Alqalam Journal of Medical and Applied Sciences. 2026;9(11):3809-3814
https://doi.org/10.54361/ajmas.261137

Original article

Localised Reactive Hyperplastic Gingival Lesions: A 20-Year Retrospective Study at the Faculty of Dentistry, University of Benghazi

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Abstract
Localised reactive hyperplastic gingival lesions are common benign proliferations associated with local irritation and chronic inflammation. Their demographic characteristics and anatomical distribution may vary across populations. To determine the frequency and distribution of localised reactive hyperplastic gingival lesions and evaluate their associations with patient age, sex, and anatomical location. This retrospective descriptive study reviewed archived histopathological records from the Oral Pathology Laboratory, Faculty of Dentistry, University of Benghazi, Libya, covering January 2000 to December 2019. A total of 237 histopathologically confirmed cases were included. Demographic, anatomical, and histopathological characteristics were extracted from the records and analysed. The mean patient age was 35.01 ± 15.59 years (range: 3–90), and females represented 73.0% of cases. Pyogenic granuloma (PG) was the most frequent diagnosis (46.8%), followed by peripheral ossifying fibroma (POF; 20.7%), Focal Fibrous Hyperplasia (IF; 19.0%), and peripheral giant cell granuloma (PGCG; 13.5%). Age did not differ significantly among diagnostic groups ($p = 0.061$), and no significant association was observed between sex and diagnosis ($p = 0.202$). Similarly, anatomical arch was not significantly associated with diagnosis ($p = 0.926$). However, a significant association was found between anatomical region and diagnosis ($\chi^2 = 11.939$, $p = 0.008$). IF and POF were proportionally more frequent anteriorly, whereas PGCG was more frequent posteriorly. PG was the predominant lesion, and anatomical region was significantly associated with histopathological diagnosis. These findings contribute to understanding the epidemiological patterns of reactive gingival lesions in a Libyan population.
Keywords. Gingiva, Pyogenic Granuloma, Focal Fibrous Hyperplasia, Peripheral Ossifying Fibroma.

Introduction

The oral mucosa is continuously exposed to various internal and external stimuli that may result in a wide spectrum of pathological conditions, ranging from inflammatory and reactive lesions to neoplastic disorders. Gingival enlargement is a relatively common clinical finding that may occur as a localised or generalised response to chronic irritation, inflammation, hormonal changes, and other local or systemic factors [1]. Localised reactive hyperplastic gingival lesions represent an important group of non-neoplastic proliferative conditions that develop in response to persistent or recurrent tissue injury, resulting in an exaggerated tissue response [2]. These lesions are frequently associated with local irritants, including dental plaque and calculus, food impaction, defective or overhanging restorations, ill-fitting prostheses, orthodontic appliances, and traumatic or iatrogenic factors. Hormonal changes, particularly those associated with pregnancy, may also influence their development [3,4].

The gingiva is the most common intraoral site for these lesions, reflecting its susceptibility to chronic local irritation and inflammation [2]. Persistent irritation may induce tissue injury and an inflammatory response, followed by proliferation of various cellular components, including endothelial cells, fibroblasts, and multinucleated giant cells, with mineralisation occurring in some lesions [5]. These processes may ultimately result in localised hyperplasia and the formation of an exophytic gingival mass [6]. Although the lesions share similar etiological factors, their clinical and histopathological characteristics differ, supporting their classification as distinct pathological entities [2]. The principal types include pyogenic granuloma [PG], peripheral ossifying fibroma [POF], peripheral giant cell granuloma [PGCG], and focal fibrous hyperplasia [FFH]. Other classifications describe these conditions using related terminology, including fibrous epulis, fibroepithelial polyp, and peripheral giant cell lesion. Although some authors have proposed that these lesions may represent different histological stages of a common reactive process, their precise relationship remains uncertain [2]. Clinically, localised reactive hyperplastic gingival lesions may present as sessile or pedunculated nodular masses with smooth or ulcerated surfaces and colouration ranging from pale pink to bright red [7]. Their clinical appearance may overlap with that of other pathological conditions, including neoplastic lesions, making histopathological examination important for establishing an accurate diagnosis [8]. Although these lesions are generally non-neoplastic, they may interfere with oral hygiene, mastication, speech, tooth eruption, and dental aesthetics [1].

