



## Hypertension and the Oral Health in Adult Bhutanese Patients - A Retrospective Descriptive Study

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### ABSTRACT

**Objective:** The objective of the study is to see the occurrences of various types of oral diseases in patients with different ranges of blood pressures (BP).

**Methods:** Four hundred adult patients were included for the study. Age, sex, body mass index, family history of hypertension, occupation, education, smoking tobacco, chewing tobacco, drinking habits, betel chewing habits, medication history, oral and systemic diseases were collected from them. The average systolic blood pressure (SBP) and diastolic blood pressure (DBP) were calculated. Oral findings such as any oral disease, tooth loss or wearing prosthesis were collected.

**Results:** Sixty-three (15.75%) of the study group had a history of hypertension (>140/90 mmHg). The occurrence of the participants with the presence of high BP (>130/85 mmHg) was 100 (25%). Participants with high BP measurement or with a history of hypertension had more number of tooth loss ( $p < 0.001$ ), and presence of removable dentures ( $p < 0.001$ ) than those patients with normal BP. Over half (54.7%) of the participants in the age group 50-69 years and 56.5% of them were female. Around 13.1% of the participants were completely edentulous while 68.2% were partially edentulous. Over 81% of our elderly people were either partially or completely edentulous. There were no differences in the presence of oral mucosal and periodontal diseases between participants with higher BP and those with normal BP.

**Conclusion:** Patients with high BP or history of hypertension had more tooth/teeth loss. Most of them were seen having dentures or preferred to stay without having dentures. Oral health was poor among patients with high BP or those with history of hypertension. It is also understood that people living with hypertension is increasing in Bhutan.

Keywords: *Blood Pressure, Oral Disease, Teeth, Bhutanese,*

### 1. Introduction

Blood pressure (BP) is the pressure exerted by the flow of blood against the artery walls (1). It is a complex trait regulated by an intricate network of physiological pathways involving extracellular fluid volume homeostasis, cardiac contractility and vascular tone through renal, neural or endocrine systems (2). A true BP is the average level of blood pressure over a prolonged duration (1). The use of systolic blood pressure (SBP) and diastolic blood

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pressure (DBP) is a means to classify individuals' blood pressure status(1). According to The seventh report of the joint national committee (JNC) on prevention, detection, evaluation and treatment of high blood pressure (The JNC 7 report), BP is divided into the following categories: normal blood pressure (SBP <120 and DBP <80 mmHg), prehypertension (SBP 120-139 or DBP 80-89 mmHg), high BP (hypertension) stage 1 (SBP 140-159 or DBP 90-99 mmHg), hypertension stage 2 (SBP  $\geq$  160 or DBP  $\geq$  100 mmHg)(3). There are various risk factors that affect the levels of BP in an individual. In most of the cases, the exact etiology of elevated BP is unknown(1). However, according to AHA (American Heart Association) the risk factors that affect the levels of BP include lack of physical activity, unhealthy diet that is high in sodium, overweight and obesity, high alcohol consumption, tobacco smoking, stress, anxiety, sleep apnea, family history of hypertension, kidney diseases, chronic diseases, old age and male gender(1, 4-6).

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## 2. Methods

### 2.1 Study participants

The patient information and data were collected and studied from the patients visiting the dental department of Jigme Dorji Wangchuck National Referral Hospital (JDWRH) from 01.01.2020 to 31.12.2020. All the participants were fully informed before obtaining written consent documents. Ethical clearance for the study was obtained from Research Ethics Board of Health (REBH), Ministry of Health (MOH), Bhutan. The information was collected from the patient's dental chart and structured questionnaire that was made to get additional information on demographic data and various factors. For sample size determination considering a two-tailed statistical test with power of 80% and alpha value of 5%, at least 345 participants were required but, we could collect 400 participants for the study. Inclusion criteria was all adult patients 18 years of age and above who visited the dental department, JDWRH with high BP. Exclusion criteria included the presence of any malignancy, patients on immune-suppressants, anti-inflammatory drugs, on chemotherapy or radiotherapy and pregnancy.

