



INFECTIOUS NATURE OF ORAL ANGIOLEIOMYOMAS – A SYSTEMATIC REVIEW

Dr. V. Vasanthakumar MDS

Oral and Maxillofacial Surgeon, Assistant Professor, Department of Dental Surgery,
Government Vellore Medical College and Hospital, Vellore Tamilnadu India

ABSTRACT

Background:

Oral angioleiomyoma is a rare benign neoplasm derived from the smooth muscle of vascular walls, representing only a minute proportion of intraoral soft-tissue tumors. Its clinical appearance is often nonspecific, frequently resembling fibrous, salivary, or vascular lesions, which makes diagnosis challenging. Histopathological confirmation, supported by immunohistochemical profiling, is essential; however, published evidence remains limited and scattered.

Objective:

To systematically review the literature on oral angioleiomyomas, focusing on their demographic and anatomical distribution, clinical presentation, histopathological and immunohistochemical characteristics, treatment approaches, and recurrence rates.

Methods:

A protocol registered with PROSPERO (CRD420251148693) guided this review, which was conducted according to PRISMA 2020 guidelines. Comprehensive searches of PubMed/MEDLINE, Embase, Scopus, Web of Science, Cochrane Library, and Google Scholar were undertaken to identify studies describing histologically confirmed oral angioleiomyomas. Eligible designs included case reports, case series, and observational studies presenting original patient data. Information on demographics, lesion site, clinical features, histological subtype, immunohistochemical profile, treatment, and outcomes was extracted.

Results:

Five studies (three case reports and two case series) encompassing 68 patients with 80 oral angioleiomyomas met the inclusion criteria. Patient ages ranged from 27 to 80 years (mean $\approx$ 55), with a slight male predominance. Lesions occurred most often on the lips, followed by the buccal mucosa, palate, and tongue. Clinically, they presented as slow-growing, well-circumscribed submucosal nodules, typically painless and <2 cm, with colour ranging from bluish-purple to normal mucosa. Histopathology revealed interlacing fascicles of spindle-shaped smooth-muscle cells surrounding vascular channels; the venous subtype predominated, while solid, cavernous, and adipocyte-rich variants were less frequent. Immunohistochemistry consistently demonstrated diffuse smooth muscle actin, with frequent desmin and h-caldesmon expression and negative S-100 staining. All studies reported conservative excision as the treatment of choice; only one recurrence occurred after incomplete removal, and no malignant transformation was documented.

Conclusions:

Oral angioleiomyoma is an uncommon but well-characterised benign smooth-muscle tumour of the oral cavity. Although its clinical appearance can mimic a range of other lesions, histopathological

evaluation with a focused immunohistochemical panel remains the diagnostic gold standard. Simple local excision provides definitive management, with recurrence exceptional when margins are clear. Larger multicentre studies with standardised reporting and long-term follow-up are warranted to refine epidemiological estimates and confirm the biological behaviour of variant subtypes.

Key words: Oral angioleiomyoma; Vascular leiomyoma; Smooth muscle tumour; Oral cavity; Lips; Buccal mucosa; Palate; Tongue; Histopathology; Immunohistochemistry; Smooth muscle actin; Desmin; h-caldesmon; Conservative excision; Recurrence.

INTRODUCTION

Angioleiomyoma, also known as vascular leiomyoma, is a benign soft-tissue tumor composed of smooth muscle bundles associated with vascular channels. It is widely recognized as one of the more common subcutaneous leiomyomas of the extremities, where it typically presents as a small, well-circumscribed nodule, often on the lower limb[1]. By contrast, its occurrence in the head and neck region is rare, and involvement of the oral cavity is particularly uncommon, accounting for only a minute proportion of benign tumors of the mouth. Because of this scarcity, oral angioleiomyoma remains a lesion with which many dental and maxillofacial practitioners have limited familiarity[2].

