Original Article

Hairy Tongue and Associated Risk Factors among Outpatients in Faculty Dentistry of Damascus University: A Cross-Sectional Study

Dania Sawan[1], Ammar Mashlah[2], Abeer Aljoujou[3], Mazen D Doumani[4*]

[1]MSc, Department of Oral Medicine, Damascus University, Damascus, Syria.

[2,3]PhD, Department of Oral Medicine, Damascus University, Damascus, Syria.

[4]Rouge private clinic, Endodontist

Email: mazendom@hotmail.com

DOI: 10.47750/pnr.2022.13.S06.342

Abstract

Aim: The term hairy tongue was first coined by Amatus Lusitanus in the year 1557 as self-renewing hairs on the tongue. It is characterized by the presence of elongated filiform papillae of the dorsum of the tongue, which gives a hairy appearance, depends on two components: elongated filiform papillae and discoloration of the dorsal tongue as the result of both extrinsic and intrinsic factors. The hair-like projections in hairy tongue are thought to develop from a lack of adequate desquamation on the dorsal tongue. This prevents the breakdown of keratin layers on the dorsal tongue leads to their accumulation, known as hyperkeratosis. This occurs on the tips of the filiform papillae and leads to their elongation to be a suitable environment for bacterial growth by trapping microscopic food particles and bacteria themselves to thrive on the fermentation of amino acids and produce porphyrins, resulting in a black or brown color.

Materials and Methods: The study design was case - control sample, among patients attending the Department of Oral Medicine at the Faculty of Dentistry at Damascus University during the period from February 2021 to January 2022.Patients (n = 20). Individuals with hairy tongue were included in the study. Tongue examination was performed according to WHO clinically without biopsy, then data were collected through the attached questionnaire in both case and control groups. It included demographic information and complete history of the patients.

Results: We found that the prevalence of hairy tongue increased with male gender, and was more common with fissured tongue 15%, we reported 70% of hairy tongue patients had the lesion in the posterior third of the tongue. There was a true statistically significant correlation between the hairy tongue and predisposing as 70% smoking, 80% poor oral hygiene, 20% use oxidizing mouthwashes, 45% xerostomia and 30% use antibiotics for a long time. Although we reported 90% of hairy tongue patients had no pain, but we recorded 35% had a metallic taste and tickling sensations, 25% had burning sensation, and 55% had halitosis. There was not real statistically significant correlation between the colour of the hairy tongue and gender but on the other hand we showed that 30% black hairy tongue patients were smokers, 45% brown hairy tongue patients drank large amount of tea and coffee, and 25% creamy hairy tongue patients used medications.

Conclusion: To conclude, hairy tongue is an asymptomatic condition involving the posterior third of the tongue, which can be easily diagnosed by clinical examination and triggered by predisposing factors. A thorough detailed history is always necessary to obtain an accurate diagnosis to investigate the risk factors for establishing the successful treatment of hairy tongue.

Keywords: hairy tongue, hyperkeratosis, Oral Medicine, porphyrins, color of tongue

INTRODUCTION

Tongue is the most complex organ in the body and has a very important structure in the oral cavity. It is involved in various functions including taste, speech, chewing and swallowing. The status of the tongue is considered an indicator of systemic health and disease. 1Tongue plays an important role in maintaining the harmony in the oral environment, it should be treated from diseases. 2-7 The term black hairy tongue was first coined by Amatus Lusitanus in the year 1557 as a condition of self-renewing hairs on the tongue.5-10 Since this discovery, there has been a heightened interest in the condition and thus the number of medical articles has increased and it was first recorded by Gurvis. It is estimated the prevalence of hairy tongue 0.4 % among south Asian Population, but 11.3% in a Turkish study, where cases increased with male gender, advancing age, smoking, drinking large amounts of hot black tea and poor oral hygiene. In contrast, Shulman et al. reported a very low prevalence of

0.0029% among patients 17 years of age and older. Other studies from the United States, Finland and Iran indicate a prevalence from 0.06 to 8.4%. 8-15 The pathophysiology of BHT has not been fully understood. BHT depends on two components: elongated filiform papillae and discoloration of the dorsal tongue (though some cases without discoloration exist, in other cases, the discoloration occurs on normal (not elongated) filiform papillae; as pseudo-black hairy tongue. These two components are the result of both extrinsic factors (i.e., mouthwashes and antibiotics) and intrinsic factors (i.e., alterations in the oral microbiome) respectively. In addition, residue from tobacco, coffee, tea and other colored foods may also help in coloring these elongated structures.

