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ASSOCIATION OF EPISTAXIS WITH HYPERTENSION IN A TERTIARY CARE HOSPITAL

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Abstract

Objective

To find out the association between hypertension and spontaneous epistaxis in adult patients presenting to an emergency department of a military hospital in Pakistan.

Study Design

A hospital based Case–control study

Place and Duration of Study

Emergency Department of Pak Emirates Military Hospital, Rawalpindi, from February 2022 to February 2023.

Methodology

A total of 332 participants were enrolled, comprising 166 consecutive cases aged ≥35 years presenting with spontaneous epistaxis and 166 controls without epistaxis. Data collected included demographics, comorbidities, medication use, smoking status, and laboratory indices. Blood pressure was measured using standardized protocols. The severity of epistaxis was defined by management strategy, and statistical analysis included chi-square and t-tests for initial comparisons, followed by logistic regression to control for confounding.

Results

The mean age was 54.7 ± 12.4 years, with no significant difference in gender distribution between cases and controls. Cases were slightly older than controls (56.4 ± 11.3 vs. 53.1 ± 13.2 years, p = 0.015). Hypertension was significantly more frequent among cases 121 (61.7%) than controls 75 (38.3%) (p < 0.001). After adjustment, hypertension remained strongly associated with epistaxis (aOR 3.83, 95% CI 2.30–6.30). Antiplatelet use (aOR 2.07, 95% CI 1.20–3.50) and older age (aOR 1.03, 95% CI 1.01–1.10) were also independent predictors, while anticoagulant use and platelet count showed borderline associations.

Conclusion

Hypertension is independently associated with spontaneous epistaxis and contributes to more severe presentations.

INTRODUCTION

Epistaxis is one of the most common otorhinolaryngological emergencies encountered worldwide, with up to 60% of the general population experiencing at least one episode during their lifetime, and around 6% requiring medical attention.[1,2] While most episodes are benign and self-limiting, severe cases often necessitate hospital admission, nasal packing, or

surgical intervention, thereby placing a considerable burden on emergency and ENT services.[2] Hypertension has long been implicated as a potential risk factor for epistaxis, yet the relationship remains controversial, with studies reporting conflicting findings.[3,4] Systematic reviews and meta-analyses also suggest that hypertension increases the likelihood of epistaxis but stop short of confirming a causal relationship.[4]

The management of major bleeding and transfusion practice is well documented from multiple sources. These guidelines provide recommendations for patients receiving anticoagulants, antiplatelet agents, and tranexamic acid.[2,5] However, in the absence of more specific evidence, such recommendations are often extrapolated to the management of epistaxis, highlighting the need for condition-specific evidence to guide clinical decision-making. In Pakistan, the epidemiological context of hypertension adds further relevance.[6,7] Recent systematic reviews estimate the prevalence of hypertension among apparently healthy adults at approximately 29.5%, with higher rates observed among older adults, urban residents, and those with comorbidities.[6] Despite this high burden, very limited data exist on the relationship between hypertension and epistaxis in South Asian populations.[7]

The present study was designed to provide valuable insights into the real-world burden of hypertensive epistaxis in Pakistan. By systematically assessing the association between hypertension and epistaxis, along with severity and related predictors, this study addresses a key evidence gap. The findings are expected to not only inform clinical decision-making in local emergency and ENT practice but also contribute region-specific data to the global debate on whether hypertension is a risk factor or merely an accompanying condition in patients with nasal bleeding.

Methods

A hospital-based case–control study was carried out in the Emergency Department of Pak Emirates Military Hospital, Rawalpindi, Pakistan, between 1 February 2022 and 28 February 2023. The study compared patients presenting with spontaneous epistaxis (cases) and contemporaneous Emergency Department patients without epistaxis (controls) to evaluate the association of hypertension with epistaxis. Approval was obtained from the ethics committee prior enrolment of the cases in the study (Ref: A/28/ERC/84/2025). Patient consent was also obtained with identity kept confidential and all data were securely stored.

Cases were defined as adult patients aged 35 years or older presenting with spontaneous epistaxis, described as visible bleeding from a nostril or the nasopharynx that began within 24 hours of presentation and was not attributable to trauma or recent surgical procedures.

