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Effect of smoking on interleukin 6, tumor necrosis factor and C-reactive protein in hypertensive patients

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Abstract

Smoking is a main independent risk factor for cardiovascular disease which include hypertension unstable angina, myocardial infarction, vascular disease and stroke. The aim of study is to identify the effect of smoking on interleukin 6, tumor necrosis factor alpha and C-reactive protein in smoking and hypertensive patients. Data collected was carried out during the period from July 2018 to September 5,125.72 cm Baji city which include measurement of Interleukin 6, C.R protein and tumor necrosis factor alpha. In this study there was a significant differences between the control and hypertensive cases, but there is non-significant differences between hypertensive smoker and non-smoker cases. About the interlukin there is a significant differences between the control and hypertensive cases In C.R protein, there is a significant differences between the control and hypertensive cases, but there is non-significant differences between hypertensive smoker and non-smoker cases, about the tumor necrosis factor, there is a significant differences between the control and hypertensive cases, but there is non-significant differences between hypertensive smoker and non-smoker

تاثير التدخين على الانتيرلوكين 6، البروتين التفاعلي سي، وعامل نخر الورم على مرضى ضغط الدم

جواد علي صالح

الخلاصة

يعتبر التدخين من عوامل الخطورة للاصابة بامراض القلب والاوعية الدموية والتي تتضمن ارتفاع ضغط الدم، الذبحة الصدرية، احتشاء عضلة القلب والجلطة الدماغية. الهدف من هذه الدراسة هو معرفة تاثير التدخين على الانتيرلوكين، البروتين المتفاعل سي وعامل نخر الورم في مرضى الضغط في مدينة بيجي للفترة من تموز 2018- الى ايلول من نقس العام. في هذه الدراسة هنالك فروقات معنوية بين الاصحاء ومرضى الضغط. فيما يخص الانتيرلوكين هتالك فرق معنوي بين المدخنين وغير المدخنين، وايضا بالنسبة للبروتين المتفاعل سي هنالك فرق معنوي بين المدخنين وغير المدخنين. وايضا هنالك فرق معنوي بين المدخنين وغير المدخنين بالنسبة لعامل نخر الورم.

Introduction

Smoking is a main cause of mortality and morbidity in the world (1, 2), it is estimated that > 5 million people die from tobacco smoke related disease every year(3), in the united states 20.5% of all adults are current smokers and smoking causes one in 5 deaths annually(4,5). Smoking is a main independent risk factor for cardiovascular disease which include hypertension, unstable angina, myocardial infarction, vascular disease, and stroke (6, 7, 8). Epidemiological study reported explain that there is more than 1 in 10 cardiovascular deaths which make up 54% of all deaths worldwide are related to smoking, while the deleterious effect of cigarette smoke on cardiovascular morbidity and mortality are well established, the onset and temporal progression of cigarette smoking – induced pathological processes and manifestation of physiological changes are poorly understand (9). Cigarette is known for its deleterious effect on many organs and systems (10), and could lead to smoking-related medical conditions, huge economic burden and increase risk of premature death, therefore there is need for assess its toxicity (11). Cigarette smoke not only contains reactive oxidants substance but also elicits marked activation of white blood cells that can play a role in oxidative damage (12). Reactive oxidants are produced during aerobic metabolism, and cause cellular damage on lipid carbohydrate, nucleic acid molecules and protein but are detoxified by the antioxidants which present in the cells, when the reactive oxidants produced in excess lead to oxidative stress and this linked to inflammation, as it activates the nuclear factor kappa-beta signaling pathway to synthesize pro-inflammatory cytokines which promote inflammation (13). Cigarette smoking is a major risk factor in the development of cardiovascular disease, and it has been recognized that cardiovascular system contains a component of inflammation and has even been referred to as inflammatory disease (14, 15). In addition, a link has been established between several other chronic inflammatory diseases and smoking, including chronic obstructive pulmonary disease, rheumatoid arthritis, systemic lupus erythematous and Crohn's disease (16, 17, and 18) One such inflammatory marker, C-reactive protein (CRP), may be easily and sensitively measured in a variety of clinical situations to monitor disease