Appropriate management therefore depends on accurate clinical and histopathological diagnosis, identification and elimination of contributing local irritants, and surgical excision when indicated. Early recognition and treatment may help prevent dentoalveolar complications and improve functional and aesthetic outcomes [9]. The frequency and distribution of reactive hyperplastic lesions may vary according to demographic characteristics, anatomical location, and the histopathological type of lesion [8]. Previous studies have documented these lesions in different populations; however, their reported patterns may not necessarily reflect the distribution observed in other geographical and clinical settings. In particular, information on the long-term frequency and demographic and anatomical distribution of localised reactive hyperplastic gingival lesions in the population served by the Faculty of Dentistry, University of Benghazi, remains limited.

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Received*: 13-09-2026 -* ***Accepted****: 11-11-2026 -* ***Published****: 18-11-2026*

Therefore, this 20-year retrospective study aimed to determine the frequency and distribution of localised reactive hyperplastic gingival lesions among biopsy specimens archived at the Department of Oral Pathology, Faculty of Dentistry, University of Benghazi. The study specifically evaluated the demographic characteristics of affected patients, including age and sex, and the anatomical distribution of the lesions. The findings may contribute to a better understanding of the local epidemiological profile of these conditions and support clinical diagnosis and future research in oral pathology.

Methods

Study Design and Setting

This retrospective descriptive study was conducted at the Oral Pathology Laboratory, Department of Oral Medicine, Pathology, Diagnosis and Radiology, Faculty of Dentistry, University of Benghazi, Libya. The study involved a review of archived histopathological records of localised reactive hyperplastic gingival lesions diagnosed over 20 years, from January 2000 to December 2019. Ethical approval was obtained from the Scientific Research Ethics Committee, Faculty of Dentistry, University of Benghazi, Libya (Approval No. 0508).

Study Population and Case Selection

A total-census sampling approach was adopted to identify all available cases meeting the eligibility criteria during the study period. The study included histopathologically confirmed cases of four localised reactive hyperplastic gingival lesions: focal fibrous hyperplasia (FFH), pyogenic granuloma (PG), peripheral ossifying fibroma (POF), and peripheral giant cell granuloma (PGCG). Cases were identified through archived biopsy records and histopathological reports.

Eligibility criteria

The inclusion criteria were histopathologically confirmed diagnoses of one of the four specified lesions within the study period, irrespective of patient age or sex, with sufficient demographic, anatomical, and diagnostic information for analysis. cases were excluded if they represented non gingival lesion, lacked a definitive histopathological diagnosis, or constituted duplicate records. Cases with unspecified anatomical locations were retained in the overall analysis but excluded from analyses involving.

Data Collection

Data were extracted from archived histopathological records and reports using a standardised data extraction form. The variables recorded included patient age and sex, anatomical location of the lesion, and histopathological diagnosis.
Anatomical location was classified according to the jaw involved (maxilla or mandible) and the regional location (the classification was based on the recorded tooth number and anatomical site. the anterior region included incisors and canines, whereas the posterior region included premolars and molars). Histopathological diagnoses were categorised as FFH, PG, POF, or PGCG.

Statistical Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS) version 28. Descriptive statistics were used to summarise the demographic, anatomical, and histopathological characteristics of the study population. Categorical variables were presented as frequencies and percentages, whereas age was summarised using the mean, standard deviation, and range. The association between histopathological diagnosis and age was assessed using the Kruskal–Wallis test because age distributions were compared across four independent diagnostic groups. Associations between categorical variables, including histopathological diagnosis, sex, anatomical arch (maxilla or mandible), and anatomical region (anterior or posterior), were examined using Pearson's chi-square test. The initial analysis included all 237 cases with histopathologically confirmed localised reactive hyperplastic gingival lesions. However, anatomical site and region were unspecified in 26 cases (11.0%). These cases were retained in the overall descriptive analysis and in analyses that did not require anatomical information but were excluded from association analyses involving anatomical site and region. Consequently, analyses of anatomical distribution and its associations with sex or histopathological diagnosis were conducted using the 211 cases with documented anatomical locations. All statistical tests were two-tailed, and a p-value of less than 0.05 was considered statistically significant.