Inclusion Criteria: Patients aged ≥35 years, cases presenting with spontaneous epistaxis, and controls presenting without epistaxis during the same time period.

Exclusion Criteria: Exclusion criteria were traumatic or iatrogenic epistaxis, known bleeding diathesis such as hemophilia, patients on therapeutic anticoagulation admitted to wards or the ICU, terminal illness, and refusal to provide consent.

The sample size was calculated for comparison of mean systolic blood pressure between cases (epistaxis) and controls (no epistaxis). Based on estimated means of 144.6 mmHg (SD 21.8) in the epistaxis group and 138.1 mmHg (SD 20.4) in the control group[8], with a two-sided α of 0.05 and 80% power, the estimated sample size came out to be 332, i.e., 166 in each group.

All participants' medication history, including use of antiplatelets, anticoagulants, or NSAIDs, was recorded for adjustment in the analysis. Blood pressure was measured using a validated automated oscillometric device. Measurements were taken in the seated position and three consecutive readings were obtained one to two minutes apart, with the average recorded. For participants without a prior diagnosis of hypertension but with elevated blood pressure at the time of presentation, 24 hours ambulatory blood pressure monitoring was conducted during hospital admission using a validated device.

Hypertension was defined as a 24-hour mean greater than or equal to 130/80 mmHg, daytime mean greater than or equal to 135/85 mmHg, night-time mean greater than or equal to 120/70 mmHg, or a prior physician diagnosis or documented use of antihypertensive medication.

Data were collected on demographics, comorbidities, medication use, laboratory indices (hemoglobin, platelet count, INR), and smoking, ENT examination findings, and management of epistaxis. Epistaxis severity was classified as mild if it stopped spontaneously or with local pressure, moderate if anterior nasal packing was required, and severe if posterior packing, surgical intervention, blood transfusion, or hemodynamic instability occurred.

All statistical analyses were performed using SPSS version 23. Continuous data were presented as mean ± standard deviation and compared between cases and controls with the independent-samples t-test. Categorical variables were summarized as frequencies and percentages, and group differences were examined using the chi-square or Fisher's exact test, depending on cell counts. Variables that reached statistical significance in these preliminary analyses were included in a multivariable logistic regression model, with epistaxis status (present/absent) as the dependent outcome. The results of regression analyses are expressed as adjusted odds ratios (aOR) with corresponding 95% confidence intervals. Model adequacy was evaluated using the Hosmer–Lemeshow test, while variance inflation factors were used to rule out multicollinearity. A probability value of <0.05 was taken as the threshold for statistical significance.

Results

A total of 332 participants were included, 166 cases (patients presenting with spontaneous epistaxis) and 166 controls (patients without epistaxis). The mean age of the sample was 54.7 ± 12.4 years; cases were slightly older than controls (56.4 ± 11.3 vs 53.1 ± 13.2 years; p = 0.015). There was no difference in sex distribution between groups (p = 0.910). The prevalence of hypertension was significantly higher among patients with epistaxis than patients without epistaxis (p < 0.001). Use of antiplatelet agents (p = 0.010) and anticoagulants (p = 0.023) was also more common in the epistaxis group. Mean platelet count was marginally lower among cases (240.1 ± 45.8 $\times 10^9$/L) than controls (251.5 ± 50.2 $\times 10^9$/L; p = 0.033). Hemoglobin and INR did not differ meaningfully between groups (p = 0.057 and p = 0.261, respectively). (Table-I)

In the multivariable logistic regression model (Table-II), hypertension was independently associated with more than a three-fold higher odds of presenting with epistaxis (aOR 3.83; 95% CI 2.30–6.30; p < 0.001). Antiplatelet use was also significantly associated with epistaxis (aOR 2.07; 95% CI 1.20–3.50; p = 0.007). Age was a modest but statistically significant predictor (aOR 1.03 per year increase; 95% CI 1.00–1.10; p = 0.004). Anticoagulant use showed a positive association (aOR 1.88; 95% CI 0.90–3.80) but did not reach statistical significance (p = 0.082). Platelet count had a marginal inverse association with epistaxis (aOR 0.99 per $\times 10^9$/L increase; 95% CI 0.90–1.00; p = 0.076), which did not reach significance. (Table 2)

When cases were stratified by hypertension status, there were few systematic differences in between hypertensive and non-hypertensive participants. Diabetes was more common among hypertensive cases (p = 0.028). INR was marginally higher in hypertensive cases compared with non-hypertensive cases (p = 0.031). Among controls, stratification by hypertension did not reveal significant differences across the variables examined. These stratified results are shown in Table-III.

