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THE RELATIONSHIP BETWEEN SMOKING, SEVERAL RISK FACTORS AND HYPERTENSION IN KINGDOM OF BAHRAIN

Abdulaziz Almehrej, Ayman Almozaini, Abdulaziz jaber Aldoseri, Abdulla Yousif Alkhaja, Abdulrhman Abdulla Alsulaiti, Ahmed Maher , Ali Mohammed Alsada, Faisal Mohammed Shoaib

Arabian Gulf University - department of community medicine - Bahrain - Manama

Abstract

In our study we are going to see the effect of smoking and some other important risk factors on the prevalence of hypertension in kingdom of Bahrain in 2012, also to identify the prevalence of smoking among hypertensive patients and to study the relationship between several risk factors like gender, age, marietal status, smoking, food, diseases, treatment, gender and Hypertension. Cigarette smoking is a powerful cardiovascular risk factor and smoking cessation is the single most effective lifestyle measure for the prevention of a large number of cardiovascular diseases. Impairment of endothelial function, arterial stiffness, inflammation, lipid modification as well as an alteration of antithrombotic and prothrombotic factors are smoking-related major determinants of initiation, and acceleration of the atherothrombotic process, leading to cardiovascular events. Cigarette smoking acutely exerts an hypertensive effect, mainly through the stimulation of the sympathetic nervous system. As concern the impact of chronic smoking on blood pressure, available data do not put clearly in evidence a direct causal relationship between these two cardiovascular risk factors, a concept supported by the evidence that no lower blood pressure values have been observed after chronic smoking cessation. Nevertheless, smoking, affecting arterial stiffness and wave reflection might have greater detrimental effect on central blood pressure, which is more closely related to target organ damage than brachial blood pressure. Hypertensive smokers are more likely to develop severe forms of hypertension, including malignant and renovascular hypertension, an effect likely due to an accelerated atherosclerosis [16]. The association between hypertension and socioeconomic status was complex and differed between men and women. Among men, those with lower educational and occupational status but who were rich were more likely to be hypertensive. More women with lower occupational and economic status were hypertensive. Study was conducted in department of medicine, SUNY Health science center, New York, USA and found that increase in Age is associated with a significant increase in the prevalence of hypertension and especially of systolic hypertension after age 60. The study showed that increase obesity in age between 30 -50 yrs , is associated with significant increase in diastolic blood pressure , and trend is also seen in African-Americans who are heavier than whites , it is found out that increase of age is associated with atherosclerotic renovascular hypertension , renal insufficiency and primary hypothyroidism. Previous studies have linked lack of exercise to hypertension development in middle age and young adults.

Keywords: *Smoking, Hypertension, Risk*

Introduction

Tobacco use is the most common cause of avoidable cardiovascular mortality worldwide [1]. There are now 1.3 billion cigarette smokers, 82 percent in developing countries, and if current practices continue, there will be an estimated one billion tobacco-related deaths during the 21st century. The immediate noxious effects of smoking are related to sympathetic nervous overactivity, which increases myocardial oxygen consumption through a rise in blood pressure, heart rate, and myocardial contractility [2].

Chronically, cigarette smoking induces arterial stiffness which may persist for a decade after smoking cessation [3]. The incidence of hypertension is increased among those who smoke 15 or more cigarettes per day [4], and the coexistence of hypertension and smoking decreases left ventricular function in asymptomatic people [5]. With each cigarette, the blood pressure rises transiently and the pressor effect may be missed if the blood pressure is measured 30 minutes after the last smoke. The transient rise in blood pressure may be most prominent with the first cigarette of the day even in habitual smokers. In one study of normotensive smokers, there was an average elevation in systolic pressure of 20 mmHg after the first cigarette [6]. Furthermore, ambulatory blood pressure monitoring suggests an interactive effect between smoking and coffee drinking in patients with mild essential hypertension, resulting in a mean elevation in daytime systolic pressure of approximately 6.0 mmHg [7].

