HYPERTENSION IN PATIENTS PRESENTING WITH EPISTAXIS AT KENYATTA NATIONAL HOSPITAL

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A dissertation Submitted in Partial Fulfillment of the Requirements for the Award of Degree of Masters of Medicine, Otorhinolaryngology, Head and Neck Surgery of the University of Nairobi.

DECLARATION

I hereby certify that this dissertation is my original work and has not been submitted for the award of any degree at any other institution.

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SUPERVISORS' APPROVAL

This dissertation has been submitted in partial fulfillment of the degree of Master of Medicine in Otorhinolaryngology, Head and Neck Surgery with our approval as supervisors.

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SUBMISSION OF DISSERTATION

This dissertation has been submitted to the Department of Surgery, School of Medicine, University of Nairobi

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ABBREVIATIONS

ABPM - Ambulatory blood pressure measurement

A/E - Accident and emergency

BP - Blood pressure

ESH - European Society of Hypertension

ENT - Ear, Nose, and Throat

HTN - Hypertension

KNH - Kenyatta National Hospital

SPSS - Statistical Package for Social Sciences

WHO - World Health Organisation

ABSTRACT

Background: A definite association between epistaxis and hypertension is not well established. Patients presenting with epistaxis, have been observed to have raised blood pressure (BP). The prevalence of hypertension (HTN) among patients with epistaxis is varied and spans from 17% to 67%. .Epistaxis may be the echelon sign of hypertension.

Objective: To determine the prevalence of hypertension among patients presenting with epistaxis at Kenyatta National Hospital (KNH).

Study Design and Site: This was a case-control study conducted at Kenyatta National Hospital.

Study Population: Patients presenting with epistaxis, with an equal number of controls presenting with otological conditions.

Methodology: The study involved 61 cases and an equal number of matched controls. On presentation, cases were stabilized, history taken followed by a general physical examination. Blood pressure measurements were then evaluated and recorded, using an automated blood pressure machine Omron model 907 (an average of three readings taken at least one minute apart). Appropriate treatment was commenced. Blood pressure measurements were repeated, one hour and 48 hours after the initial reading. Controls went through the same process except for the management of epistaxis.

Results: The demographic attributes of the two groups were similar, with a male to female ratio of 2:1. The age range was 18 to 84 and 19 to 83 with a mean of 41.0±16.0 and 41.39±16.0 for cases and controls respectively. Baseline hypertension characteristics among the two groups were similar. There was a history of hypertension in 19.7% of cases and 14.8% controls, with a mean duration of 5-6 months among both groups. Blood pressure on presentation, among the cases, was higher compared to the controls, with a mean systolic blood pressure of 142.9±25.7 versus 132.6±18.7, P=0.01; mean diastolic pressure of 89.7±16.3 versus 82.7±11.7, P=0.007. Sustained hypertension was statistically higher among cases than controls (27.9% versus 13.1%, P=0.03). The odds ratio for having epistaxis and sustained hypertension was 2.12(CI: 0.99-4.55, χ^2=4.075, P=0.04).

Conclusion: Sustained hypertension was 2.12 times more prevalent among patients with epistaxis compared to the controls.

Recommendations: Further clinical trials, Population-based prospective cohort studies should be done, to delineate a causal relationship between hypertension and epistaxis.

1.0 CHAPTER ONE: INTRODUCTION

1.1. Introduction

Epistaxis is a common otorhinolaryngology emergency. The incidence of epistaxis among the general population is about 60%. The age distribution is twofold with peaks in children (2-10 yrs) and older adults (50-80yrs). The prevalence of epistaxis has preponderance to males (58%) than females (42%) [1].

Hypertension is defined as office systolic blood pressure equal to or more than 140mmHg or diastolic blood pressure equal to or more than 90mmHg[2]. The global prevalence of hypertension is estimated to be about 26%; high blood pressure is the top modifiable risk factor for disability-adjusted life-years lost worldwide[3]. It is one of the risk factors for heart disease, stroke, and renal failure. The burden is increasing in Kenya with a prevalence of 24.9%[4].

According to the 2018 European Society of Hypertension (ESH) blood pressure is classified as shown in table 1 below[2]:

Table 1: Classification of blood pressure in adults

Classification	**Systolic blood pressure (mmHg)**		**Diastolic blood pressure (mmHg)**
Optimal	<120	and	<80
Normal	120-129	and/or	80-84
High normal	130-139	and/or	85-89
Grade 1 hypertension	140-159	and/or	90-99
Grade 2 hypertension	160-179	and/or	100-109
Grade 3 hypertension	≥180	and/or	≥110
Isolated systolic hypertension	≥140	And	<90

1.2 Relationship between Hypertension and Epistaxis

The association between epistaxis and hypertension is not well elucidated and is subject to longstanding debate. A causal and/or effect relationship between the two has not been fully established. Studies that have examined the association have shown conflicting results[5, 6]. Patients with epistaxis commonly have elevated blood pressure. It is postulated that it is related to the anxiety experienced during blood loss; Meaning that high BP readings may be the effect of

epistaxis and not the cause. Evaluation of the patients further for hypertension, is seldom done and few remain on follow up, making it difficult to infer a causal or effect association.

Long-standing hypertension is associated with nasal artery enlargement and arteriosclerosis, this leads to vascular fragility, predisposing the patients to epistaxis. Hence epistaxis may be a consequence of long-term hypertension[7].