Within the oral cavity, angioleiomyomas have been reported at a range of sites, most often the lips, buccal mucosa, palate, and tongue, although cases affecting the gingiva, retromolar area, and floor of the mouth have also been described. They generally arise as solitary, slowly enlarging nodules located within the submucosa. Lesions are typically firm or rubbery on palpation and are usually less than two centimetres in greatest dimension, though larger masses have occasionally been documented in long-standing cases[3]. The overlying mucosa may appear unremarkable or display pink, red, or bluish-purple hues depending on vascular content and depth. While most tumors are asymptomatic, some patients experience mild tenderness or a dull ache, which may reflect either contractile activity of smooth muscle fibres or compression of adjacent neural structures. These nonspecific features mean that the clinical differential diagnosis is broad, encompassing fibromas, mucoceles, haemangiomas, salivary-gland neoplasms, and peripheral nerve sheath tumors, among others. As a result, angioleiomyoma is seldom diagnosed before histological evaluation[3].

Histopathology remains central to the identification of this entity. Microscopically, angioleiomyomas consist of interlacing fascicles of spindle-shaped smooth-muscle cells with blunt nuclei, arranged around blood vessels of variable calibre. Based on the relative proportions of vascular and muscular components, three principal histological patterns are recognised: the venous type, marked by thick-walled vascular channels embedded in smooth muscle; the solid type, composed of densely packed muscle fascicles with sparse lumina; and the cavernous type, in which widely dilated vascular spaces separate the muscular bundles. Beyond these well-defined categories, occasional variants containing adipose tissue or myxoid stroma have been reported, further expanding the morphological spectrum and, at times, imitating other mesenchymal or perivascular tumors[4,5].

Immunohistochemistry plays an essential confirmatory role. Diffuse expression of smooth muscle actin is a consistent finding, with desmin and h-caldesmon frequently co-expressed, supporting smooth-muscle differentiation. Endothelial markers such as CD31 and CD34 are restricted to the lining of vascular channels, while neural markers including S-100 remain negative, helping to exclude lesions of neural origin. Together, these histological and immunohistochemical hallmarks allow reliable separation of angioleiomyomas from other vascular or spindle-cell tumors of the oral cavity[5,6].

Despite their unequivocally benign behaviour and excellent prognosis after conservative surgical removal, angioleiomyomas of the oral cavity remain incompletely characterised. Most available information derives from isolated case reports or small case series, often with variable descriptions of demographic data, site distribution, histological subtyping, immunohistochemical profiles, and follow-up outcomes. The absence of large, systematically conducted studies has limited

understanding of true incidence, sex predilection, relative frequency of histological variants, and factors influencing recurrence. Moreover, there is little guidance on the optimal scope of immunohistochemical evaluation or on the long-term management of unusual histological forms.

Given these gaps, a comprehensive synthesis of existing evidence is necessary. A systematic review that collates and critically appraises published data can provide an integrated overview of epidemiological patterns, clinical behaviour, microscopic architecture, immunophenotypic characteristics, and surgical outcomes of oral angioleiomyomas. Establishing such a knowledge base is crucial for improving diagnostic accuracy, supporting appropriate histopathological work-up, and informing evidence-based therapeutic decisions.

The present review therefore aims to assemble and analyse all available studies on angioleiomyomas of the oral cavity, with the objectives of clarifying their demographic and anatomical distribution, describing clinical and histological features including immunohistochemical findings, assessing treatment approaches and recurrence rates, and identifying priorities for future research. By presenting a consolidated appraisal of this rare lesion, the review seeks to guide clinicians and pathologists in the recognition and management of oral angioleiomyomas and to provide a foundation for further investigative work into their biological behaviour.

MATERIALS AND METHODS

This systematic review was designed and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines[7]. A PRISMA flow diagram depicts the selection process. The protocol was prospectively registered with the International Prospective Register of Systematic Reviews (PROSPERO, Registration ID: CRD420251148693).