Results

A total of 237 histopathologically diagnosed cases of localised reactive hyperplastic gingival lesions were included in the study (Table 1). The patients' mean age was 35.01 ± 15.59 years, ranging from 3 to 90 years. Females accounted for 173 cases (73.0%), while males represented 64 cases (27.0%). Regarding anatomical distribution, the maxilla was the most frequently documented site, accounting for 117 cases (49.4%), followed by the mandible, with 94 cases (39.7%). The anatomical arch was unspecified in 26 cases (11.0%). Similarly, lesions were most frequently located in the anterior region, accounting for 122 cases (51.5%), whereas 89 cases (37.6%) involved the posterior region. The anatomical region was unspecified in 26 cases (11.0%). Histopathological examination revealed that pyogenic granuloma (PG) was the most common diagnosis, accounting for 111 cases (46.8%). Peripheral ossifying fibroma (POF) in 49 cases (20.7%), followed by

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Received*: 13-09-2026 -* ***Accepted****: 11-11-2026 -* ***Published****: 18-11-2026*

focal fibrous hyperplasia (IF) was identified in 45 cases (19.0%), and peripheral giant cell granuloma (PGCG) in 32 cases (13.5%) (Table 1).

Table 1. Baseline demographic, anatomical, and histopathological characteristics of the study population (N = 237)

Characteristic	Category	n (%)
Age (years)	Mean ± SD	35.01 ± 15.59
	Range	3–90
Sex	Male	64 (27.0)
	Female	173 (73.0)
Anatomical arch	Maxilla	117 (49.4)
	Mandible	94 (39.7)
	Unspecified	26 (11.0)
Anatomical region	Anterior	122 (51.5)
	Posterior	89 (37.6)
	Unspecified	26 (11.0)
Histopathological diagnosis	Pyogenic granuloma (PG)	111 (46.8)
	Peripheral ossifying fibroma (POF)	49 (20.7)
	Focal Fibrous Hyperplasia	45 (19.0)
	Peripheral giant cell granuloma (PGCG)	32 (13.5)

Age did not differ significantly among the four histopathological diagnostic groups (Kruskal–Wallis H = 7.386, df = 3, *p* = 0.061). Although the peripheral giant cell granuloma (PGCG) group had the highest mean rank for age (147.66), followed by Focal Fibrous Hyperplasia (121.54), peripheral ossifying fibroma (POF) (117.10), and pyogenic granuloma (PG) (110.55), the overall difference was not statistically significant. Similarly, no statistically significant association was observed between sex and histopathological diagnosis (Pearson's χ^2 = 4.616, df = 3, p = 0.202). Females constituted the majority of cases across all four diagnostic groups, accounting for 86 (49.7%) of PG cases, 34 (19.7%) of FFH cases, 19 (11%) of PGCG cases, and 34 (19.7%) of POF cases.

Table 2. Association of Histopathological Diagnosis with Patient Age and sex (n=237)

Variable	Category	PG (n=111)	FFH (n=45)	PGCG (n=32)	POF (n=49)	Test statistic	p-value
Age	Mean rank	110.55	121.54	147.66	117.10	H = 7.386	0.061
Sex	Male, n (%)	25 (39.1)	11 (17.2)	13 (20.3)	15 (23.4)	χ^2 = 4.616	0.202
	Female, n (%)	86 (49.7)	34 (19.7)	19 (11.0)	34 (19.7)		

The association between anatomical arch and histopathological diagnosis was not statistically significant (Pearson's χ^2 = 0.469, df = 3, p = 0.926). Pyogenic granuloma (PG) was the most common diagnosis in both the maxilla (47.0%) and mandible (50.0%). The distributions of Focal Fibrous Hyperplasia, peripheral giant cell granuloma (PGCG), and peripheral ossifying fibroma (POF) were also relatively similar between the two arches. In contrast, a statistically significant association was observed between anatomical region (anterior versus posterior) and histopathological diagnosis (Pearson's χ^2 = 11.939, df = 3, p = 0.008). PG was the most frequent diagnosis in both regions, accounting for 45.1% of anterior lesions and 52.8% of posterior lesions. POF and IF were proportionally more frequent in the anterior region, accounting for 23.8% and 21.3% of cases, respectively, compared with 12.4% for each diagnosis in the posterior region. Conversely, PGCG was more frequent in the posterior region (22.5%) than in the anterior region (9.8%). These findings indicate that the distribution of histopathological diagnoses differed significantly between the anterior and posterior regions, although no significant association was identified with the anatomical arch.