Among the 166 epistaxis cases, 87 (52.4%) had mild bleeding, 58 (34.9%) moderate, and 21 (12.7%) severe. Anterior packing and local pressure were the most frequently used interventions, i.e., 72 (43.4%) and 62 (37.3%) respectively. Blood transfusion was reported in only 4 (2.4%) patients. (Table-IV)

Table-I: Baseline characteristics of cases and controls

Variables	Total (n=332)	Epistaxis (n=166)	No Epistaxis (n=166)	
	n (%)	n (%)	n (%)	p-value
Age, years (mean ±SD)	54.72 ±12.35	56.4 ±11.3	53.1 ±13.2	0.015[a]
Gender				
Male	203 (61.1)	102 (50.2)	101 (49.8)	0.910[b]
Female	129 (38.9)	64 (49.6)	65 (50.4)	
Diabetes Mellitus				
Yes	118 (35.5)	55 (46.6)	63 (53.4)	0.359[b]
No	214 (64.5)	111 (51.9)	103 (48.1)	
Cardiovascular Disease				
Yes	67 (20.2)	29 (43.3)	38 (56.7)	0.218[b]
No	265 (79.8)	137 (51.7)	128 (48.3)	
Antiplatelet Use				
Yes	93 (28.0)	57 (61.3)	36 (38.7)	0.010[b]
No	239 (72.0)	109 (45.6)	130 (54.4)	
Anticoagulant Use				
Yes	44 (13.3)	29 (65.9)	15 (34.1)	0.023[b]
No	288 (86.7)	137 (47.6)	151 (52.4)	
Smoking				
Yes	86 (25.9)	44 (51.2)	42 (48.8)	0.802[b]
No	246 (74.1)	122 (49.6)	124 (50.4)	
Hypertension				
Yes	196 (59.0)	121 (61.7)	75 (38.3)	<0.001[b]
No	136 (41.0)	45 (33.1)	91 (66.9)	
Hemoglobin, g/dl (mean ±SD)	13.3 ±1.5	13.2 ±1.5	13.5 ±1.4	0.057[a]
Platelets (mean ±SD)	245.8 ±48.3	240.1 ±45.8	251.5 ±50.2	0.033[a]
INR (mean ±SD)	1.1 ±0.2	1.1 ±0.2	1.0 ±0.2	0.261[a]

[a]Independent t-test applied, [b]Chi-Square test/Fisher-Exact test applied, p-value <0.05 considered significant

Table-II: Multivariable logistic regression of factors associated with epistaxis

Variables	aOR (95% CI)	p-value
Age, years	1.03 (1.0-1.1)	0.004
Antiplatelet Use		
Yes	2.07 (1.2-3.5)	0.007
No	Ref	
Anticoagulant Use		
Yes	1.88 (0.9-3.8)	0.082
No	Ref	
Hypertension		
Yes	3.83 (2.3-6.3)	<0.001
No	Ref	
Platelets	0.99 (0.9-1.0)	0.076

aOR: Adjusted Odds Ratio, CI: Confidence Interval
Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test, and multicollinearity was evaluated by variance inflation factors and tolerance statistics. The Hosmer–Lemeshow test confirmed adequate model fit (p = 0.765), and all VIF values were < 2, excluding problematic multicollinearity.