1.3 Blood Pressure Assessment

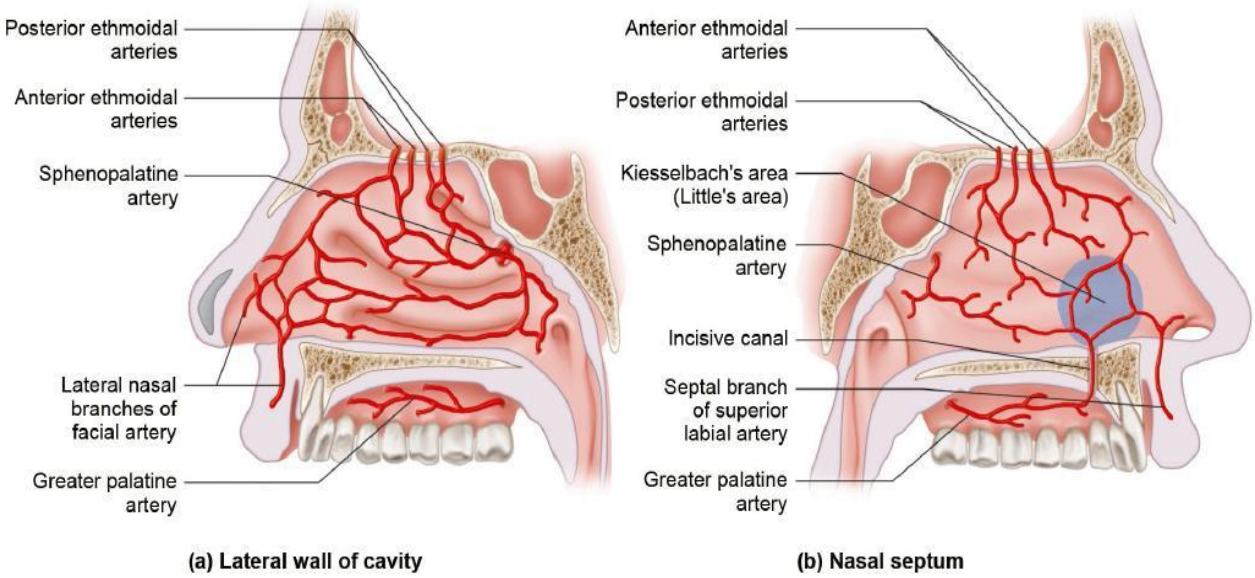
The importance of accurate BP assessment has been recognized, various tools of measuring blood pressure have been employed, and these include mercury sphygmomanometers and automated blood pressure machines, with varying accuracy and reliability. The use of automated BP machines and following a well-defined measurement procedure has minimized errors and improved validity. The devices used should have passed standardized validation tests and the observers are properly trained in techniques of BP measurements[8]. Patients should rest quietly for at least five minutes before BP measurements are taken, an appropriate cuff size for the upper arm circumference should be used to minimize errors and BP is determined from an average of three readings taken at least one minute apart[2].

The use of automated blood pressure machines confers the advantage of being able to obtain, a large number of readings. Serial BP readings have greater validity than a single office measurement. Automated measurement, in addition, eliminates observer error[2].

1.4 Anatomy

The vascular supply of the nose is derived from the terminal branches of the carotid artery. The external carotid artery supplies the nose via the facial and internal maxillary artery and the internal carotid artery via the ophthalmic artery (anterior and posterior ethmoidal arteries) with frequent anastomoses between the two systems (ipsilateral and contralateral). The facial artery via the superior labial artery supplies the anterior nasal septum. The internal maxillary artery via the sphenopalatine branch supplies posterior nasal septum. Anterior ethmoidal artery supplies the anterosuperior part of the nasal septum, posterior ethmoidal artery supplies the posterosuperior part of the nasal septum.

Functionally epistaxis is categorized into anterior and posterior bleeds, maxillary ostium serves as the dividing point between the two. Anterior bleeds originate from the Kiesselbach's plexus on the anterior nasal septum or anterior part of the lateral nasal wall, usually capillary or venous bleeds. Posterior bleeds, posterior part of the nasal cavity, often arterial in origin.



Adapted from:https://plasticsurgerykey.com/nasal-cavity-and-paranasal-sinuses/#c016_f006

Figure 1: Blood supply of the lateral wall of the nasal cavity and nasal septum

1.5 Pathophysiology

The vascular endothelium is important, in the physiological control of the vascular system. The endothelium regulates the tone of the vascular system and blood flow, the coagulation cascade, cellular proliferation in the vascular wall, and also controls immunological and inflammatory mechanisms. Nitric oxide synthesized by endothelial cells, mediates homeostasis in the intimal layer of blood vessels. The hypertension-induced stress in the intimal layer disregulates homeostasis and affects normal endothelial function

Patients with pre-existing hypertension have chronic vascular damage (end-organ damage) and are therefore prone to epistaxis, especially during abnormal blood pressure elevation. Longstanding hypertension increases the risk of epistaxis via vasculopathic effects such as atherosclerosis and endothelial rupture[9].

Blood vessels change their structure in response to increased load; raised pressure in hypertension responds to increased load by increasing wall tension (Laplace's law). This leads to changes in the structural integrity of the blood vessels[10]. Hypertension causes arteriosclerosis which undermines the integrity of nasal vessels similar to that seen in cerebral' circulation. The arteriosclerotic changes of the arteries in the nasal cavity are more pronounced in hypertensives with epistaxis than in patients with epistaxis but no hypertension. Studies in postmortem specimens found that hypertension causes nasal vascular compromise through degeneration of the fibrous layer, leading to increased vascular fragility[11]. In addition, blood vessels in the nasal

mucosa, have a thin intima layer and are therefore vulnerable to any blood pressure changes that exert shear stress predisposing hypertensives to increased susceptibility to epistaxis[5].

Patients with epistaxis may present with raised blood pressure due to rich autonomic innervation of the nasal mucosa and bleeding causes an adrenergic surge that manifests as elevated blood pressure[12].

1.6 Etiology of Epistaxis

The causes of epistaxis can be classified as local, systemic, and idiopathic. The local causes include trauma, mucosal irritation, septal abnormalities, tumours, inflammatory diseases, nasal surgery, and drugs (topical nasal steroids, cocaine abuse). The systemic causes encompass a range of conditions such as coagulopathy disorders, vascular abnormalities, arteriosclerosis, leukaemia, and organ failure (liver, kidney). Some patients (10%) usually have no defined cause after evaluation.

1.7 Clinical Presentation

Anterior nasal bleeds account for 95% of the cases; characteristically they are mild, usually have better visualization, and are easier to access. Posterior nasal bleeds account for 5% of the cases, usually severe bleeding, and have poor access due to difficult visualization. Blood is often swallowed in posterior bleeds making it difficult to assess blood loss with an increased risk of aspiration and airway compromise.