Aim and objective:

The aim of the present study was to determine the most prevalent pattern of hairy tongue among patients attending the Department of Oral Medicine of Damascus faculty in 2021, with the role of some of the possible factors in the development of lesions. We also recorded the details on age, gender, medical history, history of particular habits such as smoking, symptoms and other clinical characteristics.

Materials and methods:

The study design was cross-sectional study. Among the outpatients referred to the department of Oral Medicine, Faculty Dentistry in Damascus University in the period between February 2021 and January 2022, 20 patients were selected and enrolled in the study. The mean age was (44.53 ± 13.255), respectively, (age range: 20 to 79 years). The tongue examination was performed according to the World Health Organization clinically without biopsy. After filling out a consent form we recorded details of age, gender, demographic data, medical history, habits such as smoking, oral health, systemic diseases, and various tongue lesions associated with hairy tongue in the study sample including color, location, size, shape, movement, texture and thickness of the tongue, under the illumination of the dental chair light, using a mouth mirror, and washing the patient's mouth with sterile water before performing the intraoral examination, then Data were collected through the attached questionnaire that included demographic information and complete patient history (including information regarding individual characteristics, medical history, symptoms, medications and smoking).

Statistical processing used:

We used the following statistical methods based on the Statistical Package for Social Sciences (SPSS) edition 25 for Data Analysis:

Descriptive statistics: to Describe the sample and its characteristics, and to know the percentages and frequencies of the variables.

Independence and Correlation: to evaluate the relation between two qualitative variables (evaluation of differences in ratios), where the two variables can be independent or related, the Chi-Square analysis test was applied and the P-value < 0.05 was considered to be statistically significant with 95% confidence level.

Results:

The gender distribution of the present study showed that the hairy tongue lesions were more prevalent among males (65.2%) versus females (29.4%) when compared with control group (34.8%,70.6%). There is a true statistically significant correlation between gender and the hairy tongue, $p<0.05$ with 95% confidence level, as it was found that the hairy tongue in males is more common than in females.The results were found in table 1 that the ages of the sample ranged from 20 to 79 years with mean age of 41.43 ± 11.999, majority of the age case group was in the category 60-79 with a percentage of 100%, followed by the category 40-59 about 55.6%, then the least one was 20-39 years by percentage 36.8%. Although there is not real statistically significant correlation between age groups and hairy tongue infection $p>0.05$ with 95% confidence level. We reported as in table that 70% of hairy tongue patients have the lesion in the posterior third of the tongue, 25% of them have the lesion in the

posterior two-thirds of the tongue, and 5% have the lesion in the whole dorsum of the tongue. It also showed as in table 2 that 50% of hairy tongue patients have other tongue lesions: 15% have fissured tongue, 10% have ankyloglossia, 10% have geographic tongue 10% have macroglossia and fissured, 5% have macroglossia. There is a true statistically significant correlation between hairy tongue and the presence of other tongue lesions with $p<0.05$ and 95% confidence level, as it was found that the hairy tongue is more common with fissured tongue, followed by geographic tongue or ankyloglossia and then by macroglossia, table. The results of the table 3 showed that 80% of patients drink large amount of coffee and tea, 75% smoke, 10% of patient are edentulous, 80% with poor oral hygiene, 20% use oxidizing mouthwashes, 45% have dry mouth,5% exposure to radiation therapy, 10% use hypertensives, 20% use antidepressants, and 30% used antibiotics for a long time. There is a true statistically significant correlation between the hairy tongue and predisposing factors (smoking, excess consumption of black tea and coffee, edentulous patients, poor oral hygiene, use oxidizing mouthwashes, xerostomia, radiation therapy and use medications as hypertensives, antidepressants, and antibiotics for a long time).

