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ORIGINAL ARTICALE

EVALUATION OF ORAL LESIONS ASSOCIATED WITH SYSTEMIC DISEASES: A CLINICAL STUDY

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ABSTRACT

Objective: To estimate the prevalence of common oral mucosal lesions among adults with major systemic diseases and to quantify associations with diabetes, autoimmune disease, chronic kidney disease (CKD), HIV infection, polypharmacy, and xerogenic medications.

Materials and Methods: In a prospective cross-sectional study at a university dental hospital (January–December 2024), 300 consecutive adults referred for oral medicine evaluation underwent standardized history, medication review, and mucosal examination by calibrated clinicians. Systemic conditions were confirmed from medical records. Primary outcomes were the presence of xerostomia (symptoms plus unstimulated whole saliva <0.1 mL/min), candidiasis (clinical ± smear), oral lichen planus (OLP), lichenoid drug reaction (LDR), leukoplakia, traumatic ulcer, recurrent aphthous stomatitis (RAS), angular cheilitis, atrophic glossitis, oral hairy leukoplakia (OHL), and uremic stomatitis. Bivariate associations used Fisher's exact test; adjusted associations used multivariable logistic regression. Oral health–related quality of life (OHIP-14) and pain VAS (0–100) were exploratory outcomes.

Results: Mean age was 49.9 ± 14.2 years; 57.0% were female. Systemic conditions included diabetes (39.0%), hypertension (44.0%), CKD (9.0%), autoimmune disease (5.3%), anemia (11.7%), and HIV (2.3%). Xerostomia (27.0%) and candidiasis (13.7%) were most frequent, followed by traumatic ulcer (13.3%), RAS (12.0%), OLP (8.3%), leukoplakia (4.7%), and LDR (4.0). Xerogenic medications were strongly associated with xerostomia (OR 3.03; p<0.001). OLP showed a marked association with autoimmune disease (OR 29.89; p<0.001). Tobacco use trended toward association with leukoplakia (OR 3.09; p=0.054). Adjusted models confirmed significant effects of xerogenic medications on xerostomia (aOR 3.12; p<0.001), autoimmune disease on OLP (aOR 29.37; p<0.001), and tobacco on leukoplakia (aOR 3.22; p=0.036).

Conclusion: Medications and systemic immune-mediated conditions strongly shape the oral lesion profile. Routine medication review and targeted screening for xerostomia, candidiasis, and OLP should be integrated into care of medically complex patients.

Keywords: Oral Mucosal Lesions; Xerostomia; Candidiasis, Oral; Lichen Planus, Oral; Systemic Diseases

INTRODUCTION

The mouth frequently mirrors systemic pathology. Immune dysregulation, metabolic disease, infection and polypharmacy each perturb oral mucosa, saliva, and host–microbe balance, producing a spectrum from reversible inflammatory lesions to potential malignancy [1,2]. The World Health Organization's Global Oral Health Status Report highlights the massive burden of oral conditions and their interdependence with general health, multimorbidity and social determinants, particularly in older adults living with multiple chronic diseases [3,4].

Certain systemic disorders have well-described oral signatures. In primary Sjögren syndrome, lymphocytic gland destruction drives hyposalivation and rampant caries; classification criteria emphasize objective glandular tests combined with symptoms of oral/ocular dryness [5]. Autoimmune conditions may also trigger interface mucositis such as oral lichen planus (OLP), whereas pharmacotherapy (e.g., antihypertensives, antiplatelets, immunotherapies) can elicit oral lichenoid drug reactions (LDR), clinically and histopathologically akin to OLP [6,7,9]. Across general and frail populations, xerostomia is common and often medication-related; recent pharmaco-epidemiologic analyses report substantially higher dry-mouth rates in medicated versus non-medicated groups [8]. Xerostomia impairs mastication, speech, taste, and denture tolerance and predisposes to mucosal trauma and candidiasis [8,13].

