Predicting Association between Body Weight, Diabetes Mellitus and Hypertension among University Students in Eastern Region of Saudi Arabia

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Aim of the study to explore the association of body weight to diabetes mellitus and hypertension. Research design This study included university students using cross sectional design to fulfill the aim of this study. Setting: The study was conducted in two colleges in Prince Sattam Bin Abdulaziz University, KSA a- Applied medical sciences college b- Art & Sciences College (females branch): A total of three hundred students were included in the study. One tool was used for data collection of this study; structured students interview questionnaire sheet with the following parts: Part I: Students' demographic characteristics: age & family medical history of the studied students, Part II: measuring blood pressure, weight & height (BMI) and Part III: Laboratory tests: Random blood glucose level measurement. Results The age of the studied sample were from 18 to 25 years with mean was 20.08 ± 4.9, mean body mass index was 26.95 ± 6.75, approximately half (48%) of them were having a family history of DM ; more than two thirds (68%) of study sample have family history of hypertension. The present study revealed that statistically significant positive correlations were found between BMI&DM, also between DM& Hypertension. Recommendation: University and college administrators should take initiative to prevent and control Non Communicable Diseases (NCD). Strict rehabilitation strategies have to be adhered following the World Health Organization Health Promoting policies.

Keywords: Body Weight; College Students; Diabetes Mellitus; Hypertension; Association Between; Saudi Arabia.

The World Health Organization (WHO) stated that overweight is BMI more than or equal to 25, while obesity is BMI more than or equal to 30, which is considered as chronic disease affecting 95 million adults. Obesity is major causes for multiple organ system failure. Obesity Medicine Association reported because of obesity there were 57 diseases emerged among which the major disorders are DM and Hypertension. In kingdom of Saudi Arabia obesity and overweight are on the rise with a prevalence of 35.5%. Weight reduction is of considerable importance to public health. Prevention and control of these major disorders will improve the health of the public[1].

DM is the important health problem among all age group in the world and it is considered as epidemic. Diabetes prevalence in Kingdom of Saudi Arabia is escalating and is the second highest in Middle East and the seventh in the world for the rate of diabetes. The reason for the high prevalence is mostly due to unawareness, sedentary life-style as lack of exercise and emerging fast food culture. Because of their culture, the physical activity is restricted outside that could

be the important reason for obesity and overweight among people. College students are more addicted to fast food and more beverages. Obesity leads to many health complications like vascular complications, diabetes, hypertension and sleep apnea and less wellbeing and poor lower quality of life. Dangerous long-term complications include; cardiovascular disease, chronic kidney disease, stroke, foot ulcers, and blindness. In 2016, diabetes deaths were estimated by the International Diabetes Federation (IDF) by 4.0 million worldwide (Al Dawish *et al.*, 2016)[2]

Creating awareness is the major step in prevention of obesity. Other strategies included educational interventions for the public regarding consuming a healthy diet, following strict physical exercise regimen, maintaining normal body weight, and avoiding use of tobacco, alcohol, junk foods and beverages drinks. Stress reduction measures also should be included. Regular follow up, control of blood pressure and maintaining proper foot care is important for people with the disease. Pharmacotherapy, Bariatric surgery also helpful in reducing the weight of the people.

The preventive strategies involves counseling for healthy eating, psychological interventions for over eating people, nutritionists can plan and give diet schedule and regular follow up. Reasonable weight reduction and only half an hour of walking daily reduce the incidence of diabetes by more than one half (WORLD HEALTH ORGANIZATION, 2003)3.

Prevalence of hypertension is a major health issue in KSA affecting more than one fourth of the Saudi population. If it is unnoticed it will lead to serious health consequences, when people are not productive because of this health problem then it is a social burden .Early screening, proper health assessment, identification of disease and proper medical intervention and follow up will prevent the further health issues. Modification of   lifestyle and adhering to treatment regimen definitely lower blood pressure and decrease the risk of health complications and improve the health. Improving the educational status of the public, creating health awareness, insisting them to eat low salt diet, regular exercise, maintain optimal body mass index, and maintain normal arterial blood pressure. Adolescents are future pillars of nation, making them aware and propagating health strategies is good start and it will yield promising results.