Research Question and PICOS Framework

The research question was formulated using the PICOS framework[8]:

- **Population (P):** Patients of any age or sex with histopathologically confirmed angioleiomyoma of the oral cavity.
- **Intervention/Exposure (I):** Clinical, histological, or immunohistochemical evaluation of oral angioleiomyomas (including subtyping and use of smooth muscle markers such as SMA, desmin, and h-caldesmon).
- **Comparison (C):** Not applicable (most studies were descriptive); when available, comparisons with other benign oral soft-tissue tumors were recorded.
- **Outcomes (O):** Demographic and anatomical distribution, clinical presentation, imaging findings, histopathological subtype, immunohistochemical profile, treatment approach, recurrence, and follow-up.
- **Study Design (S):** Case reports, case series, retrospective or prospective observational studies presenting original patient data.

Search Strategy and Information Sources

A comprehensive search was conducted in PubMed/MEDLINE, Scopus, Embase, Web of Science, Cochrane Library, and Google Scholar from database inception to August 2025. Reference lists of relevant publications were hand-searched to identify additional studies.

The main search strategy for PubMed was as follows:

("angioleiomyoma" OR "vascular leiomyoma")

AND ("oral" OR "mouth" OR "lip" OR "tongue" OR "palate"

OR "buccal mucosa" OR "gingiva" OR "floor of mouth")

No restrictions were applied regarding year of publication.

Eligibility Criteria

Inclusion criteria:

- Human studies reporting primary angioleiomyoma of the oral cavity.
- Histopathological confirmation of diagnosis, with or without immunohistochemistry.
- Reports providing extractable data on at least one of the following: demographics, anatomical site, clinical features, imaging, histological subtype, immunohistochemical findings, treatment, or outcomes.

Exclusion criteria:

- Lesions located outside the oral cavity (e.g., sinonasal tract, larynx, skin).
- Reviews, editorials, or conference abstracts without individual patient data.
- Animal or in vitro studies.
- Duplicate publications (the most complete or recent version was retained).

Study Selection

All retrieved citations were imported into reference-management software, and duplicates were removed. Titles and abstracts were screened independently by two reviewers to identify potentially eligible studies. Full texts were then examined against the inclusion and exclusion criteria. Disagreements were resolved by discussion, with arbitration from a third reviewer if needed.

Data Extraction and Management

A standardised extraction sheet was developed based on the review protocol. For each eligible report, the following variables were recorded: author and year of publication, country, study design, number of cases, patient demographics, lesion site and size, duration and symptoms, imaging findings, histopathological subtype, immunohistochemical profile, treatment modality, margin status, follow-up duration, and recurrence. Extracted data were cross-checked by a second reviewer to ensure accuracy.

Data Synthesis

Due to anticipated heterogeneity in study design, reporting format, and outcome measures, a qualitative synthesis was planned rather than a meta-analysis. Data were summarised descriptively and grouped by major domains: epidemiology, lesion location, clinical characteristics, imaging findings, histological subtypes, immunohistochemical patterns, treatment, and recurrence. Frequencies, ranges, and proportions were calculated where appropriate to provide an overview of trends across the included literature.

RESULTS

Study Selection

The search across electronic databases and grey literature yielded 143 records. After removing duplicates, 112 titles and abstracts were screened. Of these, 27 full-text articles were assessed for eligibility. Five studies met the inclusion criteria and were incorporated into the final synthesis (Figure 1).

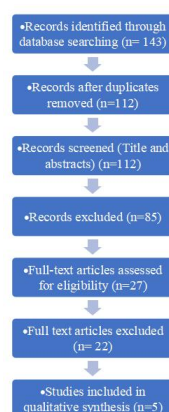


Figure 1: PRISMA flowchart

Characteristics of Included Studies

Five publications fulfilled the eligibility criteria: Brooks et al. (2002), Mahima et al. (2011), Rawal et al. (2017), Aitken-Saavedra et al. (2018), and Bubola et al. (2025). Table 1 summarises the key characteristics.

