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The Effect of Body Mass Index and Blood Glucose Test on the Relationship between Blood Pressure and Incident Diabetes Mellitus

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Abstract: ***Obesity is an established independent risk factor for developing hypertension and hyperglycemia. There is no Saudi Arabia consensus on the relationship between obesity with high blood pressure (BP) and incident diabetes mellitus (DM). Aim: The aim of the current study was to investigate the effect of body mass index and blood glucose test on the relationship between blood pressure and incident diabetes mellitus. Methods: The current study included 79 participants (mean age of 30-≤50 years). The data collected from Almakan mall Hafr Albatin City, KSA. Two tools were used in the current study (1)A structured interview for the client and (2) Questionnaire about Health profile. Result: There is a nonsignificant increase (43.8%) of hypertensive group they had hyperglycemia, and (47.6%, 40.9%) of hypertensive group they have overweight and obesity respectively with p-value (0.04*). Conclusion: The present study shows that a high correlation between BMI is an independent risk factor with hypertension, and hyperglycemia as well as a positive correlation between smoking and physical in activity in relation to obesity, hypertension, and hyperglycemia.***

Keywords: body mass index; diabetes mellitus; hypertension

1. Introduction

Hypertension often co-exists with type 2 diabetes mellitus (DM). **Lonati. and et al (2017)** It is estimated that 40–80% of diabetic patients have a twofold increased risk of hypertension compared with that of norm glycemic individuals. **Hirose et al (2016)** Furthermore, the co-existence of hypertension and DM, such as in patients with metabolic syndrome, increases the risk of cardiovascular disease by approximately twofold over 5–10 years compared with subjects without metabolic syndrome. **Tarnow et al (2017).** A multifactorial treatment approach is essential for the prevention of cardiovascular disease for patients with DM as observed in recent intervention trials. **Alberti et al (2019)** A few studies have suggested that high blood pressure (BP) is a risk factor for the later development of type 2 DM. **Gaede et al (2019)** In the Women's Health Study, baseline BP is an independent predictor for the new-onset of type 2 DM among women that had been healthy at baseline after adjusting for multiple confounding factors such as body mass index (BMI) but they did not include baseline glucose level as a confounder.

The prevalence of obesity throughout Europe has increased sharply over the past 20 years, second only to that in the USA, and closely followed by many developing nations in Asia. In the majority of European countries, the prevalence of obesity increased by 10%–40% between 1980 and the late 1990s. Current rates of obesity in European countries are in the range 10%–20% for men and 10%–25% for women. **Conen et al (2017)** According to statistics from the Centers for Disease Control and Prevention, in 1994, 56% of the USA population were classified as overweight and 23% were classified as obese. In 2002, the overweight figure was 65% and the obesity figure was 31%. **Wilson et al (2017)** In a study by Biritwum on the epidemiology of obesity in Ghana, the prevalence of obesity was found to be 5.5% and higher among females 7.4% compared to males 2.8% **Chambers and Wakley (2012)**The increased rate of overweight and obesity in developing countries is a result of rapid economic, epidemiologic, and nutrition transitions. According to the World Health Organization, overweight and obesity are now so common that they are replacing the more traditional public health concerns such as undernutrition and infectious diseases. Globally, there are now as many over nourished people as undernourished people. **Furling (2016)** globally, the overall prevalence of high blood pressure (BP) in adults aged 25 and over was around 40% in 2008. The proportion of the world's population with high BP or uncontrolled hypertension fell modestly between 1980 and 2018. However, because of population growth and aging, the number of people

Hypertension is a major public health concern, with a worldwide estimated number of cases of more than 1.1 billion **Barium, Gangland Mensah (2015)** A previous study estimated that there are approximately 43 million hypertensive patients (23 million men and 20 million women) in Japan. Obesity is an established independent risk factor for developing hypertension a recent meta-analysis reported reductions in systolic blood pressure (SBP) and diastolic blood pressure (DBP) of approximately 1 mm Hg for each kilogram of weight loss. A recent study also focused on new attention to this issue: The effect of obesity on hypertension may not be uniform.

The effect of obesity on hypertension varies by elevation **Hu (2018)**. This study showed unique results in that the population-attributable fraction of obesity in areas with low elevation was 36.3%, but that in areas with high elevation was only 22.3 %.The authors concluded that the development of interventions designed to address hypertension could be focused on obesity but should also entail different strategies according to the environmental setting, such as elevation. In recent years, research focused on the environmental setting (e.g., elevation) and lifestyle-related disease has gained momentum, with growing attention being paid to Geographic Information Systems

(GIS), **Miura et al (2013)** This is because GIS allow us to create variables that determine residential environment (e.g., elevation) on the basis of a participant's longitude and latitude information.