Table 3. Association between anatomical distribution and histopathological diagnosis (n = 211)

Anatomical variable	Category	PG, n (%)	FFH, n (%)	PGCG, n (%)	POF, n (%)	χ^2	df	*p*-value
Anatomical arch	Maxilla	55 (47.0)	20 (17.1)	18 (15.4)	24 (20.5)	0.469	3	0.926
	Mandible	47 (50.0)	17 (18.1)	14 (14.9)	16 (17.0)			
Anatomical region	Anterior	55 (45.1)	26 (21.3)	12 (9.8)	29 (23.8)	11.939	3	0.008*
	Posterior	47 (52.8)	11 (12.4)	20 (22.5)	11 (12.4)			

Discussion

Localised reactive hyperplastic lesions of the gingiva represent a group of common oral mucosal lesions that develop in response to local irritation, trauma, and chronic inflammatory stimuli. The principal histopathological diagnoses investigated in the present study were pyogenic granuloma [PG], Focal Fibrous Hyperplasia, peripheral giant cell granuloma [PGCG], and peripheral ossifying fibroma [POF]. Understanding the relative frequencies, demographic characteristics, and

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Received: *13-09-2026 -* ***Accepted:*** *11-11-2026 -* ***Published:*** *18-11-2026*

anatomical distributions of these lesions is important for interpreting their epidemiological patterns and supporting appropriate clinical assessment. The present retrospective study evaluated 237 histopathologically diagnosed cases over 20 years, providing information about the demographic characteristics, diagnostic distribution, and anatomical location of localised reactive hyperplastic gingival lesions. The mean age of patients in the present study was 35.01 ± 15.59 years, with a wide age range of 3–90 years. This finding indicates that localised reactive hyperplastic gingival lesions can occur across a broad age spectrum, although the overall distribution was centred around early to middle adulthood. The mean age was lower than the 41.58 years reported in a study of gingival lesions at King Abdulaziz University Dental Hospital [10].

Differences in patient populations, referral patterns, and the diagnostic composition of the study samples may partly explain this variation. Females accounted for 173 cases [73.0%], whereas males accounted for 64 cases [27.0%], demonstrating a clear female predominance in the overall study population. This finding is consistent with the female predominance reported for several reactive gingival lesions, particularly PG and POF, in previous studies [11–13]. Similarly, the Iraqi study reported a female predominance for PG and PGCG [14]. The female predominance observed in the present study may partly reflect the demographic distribution of the patients represented in the biopsy records and the relative frequencies of the included lesions. Hormonal influences have been proposed as potential contributors to the development of PG, particularly during pregnancy, because estrogen and progesterone may increase gingival susceptibility to irritation associated with dental plaque and calculus [11]. Nevertheless, the overall female predominance in our sample cannot be attributed exclusively to hormonal factors because pregnancy status, hormonal concentrations, and other potential sex-related risk factors were not assessed. PG was the most frequent diagnosis in the present study, accounting for 111 of 237 cases [46.8%]. POF was the second most common lesion, comprising 49 cases [20.7%], followed by IF, with 45 cases [19.0%], and PGCG, with 32 cases [13.5%]. He predominance of PG was also reported in the Iraqi study by Al Rawi [14] Although its relative frequency deferent from that observed in the present study [14].

However, the diagnostic distribution differed from that reported in the study conducted at M. R. Ambedkar Dental College and Hospital, Bengaluru, where focal fibrous hyperplasia [FFH] was the most common lesion, accounting for 38% of cases, followed by PG at 35%, POF at 18%, and PGCG at 9% [11]. These differences may reflect variation in the populations examined, referral patterns, study periods, diagnostic criteria, and the characteristics of the biopsy services involved. Differences in local oral hygiene practices, exposure to chronic irritants, and access to dental care may also contribute to variation in the distribution of reactive gingival lesions, although these factors were not directly investigated in the present study. A retrospective histopathological study of gingival lesions conducted at an academic dental centre provides additional context, although direct comparison is limited because that investigation examined a broader spectrum of gingival lesions [10]. Reactive/adaptive lesions represented most of the overall sample, and PG was the most common lesion within this category [10,13,15–17]. These findings support the importance of reactive lesions in gingival biopsy services, although differences in study populations and diagnostic classifications should be considered when comparing proportions. The relatively high frequency of PG in our sample is clinically relevant because this lesion is a reactive vascular proliferation that commonly develops in response to local irritation or trauma.

