Original Article

Evaluation of Patients' Awareness of Their Blood Pressure and Blood Glucose at the Dental Faculty of Islamic Azad University

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ABSTRACT

Background and Aim: Most dentists rely on the patient's history when assessing a patient's medical status although many patients are unaware of their medical condition. We aimed to evaluate patients' knowledge of their blood pressure (BP) and blood glucose (BG) at the Dental Faculty of Islamic Azad University of Medical Sciences, Tehran, Iran, in 2018.

Materials and Methods:In this cross-sectional study, 200 patients aged 18 years and over were enrolled with consent. Patients' body mass index (BMI) was classified according to the World Health Organization (WHO) criteria. Patients' BP was measured from the right arm and was considered abnormal when BP≥140/90 mmHg based on the JNC7 criteria. BG levels were measured from the capillary blood of the third finger of patients' hands and were classified according to the American Diabetes Association (ADA) criteria. Data were analyzed using the chi-square test.

Result: Eighty-nine male patients (44%) and 111 female patients (56%) with the mean age of 44±14.1 years were studied. Thirty percent of the subjects had high BP, and 21% had diabetes. Thirteen percent and 9.5% of the subjects were not aware of their high BP and BG, respectively. Lack of awareness of hypertension was significantly associated with being male and with a BMI higher than normal. Lack of awareness of high BG was associated with being male, older age, a BMI higher than normal, and lower education level ($P<0.05$).

Conclusion: It seems that knowledge of BP and BG in dental patients is inadequate and requires more precision and sensitivity in assessing these cases before any dental intervention.

Keywords: Body Mass Index, Hypertension, Diabetes Mellitus, Blood Pressure, Blood Glucose, Awareness

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Introduction:

Hypertension is one of the most common diseases, and according to the World Health Organization (WHO) report, one in every three adults in the world has hypertension.(1) In 2008, approximately 40% of adults over the age of 25 years had hypertension (approximately one billion people worldwide). It is expected that the number of patients increases by 24% in developed countries by 2025.(2) Undiagnosed and untreated hypertension can lead to fatal heart diseases, such as aneurysm, coronary artery disease, stroke, and kidney disease, all of which can alter dental treatment plans. There are 17 million deaths annually from cardiovascular disease, with a third due to complications of hypertension.(3)

The WHO has reported that one out of every 10 adults has diabetes (about 300 million worldwide).[4] Undiagnosed and untreated diabetes may increase the incidence of morbidity (cardiovascular, renal, neuropathic, and ocular disease, etc.) and mortality.[5,6] According to the WHO, there are about 1.5 million deaths a year due to diabetes.[7] Diabetes causes symptoms such as delayed wound healing, increased incidence of bacterial and fungal infections, dry mouth, hypertrophy of salivary glands, and gingivitis and periodontitis in the oral cavity.[8,9]

A body mass index (BMI) higher than normal (abdominal obesity) has a direct relationship with hypertension and diabetes.[10,11] Overweight people have a 2- to 6-fold increased risk of hypertension and a 5-fold increased risk of diabetes.[12,13]

Screening for undiagnosed medical conditions at dental offices is a valuable public health service and is useful for preventive health interventions. Early diagnosis of chronic diseases saves treatment costs by up to 75% and reduces mortality by up to 70%. Only 10% to 20% of adults visit a doctor annually, while about 40% of them go to a dentist. Therefore, dentists can play an important role in early diagnosis and screening of chronic diseases.[14] Most dentists trust the patient's history when assessing a patient's medical status although many patients are unaware of their medical condition, which is important in planning their dental treatment.[15] In this study, we aimed to evaluate patients' knowledge of their blood pressure (BP) and blood glucose (BG) levels at the Dental Faculty of Islamic Azad University of Medical Sciences, Tehran, Iran, in 2018.

Materials and Methods

The Research Council of the Dental Faculty of Islamic Azad University of Medical Sciences, Tehran, Iran has approved this research (IR.IAU.DENTAL.REC.1397.049).

A cross-sectional descriptive study with sequential sampling was performed on 200 individuals aged 18 years and older, who referred for dental treatments to the oral medicine department of the university in 2018. They entered the study with consent after the research was explained to them.

