciences (SPSS), Version 22. Results of qualitative variables were presented as frequency and percentage, while results of quantitative variables were presented as means and standard deviations. Results were compared using unpaired independent samples t-test and chi square test. P-values less than an alpha level of 5% were considered as "statistically significant".

Results

Table 1: Personal characteristics of study sample

Personal characteristics	No.	%
Age group		
• <40 years	11	9.9
• 40-60 years	80	72.1
• >60 years	20	18.0
• Mean+SD	55.4+12.6	
Waist-hip ratio		
Acceptable (no abdominal obesity)	22	19.8
Unacceptable (abdominal obesity)	89	80.2

Table (1) shows that the mean age of participants (SD) was 55.4 (12.6) years. Most of them (72.1%) aged 40-60 years. The waist-to-hip ratio of 89 patients (80.2%) was unacceptable (i.e., patients with abdominal obesity).

Table 2: HbA1c (Mean+SD) according to patients' waist-hip ratio

Waist-hip ratio	No.	Mean+SD	p-value
Acceptable (no central obesity)	22	7.3+1.5	
Unacceptable (central obesity)	89	9.0+1.4	<0.001

Table (2) shows that HbA1c was significantly higher among diabetic patients with abdominal obesity ($p<0.001$).

Table 3: Prevalence of associated complications according to diabetic's waist-to-hip ratio

Associated complications	No central obesity (n=22)		Central obesity (n=89)		Total (n=111)		P Value
	No.	%	No.	%	No.	%	
Hypertension	9	40.9	65	73.0	74	66.7	0.004
Retinopathy	1	4.5	23	25.8	24	21.6	0.030
Nephropathy	1	4.5	15	16.9	16	14.4	0.141
Polyneuropathy	1	4.5	18	20.2	19	17.1	0.080
Diabetic foot	0	0.0	19	21.3	19	17.1	0.017
Coronary artery disease	1	4.5	21	23.6	22	19.8	0.045

Table (3) shows that two thirds of patients were hypertensive (66.7%), 21.6% had retinopathy, 14.4% had polyneuropathy, 17.1% had nephropathy, 17.1% had diabetic foot, while 19.8% had coronary artery disease. Prevalence rates for all complications among type 2 diabetics were higher among obese than non-obese patients, with significant differences regarding hypertension ($p=0.004$), retinopathy ($p=0.030$), diabetic foot ($p=0.017$) and coronary artery disease ($p=0.045$).

Discussion

Obesity is the most important factor in predicting diabetes risk. Although body mass index is the most commonly used marker of obesity, measures of central obesity may capture the entire risk domain in a more comprehensive manner and be more meaningful across all age groups [11].

This study aimed to investigate whether central obesity is associated with development of complications among type 2 diabetic patients.

Most of our diabetic patients (80.2%) had central obesity. This finding is in agreement with that of several studies. Mugharbel and Al-Mansouri reported that most Saudi type 2 diabetic patients were obese. In countries, other than Saudi Arabia, Hillier and Pedula also stated that more than 80% of type 2 diabetics are obese [12,13].

The high prevalence of obesity among Saudi diabetics has been explained by Al-Mahroos and Al-Roomy, who stated that the rapid changes in socioeconomic status among the Saudi population, which led to an imbalance between increased intake and reduced energy expenditure, has produced a number of health risks, including obesity and diabetes [14].

This study showed that mean values for HbA1c differed significantly among diabetic patients according to their waist-to-hip ratio, with the highest values among diabetic patients with central obesity.

This finding is in agreement with those reported by several studies. Mugharbel and Al-Mansouri noted that obesity is a modifiable risk factor for type 2 diabetes, which significantly interferes with control of diabetes. Kamath et al. stressed that obesity is associated with poorer control of diabetes [12,15].

These findings have been explained by Hussain et al. who stated that, most diabetic patients are obese with elevated plasma free fatty acids levels, which may constitute an important link between obesity, insulin resistance and type 2 diabetes. Insulin resistance may originate in the adipose tissue [16]. The adipose tissue of obese patients secretes more adipokines, which cause insulin resistance. Weisberg et al. added that obesity is associated with increased macrophage activation, which leads to cytokines production that would induce lowered insulin sensitivity [17].