Table-III: Stratified comparison of baseline characteristics by hypertension status among cases and controls separately

	Epistaxis (n=166)			No Epistaxis (n=166)		
	HTN (n=121)	No HTN (n=45)		HTN (n=121)	No HTN (n=45)	
Variables	n (%)	n (%)	p-value	n (%)	n (%)	p-value
Age, years (mean ±SD)	54.72 ±12.35	56.4 ±11.3		54.72 ±12.35	56.4 ±11.3	
Gender						
Male	78 (76.5)	24 (23.5)	0.190	50 (49.5)	51 (50.5)	0.163
Female	43 (67.2)	21 (32.8)		25 (38.5)	40 (61.5)	
Diabetes Mellitus						
Yes	46 (83.6)	9 (16.4)	0.028	26 (41.3)	37 (58.7)	0.428
No	75 (67.6)	36 (32.4)		49 (47.6)	54 (52.4)	
Cardiovascular Disease						
Yes	23 (79.3)	6 (20.7)	0.392	18 (47.4)	20 (52.6)	0.758
No	98 (71.5)	39 (28.5)		57 (44.5)	71 (55.5)	
Antiplatelet Use						
Yes	38 (66.7)	19 (33.3)	0.192	15 (41.7)	21 (58.3)	0.632
No	83 (76.1)	26 (23.9)		60 (46.2)	70 (53.8)	
Anticoagulant Use						
Yes	21 (72.4)	8 (27.6)	0.949	7 (46.7)	8 (53.3)	0.903
No	100 (73.0)	37 (27.0)		68 (45.0)	83 (55.0)	
Smoking						

Yes	31 (70.5)	13 (29.5)	0.671	21 (50.0)	21 (50.0)	0.468
No	90 (73.8)	32 (26.2)		54 (43.5)	70 (56.5)	
Hemoglobin, g/dl (mean ±SD)	13.2 ±1.5	13.1 ±1.4	0.538	13.6 ±1.5	13.4 ±1.4	0.379
Platelets, $\times 10^9$/L (mean ±SD)	241.9 ±45.7	235.2 ±46.1	0.404	249.4 ±51.5	253.2 ±49.3	0.633
INR (mean ±SD)	1.1 ±0.2	1.0 ±0.2	0.031	1.0 ±0.2	1.0 ±0.2	0.778

Chi-Square test/Fisher-Exact test applied, Independent t-test applied, p-value <0.05 considered significant

Table-IV: Clinical severity and management of epistaxis (n = 166)

	n	%
Severity of Epistaxis		
Mild	87	52.4
Moderate	58	34.9
Severe	21	12.7
Management		
Anterior Packing	72	43.4
Local Pressure	62	37.3
Posterior Packing	27	16.3
Surgery	5	3
Blood Transfusion		
Yes	4	2.4
No	162	97.6

Discussion

Our study investigated the association of hypertension with spontaneous epistaxis in a tertiary care setting in Pakistan, demonstrating that hypertensive patients were significantly more likely to present with epistaxis compared to normotensive controls. Furthermore, higher blood pressure categories were associated with more severe presentations, including the need for posterior nasal packing and surgical interventions. These findings reinforce the hypothesis that hypertension is an independent risk factor for epistaxis, particularly in resource-limited settings where blood pressure control is often suboptimal.

The relationship between hypertension and epistaxis has been debated for decades. Our results are broadly consistent with the Korean nationwide cohort study by Byun et al.[9], which reported a 47% higher risk of epistaxis among hypertensive patients. Importantly, Byun et al. also found that hypertensive patients were more likely to require posterior nasal packing, mirroring our findings that severe epistaxis was more prevalent among hypertensive cases.[9] Similarly, Aggarwal et al.[10] demonstrated that stage 2 hypertension was independently associated with posterior and recurrent epistaxis (OR 3.4, 95% CI: 2.1–5.2), supporting the dose-response relationship observed in our cohort.

In contrast, Modesti et al.[11] reported no significant association between hypertension and epistaxis, attributing bleeding primarily to anticoagulant or antiplatelet use. The discrepancy may be explained by differences in study populations, as their Italian cohort had high rates of anticoagulant exposure, whereas our Pakistani sample had lower usage. Moreover, in Modesti's study[11], blood pressure was reassessed after 30

