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### RESEARCH ARTICLE

#### SCREENING OF PREHYPERTENSION AND HYPERTENSION AMONG KING FAISAL UNIVERSITY (KFU) STUDENTS.

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##### *Manuscript History*

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#### *Abstract*

**Objectives:** To screen the university students for prehypertension and hypertension and find out the contributing risk factors and their awareness level of these factors.

**Materials and Methods:** A total of 221, randomly selected (at convenience) students aged 18 to 25 years (All male) in King Faisal University, were included in the study between October 2013 and January 2014.

Blood pressure measurements were taken by trained personnel. Designed questionnaires, including questions about physical activity, lifestyle, smoking and family history of hypertension were distributed to the participants.

Body mass index was determined by measuring height and weight.

**Results:** The total participants 221 were classified into three groups according to their blood pressure levels. No hypotensive cases were found. They were classified into normotensive students where they formed 52.0% (n=115). Prehypertensive students 29.9% (n=66) and hypertensive students 18.1% (n=40). Significant relationships were found between hypertension and prehypertension and elevated BMI levels and physical inactivity. The level of awareness about major contributors to hypertension (Obesity, smoking, much salt intake) was high among the students.

**Conclusion:** One out of 6 students were prehypertensive, while one out of 3 were hypertensive, and they showed elevated BMI levels compared to normotensive students. Physical inactivity appeared to influence prehypertension and hypertension. Awareness about the risk factors and healthy life style should be enhanced.

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#### **Introduction:-**

Hypertension or high blood pressure is considered a risk factor for many disorders, particularly the leading cause of mortality worldwide, ischemic heart diseases and cerebrovascular stroke. It also tends to cause renal failure, premature mortality and disability(1).

Many risk factors are associated with hypertension. Which include dietary habits such as; high sodium, fat intake, low intake of fruits and vegetables, toxic consumption of alcohol, inadequate stress management, low levels of physical activity, being overweight and smoking (1).

The chief problems in hypertension are that many cases are acquired in young age and passed undiagnosed and it's unequally more prevalent in low and middle-income countries where the health systems are substandard(1). Hypertension has become a worldwide epidemic in the recent few years. A pooled analysis study of available national and regional data, Kearney et al (2)reported that the estimated number of adults with hypertension in 2000 to be 972 million worldwide. The same study also estimated that the hypertensive adult number in the developing world was almost doubled that in the developed world (639 million in developing countries versus 333 million in developed countries).

The prevalence of hypertension according to the same study (2)in 2000 is estimated to be 26.4% of the world's population (26.6% male and 26.1% female).The study also predicted that the number of adults with hypertension would increase to approximately 1.56 billion in the year 2025.

A study had shown that hypertension is responsible for one from every six deaths in the United States (3).

On a cross-sectional study conducted in Saudi Arabia, All Saudi population from all the 20 health regions of the country aged 15–64 years was included. Out of the total 4758 subjects who participated in the study, about 51% were females. A total of 1213 were hypertensives giving a prevalence of 25.5% (27.1% for males and 23.9% for females) (4).

"The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure"(3), provided a new guideline for hypertension, the introduction of a new term , the prehypertension , which is a range measurement of systolic BP from 120 to 139 mm Hg or a diastolic BP from 80 to 89 mm Hg and suggested that people with prehypertensive readings require health-promoting lifestyle modifications to prevent complication of hypertension.

Not only that hypertension significantly damages vital organ in the future life of young adults, but also prehypertension has the same harmful effects (5).

A recent study conducted in State of Kuwait in the years 2009-2010, the study was based on college students aging from 17-23 years, the number of the participants was 803 ,the participants were from both genders .The results of the study have shown a significant prehypertensive students ,where their proportion was 39.5% and their number was 317(out of 803) and hypertensive students comprised of 7% (number was 56). The study also found that prehypertensive and hypertensive students had a significantly higher levels of BMI-based obesity, smoking, and cholesterol consumption (6).

A cross sectional study was carried out at University of Dammam, aiming to determine the prevalence of prehypertension among young female students .The study sample size was 370 students, the results of the study had shown that the proportion of prehypertensive students to be 13.5%(7).

Our purposes were to screen for prehypertension and hypertension among university students, to relate the risk factors which they contribute to these problems and to check the level of awareness about hypertension risk factors among the students.

## **Materials and Methods:-**

### **Setting.**

The study was conducted from October 2013 to January from different colleges in King Faisal University, and who agreed to participate by giving a verbal consent.