However, habitual smokers generally have lower blood pressures than nonsmokers as observed in most [8,9], but not all [10], studies. The mild reduction in BP in smokers is related to decreased body weight [11]. Support for this observation is the higher body weight and increased blood pressure among former smokers versus that observed among never-smokers [12]. A vasodilator effect of cotinine, the major metabolite of nicotine, also may contribute to the lower blood pressure [13]. Despite these observations, smoking should be avoided in any hypertensive patient because it can markedly increase the risk of secondary cardiovascular complications and enhance the progression of renal insufficiency [14,15]. An example of the latter effect was observed in one prospective study (with a mean follow-up of 35 months) that examined the factors associated with alterations in renal function among 53 hypertensive patients in whom the serum creatinine concentration rose from 1.5 to 1.9 mg/dL (133 to 168 µmol/L) despite a significant reduction in the target mean blood pressure (127 to 97 mmHg) [14]. Smoking was the most significant independent factor underlying progressive renal disease (serum creatinine 1.5 and 2.1 mg/dL [133 and 186 µmol/L] at the beginning and end of the study for smokers, respectively, versus 1.25 and 1.32 mg/dL [110 and 117 µmol/L] for nonsmokers, respectively). The mechanism underlying this adverse effect is unclear but may be related to the transient increase in systemic blood pressure with smoking being transmitted to the glomerulus, resulting in glomerular hypertension.

Review of Literature

Two studies were conducted to determine whether smoking affected the treatment of hypertension. The study was about the effects of propranolol (a hepatically metabolized β-blocker) vs hydrochlorothiazide, smokers and nonsmokers were randomized to the propranolol treatment group. The propranolol-treated smokers had an initial blood pressure reduction (± SD) of -7.9 / -8.7 mm Hg compared

with -10. / -10.9 mm Hg for the nonsmokers. Diastolic blood pressure tended to be reduced more in nonsmokers (vs smokers) receiving hydrochlorothiazide (-12. vs -10.7 mm Hg respectively). [17]

Smoker males and females had significantly higher SBP, DBP, ABP values than non-smokers. Smoker or non-smoker adults with a positive family history of hypertension had significantly higher blood pressure and heart rate values than those with a negative family history of hypertension. In conclusion, smokers have higher blood pressure than non-smokers.[18]

Both smoking and hypertension cause an increase in LV mass, hypertension causing a more increase, than smoking, individually. Both smoking and hypertension combine together to increase the LV mass, more than either of them individually. Smoking by itself can cause an increase in LV mass independent of hypertension. [19]

CYP1A2 is associated with blood pressure (BP). The CYP1A2 rs762551 C allele is associated with lower CYP1A2 enzyme activity. CYP1A2 metabolizes caffeine and is induced by smoking. Outcome measures were BP, caffeine intake, CYP1A2 activity and polymorphisms rs762551, rs1133323 and rs1378942. CYP1A2 variants were associated with hypertension in non-smokers, but not in smokers (CYP1A2-smoking interaction P = 0.01). Higher CYP1A2 activity was linearly associated with lower BP after quitting smoking. The associations of CYP1A2 variants with BP were modified by reported caffeine intake. [20].

Adherence to a Mediterranean dietary pattern was associated with reduced risk for cardiovascular mortality even in a developing country setting. European Journal of Clinical Nutrition advance online publication, [21].animal food and high-salt patterns were associated with increased risk of hypertension, while traditional Chinese and western fast-food patterns were not associated with the risk of hypertension [22].

Multiple meta-regression models were used to assess the significance of potential moderator variables. In the full model, the variable for follow-up years was the only moderator that did not significantly account for the variance in the risk of CV disease per 10 mm Hg increment in SBP. The optimal model with sex ($P<0.01$), age ($P = 0.02$), and baseline SBP ($P<0.01$) accounted for 59% of the variation in the risk of CV disease (Table 3). Each 10 mm Hg increase in SBP increased the risk of CV disease in women by approximately 1.1 times that for men by age and baseline SBP. Thus, women were affected more adversely per each 10 mm Hg increase in SBP. The observed increase in the risk of CV disease per SBP increment was estimated to diminish slightly with increasing age and is consistent with previous research [54]. After adjusting for the main effects of sex, age, and baseline SBP, heterogeneity was reduced to $I^2 = 48.81\%$ ($P = 0.01$). Additionally, publication bias is not suspected as tests for funnel plot asymmetry were not significant (Begg's test: $P = 0.78$; Egger's test: $P = 0.64$). Although one ES observation fell on the 95% confidence band (S1 Fig), a sensitivity analysis showed that the meta-regression results were not significantly different after removing the potential outlier observation. [23]. marital quality becomes increasingly important in shaping cardiovascular risk at older ages. [24]. Taiwanese vegetarians had lower incidence of hypertension than nonvegetarians. Vegetarian diets may protect against hypertension beyond lower abdominal obesity, inflammation, and insulin resistance. [25].