Table 1. Characteristics of Included Studies on Oral Angioleiomyomas

Authors	Study	Design	No. of Lesions	Age (yrs)	Sex (M/F)	Common Sites	Histological Subtype	IHC Findings	Treatment	Recurrence
Brooks et al. (2002)[9]	Clinicopathologic characterization of oral angioleiomyomas.	Case series	15	34 – 72 (mean 52)	9/6	Lips, buccal mucosa	Venous > solid	SM A+, Desmin +	Local excision	0
Mahima et al. (2011)[10]	Recurrent oral angioleiomyoma	Case report	1	46	F	Lower lip	Venous	SM A+, Desmin +	Excision	0
Rawal et al. (2017)[11]	Angioleiomyoma (Vascular Leiomyoma) of the Oral Cavity	Case reports	2	35 – 55	1/1	Palate, buccal mucosa	Venous	SM A+, Desmin +	Excision	0
Aitken-Saavedra et al. (2018)[12]	Clinicopathologic and immunohistochemical characterization of 14 cases of angioleiomyomas in oral cavity	Case series	12	41 – 66	7/5	Lips, palate	Venous / solid	SM A+, h-caldesm on+	Excision	0
Bubola et al. (2025)[13]	Oral angioleiomyomas: a case series and review of the literature	Retrospective review & literature analysis	38	27 – 80 (mean 56.8)	29/9	Lips, palate, buccal mucosa, tongue	Venous most; solid & cavernous; 55% with adipocytes	SM A+, Desmin +, h-caldesm on+; S-100 –	Excision	1 (after incomplete removal)

Demographic Profile

Across studies, patient ages ranged from 27 to 80 years (pooled mean $\approx$ 55 years). A slight male predominance was observed (approximate ratio 1.2:1). Most cases involved middle-aged adults,

although a few lesions were reported in younger patients.

Anatomical Distribution

The lips were the most frequent site, accounting for roughly one-third of cases, followed by the buccal mucosa, palate, and tongue. Less common locations included the gingiva, retromolar region, and floor of the mouth. No consistent laterality preference was identified.

Clinical Features

Oral angioleiomyomas typically presented as solitary, well-defined nodules situated in the submucosa. They were usually firm or rubbery to palpation and painless; a minority caused mild tenderness. Lesion size was most often < 2 cm, though long-standing masses occasionally exceeded this threshold.

Colouration varied with depth and vascularity: most lesions were bluish or purple, but some appeared pink or mucosa-coloured, leading to misinterpretation as salivary-gland or fibrous lesions.

Imaging Findings

Radiographic examinations, when performed, were usually unremarkable. A few studies described ultrasound showing well-circumscribed hypoechoic nodules with internal vascular signals, while MRI demonstrated small, homogeneous, enhancing masses without invasion of adjacent structures.

Histopathological Patterns

All included studies confirmed the diagnosis through light microscopy:

- Tumours consisted of intersecting fascicles of spindle smooth-muscle cells with eosinophilic cytoplasm and blunt (“cigar-shaped”) nuclei.
- Vascular channels were interspersed, their calibre depending on subtype.
- Subtype distribution: venous type predominated ($\approx 65\%$), followed by solid and cavernous forms.
- Bubola et al. documented adipocytic differentiation in more than half of cases, expanding the recognised morphological spectrum.

Immunohistochemistry

IHC consistently supported smooth-muscle differentiation:

- **Smooth Muscle Actin (SMA):** diffuse and strong in all lesions.
- **Desmin & h-caldesmon:** frequently positive, reinforcing smooth-muscle origin.
- **CD31/CD34:** highlighted vascular endothelium but were negative in tumour bundles.
- **S-100:** uniformly negative, helping to exclude neural lesions.

