Research Article

DOI : http://doi.org/10.64805/jnda.v25i2.202602

Assessment of Comorbidities in Oral Lichen Planus: A Comparative Cross Sectional Hospital Based Study

Nisha Paunju,[1] Jyotsna Rimal,[2] Iccha Kumar Maharjan,[2] Pragya Regmee,[2] Ashish Shrestha[3]

[1]Department of Oral Medicine and Radiology, Nepalgunj Medical College &Teaching Hospital, Kohalpur, Banke, Nepal;
[2]Department of Oral Medicine and Radiology, College of Dental Surgery, B.P. Koirala Institute of Health Science, Dharan, Nepal;
[3]Department of Public Health Dentistry, College of Dental Surgery, B.P. Koirala Institute of Health Science, Dharan, Nepal.

Correspondence :
Nisha Paunju. Email: nisha.paunju2@gmail.com

ABSTRACT

Introduction: Oral lichen planus (OLP) is a chronic mucocutaneous disease with multifactorial etiology and pathogenesis. It has been associated with numerous systemic diseases. However, meager information exists on common comorbidities in OLP.

Objective: To determine the association of OLP with common comorbidities including hypertension, diabetes mellitus, dyslipidemia, thyroid dysfunction and Hepatitis C virus (HCV) infection.

Methodology: This comparative cross-sectional study was conducted at B.P. Koirala Institute of Health Sciences (BPKIHS), Nepal. Twenty-six patients (cases) with clinically and histopathologically diagnosed OLP and 26 age and sex matched healthy individuals (controls) were selected and assessed for hypertension, diabetes, thyroid dysfunction, dyslipidemia and HCV infection. Chi-square test and Odds Ratio (95% confidence interval) were used for statistical analysis.

Result: When compared to controls, patients with hypothyroidism were associated with a fivefold increased odds of having OLP (OR 5.33, 95% CI: 1.01-28.21) and the difference was statistically significant (p =0.035). Hypertension (p=0.569), diabetes (p= 0.442) and dyslipidemia (p=0.578) were not significantly associated with OLP. All the subjects screened for anti-HCV antibodies were found to be HCV negative.

Conclusion: OLP patients should be evaluated for the presence of thyroid diseases and vice versa so that it can be diagnosed at early stage and treated accurately.

Keywords: Association; comorbidity; hypothyroidism; oral lichen planus.

INTRODUCTION

Oral lichen planus (OLP) is a mucosal variant of Lichen Planus (LP) which is an immunologically based, chronic inflammatory mucocutaneous disorder.[1,2] LP generally occurs more commonly in females in the ratio of 3:2, and between 5th and 6th decade of life.[3,4] The prevalence of OLP in general population varies from 0.5 – 2.0%.[5]

Despite extensive research, the etiology of OLP and mechanism of its development is still unclear.[6] Some researchers believe a complex series of immune-

Citation
Paunju N et al. Assessment of Comorbidities in Oral Lichen Planus: A Comparative Cross Sectional Hospital Based Study. J Nepal Dent Assoc. 2025 Jul-Dec;25(41):3-10.

modulated events is responsible for the pathogenesis of OLP.[5] OLP has been reported to be associated with certain systemic diseases, including hepatitis C virus (HCV), hypertension, diabetes mellitus, and thyroid disease.[5] Among thyroid disorders, Hashimoto Thyroiditis (HT) and hypothyroidism have been identified to be associated with OLP.[7] Various research studies have also found a greater prevalence of dyslipidemia in patients with LP.[8] Currently, there is convincing evidence that at least in some geographic regions, OLP is associated with HCV infection.[7] It has therefore become a subject of interest for research studies regarding the association of OLP with systemic diseases, especially hormonal and metabolic disorders.[9]

Thus, the present study was carried out to have a better understanding of the association of OLP with hypertension, diabetes mellitus, dyslipidemia, thyroid dysfunction and HCV infection.