Study Aim and Objectives

- Aim:

To study the effect of smoking and some other important risk factors on the prevalence of hypertension in kingdom of Bahrain

- Objectives:

1. To identify the prevalence of smoking among hypertensive patients.
2. To study the relationship between several risk factors like gender, age, marietal status, smoking, food, diseases, treatment, gender and Hypertension.

Methodology

- **Study design :**
  - A cross- sectional study involving hypertensive patients in kingdom of Bahrain.

- **Study population :**
  - All hypertensive patients ≥ 18 year registered in primary health care clinics in kingdom of Bahrain .

- **Sample size:**
  - The sample was 385 patients calculated from the following formula:

$n = [(Z_{1-\alpha/2})^2 \cdot P(1-P)] / E2$

- **Case definition:**
  - Any hypertensive patients who is ≥ 18 years old registered in primary health care clinics in kingdom of bahrain.

- **Procedures of data collection:**
  - By getting information data from NCD registry source in Health Centers.
  - Interviewing patients and felling up the questionnaires.
  -

- **study instruments:**
  - A written questionnaire.
  - Mean blood pressures recorded in hypertension sheet in patients record within one year.

- **Data entry, validation and analysis :**
- The questionnaire is numbered serially.

- Coding will be done for the study variables.
- T-test will be used to measure significant difference between controlled groups in both smokers and non-smokers.
- SPSS 16 was used for data entry and interpretation .

Risk factors :

Governorate	population	Health center	%	Number of patients
Capital	9803	ALNAIM	23	89
Muharraq	10810	SH. SALMAN	25.2	97
Northern	9141	JIDHAFS	21.4	82
Southern	2511	HAMAD KANOO	5.9	23
Central	10464	SITRA	24.5	94
Total	42729			385

Qualitative	Quantitative
• Gender • Nationality • Marital status • Family history of hypertension • Smoking history • Dietary history • Physical history • Psychological history	• Age • Blood pressure • Number of cigarette packets

RESULTS

Table 1: Factors Associated with Hypertension

Pressure / Factors	Non-Hypertensive		Hypertensive	
	Count	%	Count	%
Male	117	59.7%	79	40.3%
Female	120	62.3%	72	37.7%
≤ 39 years	11	4.6%	10	6.6%
40- 49 years	62	26.2%	25	16.5%
≥ 50 years	164	69.1%	116	76.8%
Bahraini	183	63.3%	116	36.7%
Non-Bahraini	54	60.7%	35	39.3%
Married	221	93.2%	139	92%
Single	16	6.7%	12	7.9%
(+) Effect on life	26	11%	40	26.5%
(-) Effect on life	211	89%	111	73.5%
Smoker	28	11.8%	52	34.4%
Non-smoker	209	88.1%	99	65.5%
BP preceded smoking	2	0.8%	4	2.6%
Smoking preceded HT	235	99.1%	147	97.3%
Smoked before ≤ 18 yrs	26	10.9%	6	3.9%
Smoked before(19-30) yrs	17	7.1%	15	9.9%
Smoked before(31-40) yrs	70	29.5%	43	28.4%
Smoked before(41-50) yrs	105	44.3%	71	47%
Smoked before ≥ 50 yrs	19	8%	16	10.5%

Table 2: association of diseases with hypertension:

Diseases	No respiratory diseases	225	94.9%	147	97.4%
	Respiratory diseases	12	5.1%	4	2.6%
	Non diabetic	53	22.4%	32	21.2%
	Diabetic	184	77.6%	119	78.8%
	No CVS diseases	218	92%	136	90.1%
	CVS diseases	19	8%	15	9.9%
	No cancer	231	97.5%	149	98.7%
	Cancer	6	2.5%	2	1.3%
	Non dyslipidemic	123	51.9%	107	70.9%
	Dyslipidemic	114	48.1%	44	29.1%
	No renal diseases	213	89.9%	141	93.4%
	Renal diseases	24	10.1%	10	6.6%
	No other diseases	181	76.4%	110	72.8%

	Other diseases	56	23.6%	41	27.2%

Respiratory diseases : including COPD, Asthma, Diffuse parynchymal lung diseases. Diabetic : diagnosed as per the American Diabetes Association 2016. CVS diseases : including CAD, Arrythmia. Cancer : including tissue proven diagnosis of any malignancy. Dyslipidemia : diagnosed as per the local labs reference ranges of the Ministry of Health in Bahrain. Renal diseases : including chronic kidney failure, nephrotic syndrome, nephritic syndrome, renal artery stenosis, polycystic kidney disease.