Table 1 Study of the relation between gender and hairy tongue

Variable	Group	Gender		P-value
		Male %	Female%	
Group	**hairy tongue**	15 (65.2)	5 (29.4)	0.025*

Used test: Chi-Square Independence Tests‹(NS) There are no statistically significant differences, (*): essential at $P < 0.05$

Table 2 Description of lesion location in hairy tongue patients

location of the lesion	Number of patients	Ratio %
Posterior third of the tongue	14	70.0
Posterior two-thirds	5	25.0
All dorsum of tongue	1	5.0
Total	**20**	**100.0**

Table 2 Description of other tongue lesions in hairy tongue patients

Other tongue lesions	Number of patients	Ratio %
None	10	50.0
Geographic	2	10.0
Macroglossia	1	5.0
Macroglossia and Fissured	2	10.0
Fissured	3	15.0
Ankyloglossia	2	10.0
Total	**20**	**100.0**

Table 3 description of the predisposing factors: (smoking, coffee and tea drinking, edentulous patients, oxidizing mouthwashes, dry mouth, radiotherapy, anti-depressants, antibiotics, anti-hypertensives) in the group of hairy tongue patients.

Variable	No	Yes	Total
	Number of patients (%)	Number of patients (%)	Number of patients (%)
Smoking	5 (25.0)	15 (75.0)	20 (100.0)
coffee and tea drinking	4 (20.0)	16 (80.0)	20 (100.0)
edentulous patients	18 (90.0)	2 (10.0)	20 (100.0)
Oxidizing mouthwashes	16 (80.0)	4 (20.0)	20 (100.0)
Dry mouth	11 (55.0)	9 (45.0)	20 (100.0)
Radiotherapy	19 (95.0)	1 (5.0)	20 (100.0)
Anti-depressants	16 (80.0)	4 (20.0)	20 (100.0)
Antibiotics	14 (70.0)	6 (30.0)	20 (100.0)
Anti-hypertensives	18 (90.0)	2 (10.0)	20 (100.0)

Table 4 The description of the symptoms (pain, halitosis, metallic taste and tickling sensation, burning) in the group of hairy tongue patients.

Variable	No	Yes	Total
	Number of patients (%)	Number of patients (%)	Number of patients (%)
Pain	18 (90.0)	2 (10.0)	20 (100.0)
Halitosis	9 (45.0)	11 (55.0)	20 (100.0)
metallic taste and tickling sensation	13 (65.0)	7 (35.0)	20 (100.0)
Burning	15 (75.0)	5 (25.0)	20 (100.0)

Table 5 Description of tongue colour in hairy tongue patients

colour of the tongue	**Number of patients**	**Ratio %**
Black	5	25.0
Brown	9	45.0
Cream	6	30.0
Total	**20**	**100.0**

Table 6 study the relation between hairy tongue colour and each of gender, smoking, drinking coffee and tea, using medications in patients					
Variable	**Group**	**Tongue colour**			
		Black %	**Brown %**	**Cream%**	**P-value**
Gender	**Male**	5 (25.0)	6(30.0)	3 (15.0)	0.308 (NS)
	Female	0 (0.0)	3 (15.0)	3 (15.0)	
Smoking	**No**	0 (0.0)	4 (20.0)	4 (20.0)	0.011*
	Yes	5(25.0)	5 (25.0)	2 (10.0)	
Drinking coffee and tea	**No**	0 (0.0)	0 (0.0)	5 (25.0)	0.002*
	Yes	5 (25.0)	9 (45.0)	1 (5.0)	
Using medications	**No**	1 (5.0)	4 (20.0)	0(0.0)	0.001*
	yes	4 (20.0)	5 (25.0)	6(30.0)	
Used test: Chi-Square Independence Tests،(NS) There are no statistically significant differences, (*): essential at P < 0.05					