**Design:-**

Cross sectional

**Sampling:-**

A convenient sample of 231 students was selected from 3 colleges (Engineering, computer and arts) out of the 12551 KFU students (and 15 colleges). Out of these 10 questionnaires were excluded due to incomplete information.

**Data collection:-**

The study started with a short questionnaire, which included information about age, history of chronic diseases, family history of hypertension and / or diabetes mellitus, habits of physical activity, diet, lifestyle, and history of smoking. Height in cm was measured by using a measuring tape. Weight in kg was assessed using an electronic scale. BMI was calculated using Android and ios applications which work on the formula  $[\text{weight (kg)} / \text{height(m}^2\text{)}]$ . Referring to the definition of BMI given by the World Health Organization, a BMI  $\geq 25 \text{ kg} / \text{m}^2$  was overweight and a BMI  $\geq 30 \text{ kg} / \text{m}^2$  was obese (1).

One reading of systolic and diastolic blood pressures was taken using an aneroid mercury sphygmomanometer (KAWAMOTO). Referring to the Joint National Committee (JNC) 7 report, blood pressure was defined as normal blood pressure if the observed systolic blood pressure (SBP) was between 91 and 120 mmHg or diastolic blood pressure (DBP) was between 61 and 80 mmHg; pre-HTN if the observed SBP was between 121 and 139 mmHg or DBP was between 81 and 89 mmHg; and considered as HTN if the observed SBP was equal to or above 140 mmHg and DBP was equal to or above 90 mmHg (2)(3).

**Ethical Considerations:-**

Informed consent was obtained and explanation of what the research is about to all the participants. The inclusion criteria was: (1) Saudi students in King Faisal University and (2) aged between 18 and 25 years, while the exclusion criteria was: (1) having too thick or too thin arms not compatible with the cuff size (2) being more than 25 year old.

**Statistical analysis:-**

Data were collected, coded, and entered into an IBM compatible computer, using the SPSS version 19 for Windows.

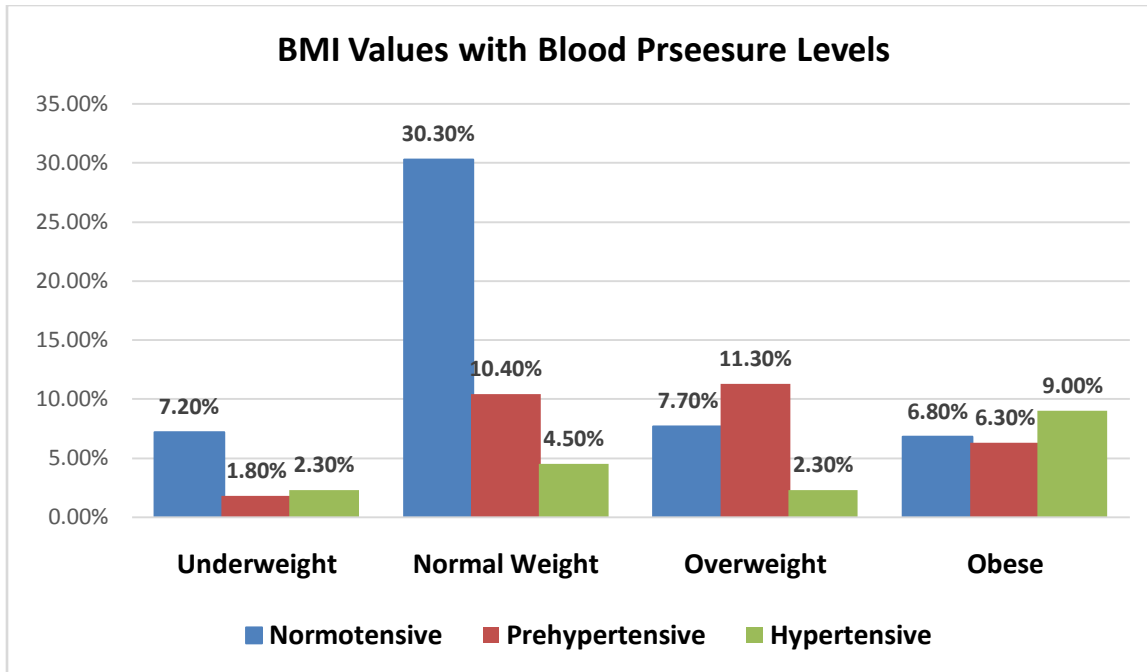
Variables were expressed as median, mean ( $\bar{X}$ ), and standard deviation (S). The arithmetic mean and median were used as measures of central tendency, while the standard was used as measures of dispersion.