Table 3: association of doing physical activities with hypertension:

Physical activities	Physical activities	61	25.7%	42	27.8%
	No Physical activities	176	74.3%	109	72.2%

Physical activities : including aerobic and anaerobic exercises performed for at least 180 minutes per week.

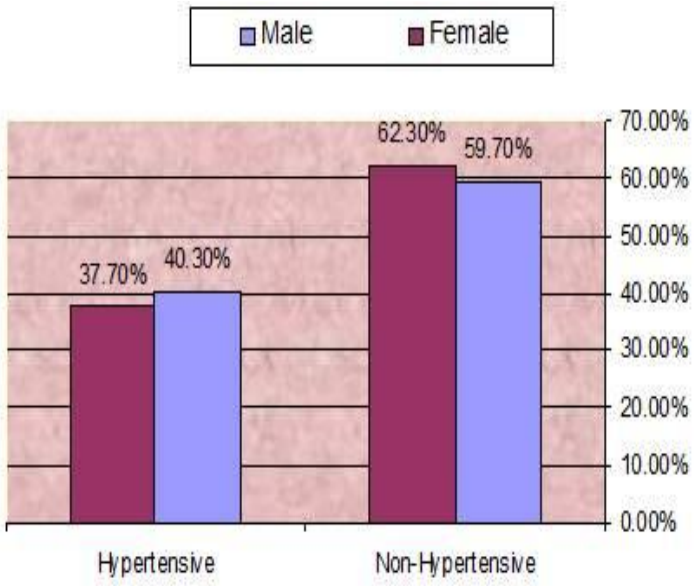

Figure 1: illustrates the relationship between gender and incidence of hypertension

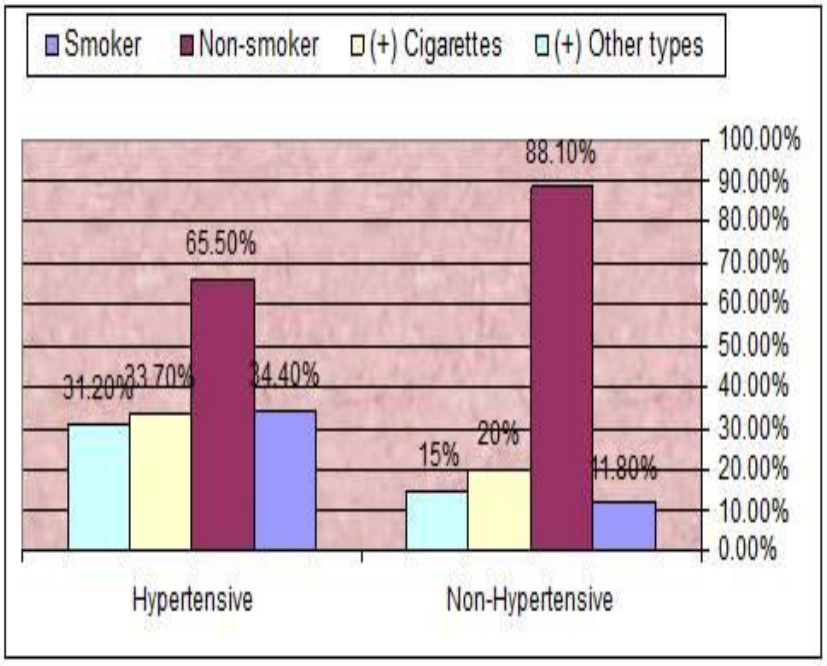

Figure 2: illustrates the prevalence of smoking and type of smoking (cigarette). Other types (chain smoke) among hypertensive and non-hypertensive population