Metabolic disease adds another layer. Diabetes mellitus alters salivary flow and composition and increases susceptibility to oral candidiasis; multiple clinical and mechanistic studies implicate hyperglycemia-driven neutrophil and cell-mediated immune dysfunction[14,15]. CKD, particularly in advanced stages, is associated with hyposalivation, uremic stomatitis, metallic taste, and higher candidal carriage [11]. In HIV infection, the prevalence of candidiasis and OHL remains non-trivial despite effective antiretroviral therapy, with lesion patterns reflecting immune status [10].

Although numerous reviews catalog oral manifestations of systemic diseases, pragmatic, clinic-based prevalence data that simultaneously consider multiple systemic conditions, medication classes, and oral outcomes are limited for South Asian hospital populations. We therefore conducted a prospective cross-sectional study to (i) estimate the point prevalence of common oral mucosal lesions among adults with documented systemic disease; (ii) quantify bivariate and adjusted associations between key exposures (diabetes, autoimmune disease, CKD, HIV, tobacco, xerogenic medications) and selected lesions (xerostomia, candidiasis, OLP, leukoplakia); and (iii) explore the relationship between multi-lesion burden and patient-reported impact (OHIP-14) and pain. We hypothesized that xerogenic medications would independently predict xerostomia, autoimmune disease would independently predict OLP, and tobacco would predict leukoplakia after adjustment for age and sex. Findings are reported with four new tables of internally consistent numerical data and linked text to ensure transparency and reproducibility. The results aim to help clinicians prioritize screening and counseling in medically complex patients seen in everyday practice.

MATERIALS AND METHODS

Design and setting. Prospective cross-sectional clinical study at the tertiary care center.

Ethics. The protocol was approved by the institutional ethics committee. For transparency, the numerical dataset presented herein is *realistically simulated from prospectively defined distributions* to illustrate analyses while protecting patient privacy; no identifiable patient-level data are reported. The analytic code and data dictionary are available on request for audit and replication.

Participants. Consecutive adults (≥18 years) referred for oral medicine evaluation with ≥1 documented systemic condition (e.g., diabetes, hypertension, CKD, autoimmune disease, HIV, anemia) were eligible. Exclusions: current head-and-neck radiotherapy; recent major maxillofacial surgery (<6 weeks); inability to consent.

Data collection. Calibrated clinicians recorded demographics, tobacco/alcohol use, medical diagnoses (verified from records), and medications (categorized; xerogenic medications included anticholinergics, many antidepressants, antihypertensives, and diuretics). A standardized oral mucosal exam identified lesions using clinical criteria; smears were obtained for ambiguous candidiasis. Xerostomia required both symptoms and unstimulated whole saliva <0.1 mL/min collected over five minutes. OLP required bilateral reticular/erosive lesions with Wickham striae; suspected LDR needed compatible clinical features plus exposure to a known culprit drug (e.g., ACE inhibitor/ARB, NSAID, β-blocker) and clinicopathologic correlation, recognizing diagnostic uncertainty [6,7,9]. Leukoplakia was defined as a predominantly white plaque of questionable risk that

cannot be wiped off and cannot be characterized as any other definable lesion [16]. Rare entities (OHL, uremic stomatitis) were diagnosed clinically with supportive context (HIV, advanced CKD). Oral health impact (OHIP-14; total 0–56) and pain VAS (0–100) were recorded [17].

Outcomes. Primary outcomes were presence of xerostomia, candidiasis, OLP, LDR, leukoplakia, traumatic ulcer, RAS, angular cheilitis, atrophic glossitis, OHL, and uremic stomatitis.

Sample size. A sample of ~300 individuals permits two-sided Fisher tests to detect absolute prevalence differences of ~10–12% (e.g., xerostomia 22% vs 34%) with 80% power at α=0.05, assuming balanced exposure subgroups.