The results of the table 4 reported 90% of hairy tongue patients had no pain, but we recorded 35% had metallic taste and tickling sensations, 25% had burning, and 55% had halitosis. In the table 5 we recorded that the colour of tongue was 30% (50% male 50% female) cream, 45% (66.7% male 33.3% female) brown, and 25% (100% male) black. There is no real statistically significant correlation between the colour of the hairy tongue and gender $p>0.05$ with 95% confidence level. We recorded a true statistically significant correlation between the colour of the hairy tongue and smoking, $p<0.05$ with 95% confidence level. The results of table 5 showed that all black hairy tongue patients, 88.8% of brown hairy tongue, and 16.7% of creamy hairy tongue were smokers. We recorded a true statistically significant correlation between the colour of the hairy tongue and consummation of tea and coffee, $p<0.05$ with 95% confidence level. The results of table 5 showed that all black and brown hairy tongue patients, and 16.7% of creamy hairy tongue drank large amount of tea and coffee. We recorded a true statistically significant correlation between the colour of the hairy tongue and use medications, $p<0.05$ with 95% confidence level. The results of table 6 showed that 80% of black hairy tongue patients, 77.7% of brown hairy tongue, and all of creamy hairy tongue used medications.

Discussion:

The present study is the first study to investigate the factors associated with hairy tongue among outpatients attending the department of Oral Medicine, Faculty Dentistry of Damascus University.The gender distribution of the present study showed that the hairy tongue lesions were more prevalent among males (65.2%) versus females (29.4%) when compared with control group (34.8%,70.6%). It agrees with the most studies showed that males presented with a greater ratio of hairy tongue lesions when compared with female patients.1-8 Age is a predisposing factor, with elderly males being more likely to develop a BHT,as the results were found in our study the ages of the sample ranged from 20 to 79 years with mean age of 41.43 ± 11.999, majority of the age case group was in the category 60-79 with a percentage of 66.7%, followed by the category 40-59 about 57.1%, then the least one was 20-39 years by percentage 28.6%, comparing to (33.3%, 42.9%, 71.4% respectively) in the control group.This agrees with most studies showing a prevalence of nearly 40% in patients over the age of 60 years, other studies considered HT is more common in elderly patients. According to some studies believed HT as a disease of old age due to react of acid in the mouth that produced by gastritis, excess of fermentable food or paucity of saliva in the aged. The acid reaction favors the growth of yeasts and filiform acidophilous bacilli, and adhesion of the epithelial scales to each other, it seems to be the essential underlying factor. 8-15 Our study reported that 70% of hairy tongue patients have the lesion in the posterior third of the tongue, 25% of them have the lesion in the posterior two-thirds of the tongue, and 5% have the lesion in the whole dorsum of the tongue. We agreed with all studies that were defined HT as an acquired condition affecting the dorsal tongue characterized by darkly discolored, elongated filiform papillae, and it typically affects the dorsum of the tongue in all studies, but it is positively correlated with the posterior third of the tongue in most studies showing a prevalence of nearly 70% in patients in our study. It is characteristically confined to the posterior two-thirds of the tongue, and the involvement of other parts of the tongue is