Results of this study showed that prevalence rates for hypertension and diabetes-related microvascular and macrovascular complications were higher among diabetes with central obesity. Tomic et al. reported that prevalence rates for nephropathy and polyneuropathy were significantly related to obesity, whereas the prevalence of retinopathy increased significantly with higher body weight. Moreover, obesity correlated with deteriorating HbA1c levels and higher systolic blood pressure [18].

Conclusion

In conclusion, prevalence of obesity is high among type 2 Saudi diabetics. Diabetes related complications are more common among diabetics with central obesity. Weight reduction is an important step toward prevention of diabetes-related microvascular and macrovascular complications.

References

1. Kaštelan S, Tomić M, Antunica AG, Ljubić S, Rabatić JS, et al. (2013) Body Mass Index: A Risk Factor for Retinopathy in Type 2 Diabetic Patients. *Mediators Inflamm* 2013: 436329.
2. Visscher TL, Seidell JC (2001) The public health impact of obesity. *Annu Rev Public Health* 22: 355-375.
3. Wannamethee SG, Shaper AG, Walker M (2005) Overweight and obesity and weight change in middle aged men: impact on cardiovascular disease and diabetes. *J Epidemiol Community Health* 5: 134-139.
4. Yaturu S (2011) Obesity and type 2 diabetes. *Journal of Diabetes Mellitus* 1: 79-95.
5. Al-Nozha MM, Al-Mazrou YY, Al-Maatouq MA, Arafah MR, Khalil MZ, et al. (2005) Obesity in Saudi Arabia. *Saudi Med J* 26: 824-829.
6. Al-Saleem SA, Alshahrani AM, Al-Khaldi YM (2013) Obesity among patients attending primary care centers, Aseer Region, Saudi Arabia. *Saudi J Obesity* 1: 67-70.
7. Ng SW, Zaghoul S, Ali HI, Harrison G, Popkin BM, et al. (2011) The prevalence and trends of overweight, obesity and nutrition-related non-communicable diseases in the Arabian Gulf States. *Obes Rev* 12: 1-13.
8. Al-Nozha MM, Al-Matouq MA, Al-Mazrou YY, Al-Harhi SS, Arafah MR, et al. (2004) Diabetes in Saudi Arabia. *Saudi Med J* 25: 1603-1610.
9. Fowler M (2008) Microvascular and Macrovascular Complications of Diabetes. *Clinical Diabetes* 26: 77-82.
10. WHO. Waist Circumference and Waist-Hip Ratio: Report of a WHO Expert Consultation Geneva, 8-11 December 2008. World Health Organization 2011. WHO Document Production Services, Geneva, Switzerland.
11. Flint E, Rimm E (2006) Obesity and cardiovascular disease risk among the young and old - is BMI the wrong benchmark? *International Journal of Epidemiology* 35: 187-189.
12. Mugharbel KM, Al-Mansouri MA (2003) Prevalence of Obesity among Type 2 Diabetic Patients in Al-Khobar Primary Health Care Centers. *J Family Community Med* 10: 49-53.
13. Hillier TA, Pedula KL (2001) Characteristics of an Adult Population with newly Diagnosed Type 2 Diabetes. *Diabetes Care* 24: 1422-1527.
14. Al-Mahroos F, AL-Roomi K (2001) Obesity Among Adult Bahraini Population: Impact of Physical Activity and educational level. *Annals of Saudi Medicine* 21: 183-187.
15. Kamath A, Shivaprakash G, Adhikari P (2011) Body mass index and Waist circumference in Type 2 Diabetes mellitus patients attending a diabetes clinic. *Int J Biol Med Res* 2: 636-638.
16. Hussain A, Hydrie MZI, Claussen B, Asghar S (2010) Type 2 Diabetes and obesity: A review. *Journal of Diabetology* 2: 1.
17. Weisberg SP, McCann D, Desai M, Rosenbaum M, Leibel RL, et al. (2003) Obesity is associated with macrophage accumulation in adipose tissue. *J Clin Invest* 112: 1796-1808.
18. Tomic M, Poljicanin T, Pavlic-Renar I, Metelko Z (2003) Obesity: A risk factor for microvascular and neuropathic complications in diabetes?. *Diabetologia Croatica* 32: 73-78.

Copyright: ©2017 F Banah, et al. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.