MATERIALS AND METHODS

A comparative cross-sectional study was conducted among 52 patients visiting the Department of Oral Medicine and Radiology, College of Dental surgery, BPKIHS among which 26 were clinically and histopathologically diagnosed with OLP and 26 were age and sex matched healthy individuals with no clinically detectable oral lesions. Duration of the study was one year (May 2020 –May 2021). Ethical clearance was obtained from Institutional Review Committee of BPKIHS (Ref. number: 406/076/077-IRC, Code number: IRC/1703/019). Informed consent was received from all participants in the written form.

Patients aged 18 years and above who had been clinically and histopathologically diagnosed OLP as per Modified World Health Organization diagnostic criteria of OLP, 2003[10] were included as cases.

The Exclusion criteria included patients unwilling to participate or not giving consent, pregnant women, known patients with Diabetes Mellitus, Hypertension, Thyroid Dysfunction, dyslipidemia and HCV infection, patients who had received any topical or systemic treatment for lichen planus in the past 6 months, patients presenting with drug induced lichenoid reaction (DILR) and LCR (lichenoid contact reaction), patients known to be suffering from any medical condition that precluded them from undergoing an oral biopsy procedure, and patients with any other coexisting oral lesion.

For the control group, age and sex matched apparently healthy individuals who visited the Department of Internal Medicine; BPKIHS for whole body checkup and with no clinically detectable oral lesions on oral screening at Department of Oral Medicine and Radiology, College of Dental surgery, BPKIHS were selected.

The sample size for this study was calculated using nMaster 2.0 software (Christian Medical College, Vellore, India). The calculation was based on comparing two independent means using the formula:

$$n = \frac{(Z_{\alpha/2} + Z_{\beta})^2 (\delta_1^2 + \delta_2^2)}{(\mu_1 - \mu_2)^2}$$

Where:

n = required sample size per group

$Z_{\alpha/2}$ = Z value for significance level (1.96 for 5%)

Z_{β} = Z value for power (0.84 for 80%)

δ_1, δ_2 = standard deviations of case and control groups

$\mu_1 - \mu_2$ = expected difference between means

Using a difference between means of 21,[9] standard deviations of 33.039[9] (cases) and 18.663[9] (controls), effect size of 0.8, alpha of 5%, and power of 80%, the calculated sample size was 26 participants per group.

General demographic data like age and gender were recorded. General examination was performed and detailed oral examination was done taking note of extent, severity and type of OLP.[4] Blood

pressure was measured using manual mercury sphygmomanometer. Patients were referred to central laboratory of BPKIHS, Dharan to do blood investigations for assessment of Blood glucose level, Thyroid function test, Lipid profile and HCV (Hepatitis C Virus) Antibody Test. Patient's lab investigation reports were obtained and recorded.

- Diagnosis of hypertension was made according to the American Heart Association (AHA) 2017 guidelines[11] as blood pressure of 130/80 mm Hg or higher.
- Diabetes was diagnosed according to criteria for diagnosis of diabetes – American Diabetes Association (ADA), 2018[12] as:
  i. FPG>=126 mg/dl OR
  ii. 2-hr- PG>=200 mg/dl
- Thyroid disorder was diagnosed according to American Thyroid Association (ATA) Guidelines.[13] The reference range of TSH as per Biochemistry lab, BPKIHS was considered.
  i. TSH: 0.3-4.5 IU/ml
- Dyslipidemia was diagnosed based on the Adult Treatment Panel Guidelines of National Cholesterol Education Program (ATP/NCEP)[14] if any 1 of the following parameters was present.
  i. TC> 200 mg/dl
  ii. TG> 150 mg/dl
  iii. HDL-C<40 mg/dl
  iv. LDL-C>160 mg/dl
- Screening for HCV infection was done by an HCV- antibody test based on The American Association for the Study of Liver Disease (AASLD) and The Infectious Diseases Society of America (IDSA) – HCV guidelines.[15]

The data collected was entered in Microsoft excel sheet. It was then transferred into SPSS (Statistical Package for Social Sciences) version 20 for statistical analysis. For descriptive statistics, continuous variables in the data set were expressed as mean and standard deviation while categorical variables were expressed as frequency and percentage and tabular and graphical presentations were made. Pearson chi-square test was used in group comparison of categorical variables. The association measurement employed was the Odds Ratio (OR) with a confidence interval of 95%.