progression (19). Other factor which related to this inflammation is interleukin-6 which is a key pro inflammatory cytokine, has been shown to be associated with increased future risk and prognostic marker future coronary events and mortality in patients with cardiovascular disease (20, 21). Tumor necrosis factor was originally described as factor produced by endotoxin stimulated macrophage which causes hemorrhagic necrosis of tumor; it is a powerful pro inflammatory cytokine with pleiotropic properties and a key mediator of inflammation (22), and its act by binding to two cell surface receptor p55 and p75, the p55 receptor seems to be responsible for mediating the majority of TNF function, both receptors can be proteoliticaly cleaved and released as soluble forms, a good marker of TNF activation(23).

Aim of study

The aim of study is to identify the effect of smoking on interleukin 6, tumor necrosis factor alpha and C-reactive protein in smoking and hypertensive patients.

Patients and methods

Cross section study done for 75 patients diagnosed clinically as a case of chronic hypertension and smoking, on medical treatment (30 case with hypertension, 30 case with hypertension and smoker and 15 case normal as a control). Data collected was carried out during the period from July 2018 to September 2018 in Bajii city which include measurement of Interleukin 6, C.R protein and tumor necrosis factor alpha to identify the effect of smoking on these parameters. The age range of studied population was from 45 years to 65 years.

In this study we exclude any disease or condition like:

1- Renal failure
2- Heart failure
3- Patients with steroid therapy
4- Obesity
5- Respiratory disease
6- Chest infection

Methods and measurements

This study was achieved by collecting 75 blood samples included (60) patients (30 hypertensive only and 30 hypertensive with smoking) and 15 subjects as control. Approximately 5 ml of human blood was collected from each subject and transferred into sterilized test tubes and allowed for 30 minute to clot at room temperature, the sample was centrifuged for 5 minutes and the serum was immediately separated and stored till used for interleukin 6, tumor necrosis factor-alpha and C - reactive protein.

Results

There are 75 patients with hypertension participated in this study, 30 cases are smoker and 30 are non-smoker, and 15 cases are normal (control), in these cases we measured the interleukin, C.R protein, and tumor necrosis factor. Regarding the interleukin, there is a significant differences between the control and hypertensive cases (smoker and non-smoker), but there is non-significant differences between hypertensive smoker and non-smoker cases (Table1) and figure (1). About the C. R protein, there is a significant differences between the control and hypertensive cases (smoker and non-smoker), but there is non-significant differences between hypertensive smoker and non-smoker cases (Table 2) and figure (2). About the tumor necrosis factor, there is a significant differences between the control and hypertensive cases (smoker and non-smoker), but there is non-

significant differences between cases (Table 3) and figure (3) hypertensive smoker and non-smoker

Table (1): Mean and SD of interleukin in all groups

Groups	Mean ± SD	P value
Control	169.0 ± 6.6	Non significant
Hypertension	215.4 ± 48.7	<0.01
Hypertension And smoker	211.6 ± 61.6	<0.01