- 1) The  $\chi^2$ -test (or likelihood ratio = LLR) was used as a non-parametric test of significance, for comparison between the distribution of two qualitative variables.
- 2) Bivariate analysis used for analysis. It was used for the analysis of two variables to determine the empirical relationship between them by using the Pearson correlation coefficient in two tailed test.

**Results:-**

The studied sample composed of 221 participants where their mean age was (21.19). They were classified into three groups according to their blood pressure status. The normotensive students where they formed 52.0% (n=115), while the prehypertensive students formed 29.9% (n=66) and the hypertensive students formed 18.1% (n=40). No hypotensive cases were noticed.

Regarding the BMI .normal (< 25%), overweight ( $\geq 25$  - < 30%), and obese ( $\geq 30\%$ ), showed that the percentage of normotensive overweight and obese students were 7.7% and 6.8% respectively, while the percentage of prehypertensive overweight and obese students were 11.3% and 6.3% respectively and hypertensive overweight and obese students were 2.3 and 9.0% respectively. These differences were highly significant, where the  $P$  value = < 0.001. See figure 1.



**Figure1:-** Descriptive comparison between blood pressure categories and BMI values among the participants. The proportions of the prehypertensive and hypertensive students who had family history of hypertension were 10.0% (n=22) and 5.9% (13) respectively. Where the *P* value = .721. Family history of diabetes mellitus had proportion for both prehypertensive and hypertensive students of 17.7% while normotensives with family history of diabetes had 17.6% with a *P*value = .572. See table 1.

Family History and Current Illnesses		% of Normotensive	% of Prehypertensive	% of Hypertensive	<i>P</i> - value
Family History of Hypertension	Presence of Family History of HTN	12.7%	10.0%	5.9%	.721
	No Family History of HTN	31.2%	15.8%	9.5%	
	No Knowledge about HTN in Family	8.1%	4.1%	2.7%	
Diabetic Patient	Diabetic Patient	1.4%	0.0%	0.0%	.249
	Not Diabetic Patient	50.9%	29.5%	18.2%	
Family History of Diabetes	Family History of DM	17.6%	10.0%	7.7%	.572
	No Family History of DM	34.4%	19.9%	10.4%	
Heart Disease	Presence of Heart Disease	0.0%	0.9%	0.0%	.095
	No Heart Disease	52.3%	29.1%	17.7%	

**Table 1:-** Significance family history and descriptive statistics with blood pressure levels.

Regarding the dietary habits the proportion of prehypertensives who at least consume fast food once a week was 21.9% and the proportion of the hypertensives was 15.9% with a *P* value measurement at 0.191.

The results have shown that proportions of rich cholesterol food intake for at least once a week were for prehypertensives 28.5% while for the hypertensives 16.3% with a  $P$  value = .136.

Smoking habits (smoker was defined who smokes at least 10 cigarettes a day\shisha occasionally) proportion in total was 26.2% (n=58).It had a proportion out of the total among Normotensives of 16.3%(n=36) while the Prehypertensives and hypertensives had the proportions of 8.1% (n=18) and 1.8% (n=4) respectively. Those findings were statistically significant sincethe  $P$  value = .030. See figure 2.