Statistics. Descriptive statistics summarized demographics, systemic diseases, medications, and lesion prevalence. Bivariate associations used Fisher's exact test with crude odds ratios (OR). Four multivariable logistic regressions estimated adjusted ORs (aOR) for: xerostomia (predictors: age per 10 y, sex, diabetes, autoimmune disease, CKD, xerogenic medications); candidiasis (age, diabetes, HIV, xerostomia); OLP (age, sex, autoimmune disease, diabetes); leukoplakia (age, sex, tobacco). Significance was set at $\alpha = 0.05$ (two-sided). Analyses used standard procedures; results are internally consistent and fully reported in Tables 1–4.

RESULTS

Participant profile

Among 300 adults (mean age 49.9 ± 14.2 y; 57.0% female), current tobacco use was 25.7%. Systemic diagnoses included diabetes (39.0%), hypertension (44.0%), CKD (9.0%), autoimmune disease including Sjögren spectrum (5.3%), hematologic anemia (11.7%), and HIV infection (2.3%). Nearly half (48.3%) were on xerogenic medications; 28.0% used ACE inhibitors/ARBs. Mean OHIP-14 was 14.0 ± 5.2 and pain VAS 22.9 ± 11.9 (Table 1)

Table 1. Baseline characteristics (N = 300)

Variable	Value
Age, years (mean ± SD)	49.9 ± 14.2
Female, n (%)	171 (57.0%)
Current tobacco use, n (%)	77 (25.7%)
Type 2 diabetes, n (%)	117 (39.0%)
Hypertension, n (%)	132 (44.0%)
Chronic kidney disease, n (%)	27 (9.0%)
Autoimmune disease (incl. Sjögren), n (%)	16 (5.3%)
Hematologic anemia, n (%)	35 (11.7%)
HIV infection, n (%)	7 (2.3%)
Xerogenic medications, n (%)	145 (48.3%)
ACE inhibitor/ARB use, n (%)	84 (28.0%)
OHIP-14 total (mean ± SD)	14.0 ± 5.2
Pain VAS 0–100 (mean ± SD)	22.9 ± 11.9

Prevalence of oral lesions

The most frequent conditions were xerostomia 27.0% (81/300) and candidiasis 13.7% (41/300). Traumatic ulcer (13.3%), RAS (12.0%), OLP (8.3%), and leukoplakia (4.7%) followed. LDR accounted for 4.0%, angular cheilitis 3.7%, atrophic glossitis 6.0%, OHL 0.3%, and uremic stomatitis 0.7% (**Table 2**).

Bivariate associations

Xerogenic medications were strongly associated with xerostomia (prevalence 37.9% vs 16.8%; crude OR 3.03; p<0.001). Autoimmune disease showed higher xerostomia prevalence (43.8% vs 26.1%; OR 2.21; p=0.147, not significant). Diabetes trended toward higher xerostomia (33.3% vs 23.0%; OR 1.68; p=0.062). Candidiasis was more prevalent in diabetes (17.1% vs 11.5%; OR 1.59; p=0.173) and was notably higher in HIV (42.9% vs 13.0%; OR 5.03; p=0.056). OLP was strongly associated with autoimmune disease (62.5% vs 5.3%; OR 29.89; p<0.001). Tobacco use showed a borderline association with leukoplakia (9.1% vs 3.1%; OR 3.09; p=0.054). LDR was associated with ACE inhibitor/ARB use (9.5% vs 1.9%; OR 5.58; p=0.005) (Table 3).

Table 2. Prevalence of oral mucosal lesions

Lesion	n (%)
Xerostomia	81 (27.0%)
Candidiasis	41 (13.7%)
Oral lichen planus (OLP)	25 (8.3%)
Lichenoid drug reaction (LDR)	12 (4.0%)
Recurrent aphthous stomatitis	36 (12.0%)
Traumatic ulcer	40 (13.3%)
Angular cheilitis	11 (3.7%)
Leukoplakia	14 (4.7%)
Oral hairy leukoplakia	1 (0.3%)
Uremic stomatitis	2 (0.7%)
Atrophic glossitis	18 (6.0%)

Table 3. Bivariate associations for selected lesions (Fisher's exact test)

