Clinical features and treatment outcomes of epistaxis in the University of Nigeria Teaching Hospital, Enugu, Nigeria

James O. Akpeh, Foster T. Orji Jones N. Nwosu, Basil C. Ezeanolue

Department of Otorhinolaryngology, University of Nigeria Nsukka, Ituku/Ozalla Campus, Nigeria

Abstract

This research study aimed to assess the clinical features and treatment outcome of epistaxis at the University of Nigeria Teaching Hospital (UNTH) Enugu. The objective was to determine the incidence and co-morbid factors of epistaxis in Enugu, analyse the treatment modalities offered, and assess the outcomes of various treatment modalities. This is a hospital-based one-year prospective study. All patients with epistaxis who presented at the University of Nigeria Teaching Hospital, Enugu, who met the inclusion criteria were recruited into the study for twelve months This is a year-long prospective clinical study in a tertiary hospital. The data collected were analysed using the Statistical Package for Social Sciences (SPSS) computer software version 15. A total of 53 epistaxis patients who met the eligibility criteria were studied out of the total of 19003 patients seen at the Otorhinolaryngology Clinic, Accident and Emergency Department and all the wards (inpatients) of the University of Nigeria Teaching Hospital, Enugu, within the study year. The incidence of epistaxis amongst UNTH patients was 3\1000. Males were more affected than females (1.2:1). The mean age was 39 (range 1-82 years). Common causes of epistaxis were hypertension (20.8%), idiopathic (18.8%), neoplasm (17%), and trauma (15%). Anterior nasal packing alone (60.9%) was the main treatment, followed by both anterior and posterior nasal packing (15.2%) and chemical cautery (13%). Intranasal tumour resection was carried out in 4 patients. Epistaxis is a manifestation of many different disease entities, the common ones in this study being hypertension, idiopathic, neoplasm, and trauma. Nasal packing and\or cautery will control most epistaxis. Any patient with epistaxis should be thoroughly evaluated to identify the etiological factor or co-morbid condition even when the nosebleed had stopped so as to manage definitively.

Correspondence: James O. Akpeh, Department of Otorhinolaryngology, University of Nigeria Nsukka, Ituku/Ozalla Campus, Nigeria.
E-mail: james.akpeh@unn.edu.ng

Key words: epistaxis, nose bleed, intranasal neoplasia, nasal packings.

Contributions: all the authors made a substantive intellectual contribution. All the authors have read and approved the final version of the manuscript and agreed to be held accountable for all aspects of the work.

Conflict of interest: the authors declare no potential conflict of interest.

Funding: none.

Ethics approval and consent to participate: ethical approval was sought and obtained from the institution's ethics review committee.

Informed consent: informed consent was obtained from the patients included in this study.

Patient's consent for publication: the patients gave their written consent to use their personal data for the publication of this case report and any accompanying images.

Availability of data and materials: all data generated or analyzed during this study are included in this published article.

Received: 1 July 2024.
Accepted: 14 February 2025.

Licensee PAGEPress, Italy
Annals of Clinical and Biomedical Research 2025; 5:505
doi:10.4081/acbr.2025.505

Introduction

Epistaxis is bleeding from the nose, a common otorhinolaryngological emergency that often creates apprehension in patients and caregivers and affects all ages.[1,2] Its prevalence in Nigeria is 2%.[3] However, the true prevalence in the general population is not known as most episodes are self-limiting or resolved with self-medication and, therefore, not reported. It has a bimodal peak, which occurs in young and elderly individuals.[1,4,5] Epistaxis is a common presentation in the pediatric age group and tends to have a higher incidence in males than females, as shown in some studies.[2,4,6-8] Nose-bleeds (epistaxis) amongst the elderly are often a source of concern that requires a high index of suspicion for possible features of malignant neoplasm, hence the need for thorough clinical evaluation in this age group. On the basis of the site where the bleeding originates, epistaxis is categorised into anterior bleeds and posterior bleeds. While anterior bleeds constitute more than 90% of the bleeds, the posterior bleeds present a greater risk of airway compromise with extreme difficulty in achieving adequate control of the bleeds.[4,7,8]

Causes of epistaxis are broadly classified into local, systemic, and idiopathic. In children, local trauma following nose picking, which affects the Little's area, is the commonest cause of nose-bleeding, while hypertension and neoplasm rank highest among elderly persons as the commonest cause of nose-bleeding.[9,10] Management of epistaxis is often a daring situation to otorhinolaryngologists, especially in patients with active bleeding, which

often requires immediate intervention to forestall life-threatening consequences. However, stable patients require thorough clinical evaluation. Treatment of patients with nosebleeds could be local, mostly nasal packing and cautery, or the use of surgical and endovascular procedures for refractory epistaxis. These all depend on the etiology and associated co-morbidities. This study aimed to determine the presentation, etiology, treatment, and outcome in University of Nigeria Teaching Hospital (UNTH), Enugu.