1.8 Management

The management of patients presenting with epistaxis is guided by three principles; evaluating the source of bleeding, hemostatic control, and treatment of the underlying cause. The initial approach to a patient entails an assessment of the airway for its patency, adequacy of breathing, and the hemodynamic status (blood pressure, pulse) with appropriate interventions done as deemed necessary. Anterior rhinoscopy is done to assess the site of the bleeding, if not able to assess the site of bleeding, nasal endoscopy is done. Oral cavity examination is also useful in assessing posterior nasal dripping.

Anterior nasal bleeds are controlled by pressure to the alaenasi for 10-15 minutes, anterior nasal packing, or chemical cautery. Posterior nasal bleeds are controlled by posterior nasal packing, endoscopic cautery, and in some intractable cases, ligation of the sphenopalatine artery may be required.

2.0 CHAPTER TWO: LITERATURE REVIEW

Hypertension as a causative factor in epistaxis is not certain. In 43% of patients, epistaxis may be the echelon symptom of underlying hypertension[13]. Hypertensive emergencies occur in 1% of hypertensive patients, defined as a finding of systolic blood pressure greater than 180mmhg or diastolic greater than 120mmhg. It is important in co-existing end-organ dysfunction such as arteriole disease which, in the nasal mucosa, manifests as epistaxis. Hypertension prevalence among patients with a diagnosis of epistaxis is varied and ranges from 17% to 67%[14]. Epistaxis in patients with hypertension has been observed in some studies to be more severe, requiring admission, with an increased likelihood of more episodes in a calendar year, other authors found the converse to be true [15,16]. There is no consensus on if epistaxis in hypertensive patients is associated with hypertension severity, with different authors inferring divergent conclusions[11, 17].

At Kenyatta National Hospital, a dissertation done by Sonigra in 1991 found that 4.5% of patients presenting with epistaxis at the ENT department had hypertension or cardiac failure[18]. In other parts of the African Continent, different studies have evaluated the hypertension prevalence in patients diagnosed to have epistaxis. In Tanzania Gilyoma et al in a prospective study on the etiological profile and treatment outcomes of epistaxis found 17% had hypertension[19]. Iseh et al in a retrospective study on the pattern of epistaxis in Sokoto Nigeria showed 18% had hypertension[20]. A variety of publications have assessed the association between epistaxis and hypertension, dissimilar results have been obtained due to differences in methodology, study population, and geographical location[5,6,21].

Herkner et al compared the arterial blood pressure of patients presenting with epistaxis with sex and age-matched controls. They found that 14% of the epistaxis group had raised blood pressure at presentation in the A/E department. Further evaluation of the cases with raised blood pressure; found that 79% had arterial hypertension. The authors used a heterogeneous group as controls and only 30% of the study subjects presenting with raised blood pressure were further evaluated for sustained hypertension[21]. In Nigeria Isezuo et al analysed data from two tertiary health institutions, patients diagnosed to have epistaxis in the emergency departments and controls matched for sex and age were recruited. Patients with epistaxis had significantly raised blood pressure as contrasted to the control group (146.1±40.7mmHg versus 123.2±16.3mmHg systolic) and (91.3±24.8mmHg versus 78.2±12.8mmHg diastolic). They also had larger proportions of cases with a previous history of hypertension 32.3% versus 7.9%. They found a prevalence of 45.2% in the epistaxis group and 13.2% in the control group. Multivariate analysis

done observed there was an association between epistaxis and hypertension. The study design was retrospective, thus; it may have been limited by recall bias[5].

In Saudi Arabia Sarhan et al examined the relationship between epistaxis and hypertension. The study involved 40 patients presenting with epistaxis and an equal number of controls matched for age and sex. They found that 35% of the patients had increased blood pressure at presentation compared to 40% among the controls. The prevalence of hypertension was 45% in the epistaxis group and 42.5% in the control group. There was no significant statistical difference between the two groups[6]. Fuchs et al in a cross-sectional population-based study involving 1174 participants in Porto Allegre demonstrated significantly higher systolic blood pressures among patients with epistaxis on presentation, on further analysis they found no association between hypertension and epistaxis in adulthood and the 6 months preceding the diagnosis of hypertension[17].

A study done in Turkey by Acar et al excluded patients known to have hypertension or cardiovascular disease. They enrolled 120 patients, 60 cases with epistaxis, and 60 controls. The authors demonstrated a higher prevalence of hypertension (33.3%) in the cases than in the control group (11.7%) [22]. Neto et al determined that there was a relationship between epistaxis and longstanding hypertension as evidenced by ventricular enlargement, and nasal artery enlargement in patients with established hypertension who presented with epistaxis. In this study, the authors sought to determine if epistaxis was a sign of target-organ damage in patients with hypertension[7]. In Japan Terakura et al in a retrospective study sought to examine the correlation between blood pressure and recurrent epistaxis in their study population. Their research found higher blood pressure in patients with recurrent epistaxis compared to controls; epistaxis was also more frequent in hypertensive patients. Multivariate logistic analysis was done and found a statistically significant association between systolic blood pressure and persistent epistaxis[23].

In Greece Kikidis et al reviewed nine studies, 6 of the 9 studies demonstrated higher arterial pressures on presentation with epistaxis compared to controls, 7 of the 9 found a correlation between blood pressure and epistaxis. They concluded that raised blood pressure during epistaxis could not establish a causal association because of confounders. They, however, noted it may aid in the diagnosis of underlying arterial hypertension[9]. Hyun et al in a meta-analysis of 10 studies found that the incidence of epistaxis was significantly increased in hypertensives; thus they opined there was an association between hypertension and epistaxis[24].

2.1 Study Justification

The burden of hypertension is increasing exponentially, according to the World Health Organization (WHO) the global prevalence of raised blood pressure is around 40% and in Africa 45%. In Kenya, the prevalence of hypertension is around 24.9%[4]. The association between epistaxis and hypertension is not well established and epistaxis may be a sentinel symptom of hypertension. Hence assessment of an association is of clinical significance.

In Kenya no other study of a similar nature has been done, previous studies on epistaxis focused on the prevalence, etiology, and management. Currently, the assessment of hypertension in patients presenting with epistaxis is not routinely done, this presents a challenge as some patients with hypertension may be undiagnosed.