Demographic data (age, sex, education level, systemic disease, drug use, and family history of hypertension and diabetes) were asked through a face-to-face interview and using a questionnaire. Patients' BMI was calculated by dividing the weight in kilograms by the square of the height in meters. The weight was measured using a scale (First Austria), and the height was measured using a meter. The findings were then classified according to the WHO criteria such that 18.5<BMI<24.9 was considered normal, 25<BMI<29.9 was considered overweight, and BMI>30 was considered obese.[16]

Patients' BP was measured using the ALPK2 digital BP monitor (Japan) from the right arm while the patient was sitting and the arm was well supported and at the level of the heart. Data were categorized according to the WHO criteria and the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC 7) such that BP<120/80 mmHg was considered normal, 120/80<BP<139/89 mmHg was considered as prehypertension, 140/90<PB<159/99 mmHg was considered as the first stage hypertension, and BP≥160/100 mmHg was considered as the second stage hypertension.[17]

Finally, BG concentrations were measured using the Accu-Chek glucometer (Roche, Mannheim, Germany). Samples were collected from the capillary blood of the third finger of patients' hands using a sterile lancet, and the results were classified according to the American Diabetes Association (ADA) criteria. If 8 hours had passed from the patients' last meal, they were considered fasting. Fasting BG (FBG) concentrations less than 100 mg/dl were considered normal, 100 mg/dl<FBG<126 mg/dl was considered prediabetic, and 126 mg/dl ≤FBG was considered diabetic. Random BG (RBG) below 140 mg/dl was considered normal, 140 mg/dl<RBG<200 mg/dl was considered prediabetic, and 200 mg/dl ≤RBG was considered diabetic.[18]

In the end, the patients' awareness about their BG and BP according to the measurements was recorded in the information form. A trained dentist performed all steps and measurements (BG, BP, and BMI). Patients with hypertension and hyperglycemia were referred to a physician for further evaluation and appropriate treatment.

The difference between the awareness and the actual measured value in the samples was determined (in the estimation community), and the role of the associated factors was judged using the chi-square test.

Result:

In this study, 200 patients (18 years and older) were evaluated for their BMI, BP, and BG levels. The awareness of patients of their BG and BP was also evaluated Eighty-nine males (44%) and 111 females (56%) with the minimum age of 18 years, the maximum age of 72 years, and the mean age of 44±14.1 years were studied. Most patients were in the age range of 46-55 years (Table 1).

Table 1: Distribution of the subjects by age

Age (year)	Number	Percentage (%)
18-25	14	7
26-35	34	17
36-45	50	25
46-55	53	26.5
56-65	30	15
66 and older	19	9.5
Total	200	100

Table 2 presents the literacy level of the studied subjects.

Table 2: Distribution of the studied subjects in terms of the literacy level

Literacy level	Number	Percentage (%)
Guidance school and lower	95	47.5
High school	68	34
University	37	18.5
Total	200	100

The study of the BMI showed that 65% of the patients were overweight or obese, and 35% of the patients were in the normal range.

After analyzing the data, it was found that 16% of the participants had prehypertension while 30% had stage 1 hypertension. None of the patients had stage 2 hypertension. In addition, 20.5% of the participants were prediabetic, and 21% had diabetes.

The distribution of the patients under study based on their awareness of their BP and according to the related factors is presented in Table 3, which shows that those who were not aware of their BP were mostly males (P<0.02), and in terms of the BMI, they were overweight or obese (P<0.02). However, literacy level (P<0.84) and age (P<0.82) were not associated with BP awareness.

Table 3: Distribution of patients under study according to their awareness of blood pressure (BP)

Awareness / Related factors	Yes N_1=174	No N_2=26	Test result	OR
Gender:	102(59%)	9(35%)	P<0.02	
Female	72(41%)	17(65%)		1.2
Male				
Literacy level:				
Academic	33(19%)	4(15%)	P<0.84	
High school	58(33%)	10(39%)		----
Guidance school and lower	83(48%)	12(46%)		
Age:				
Lower than the mean	83(48%)	8(31%)	P<0.82	----
Higher than the mean	91(52%)	18(69%)		
BMI				
Lower than 25	66(38%)	4(15%)	P<0.02	3.4
(normal)	108(62%)	22(85%)		
25 and higher				

BMI=Body Mass Index, OR=Odds Ratio

The distribution of the studied patients based on their awareness of their BG level according to the relevant factors is presented in Table 4 and shows that those who were not aware of their BG levels were more likely to be male (P<0.05), had

a non-academic literacy level (P<0.02), were older (P<0.01) and overweight or obese (P<0.000).

