

ORIGINAL ARTICLE

ASSOCIATION OF BLOOD PRESSURE AND RANDOM BLOOD GLUCOSE WITH WEIGHT STATUS OF NORMAL MALE POPULATION IN DAMMAM SAUDI ARABIA

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Background: Overweight and obesity are a big public health problem that can lead to many complications like hypertension, diabetes and dyslipidemia. However, some controversy exists in the lay press and in the medical literature about the health risks of obesity. The aims of this study were to measure body weight and height, Body Mass Index (BMI), Blood Pressure (BP), and to find the association between BMI and BP and random blood glucose. **Methods:** This study was conducted in Dammam, Saudi Arabia on 842 male visitors who attended the mobile clinic of Al-Rahma Medical Charities. Data on BMI (Kg/m^2), a weight-and-height index, blood pressure (systolic and diastolic) pulse rate and blood samples for random blood glucose were measured. **Results:** The results showed that, obesity and overweight are increased with age (35.9% and 32.9%) respectively as well as the obese group showed higher systolic and diastolic blood pressure (129.3/82.6 mmHg) compared to the normal and overweight groups. **Conclusion:** Weight disorder is a real problem, and it is associated with increased blood pressure.

Keyword: Overweight, obesity, hypertension, diabetes, Body Mass Index

INTRODUCTION

According to the World Health Organization (WHO) obesity is the accumulation of excessive body fat negatively affecting health. It was declared one of the top ten health risk conditions in the world, affecting about 300 million people worldwide (60 million adults in the United States alone).^{1,2} Obesity is the result of an imbalance between energy intake and expenditure. As in most human pathological conditions, genetic and environmental conditions play a role in its pathogenesis. In order to maintain a stable and healthy body weight, according to the equation of energy balance (energy intake=energy output+stored energy), the intake and expenditure of energy should be equivalent. However, due to increasingly sedentary life styles and diet changes, a positive energy balance has been created in many countries.³

Obesity is a chronic pathological condition and a risk factor for type 2 diabetes and cardiovascular disease (CVD). Overweight or obese people have a greater probability than normal-weight people of developing metabolic syndrome, a condition characterised by high blood pressure, insulin resistance, and dyslipidemias (high levels of total cholesterol, triglycerides and LDL and low levels of HDL).⁴⁻⁷

In Kingdom of Saudi Arabia (KSA), obesity and overweight are increasing, the large portion of the Saudi community falls either in the overweight or the obesity range that are well known risk factors to variety of medical disorders. Older studies conducted from 1990 to 1993 have shown an overall prevalence of obesity of 22.1%. Approximately 53% of Saudi adults are either overweight or obese.⁸ Moreover Al-Nozha *et*

al,⁹ reported that the prevalence of overweight in KSA was 36.0% and obesity was 35.5%.

The aim of this work was to measure body weight and height, body mass index (BMI) and blood pressure (BP), among Saudi citizens in Dammam and determine their relations with high blood pressure and blood glucose to form a baseline data of normal physiological variables.

MATERIAL AND METHODS

This work was conducted during the period 2008–2009 with the collaboration between Al-Rahma Medical Charities, and Qafelat-Alkheer Charities in Dammam. The study included all male visitors ($n=842$) who attended the mobile clinic of Al-Rahma Medical Charities. The protocol was approved by an ethical committee and thus meets the standards of the Declaration of Helsinki in its revised version of 1975 and its amendments of 1983, 1989, and 1996.¹⁰

All participants completed self administered questionnaires. The weight was measured with ordinary scale (portable balance) with indoor clothing on, but without shoes. Height measurement was carried out in the standing position without footwear; to nearest mm by using measuring tape that is part of the weighing scale. The body mass index (BMI, Kg/m^2), a weight-and-height index, is the international measure of obesity. Subjects were categorized as healthy (BMI $<18 \text{ Kg/m}^2$), lean (BMI $<25 \text{ Kg/m}^2$), obese (BMI $\geq 30.0 \text{ Kg/m}^2$), or overweight ($25\text{--}30 \text{ Kg/m}^2$).

In addition, the blood pressure (systolic and diastolic) was measured in a relaxed sitting position following 10 minutes of rest. Blood samples were taken using lancing device (Accu Chek® Roche) for random

blood glucose under Aseptic condition.¹¹ For the purpose of our work, the same technique of weight and height measurements for all subjects of the study population using the same type of equipments such as blood pressure device, weight scale and blood glucose analyser were used.

Data were analysed using SPSS-16. One-way ANOVA was conducted to investigate differences. Least significant difference tests were subsequently conducted.

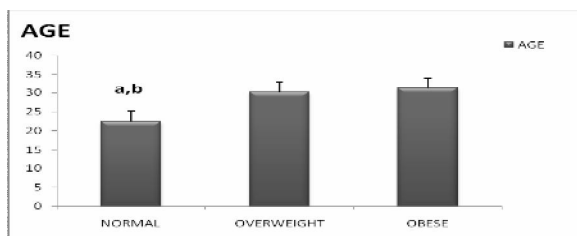
RESULTS

Table-1 gives percentage of participants according to BMI and their age (Mean±SD). Most of the participants seen were obese and overweight (35.9% & 32.9%) respectively.

