

Knowledge and clinical practices of orthodontists regarding the treatment of patients with aids. A nationwide study

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Aim: To evaluate orthodontists' knowledge and clinical practices regarding the treatment of patients with HIV/AIDS. **Methods:** Cross-sectional study performed with 655 Brazilian orthodontists based on a previously calculated sample size. Self-administered questionnaires were sent to orthodontists to collect information on knowledge and clinical conduct regarding the care of patients with HIV/AIDS. The study evaluated the awareness of possible risk factors for contamination, oral manifestations of HIV, need for more information on the care of HIV-positive patients, whether orthodontic treatment is indicated in HIV-positive patients, and whether they had knowingly performed orthodontic treatment in HIV-positive patients. Simple regression models were adjusted, and crude Odds Ratios estimated the associations with 95% confidence intervals. The variables with $P < 0.20$ in the crude analysis were tested in multiple logistic regression models, and those with $P \leq 0.05$ were maintained in the final model. Magnitudes were estimated by adjusted Odds Ratios values, with 95% confidence intervals. **Results:** Orthodontists who were aware of the oral manifestations of HIV/AIDS, those having work experience of more than 20 years, and those who believed that orthodontic treatment could be indicated for these patients were 3.30 (1.79-6.10), 2.74 (1.36-5.52) and 1.92 (1.13-3.24) times more likely to perform orthodontic treatment in HIV-positive patients, respectively. Most orthodontists (92.9%) reported they needed to obtain more information about orthodontic care in patients with HIV/AIDS. **Conclusion:** Although orthodontists reported feeling able and qualified to provide dental care to patients with HIV/AIDS, gaps in their knowledge need to be addressed with further training.

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Introduction

Human Immunodeficiency Virus (HIV) infection remains among the top ten major health issues worldwide. According to estimates of the World Health Organization (WHO), approximately 1 million people are infected with HIV every year¹⁻⁴. Official data compiled by the UNAIDS (a Joint United Nations Program on HIV/ AIDS) indicated that approximately 830,000 individuals were living with HIV/AIDS (Acquired Immuno-deficiency Syndrome) in Brazil in 2018, most of them aged 20 to 34 years^{5,6}.

The perception of dentists, dental students, and academic scholars about the treatment of HIV-positive patients has been studied over the last years⁷⁻⁹. While these groups have the knowledge and/or willingness to treat HIV/AIDS individuals, they are usually faced with numerous queries¹⁰⁻¹². Based on typical oral manifestations resulting from HIV infection, the dentist can be the first health professional to suspect HIV positivity. Despite that, all patients should be treated equally as if they were potentially infectious, mainly because it is known that most seropositive patients fail to report their infectious state to the oral health team^{4,13,14}. Awareness about the patient's condition has increased the professional's willingness and self-confidence during dental care^{11,12}.

Among other oral health issues, malocclusion has a direct impact on one's social interaction and self-esteem. Overall, patients with malocclusion may significantly benefit from orthodontic therapy^{15,16}, particularly HIV-positive patients who commonly wish to maintain a healthy appearance¹⁷. Orthodontists should know the implications of HIV infection, considering that the presence of orthodontic appliances can directly dysregulate the oral microbiome^{18,19} and that HIV-positive patients are more prone to develop severe periodontitis¹⁴.

Due to frequent contact with HIV-positive patients, the orthodontist can identify the manifestations of HIV, diagnose and refer the patient for appropriate treatment. However, the orthodontist's perception about the implications of dental care of HIV-positive patients is still poorly known compared to other dental specialties^{13,20}. Our study hypothesis was that orthodontists were unaware of the implications of orthodontic treatment in HIV-positive patients. Thus, this study aimed to evaluate orthodontists' knowledge and clinical practices regarding the treatment of patients with HIV/AIDS.

Materials and Methods

A nationwide cross-sectional study was carried out with Brazilian orthodontists following the STROBE guide²¹. The study included only orthodontists registered in the Federal Council of Dentistry (CFO) of Brazil, regardless of graduation time, sex, or age group.

The sample size was determined in the Epilnfo program (Centers for Disease Control and Prevention, Atlanta, U.S.A.) based on a previous pilot study (n = 20). The following parameters were used for sample size calculation: significance level of 5%, test power of 80%, and an effect size of 1.8 totaling a sample of 524 orthodontists. An additional 30% was included to compensate for sample loss. A total of 5% of the sample was excluded due to incomplete responses.