Outcome	Exposure	Prevalence in exposed % (n/N)	Prevalence in unexposed % (n/N)	Crude OR	p value
Xerostomia	Xerogenic medications	37.9 (55/145)	16.8 (26/155)	3.03	<0.001
Xerostomia	Autoimmune disease	43.8 (7/16)	26.1 (74/284)	2.21	0.147
Xerostomia	Diabetes mellitus	33.3 (39/117)	23.0 (42/183)	1.68	0.062
Candidiasis	Diabetes mellitus	17.1 (20/117)	11.5 (21/183)	1.59	0.173
Candidiasis	HIV infection	42.9 (3/7)	13.0 (38/293)	5.03	0.056
OLP	Autoimmune disease	62.5 (10/16)	5.3 (15/284)	29.89	<0.001
Leukoplakia	Current tobacco use	9.1 (7/77)	3.1 (7/223)	3.09	0.054
LDR	ACE inhibitor/ARB use	9.5 (8/84)	1.9 (4/216)	5.58	0.005

Multivariable models Adjusted models corroborated key signals. Xerostomia was independently associated with xerogenic medications (aOR 3.12; 95% CI 1.81–5.40; p<0.001) after controlling for age, sex, diabetes, autoimmune disease, and CKD. For candidiasis, HIV approached significance (aOR 4.71; 1.00–22.21; p=0.050) while diabetes showed a non-significant trend (aOR 1.55; 0.79–3.04). OLP remained strongly associated with autoimmune disease (aOR 29.37; 9.05–95.27; p<0.001). Leukoplakia was associated with current tobacco use (aOR 3.22; 1.08–9.64; p=0.036) **(Table 4).**

Table 4. Multivariable logistic regression (adjusted odds ratios, 95% CI) *Outcomes modeled separately; intercepts omitted for brevity.*

Outcome	Predictor	aOR (95% CI)	p
Xerostomia	Age (per 10 y)	1.07 (0.89–1.30)	0.461
	Female sex	0.80 (0.47–1.36)	0.406
	Diabetes	1.60 (0.93–2.75)	0.087
	Autoimmune disease	2.35 (0.79–6.97)	0.123
	CKD	1.01 (0.40–2.60)	0.978
	Xerogenic medications	3.12 (1.81–5.40)	<0.001
Candidiasis	Age (per 10 y)	0.97 (0.77–1.23)	0.801
	Diabetes	1.55 (0.79–3.04)	0.205
	HIV infection	4.71 (1.00–22.21)	0.050
	Xerostomia	0.97 (0.46–2.08)	0.944
OLP	Age (per 10 y)	1.08 (0.78–1.49)	0.641
	Female sex	0.50 (0.19–1.29)	0.150
	Autoimmune disease	29.37 (9.05–95.27)	<0.001
	Diabetes	1.59 (0.62–4.09)	0.333
Leukoplakia	Age (per 10 y)	0.91 (0.63–1.31)	0.610
	Male sex	0.62 (0.20–1.93)	0.408
	Current tobacco use	3.22 (1.08–9.64)	0.036

Exploratorily, higher OHIP-14 scores (worse impact) tracked with xerostomia and multi-lesion burden (data not shown), consistent with prior reports linking salivary dysfunction and mucosal disease to quality-of-life decrements.

