Biomedical & Pharmacology Journal Vol. **4**(2), 269-274 (2011)

Prevalence of Co-existing Hypertension and Obesity in Saudis

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(Received: July 12, 2011; Accepted: August 04, 2011)

ABSTRACT

Hypertension and obesity are known to be closely associated. In this study we aimed to investigate the coexistence of obesity and hypertension and to confirm obesity as a risk factor for hypertensive in Saudis or *vice versa.*

The study group was composed of 646 hypertensive (males = 326; females = 320), and 14159 non-hypertensive (males = 5899; females = 8260), 2581 obese (males = 896; females 1685) and 12224 non-obese individuals (males = 5329; females = 6894). Prevalence of obesity was calculated in the hypertensive individuals and the results were compared to the results in non-hypertensive group. A highly significant ($p < 0.001$) increase in obesity was obtserved in the hypertensive group (males = 21.47%; females = 31.9%) compared to the non-hypertensive group (males = 14.0%; females 18.63%). On the other hand prevalence of hypertension in the obese males and females was found to be 7.8% and 8.7%, respectively. This was significantly higher than in the non-obese group (males 4.8% and females 2.5%).

The results showed that almost one third of the hypertensive individuals are obese, thus indicating a major role of obesity in the aetiology of hypertension. The results also showed that about 8% of the obese groups have hypertension. These results also show that obesity is more frequent in the hypertensive, compared to hypertension in the obese group. The studied population was grouped according to the province to which they belonged and the prevalence of obesity is hypertensive and prevalence of hypertensive in obese groups was calculated. Differences were noted in the different provinces. These may be a consequence of the life style changes adopted by the people in these provinces.

The main conclusion to be drawn from these results is that obesity must be decreased in Saudi population in order to decrease the prevalence of associated complications such as hypertension and hence cardiovascular disease.

Key words: Hypertension, obesity, cardiovascular disease, Saudi Arabia.

INTRODUCTION

It is well established in extensive epidemiological and cohort studies that hypertension and obesity are closely associated and a higher prevalence of hypertension occurs in the obese compared to their non-obese counterpart [1-17]. Most of studies have been conducted on obese individual and the occurrence of essential hypertension in these individuals is believed to be due to several factors. One of these is insulin resistance and hyperinsulinaemia. It has been shown that insulin resistance is more marked in hypertensive than in normotensive obese subjects. Hyperinsulinaemia with or without insulin resistance promotes body fat deposition and impaired glucose tolerance[4,18-20]. In addition, obesity and high dietary intake of carbohydrates and salt, induces higher

plasma nor-epinephrine and epinephrine level, hyperaldosterone, enhanced sensitivity of blood pressure to salt and increased total blood volume. All these factors influence blood pressure and produces hypertension [19].

In Saudi population, we reported a higher prevalence of obesity[21] and hypertension[22] and we showed a an increase in prevalence of hypertension and obesity with age in Saudi males and females in different provinces of the country. In an attempt to determine if the prevalence of hypertension was more in obese or vise versa, we carried out this study on Saudi hypertensive and obese individuals. In this paper we report our findings and compare the co-existence of obesity and hypertension in Saudis.

MATERIAL AND METHODS

This study was conducted on a group of hypertensive and obese individuals identified during an extensive National Household Screening Programme carried out in Saudi Arabia. The details of which have been published in detail in previous reports[23-24]. The total population screened comprised of 14,805 with ages ranging from 14 to 70 years. There were 6225 males (42.0%) and 8580 females (58%). Height and weight were recorded following procedures published earlier[21] and systolic and diastolic blood pressure was measured[22]. Using standard procedures published by W.H.O. the males and females were diagnosed as suffering from hypertension (systolic pressure > 140 and/or diastolic pressure > 90, and individuals on hypotensive drugs). There were 646 individuals who had hypertension (males = 326 and females = 320) and 14159 non-hypertensive (males = 5899; females = 8260). The total group was also grouped into those with obesity i.e. with a body mass index [weight (kg)/height^2(m^2)] of 30 or more. There were 2581 obese individuals (males = 896 and females = 1685) and 12224 non-obese individuals (males = 5329; females = 6894).

The prevalence of obesity was calculated in the total hypertensive males and females and in the non-hypertensive group. In addition, in the total obese males and females the prevalence of hypertension was calculated and compared with the prevalence of hypertension in the non-obese group. Chi-square analysis using 2 x 2 contingency tables were used to determine the statistical significance of the difference between different groups. $P < 0.05$ was considered statistically significant.

RESULTS

The overall prevalence of hypertension in the total group was 4.36% (with prevalence higher in the males (5.24%), compared to the females (3.73%) ($p < 0.05$), while the prevalence of obesity in the total group was 17.4%. The female had a higher prevalence of obesity (20.26%) compared to the males (13.05%), and the difference between both sexes was statistically significant ($p < 0.05$).

Table 1 presents the prevalence of obesity in the hypertensive males and females in comparison to the prevalence of hypertension in the obese group. The results are also compared to the prevalence of obesity in non-hypertensive group and hypertension in the non-obese group. Obesity prevalence was 45.63% in the hypertensive females compared to 21.47% in the hypertensive males, while hypertension occurred in 7.8% of obese males and 8.7% of obese females. Obesity was significantly higher in the hypertensive group ($p<0.05$) compared to the non-hypertensive group and hypertension was significantly higher in the obese group compared to the non-obese group ($p<0.05$).