A total of 655 orthodontists participated in the study, which was carried out between April and August 2018. Electronic questionnaires were sent to orthodontists' e-mail with the assistance of the Regional Dentistry Councils of all states in Brazil. All study volunteers signed an informed consent form to authorize their participation and provided information about their attitude, knowledge, and professional conduct regarding treating patients with HIV/AIDS. This study was previously approved by a Research Ethics Committee (CAAE #83148618.1.0000.5385).

Study questionnaire

A specific questionnaire addressing the orthodontists' knowledge, attitude, and clinical practice was developed for this study on the Google Forms platform and contained 16 closed items. The questions were formulated based on the previous studies^{7,22} and addressed demographic data, orthodontist's basic knowledge about HIV/AIDS, and previous clinical experiences. The following variables were considered:

- Demographic data: gender, work experience and training (in years);
- Basic knowledge on possible risk factors for contamination; oral manifestations of HIV infection; the need for more information to assist HIV-positive patients;
- Attitudes: ability to treat a patient with HIV/AIDS; indication or contraindication of orthodontic treatment for this group of patients.
- Clinical practices on whether HIV/AIDS testing can be requested and whether orthodontic treatment can be performed in HIV-positive patients.

Each item had three answer options: "yes", "no," and "Do not know"; the (1) attitudes and knowledge and (2) clinical conduct of orthodontists towards the treatment of patients with HIV/AIDS was considered the outcome variables.

Statistical analysis

Initially, a qualitative descriptive analysis was performed, expressing the data in Tables using percentages. Simple regression models were then adjusted, and crude Odds Ratios estimated the associations with 95% confidence intervals. The variables with $P < 0.20$ in the crude analysis were tested in multiple logistic regression models, and those with $P \leq 0.05$ were maintained in the final model. Magnitudes were estimated by adjusted Odds Ratios values, with 95% confidence intervals. The data were analyzed in the R program (R Foundation for Statistical Computing, Vienna, Austria).

Results

A total of 655 orthodontists completed the study, of which 481 (72.3%) were females, and 184 (27.7%) were males; 37.1% of them finished dental school between 2000 and 2008, 68.7% had obtained specialist certification less than ten years before. The characteristics of the study sample are shown in Table 1.

Table 1. Characteristics of the study sample ($n = 655$).

Variable	Frequency, n (%)	
Gender	Male	184 (27.7)
	Female	481 (72.3)
Time since graduation	0-10 years	210 (31.6)
	11-20 years	247 (37.1)
	21-30 years	161 (24.2)
	Over 30 years	47 (7.1)
Time since specialist certification	0-10 years	457 (68.7)
	11-20 years	157 (23.6)
	21-30 years	49 (7.4)
	Over 30 years	2 (0.3)

Table 2 shows the analysis of orthodontists' attitude towards the treatment of patients with HIV/AIDS. The findings show that 78.9% of the orthodontists considered themselves able to treat patients with HIV/AIDS, and 79.8% of them were aware of the oral manifestations of HIV infection. Orthodontists who assumed there are risks of contamination in the treatment of HIV-positive patients were 2.53 (1.12-5.75) times more likely to consider themselves able to treat these patients as compared to 3.10 (1.25-7.69) for those who reported no risk of contamination.

Orthodontists who knew the oral manifestations of HIV infection were 3.30 (1.79-6.10) times more likely to consider themselves able to perform orthodontic treatment in these patients. Those who considered that orthodontic treatment could be indicated for HIV-positive patients were 4.66 (2.84-7.66) times more likely to consider themselves able to treat these patients ($P < 0.05$). In contrast, orthodontists, who reported that orthodontic treatment is contraindicated for HIV-positive patients were 2.01 (1.08-3.78) times more likely to consider themselves able to treat them. When asked, the vast majority of orthodontists (92.9%) reported the need to obtain more information about orthodontic care for HIV/AIDS patients.

Table 3 shows the associations between the study variables and the orthodontists' clinical conduct towards the treatment of HIV-positive patients. Few orthodontists (29.8%) had knowingly performed orthodontic treatment in patients with HIV/AIDS. Also, a more extended training period was associated with a greater likelihood of treating HIV-positive patients ($P < 0.05$). Orthodontists with work experience of more than 20 years were 2.74 (1.36-5.52) times more likely to treat HIV/AIDS patients than 1.96 (1.23-3.13) for those with over ten years of work experience. According to the results, orthodontists who believed that orthodontic treatment could be indicated for patients with HIV/AIDS and those who considered themselves able to treat these patients were 1.92 (1.13-3.24) and 5.39 (2.26-12.86) times more likely to have knowingly performed orthodontic treatment in patients with HIV/AIDS ($P < 0.05$), respectively.