RESULTS

A total of 52 participants were enrolled in the study; 26 participants (cases) with OLP and 26 age and sex matched participants (controls) without OLP. The mean age of the patients in the study was 39.35 ± 12.011 years. Out of 26 patients enrolled in each group, 16 (61.5%) patients were female and 10 (38.5%) were male. The distribution of the study population according to age and gender is depicted in Table 1.

Table 1: Distribution of the study population according to age (data presented as mean value ± standard deviation), and gender, (data presented as frequency (percentage).

Variables		Group		Total
		Cases	Controls	
Age (years)		38.23 ± 12.317	40.46 ± 11.833	39.35 ± 12.011
Gender	Male	10 (38.5%)	10 (38.5%)	20 (38.5%)
	Female	16 (61.5%)	16 (61.5%)	32(61.5%)
	Total	26(100%)	26(100%)	52(100%)

The most common morphological types of OLP observed in this study were as follows: reticular type in 15 cases (57.7%) followed by erosive type in six cases (23.1%) and plaque type in three cases (11.5%). Less common variants observed were atrophic type and bullous type in one case (3.8%) each. (Figure 1)

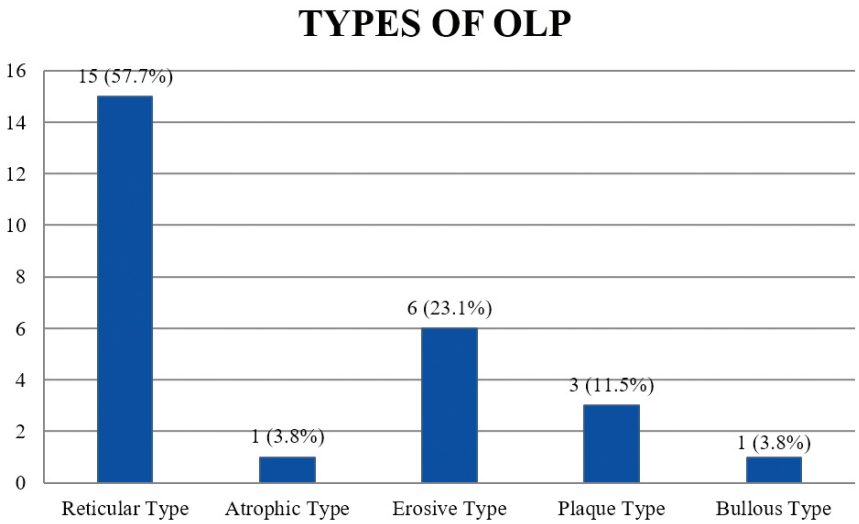

Figure 1: Distribution of patients according to type of OLP, data expressed as frequency (percentage).

Table 2: Comparison of prevalence of comorbidities in OLP cases and controls.

	Group		Total	Odds ratio (95% CI)	p value
	Cases	Controls			
Hypertension					
Absent	15(57.7%)	17(65.4%)	32 (61.5%)	1.38(0.45-4.25)	0.569 [a]
Present	11 (42.3%)	9(34.6%)	20(38.5%)		
Diabetes					
Absent	21(80.8%)	23 (88.5%)	44 (84.6%)	1.82(0.38-8.5)	0.442 [a]
Present	5 (19.2%)	3 (11.5%)	8(15.4%)		
Thyroid disorder					
Absent	18 (69.2%)	24 (92.3%)	42 (80.8%)	5.33(1.01-28.21)	0.035 [a] *
Present (Hypothyroidism)	8 (30.8%)	2 (7.7%)	10 (19.2%)		
Dyslipidemia					
Absent	13 (50.0%)	15 (57.7%)	28 (53.8%)	1.36(0.45-4.07)	0.578 [a]
Present	13 (50.0%)	11 (42.3%)	24 (46.2%)		
HCV					
Negative	26 (100%)	26(100%)	52 (100%)		.[b]
Total	26(100%)	26(100%)	52(100%)		

[a] Pearson chi-square test

*p<0.05: statistically significant

.[b] No statistics computed as HCV was negative in all participants.