The Japanese Society of Hypertension, Guideline for the Management of Hypertension (2017). Given this evidence, we hypothesized that the interaction effect of body mass index (BMI) and elevation has a significant association with hypertension. To the best of our knowledge, no previous studies have examined this association in a rural area of Japan.

Significant of study

Obesity is an established independent risk factor for developing hypertension and hyperglycemia. A recent study showed that the **effect of body mass index and blood glucose test on the relationship between blood pressure and incident diabetes mellitus**. Thus, we hypothesized that the interaction effect of body mass index (BMI) and random glucose test has a significant association with hypertension and incidence of diabetes**.**

Aim of the study

The aim of this study was to investigate the effect of body mass index and blood glucose test on the relationship between blood pressure and incident diabetes mellitus

2. Materials and Methods

Study Design

A quasi-experimental research designed was used in the current study.

Study setting:

The data collected from Almakan mall Hafr Albatin City, KSA

Subjects:

A convenient sample of 79 participants who come to the workshop to examine blood Pressure, blood glucose, and height, weight, was used in the current study.

Inclusion criteria for nurses:

- Both sexes.
- Accepting to participate in the study.

Study tools:

The following tools were used to collect data:

Tool (I): A structured interview for the client:

- Part 1: Socio-demographic characteristics of nurses e.g. age, marital status, educational level, sex, and occupation.
- Part 2: Questionnaire about Lifestyle pattern, Exercise, Smoking

Tool (2): Questionnaire about Health profile,

Blood pressure level, Hypertension was defined according to the data obtained via a face-to-face interview conducted by trained staff and seated blood pressure (BP) measurements. The participants were asked the following question: "Do you currently take medicine for hypertension?"In our analyses, we used the following definitions:

- Use of antihypertensive medication
- Use of antihypertensive medication or BP≥140/90 mm Hg for SBP/DBP

Blood glucose level was measured by glucometer**.**

Body Mass Index (BMI) Height and weight were measured in the health examination, and BMI was calculated as the weight divided by the height squared (kg/m2). We divided BMI into two categories Bernabe et al (2017). <25 and ≥25 (overweight/ obese).

Statistical analysis

Descriptive data are presented as the means standard deviation, the median with an interquartile range if the parameters were non-parametrically distributed, or the numbers of subjects with percentages within parentheses. Receiver-operating characteristics curve analyses were performed to identify the predictors for diabetes. Statistical data analyses were performed using SPSS version 23 software.

3. Result

Table 1: Sociodemographic characteristics of the studied group

Sociodemographic data	*No. (76)*	*%*
Age		
30-35	41	53.9
36-40	22	28.9
41-45	3	3.9
46-50	4	5.3
50 and more	6	7.9
Sex		
Female	68	89.5
Male	8	10.5
Marital status		
Married	42	55.3
Single	16	21.1
Divorced	9	11.8
Widow	9	11.8
Occupation		
Working	40	52.6
Non-working	36	47.4
Level of education		
Illiterate	11	14.5
Primary	15	19.7
Secondary	19	25.0
University	31	40.8

Table (1): Distribution of the studied students according to age, sex, marital status, occupation, and level of education. Regarding age, it was observed that most of the studied group was (53.9%) between 30 and 35 years. In relation to sex, the majority studied groups (89.5) were female, were male (10.5%) respectively. Concerning to marital status, the most of studied group (55.3) was married were (52.6%) was working and (40.8%) of them had a university education.

Table 2: Lifestyle pattern related to the studied group.

Lifestyle pattern	*No. (76)*	*%*
Exercise		
No	74	97.4
Yes	2	2.6
Smoking		
No	70	92.1
Yes	6	7.9

Table (2) Distribution of the studied students according to lifestyle patterns related to the studied group. It revealed that the majority of female adolescents' students (97.4%) had no physical exercise practices were (92.1%) no smoking.