Treatment and Outcomes

Management was uniform across studies: simple local excision or enucleation under local or general anaesthesia. Intraoperative bleeding was usually modest and easily controlled.

Follow-up periods (6 months to 10 years) demonstrated an excellent prognosis, with only one documented recurrence, attributed to incomplete excision. No malignant transformation or metastasis was reported.

DISCUSSION

This systematic review integrates data from five studies spanning more than two decades, providing the most comprehensive synthesis to date of the clinical and pathological spectrum of oral angioleiomyomas. Although the evidence base is modest and largely composed of descriptive studies, several consistent patterns emerge regarding epidemiology, presentation, histological architecture, immunophenotype, and outcomes.

The earliest work in the series, Brooks et al. (2002)[9], remains a cornerstone for understanding these lesions. Their analysis of 15 cases established many of the clinicopathological hallmarks that continue to define oral angioleiomyoma: a predilection for middle-aged adults, a slight male bias, and frequent occurrence in the lips and buccal mucosa. They described the venous subtype as the most common histological pattern, with solid forms less frequent, and emphasised the diagnostic utility of

smooth muscle actin and desmin immunostaining. Importantly, no recurrences were observed, supporting the indolent behaviour of the tumour.

Mahima et al. (2011)[10] contributed a detailed single-case report that highlighted the diagnostic challenge posed by lesions with pink or mucosa-coloured surfaces. Their patient presented with a lower-lip nodule initially thought to represent a salivary-gland lesion. Histology confirmed a venous-type angioleiomyoma, underscoring that colour alone is not a reliable indicator of vascularity and that biopsy is essential for accurate diagnosis.

Similarly, Rawal et al. (2017)[11] presented two cases – one on the palate and another on the buccal mucosa that illustrated the wide anatomical range of these tumours. Both lesions were painless, submucosal nodules, and histology confirmed the venous pattern with prominent vascular channels. Their report reinforced that angioleiomyomas can occur in less typical locations and still retain a benign biological profile when completely excised.

A broader clinicopathological perspective was offered by Aitken-Saavedra et al. (2018)[12], who analysed 12 cases with careful histological subtyping. They confirmed the predominance of venous architecture but also documented solid-type lesions, suggesting that while the vascular component is usually conspicuous, some tumours are more muscular. Their inclusion of h-caldesmon in the immunohistochemical panel strengthened the evidence that angioleiomyoma is a true smooth-muscle neoplasm rather than a variant of vascular malformation. None of their cases recurred, further attesting to the excellent prognosis.

The most extensive study to date, Bubola et al. (2025)[13], examined 38 tumours from institutional archives and combined these with a literature review, providing valuable epidemiological and morphological insights. Their cohort confirmed the age and sex distribution reported in earlier studies and reaffirmed the lips, palate, buccal mucosa, and tongue as principal sites. Notably, they described adipocytic differentiation in over half of their specimens, an observation not highlighted in previous series. This finding broadens the histopathological spectrum of oral angioleiomyoma and cautions against misclassifying adipocyte-rich examples as angiomyolipoma or other perivascular tumours. Bubola et al.[13] also recorded the only recurrence in the pooled literature, which occurred after incomplete excision, thereby supporting the notion that complete removal is curative.

When these studies were viewed comparatively, their results converged on several key points. All authors agreed that oral angioleiomyomas are rare, benign, and slow-growing lesions with a predilection for the lips and buccal mucosa. The venous subtype consistently emerged as the most prevalent histological pattern, while solid and cavernous forms are much less common. Colour and clinical impression vary widely, with some tumours resembling salivary or fibrous proliferations, underscoring the importance of histopathological confirmation. Across studies, immunohistochemical data were largely concordant: diffuse smooth muscle actin positivity was universal, desmin and h-caldesmon were frequently expressed, and neural markers such as S-100 were absent, reinforcing the smooth-muscle nature of the lesion.

There are, however, subtle differences. Brooks et al.[9] reported a slightly higher proportion of solid lesions than later series, perhaps reflecting differences in classification criteria or sample size.