2.2 Research Question

What is the prevalence of hypertension among patients presenting with epistaxis at Kenyatta National Hospital?

2.3 Objectives

2.3.1 Broad Objective

To determine the prevalence of hypertension among patients presenting with epistaxis at Kenyatta National Hospital.

2.3.2 Specific Objective

a) To determine whether patients with epistaxis in the emergency department have higher arterial blood pressure as compared to patients presenting with otological conditions.

b) To determine the association between elevated blood pressure during epistaxis and sustained arterial hypertension.

3.0 CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Study Design

This was a hospital-based case-control study.

3.2 Study Area

The study was conducted at Kenyatta National Hospital, Accident and Emergency department, and ENT department.

3.3 Study Population

The target population was patients presenting with epistaxis, with an equal number of controls (matched for age and sex) who presented to the otology clinic.

3.4 Inclusion Criteria for Cases

Patients aged 18 years and above who presented with epistaxis and consented to be involved in the study.

3.5 Inclusion Criteria for Control

Patients aged 18 years and above who presented to the otology clinic and who consented to be involved in the study.

3.6 Exclusion criteria for cases

The exclusion criteria for cases included the following:

a) History of nasal trauma.
b) Patients who had epistaxis after nasal surgery.
c) Patients who had coagulation disorder, on aspirin, clopidogrel.
d) Patients with sinonasal tumors, septal abnormalities.
e) Patients who had foreign bodies in the nose and presented with epistaxis.
f) Patients who declined to give consent.

3.7 Exclusion Criteria for Controls

Patients who had history or treatment for epistaxis and patients who declined to give consent.

3.8 Sample Size Calculation

A Study done by Gilyoma et al found a prevalence of hypertension in patients presenting with epistaxis of 17%[25]. The sample size was calculated using the Fleiss method for matched case controls[23].

$$n = (\frac{r+1}{r}) \frac{(\bar{p})(1-\bar{p})(Z_{\beta} + Z_{\alpha/2})^2}{(p_1 - p_2)^2}$$

n= Sample size

r=1 (equal number of cases and controls)

p_1= the proportion of hypertension in the control group, p_1=22%

p_2 =the proportion of hypertension in the epistaxis group, p_2=17%

$Z_{®}$= one-sided percentage point of the normal distribution corresponding to the power of 80%, therefore $Z_{®}$=.84

$Z_{\langle}$= two-sided percentage point of the normal distribution corresponding to a 95% level of significance (0.05), therefore $Z_{\langle}$=1.96

$$\underline{p} = \frac{p_1+p_2}{2} = \frac{0.22+0.17}{2} = 0.195$$

$$n = (\frac{1+1}{1}) \frac{(0.195)(1-0.195)(\frac{0.84+1.96^2}{2})}{(0.22-0.17)^2}$$

$$n = 122$$

The total sample size was 122 where the sample size of cases and controls were **61** in each arm.

3.9 Sampling Technique

The sample selection was done by consecutive sampling.

3.10 Study Tools

The following tools were utilized in the study:

a) Biographical Data collection sheet(Appendix III).

b) Automated blood pressure machine Omron model 907

3.11 Study Procedure

The study population was drawn from, patients above 18 years who presented with epistaxis at Kenyatta National Hospital's A/E and ENT department. On presentation, at the A/E department

detailed medical history was taken and general physical examination was done. Blood pressure was then be taken using an automated blood pressure machine Omron model 907 and recorded (an average of three readings taken at least one minute apart), with the patient in a seated position, the arm in a horizontal position at the level of the heart and the back supported. Anterior rhinoscopy was then done and depending on the findings, appropriate interventions performed. Patients were then investigated and managed as per the KNH protocol for epistaxis. Patients who met the inclusion criteria and had consented were enrolled in the study. Blood pressure assessment was repeated one hour after the initial readings and after 48 hours (an average of three readings taken at least one minute apart).

The control group (matched for sex and age) was recruited from Kenyatta National Hospital's Otology Clinic. The control group consisted of patients scheduled to undergo otological procedures who were 18 years of age and above, without any history of or treatment for epistaxis. Detailed medical history was taken and physical examination done. Blood pressure was taken using an automated blood pressure machine, on presentation into the unit, with the patient in a seated position, the arm in a horizontal position at the level of the heart, and the back supported. Blood pressure assessment was repeated one hour after the initial readings and after 48 hours (an average of three readings taken at least one minute apart).

3.12 Quality Control

The principal investigator recruited patients into the study and filled all the data collection sheets. Blood pressure machines used were automated and well-calibrated to ensure the validity and reliability of results obtained.

3.13 Data Management

The data was collected by the principal researcher using a data collection sheet, initial blood pressure measurements, and blood pressure measurements were taken, one hour, and 48hours after the interventions. Data collected during the study were entered in a computer database designed using statistical package for social sciences (SPSS version 21). Data quality control was conducted during and after entry, this included coding data and consistency checks.

3.14 Data Analysis

Data analysis was conducted using IBM SPSS statistics version 21. The characteristics of the cases and controls were summarized using descriptive statistics. Means (SD) and median (ranges) were calculated for continuous variables e.g. age. The categorical variables were analyzed by calculating percentages of cases and controls with each level of the categorical

variables among patients with and without epistaxis. The association between case-control status (i.e. hypertension status) and patient characteristics were determined by conducting chi-square tests. Statistical significance was based on a p-value < 0.05. The percentage of patients with hypertension among cases and controls were calculated. Logistic regression was used to calculate odds ratios and 95% confidence interval for the association between hypertension and epistaxis.

3.15 Ethical Considerations

The study was carried out after approval from the KNH/UON ethics and research committee (Appendix IV). Informed consent was sought from the participants before enrollment into the study. Patients who declined to participate were not discriminated against and received treatment as those who were participating in the study. There was no extra cost incurred by the participants. Utmost confidentiality was maintained during the study. There were no conflicts of interest financial or otherwise in the study. The data was only accessible to the principal researcher. Patients found to have hypertension were referred accordingly for appropriate treatment.