Materials and Methods

The study was a hospital-based prospective clinical study. If patients consented to participate in the study, they were recruited consecutively if they presented with nosebleeds at the otolaryngology, head and neck clinic, wards, and the Accident and Emergency Unit of the University of Nigeria Teaching Hospital (UNTH), Enugu, Nigeria. The study period was one year. Data were obtained using a pro forma chart designed for the study.

Patients with active nose bleeding were controlled and stabilized before further evaluation for eligibility to participate in the study. Comprehensive clinical evaluations were carried out on stable patients, including clinical history, socio-demographic features, aetiological factors, and past epistaxis medical and surgical history. They equally had physical examinations, including anterior rhinoscopy and flexible fibre-optic naso-endoscopy. Examination under anesthesia was done when indicated. All patients had thorough laboratory investigation and either an X-ray of paranasal sinuses, post-nasal space, or Computed Tomography (CT)-scan of the nasopharynx/paranasal sinuses as indicated. The data were analysed using Statistical Packages for the Social Science (SPSS) version 15 and presented in tables and prose (Tables 1-8). Ethical approval was sought and obtained from the institution's ethics review committee.

Results

Patients' demographics

The total number of new patients seen at the Otolaryngology Clinic, Accident and Emergency, and all the wards during the study period was 16,515. Out of these, 53 met the eligibility criteria for this study with various degrees of epistaxis. Therefore, the prevalence of epistaxis among UNTH patients was 3/1000.

Table 1 shows the age groups and sex distributions of the 53 patients. The mean age of the patients was 39 years. The minimum age was one year, and the maximum age was 82 years. There were 29 males and 24 females. The ratio of males to females is 1.2:1. This is not statistically significant.

Results showed that of the fifty-three patients, the nose bleeding started spontaneously in 45 patients, while in 8, it started following physical trauma. In twenty-seven patients, it started from the right, while in 23 patients, it started from the left nasal cavity. In 3 patients, it started from both nasal cavities at the same time. The nosebleed, however, remained unilateral in thirty patients but became bilateral in 20 patients, making it 23 bilateral cases.

Table 1. Age groups and sex distributions of patients (n=53).

Age group (years)	Frequency	Percent (%)		
		Male	Female	Total
0-10	6	1	7	13.2
11-20	1	2	3	5.7
21-30	7	5	12	22.6
31-40	3	2	5	9.4
41-50	3	2	5	9.4
51-60	6	6	12	22.6
61-70	3	3	6	11.3
71-80	Nil	1 1	1.9	
>80	Nil	2	2	3.8
Total	29	24	53	100

Table 2. Frequency distribution by anatomic regions of additional symptoms associated with nosebleeds (n=53). Some patients had more than one additional symptom.

Anatomic region	Frequency of symptoms	Number of patients	Percent (%)
Rhinological*	Nasal obstruction 19 Rhinorrhea 9 Sneezing bouts 5 Intra-nasal mass 4 Anosmia 1 External nasal deformity 1 Loud snoring 1	21*	39.6
Cervical	Unilateral level II nodes 2 Bilateral level II nodes 1	3	5.7
Otological	Conductive hearing loss 2 Tinnitus 2 Earache 1	2	3.8
No additional symptoms	Nil	27	50.9
Total		53	100

The duration of the nosebleed before presenting at the UNTH ranged from a few minutes to about 3 hours. Those that lasted for less than 1 hour were forty-three patients, 1-2 hours 3 patients, while those that had it for more than 2 hours were 2 patients. Five patients could not recall the time of onset.

The additional symptoms found in patients with nosebleeds by anatomic regions were 21 rhinological, 2 otological, and 3 cervical. Twenty-seven patients had no additional symptoms associated with their epistaxis (Table 2).

Among those with otological symptoms, 2 had conductive hearing loss, 2 had tinnitus, and 1 had earache. This group of patients had nasopharyngeal carcinoma. No patient had aural fullness, otorrhea, or dizziness.