Table-1: Percentage of participants according to Body Mass Index (BMI)

| BMI Group | n | % |
|---|-----|------|
| Normal (BMI <25 Kg/m ²) | 263 | 31.2 |
| Overweight (BMI 25–30 Kg/m ²) | 277 | 32.9 |
| Obese (BMI ≥30 Kg/m ²) | 302 | 35.9 |

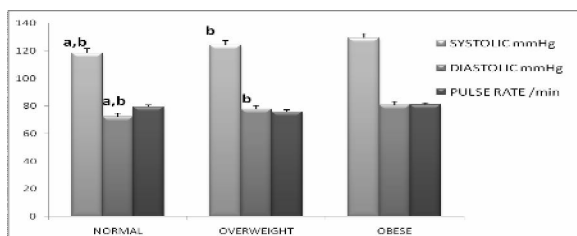
Figure-1 shows that mean age of the normal BMI group of the respondents (22.4) was significantly lower compare to the means age of overweight (30.18) and obese groups (31.16).



a: significantly different from Overweight group, b significantly different from Obese group, using one-way ANOVA

Figure-1: Mean±SEM of Age in Normal, Overweight and Obese Groups

Figure-2 shows that, the means of Systolic and diastolic blood pressure were significantly higher in overweight and obese groups (124.2/77.7 mmHg; 129.3/80.6 mmHg) than in normal weight group (118.3/72.1 mmHg).



a: significantly different from Overweight group, b significantly different from Obese group, using one-way ANOVA

Figure-2: Mean±SEM of Systolic, Diastolic Blood Pressure (mmHg), and Pulse Rate (Beat/min) in the Normal, Overweight and Obese Groups

Blood glucose showed non-significant decreases in Normal BMI group compare to the Overweight and Obese groups (Figure-3).

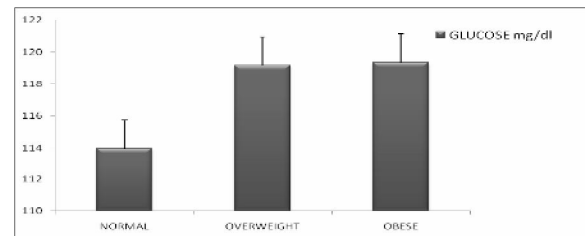


Figure-3: Mean±SEM of Glucose (mg/dl) in Normal, Overweight and Obese Groups

DISCUSSION

Obesity is a growing health concern as it is one of the leading causes of preventable deaths worldwide.¹² The problem of weight disorders has increased dramatically, it was enormous public health problems in Saudi Arabia.¹³

The present study has shown that a high percentage of the individuals are obese. The finding of the present work indicate that in the population studied obesity and overweight increases with age (35.9% and 32.9%) respectively.

These results are in agreement with other studies conducted in Saudi Arabia. A study carried out among 9061 school children aged 6–18 years demonstrated that prevalence of obesity was 15.8%.⁴ This study supports our present results.

The observed increased prevalence in obesity and overweight as shown from our study reflects a true increase in the incidence of obesity as urbanisation is spreading in Saudi Arabia, since the major causes of obesity is the changes in the diet, in terms of quantity and quality, which has become more 'Westernised'. It is characterised by high intakes of red meat, sugary desserts, high-fat foods, high-sugar drinks and refined grains.¹⁴ Moreover, recent studies revealed increasing consumption of animal products and refined foods in the diet at the expense of vegetables and fruits in Kingdom of Saudi Arabia.^{15,16} Majority of people own cars and perhaps engage in little or no physical exercises. Dietary changes have been accused for increasing the prevalence of both overweight and obesity observed among Saudi in the last few decades.⁹

Our result showed higher systolic and diastolic blood pressure (129.3/82.6 mmHg) in obese group compared to the normal and overweight groups. This is in consistency with previous studies which have reported that obese people have a greater probability than normal weight people of developing high blood pressure as part of metabolic syndrome, a condition characterised also by insulin resistance, and dyslipidemias (high levels of total cholesterol, triglycerides and LDL, and low levels of HDL).¹⁷

Moreover, substantial evidence had supported the hypothesis that obesity contributes to elevated blood pressures in humans.¹⁸ It has been observed that overweight could be a major factor in determining the increasing rates of coronary heart disease by its influence on blood pressure.¹⁹ According to WHO, chronic diseases are the major causes of death in almost all countries. It is estimated that 70% of these deaths will occur in developing Asian nations. Cardiovascular diseases are responsible for the major share of these deaths due to chronic diseases.²⁰

Recognising the extent of problem provides opportunity for prevention of cardiovascular diseases by means of lifestyle interventions targeted at populations, thereby attempting to reduce morbidity and mortality arising from these diseases in the future, since Saudi Arabia ranks 29 on a 2007 list of fattest countries with a percentage of 68.3% of its citizens being overweight (BMI>25) according to Forbes.²¹

CONCLUSION

Random blood glucose was non-significantly low in normal BMI group compare to the other groups. However, further studies to assess this relation by using fasting blood glucose sample may be required. This study did not include questionnaire for items of information on occupation, life style and physical exercise. Thus we could not adequately determine the role of social factor and exercise.