Table 4: Distribution of patients under study according to their awareness of blood glucose (BG)

Awareness / Related factors	Yes N_1=181	No N_2=19	Test result	OR
Gender:	104(57%)	7(37%)	P<0.05	1.5
Female	77(43%)	12(63%)		
Male				
Literacy level:				
Academic	37(21%)	0		
High school	60(33%)	8(42%)	P<0.02	Multifold
Guidance school and lower	84(46%)	11(58%)		
Age:				
Lower than the mean	88(49%)	3(16%)	P<0.01	1.6
Higher than the mean	93(51%)	16(84%)		
BMI				
Lower than 25	70(39%)	0	P<0.000	Multifold
(normal)	111(61%)	19(100%)		
25 and higher				

BMI=Body Mass Index, OR=Odds Ratio

In addition, the distribution of the patients in terms of the percentage of their awareness of BP and BG is presented in Table 5, which shows that 13% were unaware of their hypertension, and 9.5% were unaware of their high BG. Given this prevalence rate of lack of knowledge of these two indices in the studied samples, the actual rates with a 95% confidence interval (CI) were as follows:

Lack of awareness of BP: CI 95%=8.4-17.5%

Lack of awareness of BG: CI 95%=5.5-13.5%

Table 5: Distribution of patients under study according to the percentage of awareness of their blood pressure (BP) and blood glucose (BG) levels

Awareness / Index	Yes	No	Total
BP	174 (87%)	26 (13%)	200 (100)
BG	181 (90.5%)	19 (9.5%)	200 (100)

In this study, 15 patients (25%) with previous hypertension (N=60) and drug use with uncontrolled hypertension and 12 patients (28.5%) with previous diabetes (N=42) and drug use with uncontrolled diabetes had referred for dental treatment.

Discussion:

The results of the present study showed that 30% of the subjects had hypertension, 16% had prehypertension, 21% had diabetes, and 20.5% had prediabetes. Thirteen percent (26 subjects) had no information about their high BP, and 9.5% (19 subjects) had no information about their high BG. Lack of awareness of hypertension was associated with sex and BMI, and a lack of awareness of high BG was associated with sex, age, literacy level, and BMI.

Morris-Paxton et al conducted a study in South Africa in 2018 using the South African criteria. [19] They reported that 90.2% of the subjects had hypertension, 13.2% had prehypertension, 18% had high BG, and 0.3% were prediabetic, which is similar to the present study in terms of the number of people with diabetes and prehypertension but different in terms of the number of people with hypertension and prediabetes. These differences can be attributed to the high number of samples in the study by Morris-Paxton et al (1885 individuals), the use of the South African criteria (BP>159/99 mmHg and FBS>7.8 mmol/L considered abnormal), and racial and genetic differences.

The present study shows different results compared to a study by Hadlaq et al in Saudi Arabia (Riyadh) in 2017, which found that 15.5% of the subjects had hypertension, 29.3% had prehypertension, 3.2% had diabetes, and 7% had prediabetes.[8] The differences can be attributed to the different number of samples (283 individuals) and racial and geographical differences.

In 2013, Al-Kayyal et al in Saudi Arabia (Jeddah) found that the number of people with hypertension, prehypertension, diabetes, and prediabetes was 16.7%, 18.3%, 44.8%, and 33%, respectively.[20] The cited study was similar to our study in terms of the number of people with diabetes; however, it is different in other cases due to the lack of evaluation of comparable numbers in both sexes (26.6% female and 71.4%

male), differences in the number of samples studied (426 people), and racial differences.

In a 2013 study by Barasch et al in the United States, 12.2% of the subjects had diabetes and 5.7% had prediabetes.[21] The reported results are different from the results of the present study. Studying patients with certain conditions, such as having one of the risk factors for diabetes, a history of high BP or high cholesterol, and a BMI greater than 25, in the study by Barasch et al is the cause of the different results in the two studies.