Hypertension is a major risk factor, which may cause 7.5 million deaths in the worldwide among 12.8% of the total deaths Hypertension is the proved factor for coronary and ischemic heart disease as well as for hemorrhagic stroke. Heart failure, renal impairment, peripheral vascular disease, retinal hemorrhage and visual impairment are the complications of increased blood pressure. Treating systolic blood pressure and diastolic blood pressure until they are less than 140/90 mmHg is associated with a reduction in cardiovascular complications (Papathanasiou *et al.*, 2015)[4].

A serious complication related to diabetes and hypertension is the Cardiovascular Disease, so individuals should maintain their blood pressure levels below 130/80 mmHg. High blood pressure typically does not exhibit symptoms immediately (Midha *et al.*, 2015)[5].

Aim of The Study

Predicting Association between body weight, Diabetes Mellitus and Hypertension among university students in Saudi Arabia

Significance of The Study

Hypertension and Diabetes Mellitus (DM) are strongly associated with obesity which creates a substantial burden for the society. Adolescence health are compromised which leads to un productivity and increasing health cost and hospital expenses. Obesity, hypertension, and diabetes are linked with high risk for the development of cardiovascular and renal complications. Hyperglycemia is the common result of uncontrolled diabetes.

MATERIAL AND METHODS

Cross sectional study design was used. The study was applied in two colleges in Prince Sattam Bin Abdulaziz University, KSA a- Applied medical sciences college b- Art & Sciences College (females' branch). A total of three hundred females' students. Data were collected over a period of 3 months from first of October 2018 till end of December 2018. The sample size was determined using the epi info program using 10 % acceptable error, and 95 % confidence coefficient.

Tool

One tool was used for data collection of this

study; structured student interview questionnaire sheet with the following

Students' Demographic Variables

Age and family medical history.

Body Mass Index

Measuring blood pressure.

Laboratory Tests

Random blood glucose level measurement.

Methods

Permission for data collection was obtained from the responsible authorities after explaining the aim of the study.

A permission from the college ethics committee was obtained.

Tool validation was assessed before starting in data collection by a jury of five experts in nursing fields for content validity to ascertain appropriateness of items for measuring what they supposed to measure.

Reliability of the tool was calculated using Cronbach's Alpha test which equal 0.87.

A pilot study was carried out on 10 % (30 students) to ascertain the relevance, clarity, and applicability of the research tool, no modifications were needed.

Data were collected through an individual interview. An informed agreement was obtained from students after explaining the aim and study nature to gain their cooperation.

The researcher met with each student individually for filling the questionnaire, after this checking blood glucose level, measuring blood pressure and weight & height were noted for each student.

Participants were diagnosed as having hypertension after three consecutive measurements of their blood pressure measurements at different times in the same circumstances following WHO classifications of hypertension.

Ethical Considerations

The purpose of the study was explained to each student and an informed written consent to participate in the study was obtained. Confidentiality of the collected data and anonymity were ensured.

Data management and statistical Analysis, Data were coded, entered using the Statistical Package for Social Science (SPSS Inc., Chicago, IL, USA) version 16. Data analysis was done in the form of univariate analysis: descriptive statistics (frequency & percent for qualitative data, mean ±

SD for quantitative data). Bivariate analysis: cross tabulation. Chi-square test ($X2$) and correlation coefficient were used to test the difference between the proportions of qualitative data. Statistical significance level was considered when p-value < 0.05 for all statistical tests.

RESULTS AND DISCUSSION

The present study revealed that the entire studied sample was females; this study result comes in accordance with (Alhyas *et al.*, 2011)[6] who reported the prevalence of overweight at 25%, 33% obese which were relatively high in women. From relatively recent reports; hyperglycemia prevalence in adults was approximately 0.4%. Prevalence of hyperglycemia seems to have been increasing across recent years, and higher prevalence was associated with female sex. The prevalence of hypertension estimates of prevalence 0.6% for hypertension.

(Alqarni 2016)[7] conducted A Review on the Prevalence of Obesity in Saudi Arabia found several studies reported that KSA has a relatively high rates of overweight and obesity which were significantly increasing over the years. That with agreement with the current study reported obesity was an element considerably combined DM and Hypertension P=0.03.

Study done in China by (Shen *et al.*, 2019)[8] reported that the prevalence of overweight and obesity were significant. One study only considered the prevalence in national versus expatriate populations; this study reported that the combined prevalence of obesity and overweight was higher in Kuwaitis versus non-Kuwaitis populations[9]. The present study stated that 0. 6% of the study sample suffering from hyperglycemia this finding in congruent with (Jangra *et al.*, 2019)[10] found that the prevalence was 9.2%. It is also known that hypertension is common morbidity among patients with DM.