Aitken-Saavedra et al.[12] emphasised the value of h-caldesmon for diagnostic confidence, an aspect not systematically addressed by earlier authors. Bubola et al.[13] uniquely described adipocytic change, suggesting either a previously overlooked phenomenon or a variant more likely to be detected in larger cohorts. Single-case reports such as those by Mahima et al.[10] and Rawal et al.[11] enrich the literature by documenting unusual sites or clinical appearances that might be under-represented in institutional series.

Despite methodological limitations including the predominance of retrospective designs, variable reporting of immunohistochemistry, and inconsistent follow-up the studies collectively depict a uniform biological behaviour. None documented malignant transformation, and recurrence was confined to an incompletely removed lesion. These data strongly support the view that oral angioleiomyomas are benign neoplasms with an excellent prognosis when treated by conservative excision.

The present synthesis also clarified practical issues for clinicians and pathologists. Lesions that are

firm, well circumscribed, and submucosal, particularly in the lips or buccal mucosa, should raise suspicion for angioleiomyoma even if their surface colour is not obviously vascular. Histology remained indispensable, and a limited immunohistochemical panel (SMA with desmin or h-caldesmon) is sufficient in most cases. Recognition of histological diversity including solid areas and adipocytic metaplasia helps to prevent misdiagnosis as haemangioma, fibroma, or angiomyolipoma. Finally, the literature highlighted several avenues for future research. Large, multicentre registries would allow more precise estimates of incidence, anatomical distribution, and subtype frequency. Prospective studies with standardised immunohistochemical protocols could further define the significance of markers such as h-caldesmon or Ki-67. Additional reports of adipocyte-rich or otherwise unusual variants may clarify whether these represent a discrete subtype or simply a morphological continuum within angioleiomyoma.

In summary, despite their rarity, oral angioleiomyomas display strikingly consistent clinicopathological features across studies. They are benign smooth-muscle tumours with excellent outcomes following complete excision. Variations between studies mainly reflect differences in sample size, histological emphasis, and completeness of follow-up rather than fundamental biological diversity. Recognition of their full spectrum including occasional adipocytic differentiation combined with awareness of their indolent nature, is essential for accurate diagnosis and appropriate, minimally invasive treatment.

Conclusion

Oral angioleiomyoma is an uncommon but well-defined benign tumour of vascular smooth-muscle origin that most often presents as a slowly enlarging, well-circumscribed nodule on the lips, buccal mucosa, palate, or tongue. Although its clinical appearance may mimic fibrous, salivary, or neural lesions, histopathological examination supported by immunohistochemical demonstration of diffuse smooth-muscle actin with frequent desmin or h-caldesmon expression and absence of S-100 remains the diagnostic cornerstone. Across all studies, the venous subtype predominated, with occasional solid or cavernous forms and rare adipocytic change broadening the histological spectrum. Simple local excision was uniformly curative, recurrence occurred only after incomplete removal, and no malignant transformation was reported, underscoring the lesion's indolent nature and excellent prognosis. Future multicentre studies with standardised diagnostic protocols and long-term follow-up are needed to refine epidemiological estimates, clarify histological variability, and strengthen evidence-based recommendations for the recognition and management of this rare neoplasm.