The result of this study demonstrates that hypertension was present in 11 (42.3%) cases and nine (34.6%) controls. The odds ratio for association of OLP with hypertension was 1.38 (95%CI: 0.45-4.25) and it was not found to be statistically significant (p=0.569) (Table 2).

Diabetes mellitus was diagnosed in five cases (19.2%) and three controls (11.5%). Odds ratio for association of OLP with diabetes was 1.82 (95%CI: 0.38-8.5) and was not found to be statistically insignificant (p= 0.442) (Table 2).

In this study, eight (30.76%) OLP patients were found to have hypothyroidism in comparison to two (7.7%) control patients. When compared with controls, patients with hypothyroidism were associated with a fivefold increased odds of having OLP (OR: 5.33, 95% CI: 1.01-28.21) and the difference was statistically significant (p =0.035). Hyperthyroidism was not detected in any of the cases and controls (Table 2).

Of the 26 cases, 13 (50.0%) patients had dyslipidemia and among the 26 controls, 11 (42.3%) patients had dyslipidemia. The odds ratio for association of OLP with dyslipidemia was 1.36 (95%CI: 0.45-4.07) and it was not found to be statistically significant (p=0.578) (Table 2).

In both cases and controls, all the subjects were found to be HCV negative (Table 2).

DISCUSSION

Oral lichen planus is a T-cell-mediated, chronic inflammatory oral mucosal disease of unknown etiology. A number of systemic diseases have been associated with OLP, including hypertension and diabetes mellitus.[6] In this study, we have analysed many comorbidities like hypertension, diabetes mellitus, thyroid disorder, dyslipidemia and HCV infection in subjects with OLP and compared to controls matched for age and gender.

The mean age of patients with OLP in the present study was 38.23 ± 12.317 years, with a higher prevalence observed in females (61.5%). The mean age of OLP patients at diagnosis has been reported to be in the fifth decade;[16] however, in this study, it was observed in the third decade. This difference may reflect variations in referral patterns, earlier healthcare-seeking behaviour, or underlying population demographics. The female predominance observed in our cohort is consistent with prior literature,[16] suggesting a possible role of hormonal and immunological factors in disease susceptibility.

In terms of clinical subtypes, reticular OLP (57.7%) was the most common, followed by erosive (23.1%), plaque (11.5%), and atrophic and bullous forms (3.8% each). This is consistent with previous reports, where reticular lesions predominate due to their characteristic asymptomatic white striations. Erosive and atrophic forms, though less frequent, are clinically significant because they are often associated with pain and discomfort.[1] These findings highlight the importance of recognising all clinical subtypes for accurate diagnosis and management.

The association between OLP and hypertension was not found to be statistically significant in this study. This finding is consistent with the study by Christensen et al. which failed to demonstrate significant difference between the means of blood pressure of the lichen planus patients and the general adult population of Bergen.[17] Bagewadi et al. also clearly documented the negative association between the three entities of Grinspan.[18] According to Bagewadi et al., diabetes mellitus and hypertension do not play a direct role in the etiology of lichen planus. The occurrence of lichen planus like lesions in the oral cavity could be due to the drugs given to the patients suffering from these systemic ailments. Such oral lesions may also be dependent on the type of the drug and its duration. The finding of this study is inconsistent with the study done in 1963 by Grinspan et al. who found an interesting association of oral lichen planus with diabetes mellitus and hypertension, which he called Grinspan syndrome.[18] A study conducted by Barnett et al. confirmed an association between lichen

planus and hypertension. [19] This study however did not consider the iatrogenic effect of various drugs. The participants in the present study were not previously diagnosed with any systemic disorder. So, the development of OLP cannot be attributed to drug intake. Dissimilarities in findings of our study with other studies could be due to differences in age distribution and criteria of hypertension considered, since the borderline between normal and elevated blood pressure is a matter of definition.