RECOMMENDATIONS

Multidisciplinary approaches are required to reduce the personal and economic burden in obesity disorder and its possible complications like hypertension for the global society. It is important to institute a good public health education program on nutrition to reduce the level of obesity in Saudi Arabia. Urgent dietary management going hand in hand with regular medical follow-up should be considered to overcome or, at least, minimise the possible complications of the obesity in Saudis.

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REFERENCES

1. Hill JO, Wyatt HR, Reed GW, Peters JC. Obesity and the environment: where do we go from here. *Science* 2003;299:853–5.

2. Clement K, Ferre P. The genetics of childhood disease and development: a series of review articles. *Pediatric Research* 2003;53:721–5.
3. Pi-Sunyer X. A clinical view of the obesity problem. *Science* 2003;299:859–60.
4. Feingold KR, Grunfeld C, Pang M, Doerrler W, Krauss RM. LDL subclass phenotypes and triglyceride metabolism in non-insulin-dependent diabetes. *Arterioscler Thrombs* 1992;12:1496–502.
5. Austin MA. Hypertriglyceridemia as a cardiovascular risk factor. *Am J Cardiol* 1998;81:7B–12B.
6. Tribble DL, Krauss R M. Atherosclerotic cardiovascular disease. In: *Present Knowledge in Nutrition*. Eighth edition. Washington; International Life Sciences Institute, 2000.
7. Taskinen MR. Diabetic dyslipidemia from basic research to clinical practice. *Diabetologia* 2003;46:733–49.
8. Al-Nuaim AA, Bamgboye EA, al-Rubeaan KA, al-Mazrou Y. Overweight and obesity in Saudi Arabian adult population, role of socio-demographic variables. *J Community Health* 1997;3:211–23.
9. Al-Nozha M, Al-Mazrou Y, Al-Maatouq M, Arafah MR, Khalil MZ, Khan NB, *et al*. Obesity in Saudi Arabia. *Saudi Med J* 2005;26:824–9.
10. World Medical Association Declaration of Helsinki Recommendations guiding physicians in biomedical research involving human subjects. *JAMA* 1997;277:925–6.
11. Bjorvatn B, Sagen IM, Øyane N, Waage S, Fetveit A, Pallesen S *et al*. The association between sleep duration, body mass index and metabolic measures in the Hordaland Health Study. *European Sleep Res Society* 2007;16:66–76.
12. Barness LA, Opitz JM, Gilbert-Barness E. Obesity: genetic molecular, and environmental aspects *Am J Med Genet* 2007;A 143A(24):3016–34.
13. Alsaif M, Hakim I, Harris RB, Alduwaihy M, Al-Nuaim A, Al-Attas O. Prevalence and risk factors of obesity and overweight in adult Saudi population. *Nutrition Research* 2002;22:1243–52.
14. Antonio G, Chiara PA. A natural diet versus modern western diets. A new approach to prevent “well-being syndromes”. *Dig Dis Sci* 2005;50:1–6.
15. Amin TT, Al-Sultan AI, Ali A. Overweight and obesity and their relation to dietary habits and socio-demographic characteristics among male primary school children in Al-Hassa, Kingdom of Saudi Arabia. *Eur J Nutr* 2008;47:310–8.
16. Mahfouz AA, Abdelmoneim I, Khan MY, Daffalla AA, Diab MM, Al-Gelban KS, *et al*. Obesity and Related Behaviors among Adolescent School Boys in Abha City, Southwestern Saudi Arabia. *J Trop Pediatr* 2007;54:120–4.
17. Lakka H. The metabolic syndrome and total and cardiovascular disease mortality in middle-aged men. *JAMA* 2002;288:2709–16.
18. Landsberg L. Insulin-mediated sympathetic stimulation: Role in the pathogenesis of obesity-related hypertension (or, how insulin affects blood pressure and why). *J Hypertens* 2001;19:523–8.
19. Reddy KS, Prabhakaran D, Shah P, Shah B: Differences in body mass index and waist. Hip ratios in North Indian rural and urban populations. *Obes Rev* 2002;3:197–202.
20. World Health Organization. Preventing chronic diseases. A vital investment. *World Global Report*. Geneva: World Health Organization, 2005.
21. Streib L. World's Fattest Countries. *Forbes*; 2007 February 7. Available from: http://www.forbes.com/2007/02/07/worlds-fattest-countries-forbeslife-cx_ls_0208worldfat_2.html Forbes. Retrieved 2009-02-12.

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