The World Health Organization (WHO) reported that Saudi Arabia comes in the second highest in the Middle East, and is seventh in the world for the rate of diabetes (Al Dawish *et al.*, 2016)[2]. Moreover, study done at Tabouk University, KSA 2019 reported that 10% of the participants are hyperglycemic and 10% are developing problems in that area, with no statistically significant

difference. Saudi Arabia comes among the top ten countries of the world with highest prevalence of diabetes. Diabetes mellitus was more prevalent among Saudi population living in urban than rural areas (Mohamed, 2019[11]). These findings are in step with this study

The International Diabetes Federation cites with type I diabetes mellitus in Saudi Arabia, with an incidence of 31.4 new cases per 100,000 populations. A higher national incidence rate than the incidence rates in Dhahran (Abduljabbar *et*

al., 2010[12]) and Al-Medina (Habeb *et al*., 2011[13]) reported 27.5 per 100,000 and 26.7 per 100,000, respectively. This reflects an increase in new cases of type I diabetes mellitus in KSA. Overall, studies included in this review reported a higher incidence of type I diabetes mellitus among females than males. The highest incidence rate of diabetes should be expected among females rather than males by 2030 as reported by the International Diabetes Federation (Al Otaibi, 2017[14]). A study which was conducted by (El-Hazmi *et al*., 1998[15]) reported an inconsistently low figure, and the authors report a significantly higher prevalence with increasing age. Regarding the studies investigated the prevalence of hypertension reported rates of hypertension ranged from 6.6–33.6%. (Addo *et al*., 2011[16]).

The prevalence of overweight was 25–50%, and obesity was 10–50%, relatively high in
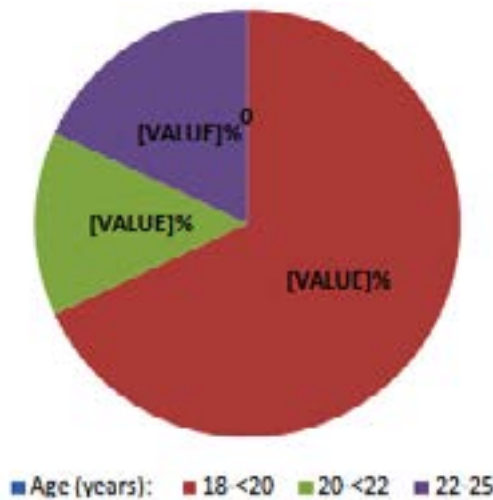

Fig. 1. Frequency distribution of the studied sample regarding age (Mean ± SD20.08 ± 4.9)

Table 1. Relation between BMI and hypertension of the studied sample

| BMI | Hypertension | | X^{2*} | P-value |
	Yes	No		
• Underweight	0	21	9.036	0.03*
• Normal weight	9	96		
• Overweight	0	75		
• Obese	9	90		

*Pearson Chi-Square
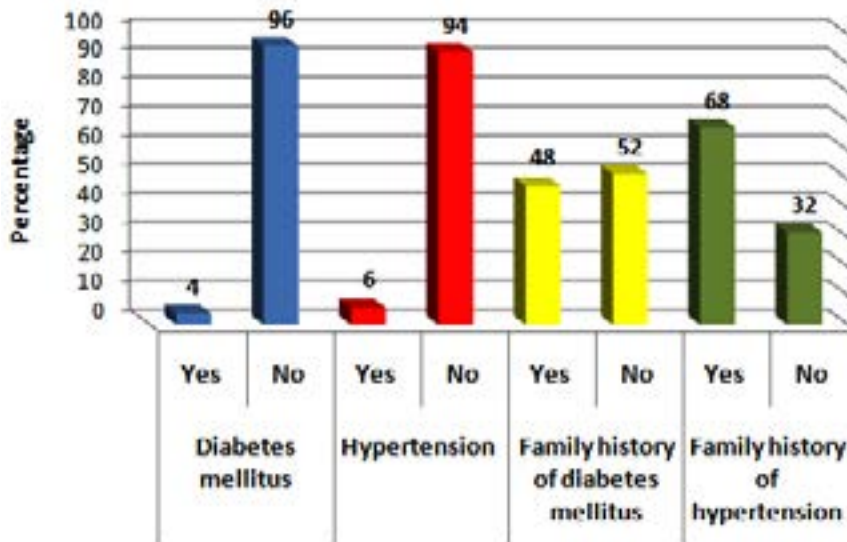Significance level was considered when p-value < 0.05