relatively rare to undermine the other leading differential diagnoses. Contradicting to the previous reported studies, fissured tongue was found to be more associated with hairy tongue rather than other tongue lesions. In our study there is a true statistically significant correlation between smoking and the hairy tongue infection, smoking leads to estimated prevalence of 75% in hairy tongue patients. 16-25 In contrast to several studies linking hairy tongue with smoking , there are some articles that do not confirm such high rates, they reported that the casual smoking poses a slightly increased risk of having BHT compared to non-smokers (15% to 10% in men, 5.5% to 5.2% in women). As a result all studies believed that smoking was a predisposing factor to trigger excess production of keratin and discoloration of the keratin.26-29 Our results show a significant relationship between HT and excess consumption of black tea and coffee which was similar to that in Prabha's study.30 However, other studies confirmed such a relationship. However we believed as most studies that excess consumption of black tea and coffee was a predisposing factor to trigger excess production of keratin, and discoloration of the keratin, by caffeinated product, or hot drinking it may lead to lowering pH on the dorsum of the tongue promoting chromogenic bacterial overgrowth, but it needs more investigation. In our study we noticed another possible etiological factor (edentulous patients) may predispose to more susceptible of hairy tongue, similarly to that in other studies. We reported 10% of the hairy tongue at edentulous patients. We suggested the reason to the diet composed of primarily soft foods. This is because Soft or pureed diets with less roughage, as in edentulous patients, are less likely to desquamate the dorsal tongue than rough or textured foods and therefore lead to keratin retention. Although the poor oral hygiene is accused in the etiology in our study. This can be attributed to presence of candida infection. We recorded 80% of hairy tongue lesions associated with poor oral health in our study, as in the other studies that reported that the poor oral hygiene are important risk factors that predispose some patients to develop BHT. On the other hand, we recorded in our study 20% of hairy tongue lesions associated with the excessive use of oxidizing mouthwashes. This agreed with existing literature also demonstrates an association between BHT and excessive use of agents intended to improve oral hygiene such as oxidizing mouthwashes, which are containing sodium perborate, sodium peroxide, and hydrogen peroxide. 30-38 This can be attributed to the excess production of keratin which can be triggered by irritants as oxidizing mouthwashes. In our study we found that another risk factor for the development of BHT was dry mouth, considering it as a predisposing factor. The result showed that 45% of patients have dry mouth. This is in agreement with most studies, where xerostomia was considered a possible etiological factor in hairy tongue. In addition, some studies support the idea that several factors can lead to xerostomia which are implicated in causation of hairy tongue . Some of these conditions that causing dry mouth are recent radiation therapy, broad spectrum of medications (local or systemic antibiotics), antidepressants, and anti-hypertensives. In our study we reported only one patient had radiation therapy with hairy tongue lesion. but other studies suggested the radiation therapy is an important risk factor that predispose some patients to develop hairy tongue. Perhaps the reasons for the different results arise from the type of population and the number of cases used in our study. Our study recorded that 10% of the hairy tongue patients used antihypertensives, 20% used antidepressant medications, and 30% used antibiotics for a period of time. we concluded that some medications were believed to be responsible for dry mouth etiology, that demonstrated to be mainly exposed to a higher risk of developing hairy tongue. Additionally, local or systemic antibiotic use may significantly alter oral flora, thus potentially predisposing the patient to develop hairy tongue. In our study we reported 10% of hairy tongue patients had pain. We suggested that the pain is a causative factor not a symptom of hairy tongue. From our point this pain hinders mastication, which is thought to limit normal desquamation of the keratinized filiform papillae and lead to hyperkeratosis and hence elongation of the papillae. Although, the course of hairy tongue is usually asymptomatic, we recorded 55% of hairy tongue patients in our sample had halitosis, 35% had metallic taste and tickling sensations, 25% had burning. We consider that was probably due to the growth of candida colonies, which causes these symptoms on the affected dorsum of the tongue. As the result in most studies. In our study the color ranges from cream to brown to black by distribution rates 30% (50% male 50% female), 45% (66.7% male 33.3% female, 20% (100% male) respectively. We disagreed with Kutlu 18 that considered the classic discoloration for the disease is black. but we agreed with others thought the symptoms are not limited to black discoloration of the tongue, as the color may also be yellow, brown, green or blue or even unpigmented. On the other hand, there was no real statistically significant correlation between the colour of the hairy tongue and gender. We did not find any article about this relationship between the colour of hairy tongue and gender, but we believed this result is logical. This may be due to the idea that colour of hairy tongue is depending on extrinsic and intrinsic factors. We recorded a true statistically significant correlation between smoking and the colour of the hairy tongue with $p<0.05$ and 95% confidence level. Moreover, that black tongue colour was most common among smokers 30%, followed by brown and then creamy. Similarly, to the study reported that hairy tongue clinically appears as elongated hair like projections on the dorsum of the tongue which gets stained blackish brown due to the presence of carbon in the tobacco smoke.33-40 Our results showed that was a true statistically significant correlation between coffee and tea drinking and the colour of the hairy tongue with $p<0.05$ and 95% confidence level, also reported that brown tongue colour was most common in patients who drink coffee and tea 45%, followed by black then creamy. Although we recorded a true statistically significant correlation between the colour of the hairy tongue and use medications for a long time with 30% creamy colour followed by brown then black. We considered the justification of this result was the discoloration is thought to be related to the presence of color-producing organisms (such as Candida albicans) or the attachment of drugs.