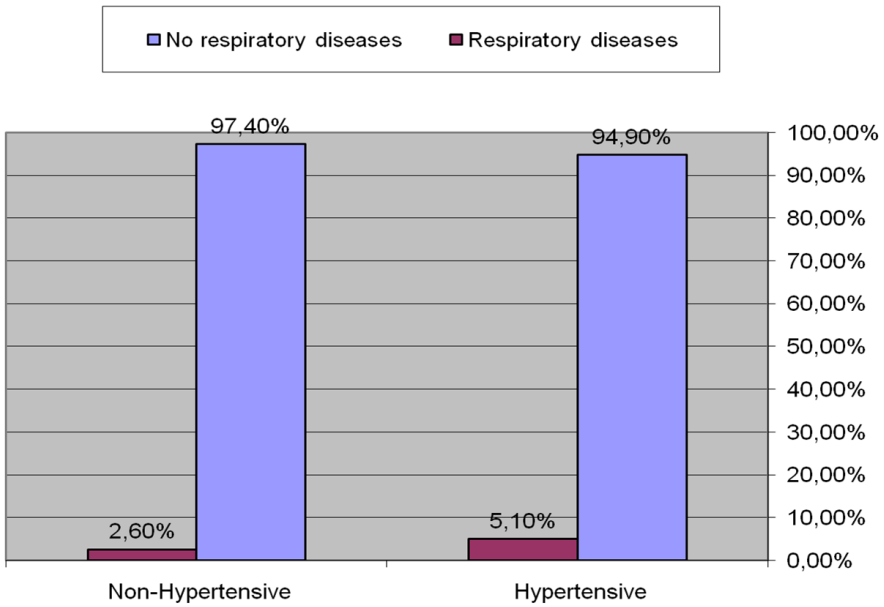

Figure 3: illustrates the prevalence of respiratory diseases : COPD, Asthma, Diffuse parynchymal lung diseases, among hypertensives and non- hypertensives.