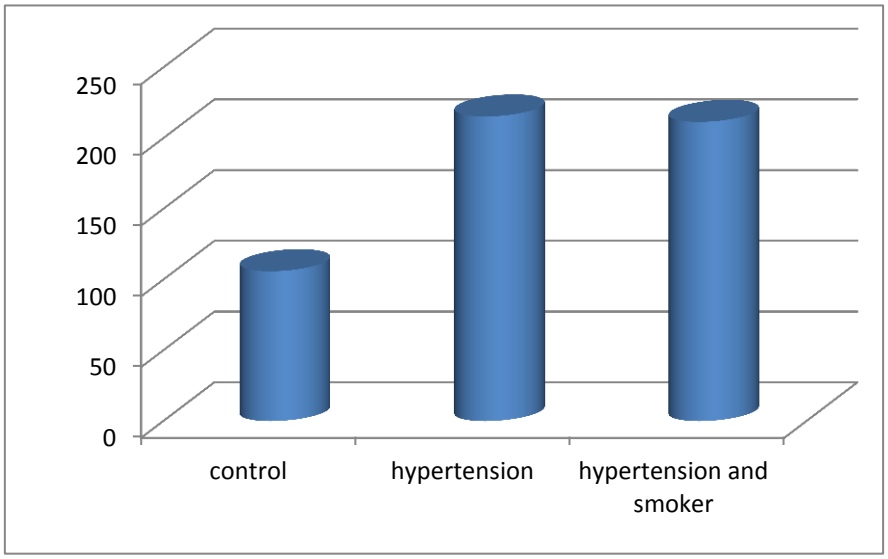

Fig. (1):- Mean of interleukin in all groups

Table (2):- Mean and SD of C. R protein in all groups

Groups	Mean ± SD	P value
Control	60± 6.2	Non significant
Hypertension	101.8 ± 5.9	<0.01
Hypertension And smoker	103 ± 16.9	<0.01

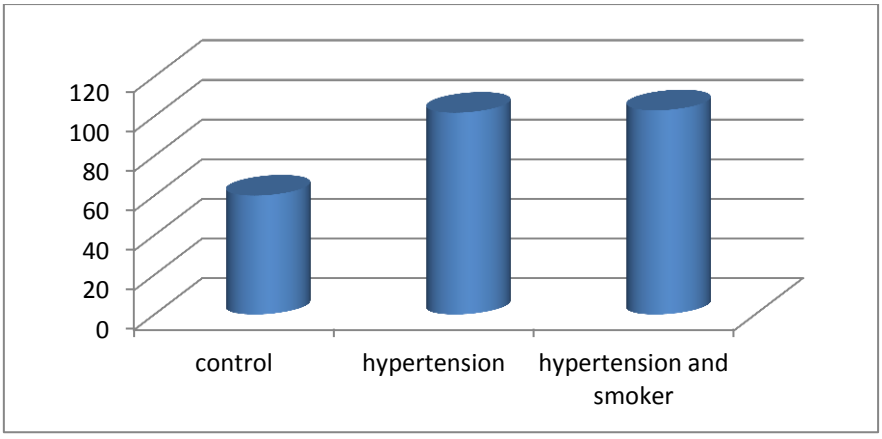

Fig. (2):- Mean of C. R protein in all groups

Table (3): Mean and SD of tumor necrosis factor in all groups

Groups	Mean ± SD	P value
Control	140 ± 4.9	Non significant
Hypertension	193.6 ± 16.3	<0.01
Hypertension and smoker	196.9 ± 16.4	<0.01