According to the results of this study, the association between OLP and diabetes was not statistically significant. This finding is consistent with the study done by Bagewadi et al.[18] Weak association was shown between OLP and diabetes in the study by Arshiya et al.[20] The finding of this study is not consistent with the studies by Donempudi et al. and Mozaffari et al. in which higher prevalence of diabetes mellitus was noted in the cases of OLP.[4,9] Autoimmune background of lichen planus as well as diabetes mellitus supports similar pathogenesis for both the diseases.[9] The common immunological trigger factors may play a critical role in the appearance of LP in diabetes mellitus.[3] Although the number of studies about the relationship between diabetes mellitus and LP has increased during the last decades, the results are conflicting. The studies had different designs, therefore variation on methods and criteria could have impacted their results. The discrepancy between the present study and others may be due to heterogeneous diagnostic criteria for OLP and diabetes mellitus, differences in patient age groups, and the absence of long-term medication use, which excluded potential iatrogenic effects.

The findings of this study confirmed that thyroid disease had a higher association with OLP than in a control group, showing an increased risk of hypothyroidism. This finding is in accordance with a previous study by Garcia-pola et al. which concluded that OLP patients were associated with thyroid disease, specifically with hypothyroidism.[16] Kumar et al. also observed a higher prevalence of hypothyroidism in OLP.[21] A significantly higher prevalence of thyroid diseases among OLP group was shown by Li et al.[5] Arduino et al. found that patients with thyroid disease had a threefold increased odds of having OLP.[22] In spite of the few reports regarding thyroid disease and OLP, there is evidence of an epidemiological association of thyroid autoantibodies in OLP patients. A study conducted among a Chinese population with OLP indicated higher frequencies of serum antithyroglobulin, and antithyroid microsomal autoantibody, than in a healthy control group.[16] The finding of this study is dissimilar with the finding of the study by Zhou et al. which demonstrated negative association between OLP and hypothyroidism among Chinese population though statistically significant higher prevalence of thyroid disease in OLP group than control group was observed.[23] Kats et al. also observed no significant association of OLP with thyroid disease.[24] Authors have suggested that the association between OLP and hypothyroidism could be linked to an unidentified common immune-mediated process, justifying the need for further studies regarding such intriguing theory.[7] The authors have stated that varying results in different studies may be partly due to different methodology (retrospective study vs. prospective study) and different diagnostic criteria for hypothyroidism.

The present study observed a non-significant increase in the prevalence of dyslipidemia among LP patients. The finding of this study is consistent with study by Baykal et al. which showed that there was no significant increase in the prevalence of dyslipidemia in patients with LP.[25] According to study by Aniyan et al., a significant number of cases were found to have association with serum dyslipidemia however, pertaining to individual serum level in cases and control, this association was not found to be statistically significant.[6] The association of LP and dyslipidemia was first reported in a case–control study by Dreiher et al. who found that LP patients had increased dyslipidemia.[26] However, no information was provided concerning patients' lipid levels, use of lipid-lowering drugs and whether or not patients received systemic therapy for LP. Kumar et al. assessed the association between LP

and dyslipidemia and determined a significantly increased rate in the patient group.[21] Evident association between dyslipidemia and OLP was also reported by Aniyan et al.[6] Several mechanisms have been suggested to explain the association of LP with dyslipidemia including chronic inflammation, increase in inflammatory markers such as CRP, and increased immunological activity of T-helper cells with the release of cytokines such as TNF-α and IL-6.[21] The results of the present study were inconsistent with those of some other studies in terms of significant co-dependency between dyslipidemia and oral lichen planus. The difference might be attributed to reasons such as test methods, differences in laboratory methods, unknown reasons contributing to the disease pathogenesis and non-definite relationship between the two diseases.