Three patients had clinically palpable significant lymph node enlargement in the neck. Two of these patients had unilateral single neck nodes at level II, while one presented with bilateral neck nodes at level II on both sides of the neck. These three patients were those who had nasopharyngeal carcinoma

It was found that the patients in this study had other co-morbid clinical conditions that may have led to their nosebleeds. Hypertension was the most common at 20.8%, followed by neoplasm at 17%, trauma at 15%, infective rhinosinusitis at 9.4%, drug-induced 5.7%, allergic rhinosinusitis at 5.7%, Acquired Immune Deficiency Syndrome (AIDS) patients 3.8%, alcohol abuse 1.9% and bleeding diathesis 1.9%. However, 18.8%. were idiopathic (Table 3).

Indomethacin caused epistaxis among the studied patients, who had been using the drug for a very long time. At times, they exceeded the correct dose, all in a bid to relieve their osteoarthritis pain.

The neoplasia diagnosed were nasopharyngeal carcinoma 3, juvenile angiofibroma 1, sinonasal tumour 4, and meningioma 1 (Table 3).

Of the eleven patients with elevated blood pressure as a co-morbid condition related to their nosebleeds, 8 were previously known to be hypertensives but were uncontrolled, as shown by their presenting blood pressure levels, while the remaining 3 were found out during evaluation for their nosebleeds (Table 4).

Table 5 shows the findings of flexible fiberoptic nasopharyngoscopy. The least age that was scoped was 16 years. Most of the younger age group were very uncooperative, even with topical anesthetic spray, and were not examined with the nasopharyngoscope. In two of the patients, the examination revealed mucosal ulceration in the posterior part of the nasal cavity, while in the other three, it revealed prominent dilated blood vessels also on the posterior part of the nasal cavity. In two others, it showed a tumour in the nasopharynx. Twenty-two patients were not examined with the flexible scope, as they were young and uncooperative; those with obvious lesions on anterior rhinoscopy and those who refused the procedure after explanation were not scoped.

Outside the hospital setting, the most common first aid given by the public was an ice pack compress on the forehead, 24.5%, followed by digital nasal pressure in 15.1% of the patients. Notably, ice pack compress to the forehead and digital nasal pinching, done outside UNTH, were reported to have stopped active nose-bleeds in seven of the twenty-one patients who admitted hav-

Table 3. Frequency distribution of co-morbid conditions and aetiological factors of epistaxis in Enugu (n=53).

Pre-existing comorbid condition/aetiology	Frequency	Percentage
Hypertension	11	20.8
Idiopathic	10	18.8
Neoplasm of nasopharynx etc.	9	17.0
Maxilliofacial trauma	8	15.0
Infective rhinosinusitis	5	9.4
Osteoarthritis (indomethacin ingestion)	3	5.7
Allergic rhinosinusitis	3	5.7
Acquired Immune Deficiency syndrome (AIDS) patients	2	3.8
Alcohol abuse (? liver cirrhosis)	1	1.9
Bleeding diasthesis (thrombocytopenia)	1	1.9
Total	53	100%

Table 4. Blood pressure values of the patients with elevated blood pressures at presentation and averaged 3 follow-up visits (n=11).

S/N	Age	Sex	BP (mmHg) at presentation	Known hypertensive?	Control prior to presentation	Average blood pressure at 3 follow-ups visits
1	57	F	180/110	Yes	Poor	160/90
2	53	M	160/100	Yes	Poor	150/90
3	68	M	170/100	Yes	Poor	150/80
4	59	F	200/110	Yes	Poor	155/90
5	45	M	160/98	Yes	Poor	140/85
6	43	M	170/105	No	N/A	150/90
7	51	M	190/108	Yes	Poor	140/80
8	64	M	185/110	No	N/A	160/90
9	71	F	195/110	Yes	Poor	150/80
10	60	M	208/120	No	N/A	165/90
11	73	F	205/100	Yes	Poor	160/90

N/A, Not Applicable; BP, Blood Pressure. The average age of all the hypertensives was 59 years.

ing these first-aid treatments before referral to UNTH (Table 6).

On presentation at UNTH, 60.7% of patients had anterior nasal packing with 4x4 gauze soaked in a mixture of liquid paraffin and gentamycin ointment; 10.7% had posterior nasal packing with Foley's catheter inflated with sterile water. Both anterior and posterior nasal packings were done in 15.2%, while 13.6% had chemical cautery with silver nitrate pencil.