3.16 Study Limitations

This study utilized office blood pressure measurements, the ideal parameters to use in terms of sensitivity and specificity are ambulatory blood pressure measurements, which was not feasible due to the nature of our study population. There was a possibility of recall bias among the cases on the frequency of epistaxis in the preceding six months. The period of follow up, in the study was 48 hrs, a longer duration would have been ideal because it mitigates possible bias resulting from white coat hypertension.

3.17 Study Dissemination

The results of this study will be disseminated to the head of the ENT department at KNH. Copies will be availed to the UON Department of surgery and the university online repository. A manuscript will be prepared and submitted for publication.

4.0 CHAPTER FOUR: RESULTS

4.1 Demographic Patterns

The study enrolled a total of 122 participants, which comprised of 61 cases and 61 controls. The age distribution is as represented in figure 1 below.

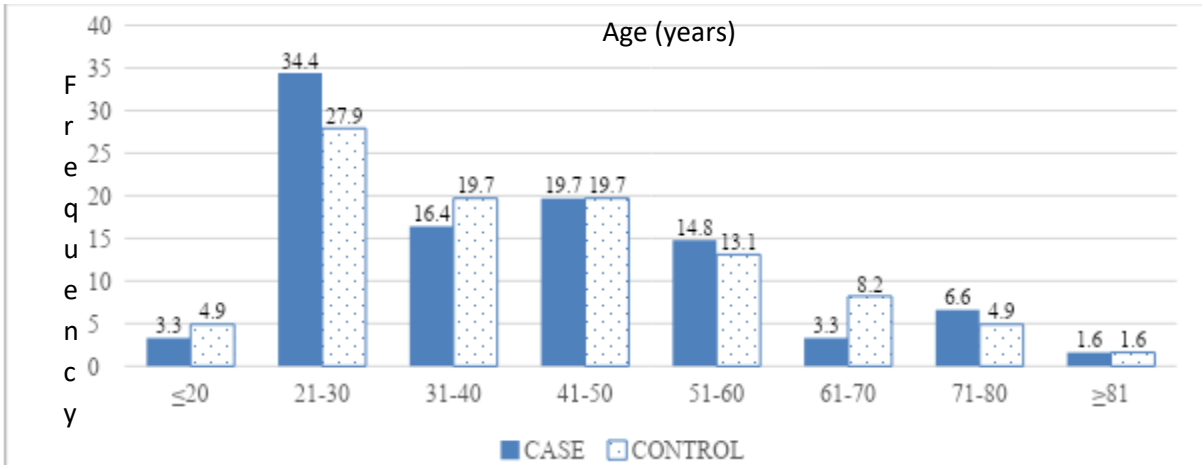


Figure 2:Age distribution graph of the study and control groups

The study consisted of 41(67.2%) males and 20 females (33.8%) in corresponding ratios among the cases and the controls, with male to female ratio of 2:1. The mean age was 41.0±16.0 for cases and 41.39±16.0 for controls, (P-0.90).

4.2 Patient characteristics with regard to epistaxis and hypertension

The history and duration of hypertension were compared between the cases and controls and no significant difference between the two groups was noted.

Table 2:Baseline characteristics among the cases and controls

Characteristic		Cases n(%)	Control n(%)	p-value
History of HTN	Yes	12(19.7)	9(14.8)	0.63
	No	49(80.3)	52(85.2)	
Mean Duration of HTN (months)		5.1±4.1	6.6±4.5	0.43
History of epistaxis	Yes	34(55.7)	0	
	No	27(45.3)	0	
Mean number of episodes (epistaxis)		2.7±4.2 times		

The proportion of patients with previous history of epistaxis was higher at presentation than those to the contrary. The number of episodes ranged from 0 to 16 times.

4.3 Blood Pressure on Presentation

Blood pressure on presentation was compared between the two groups.

Table 3: Blood pressure on presentation, stratified according to ESH guidelines

Blood pressure	Case n=61(100%)	Control n=61(100%)	P-value
Optimal	10(16.4)	11(18.0)	1.00
Normal	6(9.8)	11(18.0)	0.30
High Normal	8(13.1)	15(24.6)	0.16
Grade I HTN	12(19.7)	6(9.8)	0.20
Grade II HTN	13(21.3)	6(9.8)	0.13
Grade III HTN	8(13.1)	4(6.6)	0.36
Isolated systolic HTN	4(6.6)	8(13.1)	0.36
Mean systolic BP	142.9±25.7	132.6±18.7	0.01
Mean diastolic BP	89.7±16.3	82.7±11.7	0.007

On evaluation at presentation, cases had significantly higher blood pressure values as compared to the controls, P=0.01(systolic), P=0.007(diastolic).

4.4 Blood Pressure after Interventions

Blood pressure was evaluated, one hour after the interventions and compared between the two groups.

Table 4:Blood pressure one hour after interventions, stratified according to ESH guidelines

Blood pressure	Case n=61(100%)	Control n=61(100%)	P-value
Optimal	14(23.0)	16(26.2)	0.83
Normal	12(19.7)	17(27.9)	0.40
High Normal	9(14.8)	13(21.3)	0.48
Grade I HTN	7(11.5)	8(13.1)	1.00
Grade II HTN	9(14.8)	1(1.8)	**0.02**
Grade III HTN	4(6.6)	3(4.9)	1.00
Isolated systolic HTN	6(9.8)	3(4.9)	0.49
Mean systolic BP	133.5±20.5	128.0±20.4	0.14
Mean diastolic BP	82.6±13.9	78.7±14.0	0.1

On the assessment of blood pressure, one hour after interventions cases had higher mean blood pressure values as compared to the controls and there was a significant difference in blood pressure values in patients stratified as having Grade II hypertension, P=0.02.

4.5 Evaluation of Blood Pressure after 48 Hours

Blood pressure was evaluated 48 hours after presentation and compared between the two groups.

Table 5:Blood pressure 48 hours after presentation, stratified according to ESH guidelines.

Blood pressure	Case n=61(100%)	Control n=61(100%)	P-value
Optimal	24(39.3)	30(49.2)	0.36
Normal	11(18.0)	16(26.2)	0.38
High Normal	8(13.1)	7(11.5)	1.00
Grade I HTN	7(13.1)	3(4.9)	0.21
Grade II HTN	5(8.2)	3(4.9)	0.72
Grade III HTN	2(3.3)	0(0)	0.50
Isolated systolic HTN	3(4.9)	2(3.3)	1.00
Mean systolic BP	121.6±17.3	121.6±15.8	0.50
Mean diastolic BP	78.8±12.5	76.1±9.1	0.18

On determination of blood pressure 48 hours after presentation, there was no significant difference in mean blood pressure values between the cases and the controls.

