

# Knowledge about syphilis and its oral manifestations among dental students: a cross-sectional study from Brazil, 2019

**Antonio Carlos Pacheco Filho**

Universidade Estadual Paulista Julio de Mesquita Filho

**Artênio José Ispér Garbin**

Universidade Estadual Paulista Julio de Mesquita Filho

**Natália Cupertino Pires**

Universidade Federal do Espírito Santo

**Karina Tonini dos Santos Pacheco** (✉ [khtonini@yahoo.com.br](mailto:khtonini@yahoo.com.br))

Universidade Federal do Espírito Santo <https://orcid.org/0000-0002-4687-6062>

**Cléa Adas Saliba Garbin**

Universidade Estadual Paulista Julio de Mesquita Filho

---

## Research article

**Keywords:** Syphilis, dental students, oral manifestations

**Posted Date:** August 18th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-30272/v2>

**License:**  This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

---

# Abstract

**Background:** Clinical manifestations of the syphilis can occur in the mouth and in the perioral region. This study aimed to investigate the knowledge about syphilis and its oral manifestations among dental students and to discuss the role of the dentist in prevention and control of this disease.

**Methods:** This is a cross-sectional study carried out with 171 dentistry students enrolled in the second, third, fourth and fifth years in the first semester of 2019 from the Federal University of Espírito Santo, Brazil. Data collection was performed by a questionnaire containing 16 questions answered by students in classroom. Analyses of absolute and relative frequency were performed. To perform association among variables, the Chi-square test (or Fisher's exact test with Yates correction) was performed with 5% significance level.

**Results:** Overall, 169 students participated in the study. Only 40 (46.4%) students correctly answered the question about disease stages. Almost all participants answered that syphilis has oral manifestations; however, only 44 (25.7%) answered the question correctly. Regarding differential diagnoses of other oral lesions, only 63 (37.3%) reported knowledge on this subject. There was a statistically significant association between student's educational level and knowledge about the etiological agent ( $p < 0.0001$ ), clinical manifestations ( $p < 0.0001$ ), disease stages ( $p < 0.0001$ ), oral manifestations ( $p < 0.0001$ ) and drugs ( $p = 0.005$ ) related to the disease.

**Conclusions:** Participants showed important gaps in their knowledge about syphilis and its oral manifestations. Our findings, together with the increased number of new cases of the disease in the world, reinforce the need for training dental professionals with knowledge about early diagnosis, effective treatment and follow-up of syphilis cases.

## Background

Syphilis is a sexually transmitted infection (STI), considered a public health problem and is among one of the most common communicable diseases, affecting the health and life of people around the world. In 2016, the global incidence and prevalence rate for this infection was 6.3 million and 19.9 million cases, respectively [1]. It is estimated that 60% or more of cases occurring in men who have sex with men, being strongly associated with HIV co-infection and high-risk sexual behavior [2].

The situation of syphilis in Brazil is not different; the number of cases of the infection is worrying. Acquired syphilis, a condition of compulsory notification since 2010, had its detection rate increased from 59.1 cases per 100,000 inhabitants in 2017 to 75.8 cases per 100,000 inhabitants in 2018 [3].

The disease presents four distinct stages that are characterized by particular symptoms, clinical manifestations, and infectivity levels: primary, secondary, tertiary, and latent syphilis. Clinical manifestations can occur in the mouth and in the perioral region and primary and secondary lesions are highly contagious [4].

The main oral manifestations are hard chancre, mucous plaques and gumma. Oral chancre in primary syphilis is characterized as a painless ulcer, measuring 1 to 2 centimeters, with firm and rolled border [5]. It manifests as a single ulcer, usually on the lip or, more rarely, on the tongue [6]. Secondary syphilis presents multiple and generally symptomatic ulceration [7]. In these cases, lesions are maculopapular, affecting the hard palate and, sometimes, the soft palate. Gumma, associated with tertiary syphilis, initially manifests as one or more painless swelling, especially on the hard palate [8].