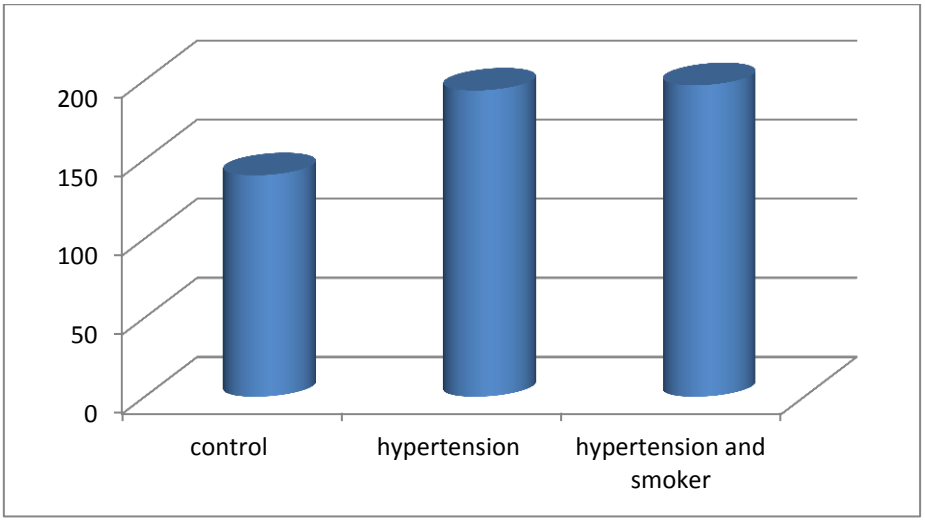

Fig. (3) : Mean of tumor necrosis factor in all groups

Discussion

According to the data obtained in this study and about the measurement of interleukin, C.R protein, and tumor necrosis factor in hypertensive patient, it was found that the concentration of interleukin is normal in control cases, but there is increase in its level in hypertension cases and smoking cases (high significant), this result agree with Bautista LE, *et al* (24) who say that a plasma level of interleukin-6 were two to four times higher(significant) in subjects with hypertension and could be risk factor for the development of hypertension. Other studies (25, 26) say that interleukin may result in elevated blood pressure by inducing endothelial dysfunction and increasing peripheral vascular resistance, and elevated interleukin-6 may precede and follow hypertension. Regarding the smoking, the Jamil A, et al (27) says that the mean interleukin-6 level was significantly increased in smokers than in non-smokers, Herfs *et al*(28) showed in his study that smokers have higher expression of interleukin in the respiratory epithelium as compared with non-smokers. Arnson et al (28) also had similar results that smoking increases the production of interleukin-6 levels were higher in smokers compared with non-smokers in a study by Moretti et al (29) and Helmersson (30) *et al*. About the C.R protein, there is a significant increase ($P<0.01$) in its level in hypertensive cases and smoking cases, and our result agree with Bautista LE, *et al* (24) who say that a hypertension associated with C-Reactive protein elevated, other studies (31,32) say that C-Reactive protein has been shown to be associated hypertension in well controlled studies. About the smoking, the Petrescu F, *et al* (33) says that heavy smoking could induce a significant increase C-reactive protein level suggesting the imbalance between proinflammatory and anti-inflammatory factors. Regarding the tumor necrosis factor-α, there is a significant increase in its level in hypertensive cases and smoking cases ($p<0.01$) which agree with study of Ito et al and Furumoto T etal (34,35) who say there is a positive association between tumor necrosis factor alpha level and hypertension, other study(24) say that a plasma level of tumor necrosis factor alpha were two to four times higher(significant) in subjects with hypertension than normal, and the plasma level of tumor necrosis factor alpha were significantly associated with increased prevalence with hypertension. Regarding the smoking, the Petrescu F, *et al* (33) says that heavy smoking could induce a significant increase in serum tumor necrosis factor alpha, and showed further increase of tumor necrosis factor alpha serum levels in patients who had a daily smoke exposure of more than 1 pack/day, other study conducted by Diez-Pina *et al* (36) reported that male smokers had higher tumor necrosis factor alpha levels than male nonsmokers. Other study Fernandez-Real and coworkers (37) demonstrated a marked increase of tumor necrosis factor alpha system activation with an increase in the number of cigarettes marked per day.

Conclusion

Based on the results presented in this study, the following conclusions are highlighted:

1-Serum interleukin-6 levels increased in patients with hypertensive smoker and hypertensive as compared to apparently healthy individual.

2- Serum tumor necrosis factor alpha levels increased in patients with hypertensive smoker and hypertensive as compared to apparently healthy individual.

3- Serum C-reactive protein levels increased in patients with hypertensive smoker and hypertensive as compared to apparently healthy individual.

Recommendations

1- Measurement of other types of interleukin in hypertensive patients and smoker

2- Measurement of interleukin-6, tumor necrosis factor-alpha, and C-reactive protein in other diseases that related to the cardiovascular system**.**

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