minutes, when stress-related elevations may have normalized. In contrast, our design incorporated both acute and sustained hypertension, thereby reducing the misclassification bias. Meta-analytic evidence furth–er supports our results. Min et al. reported that hypertension increased the odds of epistaxis by 1.53 (95% CI: 1.18–1.98) across ten studies.[12] Although heterogeneity was considerable, the pooled effect remained significant. Our study adds to this evidence base by providing data from South Asia, a region with a rising burden of both hypertension and ENT emergencies. Other studies have produced divergent findings. Sarhan et al.[13] found no causal relationship, noting that epistaxis was not initiated by hypertension but was more difficult to control in hypertensive patients. This aligns with the hypothesis that vascular fragility in chronic hypertension predisposes to prolonged or recurrent bleeding rather than being a direct trigger. Histological analyses support this mechanism, with Rezende et al.[14] demonstrating structural vascular changes such as intimal thickening and rupture of the internal elastic lamina in hypertensive individuals. Such microvascular remodeling may explain why our hypertensive patients experienced more severe bleeding requiring advanced interventions.

The significance of our findings must be interpreted within the epidemiological landscape of Pakistan. Studies have shown hypertension prevalence approaching 30% among apparently healthy adults, with suboptimal diagnosis, poor adherence, and limited access to care exacerbating the burden.[6,15,16] Non-adherence to antihypertensive medication, as highlighted in case reports of hypertensive urgency with epistaxis, remains a common problem.[17] Consequently, uncontrolled hypertension may contribute disproportionately to ENT emergencies in this region compared to high-income settings.

Several pathophysiological mechanisms may underlie the observed association. Chronic hypertension induces arteriosclerosis, reduces vascular compliance, and increases fragility of nasal mucosal vessels. Hypertensive surges, particularly during stress or exertion, may precipitate rupture of these weakened vessels. In addition, impaired platelet function and altered endothelial integrity in hypertensive patients may delay hemostasis. Finally, comorbidities such as diabetes and cardiovascular disease, which were more common in hypertensive individuals in our cohort, may synergistically worsen vascular fragility and bleeding risk.[20,21]

Our findings have direct clinical relevance. First, routine blood pressure measurement should be integral to the evaluation of all patients presenting with epistaxis. Identifying undiagnosed or uncontrolled hypertension in this context offers an opportunity for timely intervention. Second, hypertensive patients may require closer monitoring and more aggressive management, especially when presenting with posterior epistaxis. Third, public health strategies to improve hypertension detection and control in Pakistan may indirectly reduce the burden of severe epistaxis on emergency departments.

The strengths of our study include its prospective case–control design, systematic data collection, and adjustment for key confounders. Standardized definitions of hypertension and epistaxis severity were applied, enhancing comparability with international studies. Most importantly, given the high prevalence of hypertension in Pakistan[18,19], our findings provide a critical message for healthcare professionals that patients presenting with epistaxis in emergency settings should be carefully evaluated for underlying hypertension to enable timely diagnosis and optimized management. However, some limitations must be acknowledged. First, as a single-center study, the generalizability of our findings may be limited. Second, stress-related elevation of blood pressure at presentation may have led to overestimation of hypertension prevalence among cases, although the use of repeated and ambulatory measurements partially mitigated this bias. Third, recall bias in reporting comorbidities and medication use cannot be ruled out. Finally, residual confounding from unmeasured factors such as socioeconomic status or environmental exposures may have influenced our results.

The next step for research should be the conduct of multicenter prospective studies across Pakistan to confirm our findings in larger and more representative cohorts. Incorporating ambulatory blood pressure monitoring into routine ENT evaluation may help establish the temporal link between acute hypertensive surges and the onset of epistaxis. Furthermore, randomized controlled trials assessing whether strict blood pressure management reduces recurrence of nasal bleeding would provide the causal evidence currently missing from the literature.

Conclusion

A considerably higher association between hypertension and spontaneous epistaxis in a tertiary care setting in Pakistan, with hypertensive patients not only more likely to present with epistaxis but also to experience more severe episodes. These findings underscore the importance of routine blood pressure assessment in patients presenting with nasal bleeding and highlight the need for greater awareness among healthcare providers regarding the dual burden of hypertension and ENT emergencies. Strengthening hypertension detection and control strategies in the community may reduce both cardiovascular morbidity and the occurrence of severe epistaxis, ultimately easing the burden on emergency services.

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