For this reason, in many cases, the dentist is the professional who makes the diagnosis of this pathology, and therefore plays an extremely important role in contributing to the effectiveness of diagnosis, control and treatment, through the identification of its signs and symptoms, guiding the patient in relation to procedures, treatment support and follow-up [4].

In addition, *treponema pallidum* can be transmitted by blood if the individual is exposed to infected blood and body fluid [9, 10]. This possibility of non-sexual transmission makes the dentist to be among health professionals most at risk of contamination, as accidental contact with saliva and blood may occur during clinical practice. In addition, the risk is greater when considering that 9 out of 10 patients with syphilis do not present any clinical manifestations, although they remain infectious or unaware about the infection (CDC) [11, 12]

In May 2016, the World Health Assembly adopted the 2016–2021 strategy of the global health sector for STIs. This strategy includes expanding evidence-based interventions and services to control syphilis and reduce its impact as a public health problem by 2030 [13]. Our goal is to provide data that generates insights that help create interventions to combat and prevent syphilis in the Brazilian and international scenario.

Given the above and considering the importance of academic formation that allows the insertion of dentists in multiprofessional teams for diagnosis and treatment of STIs [14] and that the knowledge may influence attitudes and behaviors [15], the aim of this study was to investigate the knowledge about syphilis and oral manifestations among dental students and to discuss the role of the dentist in prevention and control of this disease.

## Methods

This is a cross-sectional study conducted with dental students from a Federal University of Espírito Santo (UFES), Brazil. UFES is located in the capital of the state of Espírito Santo in southeastern Brazil and is the only public university in the state. In 2018, the detection rate of acquired syphilis in Espírito Santo was 114.1 cases per 100,000, higher than the rate for Brazil for the same year [3].

The sample universe was composed of all students enrolled in the second semester of the second (27), third (65), fourth (55) and fifth (44) years of the first semester of 2019, including 171 students. Students in the first year and first semester of the second year (third period) were excluded for not having taken the Stomatology discipline, which officially addresses the content discussed in this study.

Data were collected through a self-administered questionnaire with closed questions, specially designed for the research. Research subjects were included in the study based on two criteria: accepting to participate in the study and being present in classroom on the day the study was carried out. Students did not know that they would be asked about syphilis and its oral manifestations on the day they were approached. The questionnaire was applied in collective mode in classroom at time considered appropriate and convenient to students, with guarantee of privacy and confidentiality of information collected from March to May 2019.

The questionnaire was developed in Portuguese and translated into English for the presentation of this research. The scientific literature [16-19] and guides from the Brazilian Ministry of Health [20] and the Centers for Disease Control and Prevention [21] were consulted to build the questionnaire. The final version containing 16 questions about identification (sex, age), school year and aspects related to knowledge about syphilis (what is it, agent etiology, forms of transmission, clinical manifestations, disease stages, oral manifestations, differential diagnoses and drugs used for treatment).

A pilot study was conducted with first-year dentistry students to ensure suitability, validity, and interpretation of answers. On the basis of comments and suggestions obtained, the questionnaire was revised. During the pilot study, researchers aimed to assess the understanding of students regarding the text, sensitivity of responses and vocabulary used. At the end, two experts were consulted to express their opinion on the final version of the instrument.

Questionnaire data were entered into the IBM SPSS Statistics for Windows 19.0 software package by two researchers, respecting the confidentiality of information. An independent researcher reviewed 10% of database entries, validating them for the analysis phase. Data were statistically analyzed through absolute and relative frequency. To perform the association among variables, the Chi-square test (or Fisher's exact test with Yates correction) was performed with 5% significance level.

This project was approved by the Ethical Committee of the Department of Science, Federal University of Espírito Santo, Brazil. All participants who agreed to participate in the research signed the Free and Informed Consent Form.