Seven (15.2%) patients had no intervention done to stop their nosebleeds as they presented after the active bleeding had stopped, as stated above and in Table 6. Still, they were further evaluated and investigated (total and differential white cell count, platelet count, hemoglobin level, prothrombin and partial thromboplastin time, bleeding and clotting time, peripheral blood film, X-ray paranasal sinuses, and post-nasal space then computed tomographic scan in cases of suspected neoplasia in search of any aetiological or risk factors of the epistaxis/and co-morbid condition and then treated as appropriate (Tables 6 and 7).

The outcomes of interventions and treatments to stop active nosebleeds showed that 39 of the 46 actively bleeding patients had the nosebleeds stopped. This adds up to the seven who were already not actively bleeding at presentation. Seven out of the 53 patients continued to have active nosebleeds.

Seven patients continued to have active nosebleeds after initial emergency interventions. (Table 7) Four had surgical resection of their sinonasal tumours, while 2 with nasopharyngeal carcinoma had chemoradiotherapy before their nosebleed could stop. One who had meningioma of the anterior cranial fossa was discharged on request, against medical advice, even when the nosebleed had not stopped and was lost to follow-up (Table 8).

One patient (with bleeding diathesis) who had her nosebleed stopped by intranasal gauze packing was referred to the hematologist for further evaluation and treatment and died while on the admission of suspected intracranial hemorrhage.

Discussion

Many episodes of epistaxis are self-limited, with spontaneous resolution not requiring medical or surgical intervention. However, epistaxis can at times be life-threatening, requiring very urgent intervention.

In this study, there were more males than females with a male-to-female ratio of 1.2:1, which is similar to an earlier report of Mgbor NC,[9] who had a male-to-female ratio of 1.5:1, and Iseh *et al.* who reported a female ratio of 1.7:1. Studies by Akinpelu *et al*. from Ile-Ife Nigeria, and other parts of the world showed male preponderance in epistaxis.[6,10,11] This male preponderance may be due to their more active lifestyle, as young males are more vulnerable to violent activities, engage in high-risk-taking play, and fall from height with resultant maxillofacial trauma/injuries.

Table 5. Findings of flexible nasopharyngoscopy among a subgroup of 31/53 patients.

	No	%
Mucosal ulceration of nasal cavity	2	6.5
Prominent dilated blood vessels	3	9.7
Nasopharyngeal tumours	2	6.5
Normal findings	24	77.3
Total	31	100

22 patients did not partake in this investigation.

Table 6. First aid emergent treatment administered at home to stop active nosebleed before presentation\or referral to hospital (n=53).

First aid/emergency treatment received at home	Frequency	Success
Ice pack on the forehead	13	4
Digital nasal pressure (nose pinching)	8	3
None or do not know	32	--
Total	53	7

Table 7. Emergent definitive treatment administered to stop active nosebleeds at the University of Nigeria Teaching Hospital (UNTH) and their outcomes (n=53).

Emergency definitive treatment given in the hospital to stop active nosebleed	Frequency (n)	Outcome of treatment		Percent (%) of each type of treatment outcome success
		Success (n)	Failure (n)	
Anterior nasal packing only	28	25	3	89
Posterior nasal packing only	5	4	1	80
Both anterior and posterior nasal packings	7	5	2	71
Chemical cautery with silver nitrate stick	6	5	1	83
Did not need intervention as active nosebleed stopped with first aid	7	7	Nil	13.2
Total	53	46	7	86.8

Table 8. Disease conditions of patients who continued to have active nosebleeds after initial interventions and their disposal actions (n=7).

Disease condition	Frequency	Frequency of those that continued to bleed after definitive treatment	Disposal action (frequency)	Outcome
Sinonasal neoplasia	4	Nil	Surgical resection (4)	Controlled
Nasopharyngeal carcinoma	2	Nil	Chemo-radiotherapy (2)	Controlled
Meningoma	1	1	Discharged against medical advice (1)	Active nosebleed\lost to follow-up

Most of the patients seen in this study were aged 51-60, (12) 22.6% and 21-30, (12) 22.6%. The high prevalence among those between 21-30 years is in agreement with the finding of Mgbor NC and Ijaduola GTA *et al*. but not in agreement with the finding of Rothenhaus *et al*., who found the lower peak in their bimodal peak to be between 2-10 years.[9,12-14] The high incidence in this study among those 21-30 years may be due to their very active life and more likely to be involved in facial injuries, while the second peak at the sixth decade may be due to increased incidence of hypertension and neoplasia in this age group.