Fig. 2. Frequency distribution of the studied sample regarding prevalence of diabetes mellitus, hypertension, and family history of diabetes mellitus and hypertension
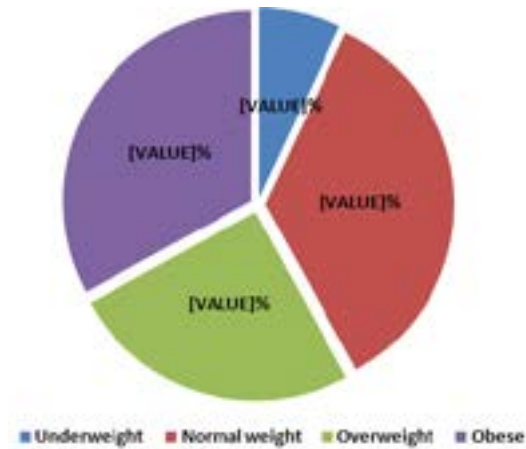
■ Underweight ■ Normal weight ■ Overweight ■ Obese

Fig. 3. Frequency distribution of the studied sample regarding body mass index(Mean ± SD 27.083 ± 7.267)

women. Recently, the prevalence of hyperglycemia in adults was approximately 10–20% (Alhyas *et al*., 20116). Prevalence of hyperglycemia appears to have been increasing over recent years, and higher prevalence again showed an association with female sex. Estimates of hypertension prevalence vary: between 6.6–33.6% for hypertension (Mills *et al*., 2016[17]).

Potentially, the prevalence of hypertension is increasing, which would be in keeping with a more widespread trend. The increasing prevalence of hyperglycemia is similarly in keeping with trends reported elsewhere. By contrast, several of the reviewed studies did demonstrate correlation between BMI, and overweight and obesity, and diabetes concentration. Moreover, the observed prevalence of overweight and obesity by DM.

This study noted differences in the patterns of spread of diabetes, overweight and obesity which parallel with the study in the Gulf region (Alhyas *et al*., 20116). Moreover, Several Studies reported that Saudi Arabia has relatively high rates of overall obesity and overweight, which are significantly increasing over the years. That with agreement in current study reported obesity was an element considerably combined DM and Hypertension table (5)

Statistical Analysis

Data were coded, entered and cleaned using the Statistical Package for Social Science (SPSS Inc., Chicago, IL, USA) version 16. Data analysis was done in the form of univariate analysis: descriptive statistics (frequency & percent for qualitative data, mean ± SD for quantitative data).

Table 2. Correlation between BMI and DM of the studied sample

BMI	DM		R*	P-value
---	Yes	No		
• Underweight	3	18	0.125	0.03*
• Normal weight	6	99		
• Overweight	0	75		
• Obese	3	96		

*Pearson's R
Significance level was considered when p-value < 0.05

Table 3. Correlation between hypertension and DM of the studied sample:

Hypertension	DM		R*	P-value
---	Yes	No		
Yes	3	15	0.163	0.005*
No	9	273		

*Pearson's R
Significance level was considered when p-value < 0.05

Table 4. Correlation between age and DM of the studied sample.

Age/Years	DM		R*	P-value
---	Yes	No		
• 22-25	6	48	0.196	0.001*
• 20	3	39		
• 18-20	3	201		

*Pearson's R
Significance level was considered when p-value < 0.05

Table 5. Correlation between hypertension and age of the studied sample

Age/Years	Hypertension		R*	P-value
---	Yes	No		
• 22-25	6	48	0.108	0.06*
• 20	3	39		
• 18-20	9	195		

*Pearson's R

Bivariate analysis: cross tabulation. Chi-square test (X2) and correlation coefficient (Pearson's R) were used to test the difference between the proportions of qualitative data. Statistical significance level was considered when p-value < 0.05 for all statistical tests.

CONCLUSION

The present study revealed that statistically significant positive correlations of BMI to DM and hypertension, correlation coefficient (Pearson's R) were used which found that the correlation between BMI and DM & hypertension P-value = 0.03, also between DM and hypertension were found P= 0.005 Moreover, correlation between age and DM of the studied sample were P= 0.001. While observed no significant difference between hypertension and age of the studied sample P= 0.06.

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