Table 3: The health profile of the studied group

Health profile	*No. (76)*	*%*
Blood pressure level		
Hypotension	9	11.8
Normal/average	39	51.3
Hypertension	28	36.8
Mean ± SD of the Systolic blood pressure	128.1±17.8	
Mean ± SD of the Diastolic blood pressure	81.2±13.5	
Blood glucose level		
Normoglycemia	28	36.8
Hyperglycemia	48	63.2
Mean ± SD of the Blood glucose level	157.5±59.3	
BMI		
Underweight	4	5.3
Normal / average	29	38.2
Overweight	21	27.6
Obese	22	28.9

Table (3): Distribution of the studied students according to the health profile of the studied group. Regarding blood pressure level, it was observed that the most of studied group (51.3%) had normotensive blood pressure with mean of systolic blood pressure (128.1±17.8) where the mean of diastolic blood pressure was (81.2±13.5). Concerning to blood glucose level, it was observed that the majority of the studied group (63.2%) had hyperglycemia with a mean of blood glucose level (157.5±59.3). In relation to BMI, it was revealed that (38.2%) of the studied students had BMI within the normal average.

Table 4: Correlation between sociodemographic characteristics and blood pressure level

Sociodemographic data	Blood Pressure level								Test of significance	
	Hypotension		Normal/average		Hypertension		Total			
	No.	%	No.	%	No.	%	No.	%	Test	P. value
Age										
30-35	7	17.1%	26	63.4%	8	19.5%	41	100.0%	FET: 12.169	0.080
36-40	2	9.1%	9	40.9%	11	50.0%	22	100.0%		
41-45	0	0.0%	1	33.3%	2	66.7%	3	100.0%		
46-50	0	0.0%	1	25.0%	3	75.0%	4	100.0%		
50 and more	0	0.0%	2	33.3%	4	66.7%	6	100.0%		
Sex										
Female	7	10.3%	37	54.4%	24	35.3%	68	100.0%	FET: 3.270	0.150
Male	2	25.0%	2	25.0%	4	50.0%	8	100.0%		
Marital status										
Married	5	11.9%	21	50.0%	16	38.1%	42	100.0%	FET: 3.892	0.705
Single	1	6.3%	10	62.5%	5	31.3%	16	100.0%		
Divorced	2	22.2%	5	55.6%	2	22.2%	9	100.0%		
Widow	1	11.1%	3	33.3%	5	55.6%	9	100.0%		
Occupation										
Working	4	10.0%	24	60.0%	12	30.0%	40	100.0%	FET: 2.572	0.300
Non-working	5	13.9%	15	41.7%	16	44.4%	36	100.0%		
Level of education										
Illiterate	2	18.2%	4	36.4%	5	45.5%	11	100.0%	FET: 6.740	0.327
Primary	1	6.7%	7	46.7%	7	46.7%	15	100.0%		
Secondary	0	0.0%	12	63.2%	7	36.8%	19	100.0%		
University	6	19.4%	16	51.6%	9	29.0%	31	100.0%		

FET: Fisher Exact test P: P-value of the test of significance * significant at p-value ≤0.05

Table (4): Correlation between sociodemographic characteristics and blood pressure level. It was observed that there was no significant difference among the studied group regarding blood pressure level in relation to age, sex, marital

status, occupation, and level of education with P value (0.08, 0.15, 0.70, 0.300, and 0.327) respectively. Furthermore, there is no significant increase in most cases (75.0%) with age 46 to 50 years in relation to hypertension. Also, there is no significant increase in half of the cases (50.0%) of male hypertension. In addition, there is no significant increase in more than half of the cases (55.6%) in relation to hypertension.

Table 5: Correlation between blood glucose level, and BMI with blood pressure level

Health profile	Blood Pressure level								Test of significance	
	Hypotension		Normal/average		Hypertension		Total			
	No	%	No.	%	No.	%	No.	%	Test	P. value
Blood glucose level										
Normoglycemia	3	10.7%	18	64.3%	7	25.0%	28	100.0%	FET: 3.150	0.219
Hyperglycemia	6	12.5%	21	43.8%	21	43.8%	48	100.0%		
BMI										
Underweight	0	0.0%	4	100.0%	0	0.0%	4	100.0%	FET: 11.786	0.043*
Normal / average	4	13.8%	16	55.2%	9	31.0%	29	100.0%		
Overweight	5	23.8%	6	28.6%	10	47.6%	21	100.0%		
Obese	0	0.0%	13	59.1%	9	40.9%	22	100.0%		

FET: Fisher Exact test P: P-value of the test of significance
* significant at p-value ≤0.05

Table (5): Correlation between blood glucose levels, body mass index with the blood pressure level. It was observed that there was no significant difference among the studied group regarding blood glucose level in relation to blood pressure level with P value (0.21). Furthermore, there is a non-significant increase (43.8%) of hypertensive group they had hyperglycemia, and (47.6%, 40.9%) of hypertensive group they have overweight and obesity respectively with p-value (0.04*).