## Results

Of the total of 171 students, questionnaires were completed by 169, for a response rate of 98.8%. Of the respondents, 129 (75.1%) of whom were female and 139 (81.9%) aged under 25 years (Table 1).

**Table 1.** Characteristics of participants (n = 169).

Variables		n(%)
Sex	Female	129 (76.3%)
	Male	40 (23.7%)
Age	Less than 25 years	139 (81.9%)
	Between 25 and 29 years	26 (15.7%)
	Between 30 and 34 years	2 (1.2%)
	Between 35 and 39 years	2 (1.2%)
Educational level	Early years of dentistry course (second and third years)	86 (51.0%)
	Final years of dentistry course (fourth and fifth years)	83 (49.0%)

All students reported to know what syphilis is and 167 (98.8%) received information about the disease during the undergraduate course. When asked about the etiological agent, 135 (79.9%) answered *Treponema pallidum*. Regarding forms of transmission, 166 (98.2%) students claimed to know them, and 160 (94.7%) considered unprotected sexual contact as one of the main transmission forms (Graph 1).

Of the total number of students, 84 (50.0%) reported to know the clinical manifestations of syphilis, of those, 66 (78.4%) reported that one of the most common syphilis lesions is hard chancre. Only 40 (46.4%) students correctly answered the question about disease stages. Almost all participants (98.8%) answered that syphilis has oral manifestations; however, only 44 (25.7%) answered the question correctly, that is, they reported that the appearance of chancre is common in the primary disease stages (Graph1).

Regarding the different diagnoses with other oral lesions, only 63 (37.3%) claimed to know them and of these, only 12 (19.3%) correctly responded the question (Hairy Leukoplakia). One hundred and ten students (63.3%) knew that the main form of treatment is penicillin (Graph 1).

There was a statistically significant association between student's educational level in the Dentistry course and knowledge about etiologic agent ( $p < 0.000$ ), clinical manifestations ( $p < 0.000$ ), disease stages ( $p < 0.000$ ), oral manifestations ( $p < 0.000$ ) and drugs ( $p = 0.005$ ) related to syphilis. Students enrolled in the early years had better knowledge about the disease than students in the final years (Table 2).

**Table 2.** Association among variables related to knowledge about syphilis and the educational level of dental students

Variable	Early years of dentistry course		Final years of dentistry course		Chi-square	p-value
	N	%	n	%		
<b>Knowledge of etiological agent</b>						
Knows	80	93.0%	55	66.3%	17.189	0.000
Does not know	6	7.0%	28	33.7%		
<b>Clinical manifestations</b>						
Knows	51	59.3%	15	18.1%	28.458	0.000
Does not know	35	40.7%	68	81.9%		
<b>Syphilis stages</b>						
Knows	34	41.5%	6	7.2%	24.491	0.000
Does not know	48	58.5%	77	92.8%		
<b>Oral manifestations</b>						
Knows	38	44.2%	6	7.2%	28.68	0.000
Does not know	48	55.8%	77	92.8%		
<b>Differential diagnosis</b>						
Knows	3	3.5%	7	8.4%	-	0.205*
Does not know	83	96.5%	76	91.6%		
<b>Drugs</b>						
Knows	65	75.6%	45	54.2%	7.569	0.005
Does not know	21	24.4%	38	45.8%		

\* Exact fisher test

## Discussion

When analyzing the results obtained in this study, it was observed that, in general, dentistry students have limited knowledge about syphilis and its oral manifestations, since although all students claim to know what syphilis is and 167 have studied the subject during undergraduate course, only half of students reported knowing the clinical manifestations of the disease, 53.6% did not know the characteristics of the stages of syphilis, only 25% correctly answered the question about the oral manifestations of the infection and 37.3% reported knowledge about the differential diagnoses of the oral manifestations of

the disease. In 2012, Moleri et al. [14] reported that although many Brazilian universities present their curricula aimed at general knowledge, they often have not adequately prepared students to recognize and diagnose complex clinical conditions, such as those presented by syphilis.