### 2.2 Assessment of blood pressure

Blood pressures were measured at least twice at an interval of five minutes. The recordings were noted and the average SBP and DBP were calculated. The JNC 7 report criteria for diagnosis of hypertension were used by physician for diagnosed cases (known history of hypertension)(7) and for new cases the definition by AHA in November 2017 was used (6).

### 2.3 Assessment of dental diseases

From dental examination chart, total numbers of remaining and missing teeth were counted (excluding all third molars). The number of teeth with dental caries, diseases of pulpal and periapical tissues were recorded from the dental chart. Diagnoses of pulpal and periapical tissue diseases were made according to the classification of the American Association of Endodontics (AAE)(8).

### 2.4 Assessment of periodontal diseases

From dental examinations chart, screening of plaque induced gingivitis or periodontitis were primarily evaluated using periodontal screening and recording code (PSR code).

### 2.5 Assessment of oral mucosal diseases

Diagnosed oral mucosal diseases were recorded from the dental chart as classified in the study of Fedele *et al.* as infectious mucosal diseases, inflammatory mucosal diseases, and non-infectious and non-inflammatory mucosal diseases(9).

## Statistical analysis

Data collected was double entered and validated using EpiData version 3.1 for entry and version 2.2.2.183 for analysis (EpiData Association, Odense, Denmark). The characteristics of the participants were described as frequencies (percentages) for qualitative variables and the quantitative variables will be summarized as means with SD. A two-sided significance and a p value of <0.05 was considered statistically significant for all the analysis.

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## 3. Results

### 3.1 Characteristics of the study participants

A total of 400 participants were included in the study who fulfilled the inclusion criteria. Demographic data including age, sex, educational status and occupation, family history of hypertension, blood pressure levels and BMI were recorded. Personal habits like tobacco smoking and alcohol consumption were also collected. The presence of a family history of hypertension was significantly associated with participants' presence of a history of hypertension.

### **3.2 Oral health of participants according to high blood pressure measurement and history of hypertension.**

A significant association in participants with increased BP measurement or with existing history of hypertension was present with number of tooth loss ( $p < 0.001$ ), and the presence of removable dentures ( $p < 0.001$ ). There were no any associations of blood pressure with non-inflammatory dental diseases, mucosal infections, mucosal inflammation and with non-inflammatory mucosal diseases.

A more detailed prospective study with a larger sample population is suggested to establish the associations between various blood pressure levels and oral diseases and to find the causal relationship.

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## **4. Discussion**

In our study we saw that tooth loss was associated with hypertension or with history of hypertension. However, it cannot be concluded that it is always associated similarly considering our study sample size. Other studies have different results like in one of the study it was seen that tooth loss was directly proportional to increase in BP among post-menopausal women(10). In the study by Shamsuddin *et al.*, hypertensive patients had less number of teeth present in the mouth(11). A higher number of participants without high BP or those without having a history of hypertension had higher PSR score than those having high BP or those having a history of hypertension. When BP is raised there are changes in microcirculation resulting in narrowing of the blood vessels and ischemia in the periodontium which promotes the development of periodontal diseases(12). The systolic and diastolic blood pressures were seen to be higher in patients with periodontitis than those without periodontitis.(13, 14). Insignificant results could be due to the type of periodontal screening method in the recent investigation and the lower sample size. There were very few studies that ever studied oral inflammation and hypertension(9). Fedele *et al.*, was the first to report that oral mucosal diseases were associated with systemic inflammation(9). During inflammation a lot of inflammatory biomarkers are produced like CRP, IL-6 and IL-8. These biomarkers contribute in atherosclerosis and raised inflammation, increasing the risk of hypertension and other cardiovascular diseases (9). There are various limitations in our study, the type of study itself, and low sample size, collection of patient data from the patients' dental chart and duration of the study.

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## **5. Conclusion**

Patients with high BP or history of hypertension had more tooth/teeth loss. Most of them were seen having dentures or preferred to stay without having dentures. Oral health was poor among patients with high BP or those with history of hypertension. It is also understood that people living with hypertension is increasing in Bhutan.

### **Acknowledgement**

President and Medical Superintendent of JDWNRH for allowing us to do the study and staffs of dental department for their continued support without which this study would not have been possible.

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