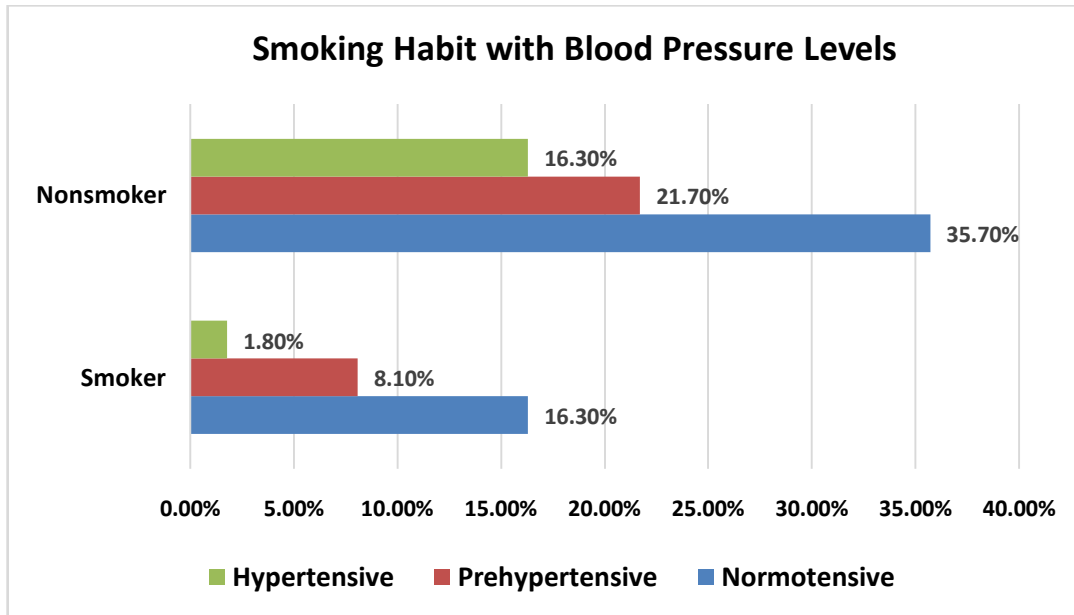


Figure2:- Levelsof blood pressure and smoking habit.

Students who exercise regularly (at least 3 times a week) had the proportions of 20.9% among normotensives 13.2% among Prehypertensives and 3.7% in hypertensives. However the proportion of students with no physical activity was 8.2% out of the total .19.6% (n=13) from the total prehypertensives and lastly 46.1%(n=18) out from the total hypertensives. Those results were statistically significant wherethe  $P$  value = .039 .See table 2.

Physical Activity		% of Normotensive	% of Prehypertensive	% of Hypertensive	% out of Total	P-value
Rate of Physical Activity	Daily Physical Activity	6.8%	6.4%	2.3%	15.5%	.039
	3-7 Times a Week	14.1%	6.8%	1.4%	22.3%	
	Once a Week	17.3%	10.9%	5.9%	34.1%	
	No Physical Activity	14.1%	5.9%	8.2%	28.2%	
	% out of Total	52.3%	30.0%	17.7%	100.0%	

Table 2:- Significance of level of physical activity and descriptive statistics with blood pressure levels.

The level of awareness about the major contributors to hypertension was about 86.9%(n=192) for those who thought that obesity could cause hypertension , while 71.5% (n=158) believed smoking could contribute to the problem, and finally 90.5% (n= 200) agreed that much salt intake would cause hypertension.Further on those who thought obesity could cause hypertension ,15.8% (n=35)out of the total were hypertensives while 26.7% (n=59) Were prehypertensives.While the prehypertensives and hypertensives proportions who thought smoking could cause hypertension were 23.5% (n=52) and 10.0% (n=22) respectively.26.7% (n=59) was the proportion of

prehypertensives who thought that much salt intake would cause hypertension while 16.3 (n=36) was the proportions of hypertensives who did think that much salt could cause it. See table 3.

Awareness about HTN		% of Normotensive	% of Prehypertensive	% of Hypertensive	P-Value
Obesity Causing HTN	Obesity Causes HTN	45.2%	26.6%	14.9%	.805
	Obesity Doesn't Cause HTN	5.8%	1.8%	1.3%	
	No Knowledge about That	1.8%	1.3%	0.90%	
Smoking Causing HTN	Smoking Causes HTN	38.4%	23.5%	9.5%	.085
	Smoking Doesn't Cause HTN	11.7%	5.8%	5.8%	
	No Knowledge about That	2.7%	0.45%	1.8%	
Obesity Causing HTN	Much Salt Intake Causes HTN	47.9%	26.6%	15.8%	.993
	Much Salt Intake Doesn't Cause HTN	3.6%	2.2%	0.90%	
	No Knowledge about That	1.3%	0.90%	0.45%	

**Table 3:-** Level of awareness about the major contributors to hypertension

### Discussion:-

The prevalence of prehypertension and hypertension among students in King Faisal University was found to be 29.9% and 18.1% respectively. The combined prevalence of both prehypertension and hypertension was relatively high (48%). Smoking, Physical inactivity and high BMI of selected participants were found to be associated with the prevalence of prehypertension and hypertension, unlike other risk factors such as family history of hypertension and fast food consumption. Our study result was in accordance with studies done recently. These results were in agreement with a study conducted on university students in Dammam finding that 32.7% of the students were prehypertensive, but a lower prevalence of hypertension (30.2%) (8), another study found that 17.3% of Saudi military personnel between the ages of 23-37 were prehypertensive (9). A different study was conducted on a similar target group in Kuwait recorded a higher prevalence of prehypertension which was 39.4% and a lower prevalence of hypertension which was 7% (6). Similarly in the United States, a study found the prevalence of prehypertension to be 40% among people aged 18 to 39 years (10).