Despite its name, PG is not a true granuloma and is not necessarily associated with a pyogenic infection; histologically, it is characterised by prominent vascular proliferation, immature connective tissue, and inflammatory cells [11–20]. Its reactive nature and vascularity may contribute to its frequent recognition in clinical practice and its representation among gingival biopsy specimens. POF accounted for 20.7% of cases in the present study, a proportion comparable to the 18% reported in a previous study [11]. Both findings identify POF as one of the principal localised reactive hyperplastic lesions of the gingiva. POF is generally considered a reactive lesion potentially arising from tissues associated with the periodontal ligament or periosteum and may contain mineralised components within a fibrous connective tissue background [21,22]. The relatively similar proportions reported in these studies suggest that POF constitutes a substantial component of biopsy-diagnosed reactive gingival lesions across different clinical settings. IF represented 19% of the cases in the present study, whereas FFH accounted for 38% in the study conducted at M. R. Ambedkar Dental College and Hospital [11]. Although the terminology differs, irritation fibroma and focal fibrous hyperplasia are commonly used to describe localised reactive fibrous proliferations associated with trauma or chronic irritation. The lower proportion of IF in the present study may reflect differences in diagnostic classification, biopsy submission practices, or the relative frequencies of other lesions. Because the present investigation included histopathologically diagnosed biopsy cases, the results describe the distribution of lesions submitted for histopathological examination rather than the prevalence of these lesions in the general population. PGCG accounted for 13.5% of cases, making it the least frequent diagnostic category in the present study. This proportion was higher than the 9% reported in the Bengaluru study [11].

PGCG is a localised reactive lesion that develops on the gingiva or alveolar mucosa and is characterised histologically by multinucleated giant cells within a vascular and cellular connective tissue stroma. Its occurrence may be associated with local irritants and tissue responses. The association between sex and histopathological diagnosis was not statistically significant [Pearson's $\chi^2 = 4.616$, df = 3, p = 0.202; N = 237]. Although females accounted for the majority of cases overall, the distribution of diagnoses did not differ significantly between males and females. Among males, PG accounted for 25 cases [39.1%], followed by POF in 15 cases [23.4%], PGCG in 13 cases [20.3%], and IF in 11 cases [17.2%]. Among females, PG was also the most frequent diagnosis, accounting for 86 cases [49.7%], followed by IF and POF, each accounting for 34 cases [19.7%], and PGCG, accounting for 19 cases [11.0%]. These findings suggest that PG was the predominant diagnosis in both sexes, although its proportion was higher among females. The relatively higher proportion of PGCG among males

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Received*: 13-09-2026 -* ***Accepted****: 11-11-2026 -* ***Published****: 18-11-2026*

and the higher proportion of PG among females were descriptive differences that did not reach statistical significance. Previous studies have reported different lesion-specific sex distributions, including male predominance for FFH and female predominance for PG and POF[11,13,22]. It was also reported female predominance for PG, PGCG, and POF, although it identified a relatively high number of PG cases among adolescent males [14]. Such differences suggest that the sex distribution of reactive gingival lesions may vary across populations and diagnostic categories. Importantly, the non-significant result in our study does not establish that sex does not influence lesion development; rather, it indicates that the observed differences were insufficient to demonstrate a statistically significant association in this sample. Age distributions did not differ significantly among the four histopathological diagnostic groups [Kruskal–Wallis H = 7.386, df = 3, p = 0.061; N = 237]. PGCG had the highest mean rank for age [147.66], followed by IF [121.54], POF [117.10], and PG [110.55]. Although the higher mean rank for PGCG suggests a tendency towards higher ages in this group, the overall comparison did not reach statistical significance. Therefore, the findings do not provide sufficient evidence of an association between patient age and histopathological diagnosis.