References

1. Koga M, Nishio J, Koga T, Koga K, Nakayama S, Yamamoto T. An Update on Clinicopathological, Imaging, and Genetic Features of Angioleiomyoma. *Cancer Diagn Progn.* 2023 Mar 3;3(2):145-150. doi: 10.21873/cdp.10193. PMID: 36875312; PMCID: PMC9949533.
2. Veeresh M, Sudhakara M, Girish G, Naik C. Leiomyoma: A rare tumor in the head and neck and oral cavity: Report of 3 cases with review. *J Oral Maxillofac Pathol.* 2013 May;17(2):281-7. doi: 10.4103/0973-029X.119770. PMID: 24250094; PMCID: PMC3830242.
3. Matiakis A, Karakostas P, Pavlou AM, Anagnostou E, Pouloupoulos A. Angioleiomyoma of the oral cavity: a case report and brief review of the literature. *J Korean Assoc Oral Maxillofac Surg.* 2018 Jun;44(3):136-139. doi: 10.5125/jkaoms.2018.44.3.136. Epub 2018 Jun 26. PMID: 29963495; PMCID: PMC6024062.
4. Jafarian M, Mashhadi Abbas F, Ghazizadeh Ahsaie M, Saebnoori H. Clinical, Imaging and Histopathology of Angioleiomyoma of the Buccal Cheek. *Case Rep Dent.* 2021 Apr 30;2021:9940304. doi: 10.1155/2021/9940304. PMID: 34012685; PMCID: PMC8105109.
5. Matsuyama A, Hisaoka M, Hashimoto H. Angioleiomyoma: a clinicopathologic and immunohistochemical reappraisal with special reference to the correlation with myopericytoma. *Hum Pathol.* 2007 Apr;38(4):645-51. doi: 10.1016/j.humpath.2006.10.012. Epub 2007 Jan 31. PMID: 17270242.
6. Giudice A, Bennardo F, Buffone C, Brancaccio Y, Plutino FM, Fortunato L. Clinical and

- Immunohistochemical Features of Oral Angioleiomyoma: A Comprehensive Review of the Literature and Report of a Case in a Young Patient. *Case Rep Dent*. 2019 Feb 27;2019:2498353. doi: 10.1155/2019/2498353. PMID: 30937194; PMCID: PMC6415311.
7. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R, Glanville J, Grimshaw JM, Hróbjartsson A, Lalu MM, Li T, Loder EW, Mayo-Wilson E, McDonald S, McGuinness LA, Stewart LA, Thomas J, Tricco AC, Welch VA, Whiting P, Moher D. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ*. 2021 Mar 29;372:n71. doi: 10.1136/bmj.n71. PMID: 33782057; PMCID: PMC8005924.
8. Amir-Behghadami M, Janati A Population, Intervention, Comparison, Outcomes and Study (PICOS) design as a framework to formulate eligibility criteria in systematic reviews *Emergency Medicine Journal* 2020;37:387.
9. Brooks JK, Nikitakis NG, Goodman NJ, Levy BA. Clinicopathologic characterization of oral angioleiomyomas. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2002 Aug;94(2):221-7. doi: 10.1067/moe.2002.125276. PMID: 12221390.
10. Mahima VG, Patil K, Srikanth HS. Recurrent oral angioleiomyoma. *Contemp Clin Dent*. 2011 Apr;2(2):102-5. doi: 10.4103/0976-237X.83071. PMID: 21957385; PMCID: PMC3180846.
11. Rawal SY, Rawal YB. Angioleiomyoma (Vascular Leiomyoma) of the Oral Cavity. *Head Neck Pathol*. 2018 Mar;12(1):123-126. doi: 10.1007/s12105-017-0827-9. Epub 2017 Jun 6. PMID: 28589436; PMCID: PMC5873482.
12. Aitken-Saavedra J, da Silva KD, Gomes AP, Vasconcelos AC, Etges A, Nóbrega TG, Tarquinio SB. Clinicopathologic and immunohistochemical characterization of 14 cases of angioleiomyomas in oral cavity. *Med Oral Patol Oral Cir Bucal*. 2018 Sep 1;23(5):e564-e568. doi: 10.4317/medoral.22649. PMID: 30148476; PMCID: PMC6167101.
13. Bubola J, Bradley G, Leong I, Chugh D, Magalhaes M. Oral angioleiomyomas: a case series and review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2025 Oct;140(4):467-475. doi: 10.1016/j.oooo.2025.04.097. Epub 2025 Apr 28. PMID: 40410117.