4.6 Evaluation of sustained hypertension

Sustained hypertension was determined among the cases and the controls, defined as hypertension 48 hours after presentation.

Table 6:Prevalence of hypertension and sustained hypertension

PREVALENCE OF HTN		CASES n=61(100%)	CONTROLS n=61(100%)	χ^2	P-VALUE	OR
0hours	Yes	37(60.7)	24(39.3)	**5.55**	**0.02**	**1.54**
	No	24(39.3)	37(60.7)			
1hour	Yes	26(42.6)	15(24.6)	**4.45**	**0.03**	**1.55**
	No	35(57.4)	46(75.4)			
48hrs (Sustained HTN)	Yes	17(29.5)	8(13.1)	**4.48**	**0.03**	**2.12**
	No	44(70.5)	53(86.5)			

The prevalence of HTN at 0,1and 48hours was higher among cases than controls. The odds ratio for having epistaxis and sustained hypertension was 2.12(CI: 0.99-4.55, χ^2=4.075, P=0.03).

4.7 Recurrent Epistaxis and Sustained Hypertension

The relationship between recurrent epistaxis and sustained hypertension was assessed.

Table 7: Number of episodes of epistaxis among patients with sustained hypertension

EPISTAXIS	SUSTAINED HTN		P-VALUE
	YES	NO	
NUMBER OF EPISODES	6.9±4.6	3.14±4.6	0.12

Patients with sustained hypertension had a mean of 6.9±4.6 episodes of epistaxis in the past 6months while respondents without sustained hypertension had 3.14±4.6 episodes in the past 6months, but this relationship was not significant, P=0.12.

The 17 cases with sustained HTN were further evaluated, 7(41.1%) had recurrent epistaxis, defined as having more than 1 episode of epistaxis in the past 6 months.

4.8 Epistaxis as the Echelon Symptom of Hypertension

Among the 17 cases with sustained hypertension, 7/17(41.2%) had no previous history of epistaxis and hypertension.

5.0 CHAPTER FIVE: DISCUSSION, CONCLUSION & RECOMMENDATIONS

5.1 Discussion

The association between epistaxis and hypertension is not well established and is subject to considerable debate and divergent opinions, with studies inferring different results and conclusions. The inconsistency is due to different methodologies, study population, limited control of baseline confounders, diurnal variation in blood pressure, and varied methods of blood pressure measurement. This study sought to mitigate the above by use of case-control study design, appropriate controls well matched for age and sex, follow up of patients beyond presentation (48hours), and exclusion of confounders.

The demographic patterns in this study found epistaxis to have a preponderance of males, with a male to female ratio of 2:1. This is similar to other populations within Africa and beyond [26, 27]. In this study the mean age (41.0±16.0) was also found to be similar to studies done within the region, this differed with a survey in Korea where authors observed a significantly older mean age (57.2±16.0)[19, 26, 27]. These findings are in tandem with demographics in the study populations referenced above. The mean age is of significance in the study as an older populace is likely to have higher mean blood pressure.

Blood pressure on presentation among the cases was significantly higher compared to the controls with a mean systolic blood pressure of 142.9±25.7 versus 132.6±18.7, P=0.01; mean diastolic pressure of 89.7±16.3 versus 82.7±11.7, P=0.007. Corresponds to findings by other authors in their studies[5, 17, 21, 27]. This observation is postulated to be due to the adrenergic effect, induced by anxiety during epistaxis, thus difficult to infer a causative relationship. These findings differ with Sarhanet al[6] and Theodosis et al[16] who found no difference in blood pressure on presentation between the two groups; however, their studies were limited in terms of small study sample size. In addition on further evaluation, one hour after interventions, cases had higher mean blood pressure values compared to the controls, but this relationship was not statistically significant (P=0.14). The proportion of cases with high blood pressure reduced, this may have been due to allayed anxiety after control of epistaxis.

The hypertension characteristics at presentation (history and duration of hypertension) among the cases and controls were assessed and no significant difference between the two groups was noted. This was important as there was no bias, as far as pre-existing hypertension is concerned, in either group. The prevalence of hypertension at presentation in this survey was higher for cases than controls (60.7% versus 39.3%, χ^2=5.55, P-0.02), and the relationship was significant.

This mirrors findings from Herkner[21], demonstrated a prevalence of (75% versus 54%, P<0.001), and Kim[27], determined a prevalence of (16.2% versus 4.9%, P<0.001). The higher prevalence of hypertension in our study, maybe due to a relatively smaller sample size. The prevalence of hypertension after interventions in our survey was higher for cases than controls (42.6% versus 24.6%, P-0.03), and was statistically significant.

Sustained hypertension (defined as hypertension 48 hours after presentation) was evaluated among the cases and the controls and observed to be more prevalent among cases than controls (27.9% versus 13.1%, P-0.03). The prevalence rate of 27.9% is congruent to Kenyan population-based data of hypertension prevalence of around 24.9%[4]. The findings are in tandem with a study done in Nigeria[5], where the authors also demonstrated a significant difference between the two groups, with the prevalence of (45.2% versus 13.2%, P-0.001). In Austria[21] the researchers observed a prevalence of 24 %(sustained hypertension), however, there was no comparison with controls in the second part of their study, which entailed follow up beyond the initial presentation. The above contrasted to findings in Saudi Arabia[6] where authors found no significant difference in sustained hypertension, between cases and controls (45% versus 42.5%, P=0.782). Their observations mirrored findings by authors in Greece[16] who also demonstrated no significant difference between the two groups (42.9% versus 28.9, P-0.07). The findings in our survey may be due to, population demographics, use of office blood pressure measurements, and shorter periods of follow up.