In this study none of the subjects were positive for HCV, so the association of OLP with HCV could not be determined. Significant association of OLP with HCV infection was shown by Manomaivat et al.[27] In Europe, the relationship between hepatitis C virus and OLP was stronger in Mediterranean countries than in Northern European countries. Among Asian countries, particularly in Japan, it has been reported that a prevalence of 49% of OLP patients suffered from chronic hepatitis C virus infection.[16] The study by Anwar et al. did not detect a statistically significant relationship between OLP and HCV infection in Pakistani population which could be due to genetic variation or geographic relationship.[28] This study had no HCV positive participants and this could be attributed to the fact of low prevalence of HCV in Nepal (0.66%).[29]

The study was limited by a small sample size and short duration; therefore, larger studies with longer follow-up are needed to generalize these findings. Further research is necessary to investigate the effects of iatrogenic factors (medications) and immunological factors (stress) among patients with OLP and systemic diseases, to explore possible associations and their potential influence on the prognosis of OLP lesions.

CONCLUSION

This study suggests that OLP and thyroid disease can be considered comorbid conditions, with OLP patients showing an increased risk of hypothyroidism. These findings highlight the importance of screening for thyroid dysfunction in patients with OLP, as early detection and prompt management may help prevent long-term morbidity.

CONFLICT OF INTEREST: None.

REFERENCES

1. Olson MA, Rogers III RS, Bruce AJ. Oral lichen planus. Clin Dermatol. 2016;34(4):495-504. [PubMed | Full Text | DOI]
2. Mehdipour M, Zenouz AT, Davoodi F, et al. Evaluation of the relationship between serum lipid profile and oral lichen planus. J Dent Res Dent Clin Dent Prospects. 2015;9(4):261-6. [PubMed| Full Text | DOI]
3. Shailaja G. Association between serum lipid profile and oral lichen planus. IOSR J Dent Med Sci. 2017;16(10):29-31. [Full Text | DOI]
4. Mozaffari HR, Sharifi R, Sadeghi M. Prevalence of oral lichen planus in diabetes mellitus: a meta-analysis study. Acta Inform Med. 2016;24(6):390-3. [PubMed| Full Text | DOI]
5. Li D, Li J, Li C, et al. The association of thyroid disease and oral lichen planus: a literature review and meta-analysis. Front. Endocrinol. 2017;8:310-7. [PubMed| Full Text | DOI]
6. Aniyan KY, Guledgud MV, Patil K. Alterations of serum lipid profile patterns in oral lichen planus patients: A case–control study. Contemp Clin Dent. 2018;9(Suppl 1):112-121. [PubMed| Full Text | DOI]
7. Kurago ZB. Etiology and pathogenesis of oral lichen planus: an overview. Oral Surg Oral Med Oral Pathol Oral Radiol. 2016;122(1):72-80. [PubMed| Full Text | DOI]

8. Cassol-Spanemberg J, Rodriguez-de Rivera-Campillo ME, Otero-Rey EM, et al. Oral lichen planus and its relationship with systemic diseases. A review of evidence. J Clin Exp Dent. 2018;10(9):938-944. [PubMed| Full Text | DOI]

9. Donempudi P, Bhayya H, Meduri V, et al. Association of oral lichen planus with hepatitis C virus, surface antigen of hepatitis B virus, and diabetes: a clinical and biochemical study. J Indian Acad Oral Med Radiol. 2016;28(3):256-61. [Full Text | DOI]

10. Rad M, Hashemipoor MA, Mojtahedi A, et al. Correlation between clinical and histopathologic diagnoses of oral lichen planus based on modified WHO diagnostic criteria. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2009;107(6):796-800. [PubMed| Full Text | DOI]

11. Whelton PK, Carey RM, Aronow WS, et al. Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol. 2018;71(19):e127-248. [PubMed| Full Text | DOI]