The BMI of 22.2% (n=49) of the study group was above 30, which indicates obesity according to the BMI standards. In addition, we found that 62.5% of the hypertensive students were overweight or obese (n=25), while 59.1% of the prehypertensive students were overweight or obese (n=39). Those findings were highly significant since  $P=0.001$ . Our study has found that obese students were mostly hypertensive (40.8%), overweight was most presented with prehypertension (53.1%), while the majority of normal weight students were normotensives (67%). Al-Asmary SM *et al.*, have showed that obesity was the only significant predictor of prehypertension and it was significantly associated with newly diagnosed hypertension (8). A recent study among Canadian adults showed the prevalence of high blood pressure was greater in those with higher BMI (11). In China, overweight and obesity were risk factors for prehypertension and hypertension (12). Physical inactivity was found to be the most prevalent risk factor for high blood pressure in a study that was done in the University of Dammam among female students, followed by overweight and obesity (7).

We found that 33.3% of the prehypertensive students and 32.5% of the hypertensive students had family history of hypertension. Family history of hypertension has low correlation with prehypertension and hypertension despite being proven otherwise by other literatures (8)(13).

Regarding the dietary habits, *p* value of fast food and cholesterol rich food consumption had the values 0.191 and 0.136, respectively. Those results aren't statistically significant. The Dammam study found that there was no relationship between having high blood pressure and dietary habits (7). However, WHO considers unhealthy food consumption one of the risk factors of hypertension (1). High levels of salt intake had *p* value of 0.407, which is statistically insignificant despite being proven otherwise by an American research on relationship between sodium intake and blood pressure among adults(14) . The *p* value regarding the consumption of fruits and vegetables was found to be insignificant (*p* value = 0.210).

There is a significant relationship between physical inactivity and hypertension (*p* value = 0.039). The percentage of prehypertensive and hypertensive students who exercise less than 3 times a week is 56.1% and 77.5%, respectively. In agreement with our study, a cross sectional study on Saudi adult population, found that hypertension was significantly associated with lower levels of physical activity (4).

The present data showed that smoking habit was 26.2% among college students in total, and the percentage of smoking was highest among normotensives compared to hypertensive and pre- hypertensive students, and those results were statistically significant. These results contradicted the results of a study in which the habit of smoking was an important risk factor for hypertension and prehypertension (15). Al-Safi's regional study concluded that blood pressure is higher among smokers than non-smokers (16).

Our data revealed that level of awareness about the major factors affecting blood pressure was found very high. The students' level of awareness about high salt intake contribution to hypertension was 90.5%. Regarding obesity, 86.9% of the students acknowledged it as a risk factor for hypertension, while 71.5% of the student were aware that smoking was also a risk factor. A study about the knowledge regarding risk factors of hypertension found that percentages of the student who believed that high salt intake, obesity and smoking are risk factors are 69.1%, 73.6% and 71.8%, respectively (17).

### **Recommendations and Conclusion:-**

In the end of the study we found out that there was a noticeable prevalence for the hypertension and prehypertension among male college students that represented the young adult population in Al Ahsa, and it showed that there was a high association between elevated blood pressure with elevated BMI, smoking and physical inactivity. We can say that high BMI, smoking and physical inactivity are important factors in the occurrence of prehypertension among young adults.

Healthy lifestyle is the first thing that needs to be focused on for the prehypertensive and hypertensive patients starting with regular exercise for at least thirty to sixty minutes in most days of the week which can decrease the high blood pressure for a fair amount and it can help in preventing the prehypertension to turn into a full-blown hypertension.

Regular checking of blood pressure in early age can detect the early cases of high blood pressure so then the situation can be controlled in an early stage before progressing to unpreventable ones. In the community level, official organizations can encourage people to take parts in various health activities. Even though there was a high level of awareness about the major risk factors for hypertension, but many samples showed noticeable numbers of hypertensive and prehypertensive cases which they were obese or overweight, so there is a need to increase the level of awareness about the harmful effects of obesity, physical inactivity, smoking and high salt intake, and we can do so by making local Campaigns and rewarding the people for their participating as an incentive for their entry. Emphasizing advertising for the tobacco and obesity control programs that are offered by the official organizations. Organized Sport events encourage people to participate and can also provide information about the beneficial effects of regular exercise and encourage them to exercise regularly.

### **Limitation:-**

Blood pressure measurements were taken once for the participants.

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