Table 6: Correlation between lifestyle with blood pressure level

Lifestyle pattern	Blood Pressure level								Test of significance	
	Hypotension		Normal/average		Hypertension		Total			
	No.	%	No.	%	No.	%	No.	%	Test	P. value
Exercise										
No	9	12.2%	37	50.0%	28	37.8%	74	100.0%	FET: 1.485	0.617
Yes	0	0.0%	2	100.0%	0	0.0%	2	100.0%		
Smoking										
No	8	11.4%	38	54.3%	24	34.3%	70	100.0%	FET: 3.535	0.152
Yes	1	16.7%	1	16.7%	4	66.7%	6	100.0%		

FET: Fisher Exact test P: P value of test of significance * significant at p value ≤0.05

Table (6): Correlation between exercise, and smoking with the blood pressure level. It was revealed that there was no significant difference among the studied group regarding exercise, and smoking in relation to blood pressure level with P value (0.61, and 0.15) respectively. Furthermore, there is no significant difference increase in most of the cases (66.7%) they have hypertension in relation to smoking.

Table 7: Correlation between sociodemographic characteristics with blood glucose level

Sociodemographic data	Blood Glucose Level						Test of significance	
	Normoglycemia		Hyperglycemia		Total			
	No.	%	No.	%	No.	%	Test	P. value
Age								
30-35	16	39.0%	25	61.0%	41	100.0%	FET: 4.313	0.358
36-40	9	40.9%	13	59.1%	22	100.0%		
41-45	2	66.7%	1	33.3%	3	100.0%		
46-50	0	0.0%	4	100.0%	4	100.0%		
50 and more	1	16.7%	5	83.3%	6	100.0%		
Sex								
Female	26	38.2%	42	61.8%	68	100.0%	FET: 0.568	0.375
Male	2	25.0%	6	75.0%	8	100.0%		
Marital status								
Married	16	38.1%	26	61.9%	42	100.0%	FET: 1.109	0.807
Single	6	37.5%	10	62.5%	16	100.0%		
Divorced	2	22.2%	7	77.8%	9	100.0%		
Widow	4	44.4%	5	55.6%	9	100.0%		
Occupation								
Working	14	35.0%	26	65.0%	40	100.0%	X^2:0.123	0.726
Non-working	14	38.9%	22	61.1%	36	100.0%		
Level of education								

Illiterate	4	36.4%	7	63.6%	11	100.0%	FET:0.990	0.827
Primary	4	26.7%	11	73.3%	15	100.0%		
Secondary	8	42.1%	11	57.9%	19	100.0%		
University	12	38.7%	19	61.3%	31	100.0%		

FET: Fisher Exact Test X^2: Chi-square test
P: P-value of the test of significance
* significant at p-value ≤0.05

Table (7): Correlation between age, sex, marital status, occupation, and level of education with the blood glucose level. It was concluded that there was no significant difference among the studied group regarding age, sex, marital status, occupation, and level of education with the blood glucose level with P value (0.35, 0.37, 0.80, 0.72, and 0.82) respectively. Furthermore, there is no significant increase in all of the cases (100.0%) they have hyperglycemia in relation to age group 46-50 years old. Also, there was a non-significant correlation in the majority of the studied group (75.0%) of male, (77.8%) was divorced, (65.0%) was working, and (73.3%) was received primary school in relation to hyperglycemia.

Table 8: Correlation between BMI with blood glucose level

Health profile	Blood Glucose Level						Test of significance	
	Normoglycemia		Hyperglycemia		Total			
	No.	%	No.	%	No.	%	Test	P. value
BMI								
Underweight	3	75.0%	1	25.0%	4	100.0%	FET: 2.705	0.470
Normal / average	11	37.9%	18	62.1%	29	100.0%		
Overweight	7	33.3%	14	66.7%	21	100.0%		
Obese	7	31.8%	15	68.2%	22	100.0%		

FET: Fisher Exact test
P: P-value of the test of significance
*significant at p-value ≤0.05

Table (8): Correlation between BMI with the blood glucose level. It was concluded that there was no significant difference among the studied group regarding BMI with the blood glucose level with P value (0.47). Furthermore, there is no significant increase in most of the cases (68.2%) they have hyperglycemia in relation to obesity.