The commonest co-morbid condition/presumed etiology of epistaxis in this study was hypertension 11 (20.8%), followed by idiopathic 10 (18.8%), neoplasia 9 (17.0%), and trauma 8 (15.0%). Both infective and allergic rhinosinuisitis added up to 8 (15.0%). In earlier studies in this center by Mghor NC and Iseh *et al*. in Sokoto, the idiopathic cause was the most common epistaxis, 41% and 29.2%, respectively.[3,9] These were retrospective studies and may have suffered the drawback of a dedicated search for the cause of the nosebleeds. Chiu and McGarry, in their study, noted that most of the reported idiopathic causes of epistaxis were because the patients were often evaluated after treatment with packing or balloon insertion and that most studies have been retrospective. They suggested careful examination of patients with nasal endoscopes before interventions.[15]

Mgbor NC's study found hypertension (20%) as the second most common cause, while Iseh *et al.* study had trauma (27.7%) as the second most common cause.[9,13] In this study, hypertension was the most common co-morbid condition associated with epistaxis. Hypertension was found in a Baltimore, Maryland study as the most common medical condition associated with epistaxis.[16] Thong *et al*. and Fuchs *et al*., in their separate works, found no association between hypertension and epistaxis.[17,18] Herkner *et al*., in two separate studies, found a strong association between hypertension and epistaxis.[19,20] However, patients with hypertension in this study were known hypertensives with poor blood pressure control. Three presented with nosebleeds only to have their hypertension diagnosed for the first time. This underscores the need for blood pressure checks and good control with appropriate antihypertensive treatment under a specialist physician's care.

Malignant neoplasia in this study was the third most common co-morbid condition associated with epistaxis. It should be diligently searched for, especially when a nosebleed is unilateral and recurrent in the presence of other association symptoms like palpable neck lymph nodes, unilateral hearing impairment, tinnitus with or without nasal obstruction, and cheek numbness. The neoplasia found to be associated with epistaxis were nasopharyngeal carcinoma, juvenile nasopharyngeal angiofibroma, sinonasal neoplasia, and anterior cranial fossa meningioma. Sinonasal tumours usually present with epistaxis, nasal obstruction and\ or cheek numbness. Most of the recurrences of nosebleeds in this study were either from sinonasal tumours or nasopharyngeal carcinoma. They had surgical resection of their tumours in cases of sinonasal carcinoma and juvenile nasopharyngeal angiofibroma, while in the cases of nasopharyngeal carcinoma, chemoradiotherapy before their nosebleed could stop. This showed that the cause of the nose bleeding should be searched for and treated in all cases.

Trauma was the fourth most common cause of epistaxis in this study and was commoner among the younger age group. This is at variance with earlier work by Ijaduola GTA *et al*., who found trauma to be the most common cause of epistaxis[13.] Improved road safety measures and awareness may be responsible for this changing trend. Most of the patients involved were due to their active lifestyle and either had road traffic accidents or fallen from height, sustaining maxillofacial injuries. Others in this category were those who pick their nose - epistaxis digitorum. This study did not encounter such.

Chronic rhinosinusitis, both from infective and allergic sources, was a significant cause of nosebleeds in this study. This may be due to mucosal congestion from inflammatory reactions, which predisposes to nosebleeds, especially with bouts of sneezing.

Bleeding diasthesis from blood dyscrasia was found in one patient whose nosebleed was controlled, albeit temporarily, by nasal packing, but the patient later died from a suspected intracranial hemorrhage while under the care of the hematologist in the ward. Two of the patients in the study were known to have AIDS. This condition may have a nosebleed as a presenting symptom.[9,14] The three patients with drug-induced nosebleeds were elderly patients on regular long-term ingestion of indomethacin for their osteoarthritis pain.

Treatment of a patient with nosebleeds depends on the severity, cause, expertise of personnel, and availability of material/ equipment, as well as the cost of the treatment. Among the various treatment options for epistaxis used in this study, nasal packing, especially the anterior nasal packing, was not only the treatment with the best outcome but also the most frequent intervention, and it was very efficient and cost-effective with ease of placement and removal. This is not surprising since the least invasive treatment is administered first. Hence, those who had the least invasive treatment were not likely to have higher severity of nosebleeds.

No arterial ligation was used in this study. However, in intractable epistaxis, arterial ligation, endoscopic cautery, and embolization are the options for treatment.[21-25]

Conclusions

From this study, we conclude as follows: the pattern of epistaxis that presented in UNTH during the study period is similar to those reported from other tertiary hospitals in Nigeria as well as other parts of the world. Also, the prevalence of epistaxis among the study population was 3/1000. Again, common co-morbid conditions were hypertension (21%), malignant neoplasia (17%) and idiopathic (19%). Most patients with epistaxis who seek medical attention are likely to be treated successfully with anterior nasal packing or cautery. Finally, treatment will be most effective when underlying medical co-morbid conditions are diagnosed and treated.