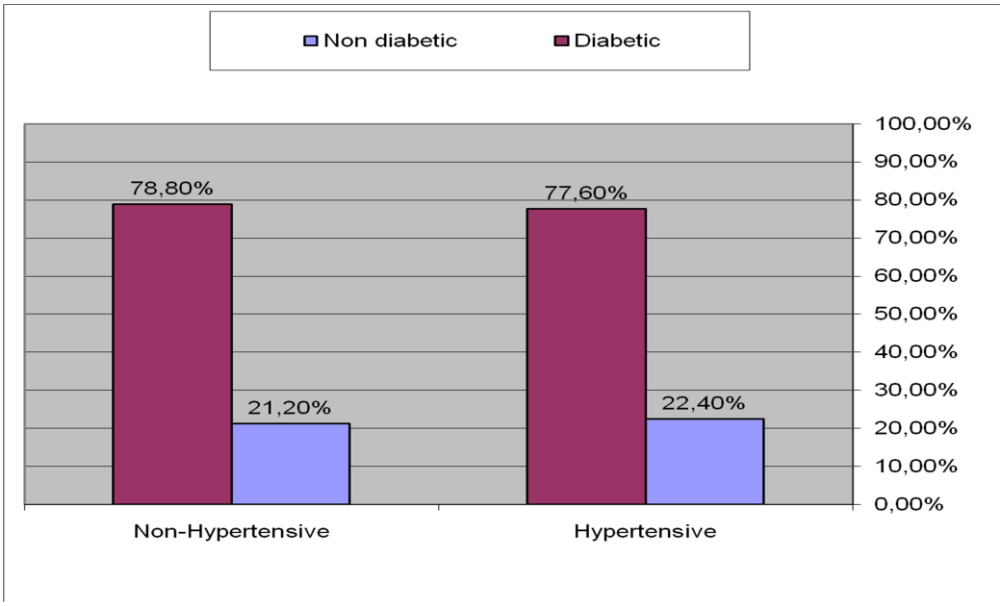

Figure 14 : shows the relationship between diabetes and hypertension

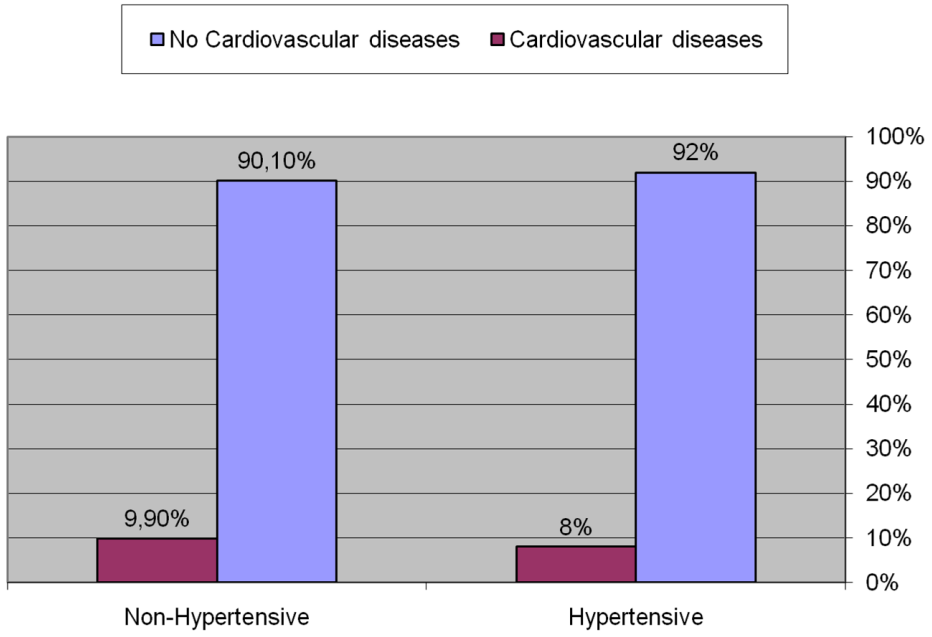

Figure 5 : illustrates the prevalence of cardiovascular disease : CAD, arrythmias among hypertensives and non-hypertensives.

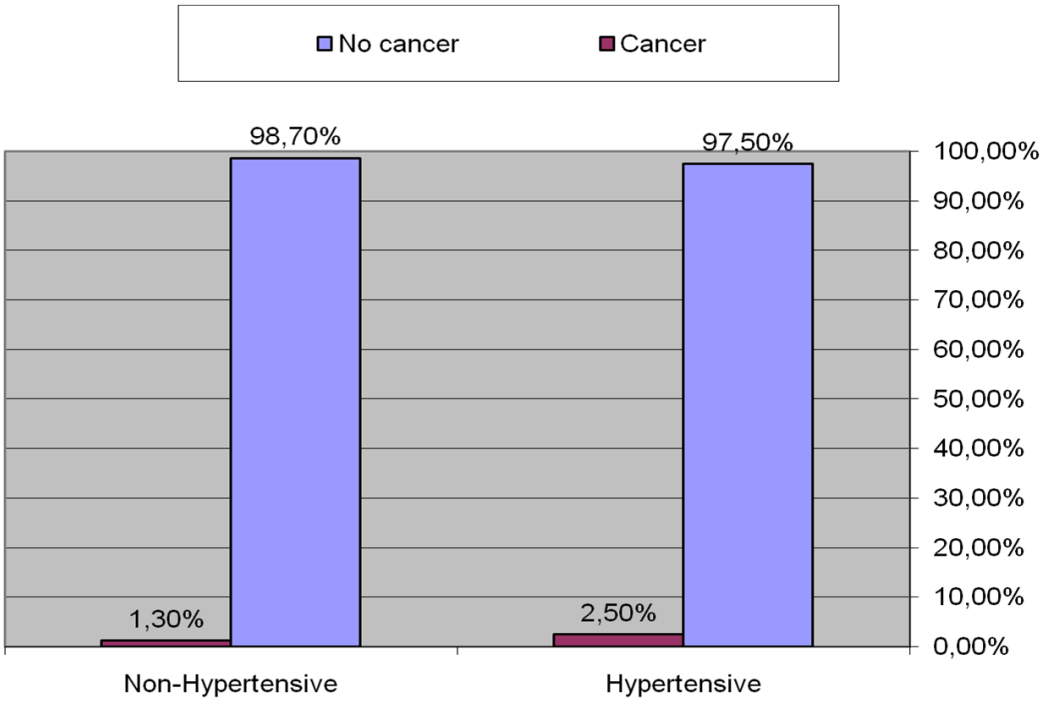

Figure 6 : illustrates the prevelance of cancer among hypertensives and non-hypertensives