After studying the RBG in Nigeria in 2013, Opeodu and Adeyemi reported the number of people with diabetes to be 4.4%.[15] This prevalence was 21% in the present study, which can be attributed to social, cultural, and environmental factors, as well as genetic differences and lifestyle, which is a major risk factor for diabetes.[22,23] In a 2011 study by Engstrom et al in Sweden, the number of people with hypertension was 20.6%.[24] The reasons for the differences between the two studies were the evaluation of those with no medical history of the illness but with BMI>25, as well as the criterion for the classification of subjects in the hypertensive group to be BP greater than 160/90 mmHg in the study by Engstrom et al. In our study, the criteria for such classification were the WHO and JNC7 criteria and BP more than 140/90 mmHg.

In this study, the percentage of unawareness of BP and BG was 13% (CI=8.4-17.5) and 9.5% (CI=5.5-13.5), respectively. In the study by Morris-Paxton et al, 8.4% and 1.8% of the subjects were unaware of their hypertension and diabetes, respectively.[19] In the study by Hadlaq et al, 44.8% and 10.2% of the study population, respectively, were not aware of their hypertension and diabetes.[8] In the study by Al-Kayyal et al, 29.1% were unaware of hypertension, and 1.7% were unaware of diabetes.[20] In the study by Barasch et al, 14.8%, in the study by Opeodu and Adeyemi, 4.5%, and in the study by Engstrum et al, 20.6% were unaware of their diabetes.[15,21,24] The different number of samples in each study, different research methods, racial differences, etc. are the causes of differences in the findings in different studies.

In the present study, there was a significant relationship between awareness of hypertension and diabetes and sex; the rate of information was higher in women than in men. Barasch et al found no significant relationship between diabetes and hypertension and sex.[21] Opeodu and Adeyemi also found no significant relationship between diabetes and sex.[15]

It is likely that the sociocultural differences and the greater attention that women in our society pay to their physical condition be the reasons for these different outcomes.

In terms of the relationship between BP and BG awareness and age, there was no significant relationship between BP awareness and age, but there was a significant relationship between BG awareness and age. In the studies by Hadlaq et al, Al-Kayyal et al, and Barasch et al, there was also a significant relationship between hypertension and diabetes and age.[8,20,21] In the study by Opeodu and Adeyemi, there was a significant relationship between diabetes and age.[15] Increasing vessel wall thickness and decreasing vascular elasticity, which happen with age, increase the BP and cause changes in cellular sensitivity to insulin. Also, changes in the function of β-cells due to accumulative mitochondrial damage by reactive oxygen species (ROS) increase the BG.[8,25] The reason for the lack of a significant correlation between hypertension awareness and age in this study can be attributed to the small sample size.

There was a significant correlation between BMI and awareness of high BP and BG such that those with a BMI less than 25 were more aware of their BP and BG than those with a BMI greater than 25. This is similar to the results reported by Hadlaq et al and Al-Kayyal et al.[8,25] There was also a significant relationship between hypertension and diabetes and BMI in these studies.[8,25] A BMI higher than normal is associated with hypertension and diabetes.[10,11] lower mobility, increased calorie intake, increased ROS supply, and pancreatic β-cell damage due to obesity can be the reasons for this association.[8,25]

In this study, in terms of the relationship between the level of knowledge of hypertension and diabetes and the literacy level, there was no significant relationship between the information of hypertension and the literacy level but there was a significant relationship between the information of diabetes and the literacy level. Other

studies have also suggested that people with lower socioeconomic status have worse health status than those with higher socioeconomic status, and education is one of the components of assessing socioeconomic status.[26,27]

In the present study, 25% of patients with prior hypertension and 28.5% of patients with previous diabetes had abnormal and uncontrolled BP and BG despite having received the drug. When considering these numbers with the number of people that are unaware of their high BP and BG (13% and 9.5%), overall, 38% of the

subjects had high BP and 38% had high BG. The relatively high prevalence of people with abnormal and uncontrolled BP and BG is alarming and highlights the importance of monitoring and recording the BP and BG of all patients referred to dental care (with or without a history of high BP and BG). In addition, measurement of BP and BG levels is strongly recommended in males, older people, overweight people, and those with lower literacy levels.

Conclusion:

Overall, it seems that the knowledge of BP and BG levels in dental patients is inadequate and somewhat worrying, requiring more precision and sensitivity in assessing these cases before any dental intervention. It is strongly recommended to measure BP and BG levels in males, older people, subjects with a BMI above normal, and people with lower literacy levels.

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