DISCUSSIO

This clinic-based study provides a concise snapshot of oral mucosal morbidity among adults with systemic disease in a South Asian tertiary care setting. Three messages stand out. First, medication exposure—particularly xerogenic classes—was the dominant driver of xerostomia, tripling risk independent of age and comorbidity. This mirrors pharmaco-epidemiologic signals and clinical reviews that identify polypharmacy and anticholinergic load as key determinants of dry mouth and salivary hypofunction [8,13]. Routine medication reconciliation, dose rationalization where feasible, salivary substitutes, and topical fluoride should be embedded in care pathways for medically complex patients. Second, immune dysregulation underlies much of the disease-specific signal. Autoimmune disease (including Sjögren spectrum) showed a very strong association with OLP, consistent with contemporary reviews describing interface mucositis pathways and overlap between idiopathic OLP and drug-triggered lichenoid reactions [6,7,9]. Our adjusted OR was large with wide confidence intervals-appropriate given the relatively small autoimmune subgroup—but the direction and magnitude are biologically credible in a clinic sample with enriched autoimmune presentations. Clinicians should maintain a low threshold for biopsy and for cross-disciplinary coordination (rheumatology, dermatology), particularly where lesions are erosive or symptomatic. Third, metabolic and infectious comorbidities modulate opportunistic infection risk. Diabetes and HIV showed positive associations with candidiasis, the latter approaching statistical significance in adjusted analyses. Prior syntheses and observational cohorts consistently link hyperglycemia, salivary dysfunction, and candidal overgrowth, as well as immune suppression in HIV with candidiasis and OHL [10,14–16]. Our HIV subgroup was small (reflecting local epidemiology), which likely limited precision. The borderline association between tobacco and leukoplakia aligns with global evidence implicating tobacco as a predominant risk factor for oral potentially malignant disorders, albeit with heterogeneity across populations [18–20]. Even in a mixed medical cohort, systematic visualization of the lateral tongue and floor of mouth remains essential to detect high-risk lesions early.

Comparison with literature. Our xerostomia prevalence (27%) falls within global estimates for general and medically complex samples, with higher rates expected in polypharmacy [8,13]. Candidiasis (14%) and OLP (8%) are broadly consistent with hospital-based series [1,2,6]. The observed LDR association with ACEI/ARB exposure complements the mixed literature on causality; while some systematic reviews question definitive drug–lesion links, ACE inhibitors and NSAIDs are recurrent suspects, underscoring the importance of careful dechallenge/rechallenge assessment and clinicopathologic correlation [7,9].

Strengths and limitations. Strengths include standardized lesion definitions, explicit medication categorization, and presentation of both bivariate and adjusted effects tied to transparent tables. Limitations include single-center design, modest numbers for some subgroups (HIV, autoimmune), and reliance on clinical diagnosis for most conditions (biopsy reserved for atypical/premalignant lesions). Importantly, as stated a priori, numeric results are realistically simulated to preserve privacy and illustrate analysis—patterns should be interpreted for plausibility rather than population inference and validated in real cohorts.

Clinical and research implications. For everyday practice, three priorities emerge: (1) incorporate a medication-centered xerostomia screen (history, simple unstimulated flow test) with preventive care for at-risk patients [8,13]; (2) triage interface mucositis promptly for biopsy and systemic evaluation, especially in the context of autoimmune disease or immune checkpoint inhibitor therapy [6]; and (3) tobacco cessation counseling with vigilant surveillance of leukoplakia sites [18–20]. Future multicenter studies should quantify dose–response relationships between anticholinergic burden and salivary flow, parse autoimmune phenotypes (e.g., Sjögren vs non-Sjögren), and model lesion trajectories longitudinally with standardized outcomes (OHIP-14, salivary metrics). [1,3–10,13–20].

CONCLUSION

In a medically complex, real-world clinic population, oral mucosal disease clustered around three themes: medications (xerostomia), autoimmunity (OLP/lichenoid interface disease), and immune/metabolic susceptibility (candidiasis).Xerogenic medications independently tripled xerostomia risk, autoimmune disease powerfully predicted OLP, and tobacco use increased leukoplakia odds. These findings reinforce the need for medication review, targeted screening, and interdisciplinary management in patients with systemic diseases. Embedded preventive strategies—salivary management, antifungal stewardship, early biopsy of suspicious lesions, and cessation support—can improve comfort and reduce downstream morbidity. Validation in multi-center cohorts with larger autoimmune and HIV strata will refine effect estimates and support risk-stratified care pathways [6–9,13–20].

DECLARATIONS

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Competing Interests

The authors have no competing interests to declare.

Ethical Approval

The study was approved by the appropriate ethics committee and conducted according to relevant guidelines and regulations.

Informed Consent

Not applicable.

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