Conclusion

To conclude, hairy tongue is an insignificant condition involving the posterior third of tongue, which can be diagnosed easily by clinical examination. It is more common with fissured tongue. Although its etiology is not fully understood, hairy tongue is frequency increased with male gender, smoking, excess consumption of black tea and coffee, edentulous patients, poor oral hygiene, use oxidizing mouthwashes, xerostomia, radiation therapy and use medications as hypertensives, antidepressants, and antibiotics for a long time. Hairy tongue is usually asymptomatic. Some cases were associated with halitosis, metallic taste and tickling sensations, and burning. The colour of hairy tongue ranges from cream to brown to black and is depending on extrinsic and intrinsic factors. A thorough detailed history is always necessary for establishing the diagnosis and treatment of hairy tongue.

Recommendations

Further studies are required with a larger sample size and more geographic extension to assess hairy tongue patients.

Limitation

A limitation of our study was that only one experienced clinician performed the tests, but like most similar studies, we used only one trained and calibrated examiner to avoid inter-observer variations. Training and calibration of the examiner minimized intra-observer variability.

REFERENCES

1. Rajarammohan, K., Narayanan, M., Ravikumar, P. T., Fenn, S. M., & Gokulraj, S. (2020). Hairy Tongue–A Series of 4 Cases. Journal of Evolution of Medical and Dental Sciences, 9(35), 2567–2571.
2. Calabrese, L., Bizzoca, M. E., Grigolato, R., Maffini, F. A., Tagliabue, M., Negro, R., Leuci, S., Mignogna, M. D., & Lo Muzio, L. (2020). From Bench to Bedside in Tongue Muscle Cancer Invasion and Back again: Gross Anatomy, Microanatomy, Surgical Treatments and Basic Research. Life, 10(9), 197. https://doi.org/10.3390/life10090197
3. LAMBERTINI, M., PATRIZI, A., RAVAIOLI, G. M., & DIKA, E. (2018). Giornale Italiano di Dermatologia e Venereologia 2018 October; 153 (5): 666-71. Giornale Italiano Di Dermatologia, 153.
4. Akcaboy, M., Sahin, S., Zorlu, P., & Şenel, S. (2017). Ranitidine-induced black tongue: A case report. Pediatric Dermatology, 34(6), e334–e336.
5. Anitha, N., & Jayachandran, D. (2021). Tongue Lesions-A Review. NVEO-NATURAL VOLATILES & ESSENTIAL OILS Journal| NVEO, 28–37.
6. outpatients. Oral Diseases, 9(4), 188–195.
7. Burge, E., & Kogilwaimath, S. (2021). Hairy tongue. CMAJ, 193(16), E561–E561. https://doi.org/10.1503/cmaj.201559
8. Ansarin, M., Bruschini, R., Navach, V., Giugliano, G., Calabrese, L., Chiesa, F., Medina, J. E., Kowalski, L. P., & Shah, J. P. (2019). Classification of GLOSSECTOMIES: Proposal for tongue cancer resections. Head & Neck, 41(3), 821–827.