This study found an association between hypertension and epistaxis with an odds ratio for having epistaxis and sustained hypertension being 2.12(CI: 0.99-4.55, χ^2=4.075, P=0.03). This indicated that hypertension was 2.12 times more prevalent among the patients with epistaxis compared with the controls. This is Congruent to other authors[5, 21, 23], who found a statistically significant association between epistaxis and hypertension. The above determination is in contrast to findings by other studies[6, 11, 16, 17], which showed no association between epistaxis and hypertension. The dichotomy in findings between various studies may be due to differences in methodology as relates to heterogeneous controls, study population, and periods of follow up.

In our study patients with sustained hypertension had more episodes of epistaxis, compared to cases without hypertension, this relationship, however, was not significant, P=0.12. This mirrors findings by Terakura[23], who observed significantly raised blood pressure in patients with recurrent epistaxis. This is postulated to be due to atherosclerotic changes (induced by hypertension) within the caliber of the blood vessels, leading to loss of structural integrity and vascular fragility. On the contrary, Knopfholz[11] determined that there was no association between recurrent epistaxis and sustained hypertension.

Epistaxis has been shown by some studies [13, 21], to be an underlying sign of hypertension. In our study, we observed that 41.2 % of the patients with sustained hypertension had no history of prior epistaxis and hypertension. Epistaxis thus maybe the echelon symptom of underlying hypertension.

5.2 Conclusion

Patients with epistaxis on presentation, have higher arterial blood pressure compared with controls. The prevalence of hypertension among patients presenting with epistaxis was 60.7%. Sustained hypertension was 2.12 times more prevalent among patients with epistaxis compared with the controls. Our findings support an association between epistaxis and hypertension in the study population.

5.3 Recommendations

Management of patients with epistaxis and high blood pressure on presentation should include confirmation or exclusion of sustained arterial hypertension, through follow up and assessment of blood pressure beyond the presenting episode. Further clinical trials, Population-based prospective cohort studies should be done, to delineate a causal relationship between hypertension and epistaxis.

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TIMELINE

PERIOD	ACTIVITY
August 2017-June 2018	Study proposal writing and presentation
September 2018-February 2019	Ethics
March 2019-Jan 2020	Data collection
February 2020-May2020	Data analysis and writing of the paper
June 2020	Presentation of results

BUDGET

ITEM	COST (KSH)
Stationary	5,000
Blood pressure machines (2)	30,000
Statistician	30,000
Miscellaneous	8,000
Total	73,000

APPENDICES

Appendix I: Consent form (English version)

Part 1: General Patient Information Form

1. Introduction

I am a senior house officer in the ENT-Head &Neck Surgery department. I am requesting your consent to participate in a study on hypertension in patients presenting with epistaxis at Kenyatta National Hospital.

2. How you will participate

- **a)** I will ask you questions regarding your past medical history and the current complaints.
- **b)** I will carry out a complete Ear, Nose, Throat, Head, and Neck examination.
- **c)** There will be no monetary benefits for participating in the study and it will be purely voluntary.
- **d)** You will incur no extra financial costs and confidentiality will be maintained at all times.
- **e)** You will reserve the right to withdraw from the study at any time without any penalty.
- **f)** You will be informed about the investigations and the importance of the results.

3. How will participation affect you?

The study does not affect you negatively in any way because:

- **a)** All the information you give will be confidential.
- **b)** The conclusions drawn from the study shall be useful to improve the current management of hypertension and epistaxis

4. Are there any hidden dangers in your participation or non-participation?

- **a)** None whatsoever.
- **b)** Objecting to any part or whole of this study will not affect the quality of care you will receive.

5. What do we do with the information we get.

The information we get will help us in the long run in managing the condition better.

Like all scientific information, we will seek to share our findings with other people undertaking similar studies.

Therefore we may publish our findings in scientific journals or present them in scientific meetings.

6. Are you satisfied with the information given?

If you are satisfied with our explanation and you are willing to participate, then please sign the consent form below.

Part 2: Consent form (English)

Patient number: ……

Consent by patient:

I…….of……do hereby give consent to be included in this study on hypertension in patients presenting with epistaxis at Kenyatta National Hospital.

The nature of the study has been explained to me by Dr. ……..

Date……. ……Signed……

I Dr……..confirm that I have explained to the patient the nature of the study.

Date…….. Signed……

Contacts:

Principal researcher:

Dr. John KabeuMwai.

Resident in ENT, Head and Neck Surgery,

University of Nairobi.

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Supervisors:

Dr. Joyce Aswani

Lecturer ENT-Head & Neck surgery,

University of Nairobi.

Dr. Peter Masinde

Consultant ENT Head & Neck Surgery,

Kenyatta National Hospital.

Dr.MartinMurage

Consultant Physician and cardiologist,

Kenyatta National Hospital.

If you have any questions on your rights as a participant contact the *Kenyatta National Hospital/UON- Ethics and Research Committee (KNH/UON-ERC)* by calling *2726300 Ext.44355*.

Appendix II: Fomu ya Idhini (Swahili)

Sehemuya kwanza: Fomu ya Maelezo Kuhusu utafiti na idhini

Kushiriki katika utafiti huu ni kwa hiari yako Lengo letu la kufanya utafiti huu ni kuwezesha kutathimini jinsi shinikizo la damu lina ambatana na kuvujaa damu kwa mapua katika Hospitali Kuu ya Kenyatta.

Jinsi utakavyoshiriki.

1. Nitakuuliza maswali kuhusu afya yako
2. Nitapima shinikizo la damu hapo mwanzoni.
3. Nitapima shinikizo la damu kwa masaa arubaini na nane.
4. Hakuna zawadi ambayo utakayo pewa na ni ya kujitolea.
5. Hakuna malipo ambayo utahitajika kulipa na kila kitu utakacho niambia itakuwa ya siri.
6. Uko na haki ya kutoka wakati wowote, ukihitaji kujadiliana na jamaa au familia una uhuru wa kufanya hivyo na niko tayari kujibu maswali yoyote.

Hakuna hatari yoyote ya kushiriki au kutoshiriki kwasababu kila kitu itakuwa siri na habari itakayo tokea na utafiti huu pengine haita kufaidi kibinafsi lakini itatupa maarifa ambayo yataboresha utabibu wa ugonjwa huu siku zijazo.