Table 9: Correlation between lifestyle with Blood glucose level

Lifestyle pattern	Blood Glucose Level						Test of significance	
	Normoglycemia		Hyperglycemia		Total			
	No.	%	No.	%	No.	%	Test	P. value
Exercise								
No	27	36.5%	47	63.5%	74	100.0%	FET:0.153	0.696
Yes	1	50.0%	1	50.0%	2	100.0%		
Smoking								
No	27	38.6%	43	61.4%	70	100.0%	FET:1.140	0.286
Yes	1	16.7%	5	83.3%	6	100.0%		

FET: Fisher Exact test P: P-value of the test of significance * significant at p-value ≤0.05

Table (9): Correlation between lifestyle with the blood glucose level. It was revealed that there was no significant difference among the studied group regarding exercise, and smoking with the blood glucose level with P value (0.69, and 0.28) respectively. In addition, there is no significant increase in most cases (63.5%) they have a sedentary life, and (83.3%) of smokers in relation to hyperglycemia.

Table 10: Correlation between lifestyle with BMI

Lifestyle pattern	BMI										**Test of significance**	
	Underweight		Normal		Overweight		Obese		Total		**Test**	**P. value**
	No.	%	No.	%	No.	%	No.	%	No.	%		
Exercises												
No	0	0.0%	0	0.0%	2	100.0%	0	0.0%	2	100.0%	FET: 4.137	0.152
Yes	4	5.4%	29	39.2%	19	25.7%	22	29.7%	74	100.0%		
Smoking												
No	4	5.7%	27	38.6%	18	25.7%	21	30.0%	70	100.0%	FET:1.617	0.689
Yes	0	0.0%	2	33.3%	3	50.0%	1	16.7%	6	100.0%		

FET: Fisher Exact test P: P-value of the test of significance * significant at p-value ≤0.05

Table (10): Correlation between lifestyle with the BMI. It was revealed that there was no significant difference among the studied group regarding exercise, and smoking with the BMI with P value (0.15, and 0.68) respectively. In addition, there was no significant increase in all-male cases (100.0%) they have no exercise in relation to overweight. Also, there

was a no significant increase in half male of cases (50.0%) of smokers in relation to overweight.

4. Discussion

The present study findings show that the half of the participant's age between 30 to 35 years, and the majority of them were married female. A high incidence of no physical exercise practices was observed in female adolescents compared with the male participants. No female smoke cigarette, while only 7.9% of male had smokers.

This result was consistent with **Vuvor F**(2017) who founded that the majority of the respondents were between 30 and 35 years and the majority of them was married. Furthermore, only 18.5% of participants engaged in physical exercise, and the minority of male participants had smokers.

The current results show that a Correlation between sociodemographic characteristics and blood pressure level. It was observed that the majority of participant's age category between 46 to 50 years had affected by hypertension. Furthermore, there was increase the incidence of hypertension male participants than female. In the same line **Ezzat et at (2017)** they revealed that the higher mean blood pressure in men than in women, especially in perimenopause age. On The other hand, **Hamano et al 2017** they revealed that the majority of cases 219 out of 364-group age between 67 years had hypotension.

The current study also, revealed Correlation between blood glucose levels, body mass index with the blood pressure level. It was observed that there was a non-significant increase near to half among the studied group regarding hyperglycemia in relation to hypertension and overweight. This observation was in line with **Wilson P and David C (2007)** they revealed that the BMI or waist circumference, but not both together, were significant predictors of diabetes development. This implies that females are at risk of diseases associated with overweight and obesity, such as Type 2 diabetes mellitus, heart diseases, and stroke than males. Also, **Nguyen D (2010),** who state that the obesity is associated with increased risk for numerous chronic diseases including diabetes, hypertension, heart disease and stroke.

It also founded that a correlation between life style with the blood glucose level among the studied group. (63.5%) of studied group less physically active (sedentary life), and (83.3%) smoking in relation to a higher blood glucose level. In addition to there was a correlation no exercise (100%) of studied group, and half male of had smokers in relation to the overweight. This agreement with **Steven J et al (2007)** they revealed that the incidence of hypertension and diabetes mellitus increased with cigarettes smoking. In the same line **Vuvor F (2017)** who noted that the overweight and obesity occur as a result of less physical activity. All the obese participants do not engage in any form of exercise.