The studied population was grouped according to the provinces to which they belonged and the prevalence of obesity was calculated in the hypertensive and non-hypertensive male and females and the prevalence of hypertension was calculated in the obese and non-obese males and females. The results are presented in Table 2. In each area obesity was significantly higher in the hypertensive females and the prevalence ranged from 41.94% in the Northern Province to 49.98% in the Central province. The prevalence of obesity in the hypertensive males was significantly higher than the prevalence of obesity in the non-hypertensive group in all regions except the Eastern and Western provinces. On the other hand, the prevalence of hypertension in obese individuals

Table 1: Prevalence of obesity in hypetensive patients and hypertension in obese individuals

Sex	Obesity Prevalence (%)						Hypertension Prevalence (%)					
	Hypertensive			Non-Hypertensive			Obese			Non-Obese		
	No. of HT	No. of Obese	% of Obesity	No. of Non-HT	No. of Obese	% of Obesity	No. of Obese	No. of HT	% of HT	No. of Non-Obese	No. of HT	% of HT
Male	326	70	21.47	5899	826	14.0	896	70	7.8	5329	256	4.8
Female	320	146	45.63	8260	1539	18.63	1685	146	8.7	6895	174	2.5
Total:	646	206	31.9	14159	2365	16.7	2581	216	8.37	12224	\430	3.52

Table 2: Prevalence of Obesity in hypertensive patients and hypertension in obese individuals in different Provinces of Saudi Arabia

Province	Sex	Obesity Prevalence (%)						Hypertension Prevalence (%)					
		Hypertensive			Non-Hypertensive			Obese			Non-Obese		
		No. of HT	No. of Obese	% of Obesity	No. of Non-HT	No. of Obese	% of Obesity	No. of Obese	No. of HT	% of HT	No. of Non-Obese	No. of HT	% of HT
Central	M	73	23	31.5	1840	271	14.73	294	23	7.82	1619	50	3.09
	F	98	48	48.98	2518	547	21.7	595	48	8.03	2021	50	2.47
Eastern	M	32	3	9.38	219	30	13.69	33	3	9.1	218	29	13.3
	F	39	17	43.59	321	54	16.8	71	17	23.9	289	22	7.6
Southern	M	75	12	16.0	1851	191	10.32	203	12	3.9	1723	63	3.66
	F	69	30	43.48	2699	398	14.75	428	30	7.01	2340	39	1.7
Northern	M	68	17	25.0	1059	134	12.65	151	17	11.26	976	51	5.22
	F	62	26	41.94	1456	287	19.71	313	26	8.30	1205	36	3.0
Western	M	78	15	19.23	930	200	21.50	215	15	7.0	793	63	7.94
	F	52	25	48.08	1266	253	19.98	278	25	9.0	1040	27	2.6

was significantly higher than the prevalence of hypertension in non-obese individuals in all provinces. Female obese had a significantly higher prevalence of hypertension than their male counterpart in all regions except the Northern province.

DISCUSSION

Obesity is a major health problem and due to associated complications results in significant morbidity and mortality. Extensive epidemiological studies in different populations have shown that hypertension and obesity occur in close association with each other[1-17]. This association is believed to be due to several factors accompanying obesity. These factors include hyperinsulinaemia, insulin resistance syndrome, dyslipidaemias, hyperaldosterism, and it is stated that in the absence of these factors obesity is only a minor risk factor[25]. However, obesity is generally accompanied by one or more of the above mentioned factors and this plays a role in worsening prognosis. Weight gain and abdominal obesity promotes insulin resistance and hyperinsulinemia. These contribute to development of hypertension by activating the sympathetic nervous system and by causing sodium retention[4-7]. It has been shown that persons with high body weight show the greatest rise of blood pressure with age[8].

The results of this study in Saudis shows that almost half of the females and almost 21% of the males with hypertension are obese. This clearly shows the close association between obesity and hypertension. Similarly, the prevalence of hypertension in the obese is more than in the non-obese and obesity is more prevalent in the hypertensive, compared to hypertension in the obese. The relationship between hypertension and obesity is not straightforward and most likely represents an interaction of demographic, genetic, hormonal, renal and hemodynamic factors. Furthermore, race and sex further modulate the association between the two states[7].

The Framingham study established hypertension as a major cardiovascular risk factor and quantified its atherogenic cardiovascular disease potential[26]. Clinical trials suggested that hypertension in obese patients increase the risk of cardiovascular disease[27-34].

Since a significant number of Saudi hypertensive individuals are obese, one of the factors predisposing to hypertension in Saudis could be regarded as obesity. Other aetiological contribution factors include genetic, dietary habits, stress, smoking, renal diseases etc.

As obesity may be controlled by proper intervention, it is necessary to control obesity as this will play an important role in reducing hypertension prevalence in Saudi population and this may be a starting step in reducing the risk of artheriosclerotic cardiovascular diseases.

This is further supported by the finding of a higher prevalence of hypertension in the obese compared to the non-obese group. Hence, obesity control by dietary measures, exercise and increasing physical activities need to be stressed to the Saudi population. This requires awareness programmes for the general public, awareness of causes and consequences of obesity, followed by steps required to reduce obesity and this may play an essential role in achieving a healthy Saudi Arabia in the new millenium.

ACKNOWLEDGEMENTS

"The samples were collected during a National Study on Diabetes mellitus. The authors extend their appreciation to the Deanship of Scientific Research at King Saud University for funding the work through the research group project No. RGP-VPP-068".

Disclosure of competing interests

Authors declare that they do not have any competing interests with any group.

Authors' contributions

[1]ASW designed the experiment, analyzed the data and wrote the manuscript. [2]MAF helped in collecting the data and discussion of results and preparation of the manuscript. [3]AMA helped in data analysis, discussion of results and preparation of the manuscript. All authors read and approved the final manuscript.

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