Kuna uwezekano wa kuchapishwa kwa matokeo ya utafiti huu katika majarida ya kisayansi au kuwekwa katika mikutano ya kisayansi.

Kama umeridhika na maelezo, na uko tayari kushiriki, tafadhali weka sahihi yako kwenye fomu ya idhini.

Sehemu ya Pili: Kibali cha Utafiti

Nambari ya utafiti…….

Mimi Bi / Bwana……..nime kubali kushiriki katika utafiti huu baada ya kuelezwa na Daktari……..

Sahihi yangu ni thibitisho ya kwamba nime elewa umuhimu wa utafiti huu na kwamba habari yoyote nitakayotoa itawekwa siri.

Pia nathibitisha ya kwamba sijapewa au kuahidiwa pesa au chochote kile ili nishiriki kwenye utafiti huu.

Sahihi…….Tarehe……

……..

Ikiwa una swali ama ungetaka kupata maelezo zaidi kuhusu utafiti huu, wasiliana nami

Daktari John Kabeu Mwai, mwanafunzi wa upasuaji wa masikio,mapua na koo,

Chuo kikuu cha Nairobi,anwani 75992-00200, Nairobi

Simu 0721656542

Baruapepe: ryanmwai2@gmail.com

Wasimamizi:

Daktari Joyce Aswani

Daktari wa upasuaji wa masikio,mapua na koo

Idara ya upasuaji,kitengo cha upasuaji.

Chuo kikuu cha Nairobi, anwani 2134-00100,Nairobi,

Daktari Peter Masinde

Daktari wa upasuaji wa masikio,mapua na koo

Hosipitali kuu ya Kenyatta

anwani 29838-00202,Nairobi.

Daktari Martin Murage

DaktariwaJinsiayabinadamunaroho

Hosipitalikuuya Kenyatta

anwani 29838-00202, Nairobi.

Mwenyekiti

KNH/UON Ethical and Research Committee

Hosipitali kuu ya Kenyatta,

Simu 2726300-9 Ext.44355

Appendix III: Data Collection Form

(a): Data Collection Form for Cases

Study number..... Date.....

Biodata

IP NO..... Age..... Gender.....

Occupation.....

History of previous Epistaxis (tick) Yes ( ) No ( )

If yes how many episodes in the previous 6months……..

Previous history of hypertension (tick) Yes ( ) No ( )

Blood pressure on presentation Systolic……Diastolic…….

Blood pressure one hour after the interventions, Systolic…… Diastolic…….

Blood pressure 48 hours after the interventions, Systolic…… Diastolic……

Severity, requires blood transfusion (tick) Yes ( ) No ( )

(b): Data Collection Form for Controls

Study number.....Date.....

Bio-data

IP NO..... Age.....Gender.....

Occupation.....

Previous history of hypertension (tick) Yes ( ) No ( )

Blood pressure on presentation Systolic…….. Diastolic…….

Blood pressure one hour after the interventions, Systolic…… Diastolic……

Blood pressure 48 hours after the interventions, Systolic…… Diastolic…….

Appendix IV: KNH/ UoN ERC Letter of Approval

UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
Tel:(254-020) 2726300 Ext 44355

KNH-UON ERC
Email: uonknh_erc@uonbi.ac.ke
Website: http://www.erc.uonbi.ac.ke
Facebook: https://www.facebook.com/uonknh.erc
Twitter: @UONKNH_ERC https://twitter.com/UONKNH_ERC

KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726300-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

KENYATTA NATIONAL HOSPITAL * APPROVED 07 FEB 2019 KNH/UoN-ERC P. O. BOX 20723 - 00202 NAIROBI *

Ref: KNH-ERC/A/39

7th February, 2019

Dr. John Kabeu Mwai
Reg.No.H58/67463/2013
Dept. of Surgery
School of Medicine
College of Health Sciences
University of Nairobi

Dear Dr. Mwai

RESEARCH PROPOSAL – HYPERTENSION IN PATIENTS PRESENTING WITH EPISTAXIS AT KENYATTA NATIONAL HOSPITAL (P693/09/2018)

This is to inform you that the KNH- UoN Ethics & Research Committee (KNH- UoN ERC) has reviewed and approved your above research proposal. The approval period is 7th February 2019 – 6th February 2020.

This approval is subject to compliance with the following requirements:

a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
b) All changes (amendments, deviations, violations etc.) are submitted for review and approval by KNH-UoN ERC before implementation.
c) Death and life threatening problems and serious adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH-UoN ERC within 72 hours of notification.
d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH- UoN ERC within 72 hours.
e) Clearance for export of biological specimens must be obtained from KNH- UoN ERC for each batch of shipment.
f) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (*Attach a comprehensive progress report to support the renewal*).
g) Submission of an *executive summary* report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/ or plagiarism.

Protect to discover

For more details consult the KNH- UoN ERC website **http://www.erc.uonbi.ac.ke**

Yours sincerely,

PROF. M. L. CHINDIA
SECRETARY, KNH-UoN ERC

c.c. The Principal, College of Health Sciences, UoN
The Director, CS, KNH
The Chairperson, KNH- UoN ERC
The Assistant Director, Health Information, KNH
The Dean, School of Medicine, UoN
The Chair, Dept. of Surgery, UoN
Supervisors: Dr. Joyce Aswani, Dr. Peter Masinde, Dr. Martin Murage

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Appendix V: Antiplagiarism Certificate

HYPERTENSION IN PATIENTS PRESENTING WITH EPISTAXIS AT KENYATTA NATIONAL HOSPITAL

ORIGINALITY REPORT

14%	7%	8%	9%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	www.ncbi.nlm.nih.gov Internet Source	1%
2	Submitted to National postgraduate Medical College of Nigeria Student Paper	1%
3	Harald Herkner, Anton N. Laggner, Marcus Müllner, Michael Formanek et al. "Hypertension in patients presenting with epistaxis", Annals of Emergency Medicine, 2000 Publication	1%
4	Submitted to Mount Kenya University Student Paper	1%
5	es.scribd.com Internet Source	1%
6	Submitted to University of Nairobi Student Paper	1%
7	D. Kikidis, K. Tsioufis, V. Papanikolaou, K. Zerva, A. Hantzakos. "Is epistaxis associated	1%