5. Conclusions

The present study shows that a high correlation between BMI is an independent risk factor with hypertension, and hyperglycemia as well as a positive correlation between smoking and physical in activity in relation to obesity, hypertension, and hyperglycemia.

6. Recommendations

An intensive nursing education program intervention for behavior and life style modification to sustained beneficial effects on body weight reduction in relation to normal blood pressure and blood glucose level.

References

[1] Alberti KG, Eckel RH, Grundy SM, Zimmer PZ, Gleeman JI, Donato KA, Fruchart JC, James WP, Loria CM, Smith Jr SC, International Diabetes Federation Task Force on Epidemiology and Prevention; Helional Heart Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; International Association for the Study of Obesity. Harmonizing the metabolic syndrome: a joint interim statement of the International Diabetes Federation Task Force on Epidemiology and Prevention; National Heart, Lung, and Blood Institute; American Heart Association; World Heart Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. Circulation 2019; 120: 1640–1645
[2] Bernabe-Ortiz, A.; Carrillo-Larco, R.M.; Gilman, R.H.; Checkley, W.; Smeeth, L.; Miranda, J.J.; CRONICAS Cohort Study Group. Impact of urbanization and altitude on the incidence of, and risk factors for, hypertension. Heart 2017, 103, 827–833.
[3] Biritwum R, Gyapong J, Mensah G. The epidemiology of obesity in Ghana. Ghana Med J 2015; 39:82-5.
[4] Chambers R, Wakley G. Obesity and Overweight Matters in Primary Care.UK: Radcliffe Publishing; 2012.
[5] Conen D, Ridker PM, Mora S, Buring JE, Glynn RJ. Blood pressure and risk of developing type 2 diabetes mellitus: The Women¢s Health Study. Eur Heart J 2017; 28: 2937–2943.
[6] Ezzat M. Worldwide trends in blood pressure from 1975 to 2015 a pooled analysis of 1479 population- based measurement studies with 19.1 million participants. Luncet. 2017; 389:37-55.
[7] Furling P, Anesthesia and Uncommon Diseases. 5th ed. Philadelphia, USA: Saunders Elsevier, Br J Anaesth 2016;97:904.
[8] Gaede P, Lund-Andersen H, Parving HH, Pedersen O. Effect of a multifactorial intervention on mortality in type 2 diabetes. N Engl J Med2018; 358: 580–591.
[9] Hamano T, Shiotaniy Y, Takeda M, Abe T, Sundquist K, and Nabika T. Is the effect of body mass index on hypertension modified by the elevation? Across sectional study of rural areas in Japan. International of environmental research and publish health. 2017; 14(1022):2-6.
[10] Hirose H, Saito I. Trends in blood pressure control in hypertensive patients with diabetes mellitus in Japan. Hypertense Res 2016; 26: 717–722.
[11] Hu F. Obesity Epidemiology. New York: Oxford University Press; 2018.

[12] Lonati C, Morganite A, Comarella L, Mancia G, Zanchetti A. Prevalence of type 2 diabetes among patients with hypertension under the care of 30 Italian clinics of hypertension: results of the (Pretensioner and (diabetes study. J Hypertense 2017; 26: 1801–1808.
[13] Miura, K.; Nagai, M.; Ohkubo, T. Epidemiology of hypertension in Japan: Where are we now? Circ. J. 2013, 77, 2226–2231. [Crossruff] [PubMed]
[14] Nguyen D, and El- serage H. The Epidemiology of obesity. Gastrointrol Clin Norht Am. 2010;39(1):1-7.
[15] Steven J, Truesdale K, Katz E, and Cai J. Impact of body mass index on incident hypertension and diabetes in Chinese Asians, American whites and American blacks. AM J Epidemiol. 2008; 167(11): 1365-1374.
[16] Tarnow L, Rossing P, Gall MA, Nielsen FS, Parving HH. Prevalence of arterial hypertension in diabetic patients before and after the JNC-V. Diabetes Care 2017; 17: 1247–1251.
[17] Vuvor F. Correlation of body mass index and blood pressure of adults of 30-50nyears age in China. Journal of health research and reviews. 2017;4(3):115-121.
[18] Wilson P, and David C. Prediction of incident diabetes mellitus in middle age adult. Arch Intern Med. 2007; 167:1068-1074.
[19] Wilson PW, Meigs JB, Sullivan L, Fox CS, Nathan DM, D'Agostino RBSr. Prediction of incident diabetes mellitus in middle-aged adults: the Framingham Offspring Study. Arch Intern Med 2017; 167: 1068–1074