12. American Diabetes Association. 2. Classification and diagnosis of diabetes: standards of medical care in diabetes—2018. Diabetes Care. 2018;41(Supplement 1):S13- S27. [PubMed| Full Text | DOI]

13. Ladenson PW, Singer PA, Ain KB, et al. American Thyroid Association guidelines for detection of thyroid dysfunction. Arch Intern Med. 2000;160(11):1573-5. [PubMed| Full Text | DOI]

14. Helms RA, Quan DJ, editors. Textbook of therapeutics: drug and disease management. Lippincott Williams & Wilkins. 2006;8:1082-5. [Full Text]

15. AASLD-IDSA HCV Guidance Panel. Hepatitis C guidance 2018 update: AASLD-IDSA recommendations for testing, managing, and treating hepatitis C virus infection. Clin Infect Dis. 2018;67(10):1477-92. [PubMed| Full Text| DOI]

16. Garcia-Pola MJ, Llorente-Pendás S, Seoane-Romero JM, et al. Thyroid disease and oral lichen planus as comorbidity: a prospective case-control study. Dermatology. 2016;232(2):214-9. [PubMed| Full Text | DOI]

17. Christensen E, Holmstrup P, Wiberg-Jorgensen F, et al. Arterial blood pressure in patients with oral lichen planus. J Oral Pathol. 1977;6(3):139-42. [PubMed| Full Text | DOI]

18. Bagewadi A, Bhoweer AK. Oral lichen planus and its association with diabetes mellitus and hypertension. J Indian Acad Oral Med Radiol. 2011;23(5):300. [Full Text]

19. Barnett JH, Barnett SM. Lichenoid drug reaction to chlorpropamide and tolazamide. Cutis. 1984;34(6):542-4. [PubMed| Full Text]

20. Ara SA, Mamatha GP, Rao BB. Incidence of diabetes mellitus in patients with lichen planus. Int J Dent Clin. 2011;3(1):29-33. [Full Text]

21. Kumar SA, Raju PK, Gopal KV, et al. Comorbidities in lichen planus: a case–control study in Indian patients. Indian Dermatol Online J. 2019;10(1):34-7. [PubMed| Full Text | DOI]

22. Arduino PG, Karimi D, Tirone F, et al. Evidence of earlier thyroid dysfunction in newly diagnosed oral lichen planus patients: a hint for endocrinologists. Endocr Connect. 2017;6(8):726-30. [PubMed| Full Text | DOI]

23. Zhou T, Li D, Chen Q, et al. Correlation between Oral Lichen Planus and thyroid disease in China: a case-control study. Front Endocrinol. 2018;9:330-6. [PubMed| Full Text | DOI]

24. Kats L, Goldman Y, Kahn A, et al. Oral lichen planus and thyroid gland diseases: possible associations. BMC Oral Health. 2019;19(1):169. [PubMed| Full Text | DOI]

25. Baykal L, Arıca DA, Yaylı S, et al. Prevalence of metabolic syndrome in patients with mucosal lichen planus: a case–control study. Am J Clin Dermatol. 2015; 16(5):439-45. [PubMed| Full Text | DOI]

26. Dreiher J, Shapiro J, Cohen AD. Lichen planus and dyslipidaemia: a case– control study. Br J Dermatol. 2009;161(3):626-9. [PubMed| Full Text | DOI]

27. Manomaivat T, Pongsiriwet S, Kuansuwan C, et al. Association between hepatitis C infection in Thai patients with oral lichen planus: a case-control study. J Investig Clin Dent. 2018;6(3):772-5. [PubMed| Full Text | DOI]

28. Anwar MA, Iqrar S, Akram Z, et al. Oral lichen planus and hepatitis C virus infection; a symbiotic relationship or a mere co-incidence? Int J Res Med Sci. 2018;6(3):772-5. [Full Text | DOI]

29. Shrestha A. Viral hepatitis in Nepal: Past, present, and future. Euroasian J Hepatogastroenterol. 2016;6(1):59. [PubMed| Full Text | DOI]