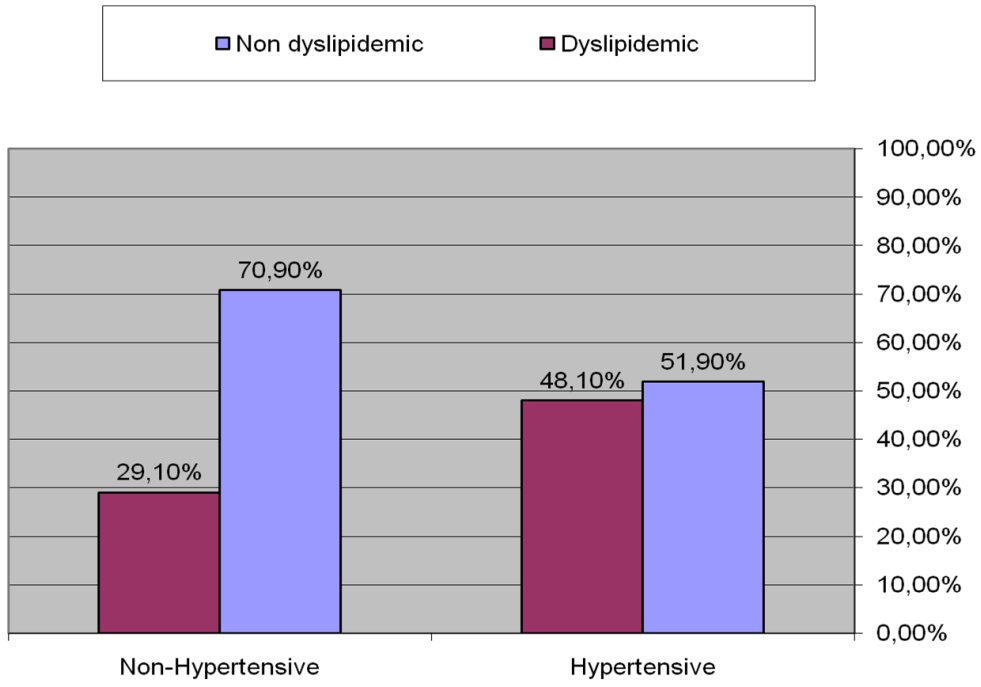

Figure 7 : illustrates the relationship between Dyslipidemia and Hypertension

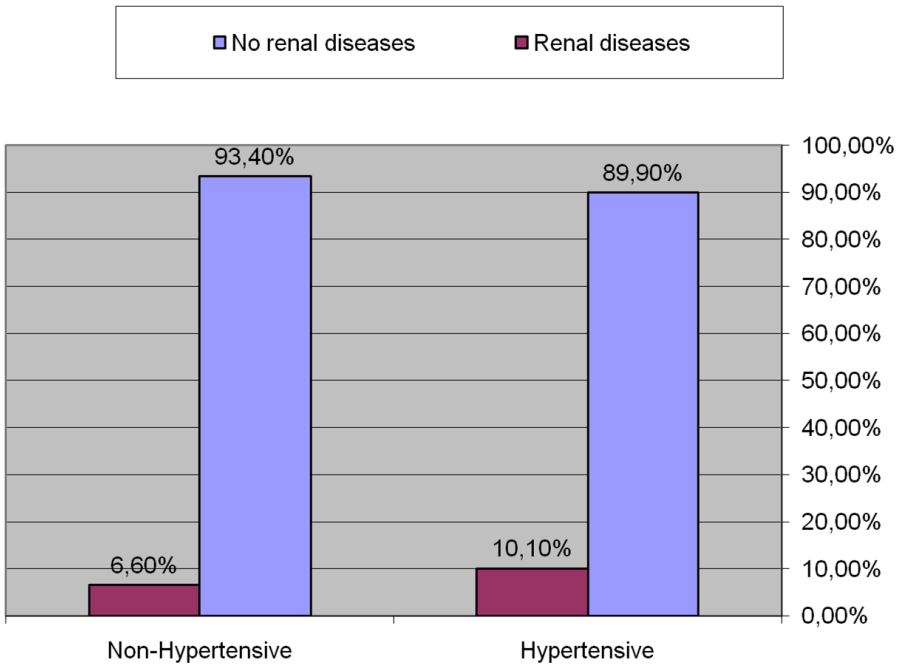

Figure 8 : illustrates the prevalence of renal disease (chronic kidney disease, nephrotic syndrome, nephritic syndrome, renal artery stenosis, polycystic kidney disease among hypertensives and non-hypertensives.