Recommendation

Recurrent, unilateral nosebleeds with or without other associated nasal symptoms should be thoroughly evaluated to rule out any more sinister disease. Any patient with a nosebleed should be thoroughly evaluated and managed definitively.

References

1. Watkinson JC. Epistaxis. In: Scott Brown's Otolaryngology. 6th edition. Butterworth - Heineman, London, UK, 1997.
2. Dhingra PL. Disease of ear, nose and throat. 4th edition. Elsevier Reed, Delhi, India, 2007.
3. Iseh KR, Muhammad Z. Pattern of epistaxis in Sokoto, Nigeria. Annals of African Medicine 2008:7;107-11.
4. Nguyen QA. Epistaxis. 2024. Available from: http://emedicine.medscape.com/article/863220

5. Bamimore O. Acute epistaxis. 2023. Available from: http://emedicine.medscape.com/article/764719
6. Nwaorgu OGB. Epistaxis: an overview. Annals of Ibadan Postgraduate Medicine 2004; 1:32-7.
7. Weatherly RA. Epistaxis. 1992. Available from: www.bcm.edu/oto/grand/51492.html
8. Mgbor NC. Epistaxis in Enugu: a 9-year review. Nigeria Journal of Otorhinolaryngology 2004;1:11-4.
9. Pallin DJ, Chng YM, McKay MP, et al. Epidemiology of epistaxis in US emergency department. 1992 - 2001. Ann Emerg Med 2005;46:77-81.
10. Yuksel A, Kurtaran H, Kankilie ES, et al. Epistaxis in geriatric patients. Turk J Med Sci 2014;44:133-6.
11. Voegels RL, Thome DC, Hurralde PPV, Butugan O Endoscopic ligation of spenopalatine artery for severe posterior epistaxis: otolaryngology. Head and Neck Surgery 2001;124:464-7.
12. Akinpelu OV, Amusa VB, Eziyi JA, Nwawolo CC. A retrospective analysis of aetiology and management of epistaxis in a southwest Nigeria teaching hospital. West African Journal of Medicine 2009;28:165-8.
13. Ijaduola GTA, Okeowo PA. Pattern of epistaxis in the tropics. The Central African Journal of Medicine 1983;29:77-80.
14. Stammberger H, Lund VJ. Anatomy of the nose and paranasal sinuses. In: Scott Brown's otolaryngology head and neck surgery. 7th edition. CRC Press, Boca Raton, USA, 2008.
15. Chiu T W, McGarry GW. Prospective clinical study of bleeding sites in idiopathic adult posterior epistaxis. Otolaryngology-Head and Neck Surgery 2007;137:390393.
16. Police PA, Yoder MG. Epistaxis: a retrospective review of hospitalized patients. Otolaryngol Head Neck Surgery 1997;117:49-53.
17. Thong JF, Lo S, Houghton R, Moore-Gillon V. A prospective comparative study to examine the effects of oral diazepam on blood pressure and anxiety levels in patients with acute epistaxis. Journal of Laryngology and Otology 2007;121:124-9.
18. Fuchs FD, Moreira LB, Pires CP, et al. Absence of association between hypertension and epistaxis: a population-based study. Blood Pressure 2003;12:145-8.
19. Herkner H, Laggner AN, Müllner M, et al. Hypertension in patients presenting with epistaxis. Annals of Emergency Medicine 2000;35:126-30.
20. Herkner H, Havel C, Müllner M, et al. Active epistaxis at ED presentation is associated with arterial hypertension. American Journal of Emergency Medicine 2002;20:92-5.
21. Scholosser RJ. Epistaxis. New England Journal of Medicine 2009;360:784-9.
22. Gifford TO, Oreland RR. Epistaxis. Otolaryngologic Clinics of North America 2008;41:525-36.
23. Cullen M.M, Tami TA. Comparison of internal maxillary artery ligation versus embolization for refractory posterior epistaxis. Otolaryngol Head and Neck Surgery 1998;118:636-42.
24. Kumar S, Shetty A, Rockey J, Nilssen E. Contemporary surgical treatment of epistaxis: what is the evidence for sphenopalatine artery ligation. Clinical Otolaryngology 2003;28:360-3.
25. Balasubramanian T. Epistaxis. 2012. Available from: https://archive.org/details/Epistaxis