9. Avcu, N., & Kanli, A. (2003). The prevalence of tongue lesions in 5150 Turkish dental
10. Camkurt, M. A., Metin, M. S., & Sonmez, E. O. (2015). Black Hairy Tongue Probably Related to Paroxetine Use: A Case Report. Klinik Psikofarmakoloji Bülteni-Bulletin of Clinical Psychopharmacology, 25(4), 403–406. https://doi.org/10.5455/bcp.20150707104145
11. Erriu, M., Pili, F. M. G., Denotti, G., & Garau, V. (2016). Black hairy tongue in a patient with amyotrophic lateral sclerosis. Journal of International Society of Preventive & Community Dentistry, 6(1), 80–83. https://doi.org/10.4103/2231-0762.175408
12. Casu, C., Nosotti, M. G., & Sinesi, A. (2019). Hairy tongue, geographic tongue, scrotal tongue and systemic connections: Clinical images and an overview. Dentist Case Rep, 3, 01–03.
13. Cheshire Jr, W. P. (2004). Unilateral black hairy tongue in trigeminal neuralgia. Headache: The Journal of Head and Face Pain, 44(9), 908–910.
14. Gurvits, G. E., & Tan, A. (2014). Black hairy tongue syndrome. World Journal of Gastroenterology : WJG, 20(31), 10845–10850. https://doi.org/10.3748/wjg.v20.i31.10845
15. Sakamoto, Y. (2018). Structural arrangement of the intrinsic muscles of the tongue and their relationships with the extrinsic muscles. Surgical and Radiologic Anatomy: SRA, 40(6), 681–688. https://doi.org/10.1007/s00276-018-1993-5
16. Sanders, I., & Mu, L. (2013). A Three-Dimensional Atlas of Human Tongue Muscles. The Anatomical Record, 296(7), 1102–1114. https://doi.org/10.1002/ar.22711
17. Jain, A. K., Puri, M. M., & Sarin, R. (2017a). Black brown discoloration and hairy tongue–A rare linezolid side effect. Indian Journal of Tuberculosis, 64(1), 44–46.
18. Kutlu, Ö., Özdemir, P., Karadeniz, T. B., Vahaboğlu, G., & Ekşioğlu, H. M. (2015). A case of black hairy tongue responding to oral nystatin and vitamin B complex treatment. TURKDERM - Turkish Archives of Dermatology and Venereology, 49(4), 291–293. https://doi.org/10.4274/turkderm.61214
19. Jain, A. K., Puri, M. M., & Sarin, R. (2017b). Black brown discoloration and hairy tongue – A rare linezolid side effect. Indian Journal of Tuberculosis, 64(1), 44–46. https://doi.org/10.1016/j.ijtb.2016.06.003
20. Jhaj, R., Gour, P. R., & Asati, D. P. (2016). Black hairy tongue with a fixed dose combination of olanzapine and fluoxetine. Indian Journal of Pharmacology, 48(3), 318–320. https://doi.org/10.4103/0253-7613.182894
21. Kazemi, A., Shulman, K., & Russo, M. (2021). Amitriptyline-Induced Multifocal Oral Mucosal Dyspigmentation-Bridging Pharmacopsychodermatology in Skin of Color.
22. LAMBERTINI, M., PATRIZI, A., RAVAIOLI, G. M., & DIKA, E. (2018). Giornale Italiano di Dermatologia e Venereologia 2018 October; 153 (5): 666-71. Giornale Italiano Di Dermatologia, 153.