In this perspective, few students know the oral manifestations of syphilis. In agreement with our research, when investigating knowledge about occupational blood-borne pathogen among Chinese dentistry students, Wu et al. [15], 2016 found that less than half of participants were able to recognize the main oral manifestations of syphilis

Recognizing the oral manifestations of syphilis is a crucial role of the dentist, because as oral lesions are highly contagious, the reliability of the correct diagnosis helps in the adequate management, reduces the infection chain and reduces the risk of transmission to health professional [22]. It is worth mentioning that the least registered form of transmission by students was through clinical dental practice in view of exposure to contaminated blood or saliva. This occurs when correct professional practice is not established [4, 12].

In addition, a small percentage of students reported knowledge about the differential diagnoses of oral manifestations of the disease. Indeed, studies have shown that the diagnosis of oral manifestations of syphilis represents a challenge for professionals because they have a variety of clinical appearances [23, 24]. The fact that some characteristics may be similar to other conditions is of concern, and if diagnosis is not performed in the primary and secondary stages, the patient is exposed to the risk of complications related to the tertiary stage [23].

Our study also showed that students enrolled in the early years of the Dentistry course had better knowledge about etiologic agents, clinical manifestations, disease stages, oral manifestations and drugs than students enrolled in the last two years. The only association that was not statistically significant was in relation to differential diagnosis, where knowledge was low for both groups.

Unlike this research, studies that investigated the knowledge of dental students about HIV / AIDS [25-27] and occupational of blood-borne pathogens [28,29] showed that knowledge about some aspects was greater among students with higher educational level. Keser et al. [25] justified this finding by the fact that the older group may have gained more experience over the years and was exposed to larger number of patients compared to the younger group. Brailo et al. [29] reported that this finding can be explained by the fact that in the clinical phase, at the beginning of the clinical practice in each department, students are introduced to this content again.

Usually, in the first years of the Dentistry course, students have the Stomatology discipline, which addresses the content about syphilis and its oral manifestations. However, it is essential that this content is addressed in other moments and disciplines throughout the undergraduate course, so that students are aware of all aspects that involve the disease, regardless of the educational level they are attending.

A fact that attracted attention was that studies on knowledge about the transmission of blood-borne pathogens among dental students conducted by Myers et al. [28] and Brailo et al. [29], published in 2012 and 2011, respectively, did not address syphilis. The study by Wu et al. [15], published in 2016, included the disease, probably due to its increasing prevalence worldwide. Syphilis started to become evident again a few years ago, so many clinicians do not consider syphilis in their differential diagnosis of oral lesions [30]. In Brazil, the disease has shown significant increase in incidence since 2010. The detection rate of acquired syphilis increased from 2.1 cases per 100,000 inhabitants in 2010 to 75.8 cases per 100,000 inhabitants in 2018 [3].

The number of participants who recognized penicillin as the drug of choice for treatment was less than expected. Penicillin became universal as an effective way of treating syphilis and was responsible for the significant decrease in the epidemiological numbers of the disease. The effective cure of syphilis with penicillin and the decrease in cases over time, that is, the positive result in coping with the disease gradually left a significant gap in medical and dental education. [14].

The study has limitations due to its cross-sectional design, which prevented establishing cause and effect relationships. In addition, the study was conducted in only one teaching institution. However, to the best of our knowledge, this is the first study to analyze the knowledge of dentistry students about syphilis and its oral manifestations. Our findings, together with the increased number of new cases of the disease in the world, reinforce the need for training dental professional with knowledge about early diagnosis, effective treatment and follow-up of syphilis cases. As the main form of infection transmission is sexual, its diagnosis and treatment must consider socio-cultural and ethical scope. The disease has repercussions on the affected people's way of life, and this issue should also be addressed during the undergraduate courses [31].