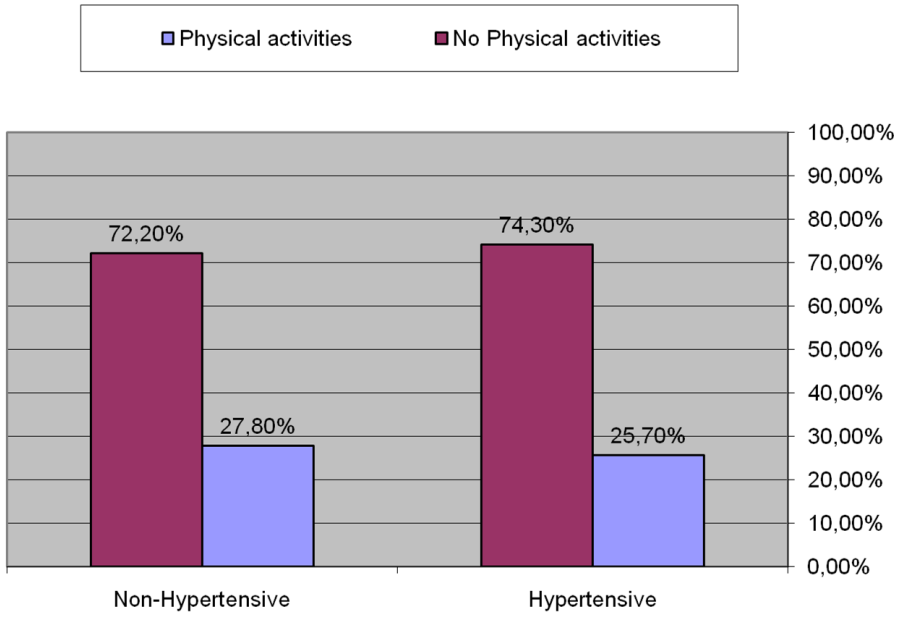

Figure 9 : illustrates the relationship of performing physical activity and occurrence of hypertension.

Discussion and conclusion

In this representative health examination survey, there is no significant effect of smoking on blood pressure among the population. Smoking is clearly not an adequate behavior to alter blood pressure low among individuals. Future studies should examine interactions between smoking status and obesity, overweight and normal weight with respect to hypertension. Blood pressure, but also multiple change of health-related behavior, particularly diet and exercise, should be analyzed in the context of smoking cessation. Public health efforts to encourage smoking cessation should be supported, but the need to control body weight in the prevention of hypertension should also be promoted.

According to our survey the Table shows that the percentage of male who suffering from hypertension is less than female that have hypertension. The relation between age and hypertension show that the patients who are older than 50 years old are more prone to have hypertension where as the patients who are less than 39 years old are more chance to become hypertensive.

The percentage of Bahraini and non Bahraini who have hypertension is higher than non hypertension. Marriage patients are more susceptible to have hypertension than single patients. Most of the hypertensive patients are heavy smokers. So we conclude that there is high relationship between smoking and hypertension. Long duration smokers are at high risk of developing hypertension. Most of hypertensive patient are cigarette smokers and at least one packet per day. Also we can see from the table that hypertensive patient eats vegetable more than non hypertensive patient. Also patients with hypertension who eat fruits are more than non hypertensive patients.

In addition, hypertensive patients are used to eat fast food more than non hypertensive patients. Also we can see that patients with hypertension are eating meet more than non hypertensive patients. Numbers also show that hypertensive patients drink milk more than non hypertensive patients. According to table, hypertensive patients are less prone to have respiratory diseases. Also we can see that number of hypertensive patients who have also diabetes is increase so we conclude that there is a relationship between hypertension and diabetes.

Numbers show that hypertensive patients are more to have cardiovascular diseases than non hypertensive patients. Table show that there is no relation between cancer and hypertension because there is few hypertensive patients have cancer. Patient with hypertension are less likely to be dyslipidemic and have renal diseases. According to the table, we studied many symptoms associated with hypertension and we found that some specific symptoms increase significantly in patient with hypertension and some of them have no significant correlation with hypertension.

First headache, the results show that most of the hypertensive patients suffer from headache while less percentage does not suffer from headache. Second, the data showed that there is no significant relationship between feeling dizzy and being hypertensive. Third most of patients with hypertension and without hypertension do not suffer from chest pain so it seems like there is no relationship between hypertension and causes of chest pain. Fourth, 64.9% of hypertensive patients are more susceptible to be fatigue than who are non hypertensive patients. Fifth, almost 10% of hypertensive and non hypertensive

patients suffer from dyspnea but the majority of the patients have not show that they suffer from dyspnea. Improvements in patient activation were associated individuals on performing exercise had a 28% lower risk for hypertension, adjusting for age and sex (odds ratio: 0.61, 95% confidence interval: 0.50-0.87; SBP: -3.3 mmHg, P<0.001; DBP: -1.5 mmHg, P<0.001). The results stay statistically significant (odds ratio: 0.72, 95% confidence interval: 0.55-0.86; SBP: -2.4 mmHg, P<0.05; DBP: -1.1 mmHg, P<0.05). The protective association between exercise and hypertension appeared to be concordant across age groups.

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