23. Luo, S., Luo, Q., Gao, X., & Li, J. (2020a). Adverse reaction report and retrospective analysis of black hairy tongue caused by linezolid. Respiratory Medicine Case Reports, 31, 101159.
24. Owczarek-Drabińska, J. E., & Radwan-Oczko, M. (2020). A Case of Lingua Villosa Nigra (Black Hairy Tongue) in a 3-Month-Old Infant. The American Journal of Case Reports, 21, e926362-1.
25. Luo, S., Luo, Q., Gao, X., & Li, J. (2020b). Adverse reaction report and retrospective analysis of black hairy tongue caused by linezolid. Respiratory Medicine Case Reports, 31, 101159. https://doi.org/10.1016/j.rmcr.2020.101159
26. Murry, T., Carrau, R. L., & Chan, K. (2020). Clinical management of swallowing disorders. Plural Publishing.
27. Ren, J., Zheng, Y., Du, H., Wang, S., Liu, L., Duan, W., Zhang, Z., Heng, L., & Yang, Q. (2020). Antibiotic-induced black hairy tongue: Two case reports and a review of the literature. Journal of International Medical Research, 48(10), 0300060520961279.
28. , L., & Giger, R. (2011). Black hairy tongue. The American Journal of Medicine, 124(9), 816–817.
29. Popik, E., Barroso, F., Pombeiro, J., Carvalho, C., & Almeida, A. (2018). Hairy tongue in a 1-month-old infant. Archives of Disease in Childhood, archdischild-2017.
30. Prabha, N., Arora, R. D., Singh, N., & Nagarkar, N. M. (2020). Glycopyrrolate-Induced Black Hairy Tongue. Indian Dermatology Online Journal, 11(2), 256–257. https://doi.org/10.4103/idoj.IDOJ_54_19
31. Rosebush, M. S., Briody, A. N., & Cordell, K. G. (2019). Black and Brown: Non-neoplastic Pigmentation of the Oral Mucosa. Head and Neck Pathology, 13(1), 47–55. https://doi.org/10.1007/s12105-018-0980-9
32. Schlager, E., St. Claire, C., Ashack, K., & Khachemoune, A. (2017). Black Hairy Tongue: Predisposing Factors, Diagnosis, and Treatment. American Journal of Clinical Dermatology, 18(4), 563–569. https://doi.org/10.1007/s40257-017-0268-y
33. Sheikh, Z., Khan, A. S., & Khan, S. (2011). Lingua villosa nigra. The Lancet, 377(9772), 1183. https://doi.org/10.1016/S0140-6736(10)60930-0
34. Sreeja, C., Ramakrishnan, K., Vijayalakshmi, D., Devi, M., Aesha, I., & Vijayabanu, B. (2015). Oral pigmentation: A review. Journal of Pharmacy & Bioallied Sciences, 7(Suppl 2), S403.
35. Tavares, T. S., Meirelles, D. P., de Aguiar, M. C. F., & Caldeira, P. C. (2018). Pigmented lesions of the oral mucosa: A cross-sectional study of 458 histopathological specimens. Oral Diseases, 24(8), 1484–1491.
36. Cesare, B., Giovanni, B., Luigi, V., Paolo, C., Michele, R., & Luca, A. (2018). Linezolid-induced black hairy tongue. Acta Bio Medica : Atenei Parmensis, 89(3), 408–410. https://doi.org/10.23750/abm.v89i3.7060
37. Thompson, D. F., & Kessler, T. L. (2010). Drug-induced black hairy tongue. Pharmacotherapy, 30(6), 585–593. https://doi.org/10.1592/phco.30.6.585
38. Tosios, K. I., Kalogirou, E.-M., & Sklavounou, A. (2018). Drug-associated hyperpigmentation of the oral mucosa: Report of four cases. Oral Surgery, Oral Medicine, Oral Pathology and Oral Radiology, 125(3), e54–e66.
39. Uribe, P., Collgros, H., Scolyer, R. A., Menzies, S. W., & Guitera, P. (2017). In vivo reflectance confocal microscopy for the diagnosis of melanoma and melanotic macules of the lip. JAMA Dermatology, 153(9), 882–891.
40. Yüzbaşıoğlu, M., & Karagözlü, G. (2020). A benign pigmented lesion: A case of black hairy tongue. TURKISH JOURNAL OF FAMILY PRACTICE, 24(1), 51–55. https://doi.org/10.15511/tahd.20.00151