It is necessary to raise the student's interest not only in the clinical aspect of the disease, but also in care issues. Improving students' knowledge can be an effective way to increase the willingness to treat patients [15]. However, it is necessary to seek educational methods that can improve student's experience and learning skills.

## **Conclusions**

Participants showed important gaps in their knowledge about syphilis and its oral manifestations. Knowledge was associated with student's educational level during the undergraduate course. Our results support the request to improve/include syphilis and its oral manifestations in the curricula of Dentistry Education Institutions. We believe that this is an important intervention that can help control and prevent this disease in scenarios where it is prevalent.

## **Declarations**

### **Ethics approval and consent to participate**

This project was approved by the Ethical Committee of the Department of Science, Federal University of Espírito Santo, Brazil (number: 2.801.172). All participants who agreed to participate in the research signed the Free and Informed Consent Form.

## Consent for publication

Not applicable.

## Availability of data and materials

*All data generated or analysed during this study are included in this published article*

Further data may be requested by contacting the corresponding author. Any data regarding the study will be willingly provided.

## Competing interests

The authors declare that they have no competing interests

## Funding

"This study was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001"

## Authors' contributions

These authors contributed equally to this work.

## References

1. Rowley J, Vander Hoorn S, Korenromp E, Low N, Unemo M, Abu-Raddad LJ, et al. Chlamydia, gonorrhoea, trichomoniasis and syphilis: global prevalence and incidence estimates, 2016. *Bull World Health Organ.* 2019; 97:548-62.
2. Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveillance 2017. Atlanta: U.S. Department of Health and Human Services; 2018.
3. Brazil. Ministry of Health. Health Surveillance Service. Epidemiological Bulletin. Syphilis 2019. Brasília, Brazil: Ministry of Health; 2019.
4. Little JW. Syphilis: An update. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2005;100:3-9.
5. Lu DJ, Zbar A. Atypical presentation of syphilis as an aphthous ulcer. *CMAJ.* 2017;189:E748.
6. Minicucci EM, Vieira RA, Oliveira DT, Marques SA. Oral manifestations of secondary syphilis in the elderly –a timely reminder for dentists. *Aust Dent J.* 2013;58:368-70.
7. Lim JHL, Chio MTW. Watch the Tongue. *Ann Acad Med.* 2015; 44(12):575-6.
8. Leão JC, Gueiros LA, Porter SR. Oral manifestations of syphilis. *Clinics.* 2006;61:161-6.