Previous studies have reported different age patterns, with FFH and PG frequently occurring during the third and fourth decades and POF commonly reported in younger adults [11]. Another study reported a peak incidence of PG in the second decade [14]. These differences may reflect variation in the populations examined, diagnostic composition, and referral patterns. The broad age range in the present study further demonstrates that these lesions are not restricted to a single age group. However, because the age comparison was not statistically significant, the observed differences in mean ranks should be interpreted cautiously. Regarding anatomical distribution, the maxilla was the most frequently documented arch, accounting for 117 cases [49.4%], compared with 94 cases [39.7%] involving the mandible. Anatomical information was unavailable for 26 cases [11.0%]. Among cases with recorded anatomical locations, the anterior region was more frequently affected, accounting for 122 cases, whereas 89 cases involved the posterior region. These overall distributions describe the anatomical characteristics of the study population; however, they do not necessarily indicate a statistically significant preference for a particular arch or region for individual diagnostic categories. The association between arch and histopathological diagnosis was not statistically significant [Pearson's χ^2 = 0.469, df = 3, p = 0.926; N = 211]. PG was the most frequent diagnosis in both the maxilla, accounting for 55 cases [47.0%], and the mandible, accounting for 47 cases [50 %]. The distributions of IF, PGCG, and POF were also broadly similar across the two arches. Although POF represented 20.5% of maxillary lesions compared with 17% of mandibular lesions, this descriptive difference was not statistically significant. These findings suggest that the distribution of the four diagnostic categories did not differ significantly between the maxilla and mandible in the present sample.

Previous reports have described maxillary predominance for PG and POF [14,23]; however, the absence of a significant association in our study indicates that such patterns should not be assumed to apply uniformly across populations. In contrast, a statistically significant association was observed between anatomical region and histopathological diagnosis [Pearson's χ^2 = 11.939, df = 3, *p* = 0.008; N = 211]. Among anterior lesions, PG accounted for 55 cases [45.1%], followed by POF in 29 cases [23.8%], IF in 26 cases [21.3%], and PGCG in 12 cases [9.8%]. Among posterior lesions, PG remained the most frequent diagnosis, accounting for 47 cases [52.8%], followed by PGCG in 20 cases [22.5%], IF in 11 cases [12.4%], and POF in 11 cases [12.4%]. These descriptive findings indicate that IF and POF were more frequently located anteriorly, whereas PGCG was more frequently located posteriorly. PG showed a comparatively more balanced distribution across the two regions. The significant association between anatomical region and diagnosis is an important finding because it indicates that the relative distribution of histopathological categories varied between anterior and posterior sites. The pattern also differ from anterior predominance of PG reported in Iraq study reported by Al Rawi [14]. Such differences may reflect variation in study populations, diagnostic composition, and case selection. The anterior predominance of IF and POF may be compatible with previously discussed associations between reactive lesions and local irritation or periodontal ligament-related tissues [21,22]; however, the present study did not assess the underlying etiological factors and therefore cannot establish the mechanisms responsible for the observed anatomical distribution.

Several limitations should be considered when interpreting these findings. First, the retrospective design relied on archived histopathological records, which restricted the analysis to information documented in the original files. Second, anatomical information was missing for 26 cases [11%], leaving 211 cases available for analyses of anatomical arch and region. Consequently, the anatomical findings should be interpreted in relation to cases with complete location data. Third, biopsy-based data may not represent the distribution of lesions in the general population because lesions that were not biopsied or referred for histopathological examination were not included. Furthermore, potential contributing factors, including oral hygiene, plaque accumulation, calculus, trauma, pregnancy, and hormonal status, were not directly assessed. Finally, the single-centre setting may limit the generalizability of the findings to other populations.

Future multicentre studies incorporating standardised clinical information, consistent diagnostic classifications, and more comprehensive assessment of local and systemic risk factors could provide a clearer understanding of the epidemiology and potential determinants of localised reactive hyperplastic gingival lesions.

Conclusion

Pyogenic granuloma was the most frequent histopathological diagnosis, followed by peripheral ossifying fibroma, Focal Fibrous Hyperplasia, and peripheral giant cell granuloma. Females constituted the majority of cases; region was significantly associated with histopathological diagnosis, with Focal Fibrous Hyperplasia and peripheral ossifying fibroma

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Received: *13-09-2026 -* ***Accepted:*** *11-11-2026 -* ***Published:*** *18-11-2026*

occurring more frequently in the anterior region, whereas peripheral giant cell granuloma was more frequently observed posteriorly. These findings highlight the importance of anatomical location in understanding the distribution of reactive gingival lesions.

Conflicts of Interest

The authors declare no conflicts of interest.

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