9. DePaola LG, Grant LE. Infection Control in the Dental Office. A Global Perspective. Cham: Springer Nature Switzerland AG; 2020. <https://doi.org/10.1007/978-3-030-30085-2>
10. Stoltey JE, Cohen SE. Syphilis transmission: a review of the current evidence. *Sex Health*. 2015; 12:103-9.
11. Centres for Disease Control and Prevention. Guidelines for infection control in dental health-care settings – 2003. *MMWR Recomm Rep* 2003; 52: 1–68.
12. Leuci S, Martina S, Adamo D, Ruoppo E, Santarelli A, Sorrentino R et al. Oral Syphilis: a retrospective analysis of 12 cases and a review of the literature *Oral Diseases*. 2013;19:738-46.
13. World Health Organization. Global health sector strategy on sexually transmitted infections, 2016-2021: Towards ending STIs. Report No.: WHO/RHR/16.09. Geneva: WHO; jun. 2016. <https://www.who.int/reproductivehealth/publications/rtis/ghss-stis/en/>. Accessed 20 July 2020.
14. Moleri AB, Lobo CB, Santos FR, Silva EJ, Gouvêas CVD, Moreira LC. Differential diagnosis of manifestations of syphilis and aids with lichen planus in mouth: case report. *J Bras Doenças Sex Transm*. 2012;24:113-7.
15. Wu L, Yin Y-L, Song J-L, Chen Y, Wu Y-F, Zhao L. Knowledge, attitudes and practices surrounding occupational blood-borne pathogen exposure amongst students in two Chinese dental schools. *Eur J Dent Educ*. 2016; 20:206-12.
16. Neville BW, Damm DD. *Oral and Maxillofacial Pathology*, 4th Edition. Elsevier; 2016.
17. Seibt CE, Munerato MC. Secondary syphilis in the oral cavity and the role of the dental surgeon in STD prevention, diagnosis and treatment: a case series study *Braz J Infect Dis*. 2016; 20:393-8.
18. Strieder LR, León JE, Carvalho YR, Kaminagakura E. Oral syphilis: report of three cases and characterization of the inflammatory cells. *Annals of Diagnostic Pathology*. 2015; 19:76-80.
19. Sukumaran A. Resurgence of syphilis: Challenges for dental care providers. *J Dent Res Rev*. 2016; 3:115-6.
20. Brazil. Ministry of Health. Health Surveillance Service. Department of Chronic Conditions Diseases and Sexually Transmitted Infections. Clinical Protocol and Therapeutic Guidelines for Comprehensive Care to People with Sexually Transmitted Infections (STI) Brasília: Ministry of Health; 2015.
21. Centers for Disease Control and Prevention (CDC). Syphilis: a provider's guide to treatment and prevention. Washington: CDC; 2017. <https://www.cdc.gov/std/syphilis/Syphilis-Pocket-Guide-FINAL-508.pdf>. Accessed 20 July 2020.
22. Garbin CAS, Pacheco Filho A, Garbin AJI, Pacheco KTS. The dentist's role in syphilis prevention and control. *Rev Soc Bras Med Trop*. 2019; 52:e20180252.
23. Fregnani ER, Perez-de-Oliveira ME, Parahyba CF, Perez DEC. Primary syphilis: an uncommon manifestation in the oral cavity. *J Formosan Med Assoc*. 2017;116:326-7.
24. Santos IS, Bastos DB, Valente VB, D'Vila SP, Tjioe KC, Biasoli ER, et al. Reemerging syphilis: diagnosis from oral lesions. *J Oral Diag*. 2017;2(1).

25. Keser G, Göcüncü N, Pekiner FN. Assessment of knowledge level about acquired immune deficiency syndrome and patient approaches of dental students. *Niger J Clin Pract.* 2019; 22:1259-65.
26. Ryalat ST, Sawair FA, Shayyab MH, Amin WM. The knowledge and attitude about HIV/AIDS among Jordanian dental students: (Clinical versus pre clinical students) at the University of Jordan. *BMC Res Notes.* 2011; 4:191.
27. Lorosa AH, Pereira CM, Hussne RP, Silva-Boghossian CM. Evaluation of dental students' knowledge and patient care towards HIV/AIDS individuals. *Eur J Dent Educ.* 201;23:212-9.
28. Myers JE, Myers R, Wheat ME, Yin MT. Dental students and bloodborne pathogens: occupational exposures, knowledge, and attitudes. *J Dent Educ.* 2012;76:479-86.
29. Brailo V, Pelivan I, Škaricić J, Vuletić M, Dulčić N, Cerjan-Letica G. Treating patients with HIV and Hepatitis B and C infections: Croatian dental students' knowledge, attitudes, and risk perceptions. *J Dent Educ.* 2011;75:1115-26.
30. Siqueira CS, Saturno JL, Sousa SCOM, Silveira FRX. Diagnostic approaches in unsuspected oral lesions of syphilis. *Int J Oral Maxillofac Surg.* 2014; 43:1436-40.
31. Kassebau DK, Tedesco LA. The 21st-Century Dental Curriculum: a framework for understanding current models. *J Dent Educ.* 2017; 81:eS13-eS2.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Questionnairesupplementaryfile2.doc](#)
- [STROBEchecklistcrosssectionalsupplementaryfile1.doc](#)
- [graph1.PNG](#)