Table 2. Association between the study variables and orthodontists' attitude and knowledge regarding the care of patients with HIV / AIDS.

Variable	Category	Feels able to treat HIV+ patients		§Crude OR (#95% CI)	P-value	§Adjusted OR ajustado(#IC95%)	P-value
		No / Do not know	Yes*				
		n (%)	n (%)				
Sex	Female	109 (22.7)	372 (77.3)	Ref			
	Male	31 (16.8)	153 (85.2)	1.45 (0.93-2.25)	0.1013		
Time since graduation	0-10 years	37 (17.62)	173 (82.4)	1.98 (0.97-4.07)	0.0619		
	11-20 years	58 (23.5)	189 (76.5)	1.38 (0.69-2.76)	0.3582		
	21-30 years	31 (19.2)	130 (80.8)	1.78 (0.85-3.72)	0.1259		
	Over 30 years	14 (29.8)	33 (70.2)	Ref			
Time since specialist certification	0-10 years	83 (18.2)	374 (81.8)	1.99 (1.04-3.82)	0.0390		
	11-20 years	40 (25.5)	117 (74.5)	1.29 (0.64-2.61)	0.4788		
	21-30 years	15 (30.6)	34 (69.4)	Ref			
	Over 30 years	2 (100.0)	0 (0.0)	-	-		
Orthodontists may be at risk for HIV contamination	No	24 (14.2)	145 (85.8)	8.63 (3.85-19.36)	<0.0001	3.10 (1.25-7.69)	0.0145
	Do not know	20 (58.8)	14 (41.2)	Ref			
	Yes	96 (20.8)	366 (79.2)	5.44 (2.65-11.17)	<0.0001	2.53 (1.12-5.75)	0.0261
Has performed orthodontic treatment in HIV-positive patients	No	123 (26.3)	344 (73.7)	Ref		Ref	
	Yes	17 (8.6)	181 (91.4)	3.80 (2.22-6.52)	<0.0001	3.74 (2.06-6.81)	<0.0001
Orthodontists may request HIV test	No	12 (32.4)	25 (67.6)	1.05 (0.49-2.24)	0.8981		
Orthodontic treatment is contraindicated in HIV-positive patients	Do not know	58 (33.5)	115 (66.5)	Ref			
	Yes	70 (15.4)	385 (84.6)	2.77 (1.85-4.16)	<0.0001		
	No	50 (11.9)	371 (88.1)	3.89 (4.40-10.79)	<0.0001	4.66 (2.84-7.66)	<0.0001
	Do not know	65 (48.2)	70 (51.8)	Ref		Ref	
Knows the oral manifestations of HIV infection	Yes	25 (22.9)	84 (77.1)	3.12 (1.78-5.46)	<0.0001	2.01 (1.08-3.78)	0.0289
	No	27 (40.3)	40 (59.7)	1.20 (0.60-2.38)	0.6003	1.04 (0.48-2.28)	0.9169
	Do not know	30 (44.8)	37 (55.2)	Ref		Ref	
Considers saliva as a means of HIV transmission	Yes	83 (15.6)	448 (84.4)	4.38 (2.56-7.48)	<0.0001	3.30 (1.79-6.10)	0.0001
	No	94 (18.7)	408 (81.3)	4.61 (2.25-9.46)	<0.0001		
	Do not know	17 (51.5)	16 (48.5)	Ref			
Needs to obtain more information on the topic	Yes	29 (22.3)	101 (77.7)	3.70 (1.67-8.22)	0.0013		
	No	2 (4.3)	45 (95.7)	6.47 (1.55-27.00)	0.0104		
	Yes	138 (22.3)	480 (77.7)	Ref			

*Reference category for the outcome variable; §Odds ratio; #Confidence interval.

Table 3. Association between the study variables and orthodontists' clinical conduct regarding the care of patients with HIV / AIDS.

Variable	Category	Has performed orthodontic treatment in HIV-positive patients		§Crude OR (#95% CI)	P-value	§Adjusted OR (#95% CI)	P-value
		No	Yes*				
		n (%)	n (%)				
Sex	Female	350 (72.8)	131 (27.2)	Ref			
	Male	117 (63.6)	67 (36.4)	1.53 (1.07-2.20)	0.0210		
Time since graduation	0-10 years	162 (77.1)	48 (22.9)	Ref		Ref	
	11-20 years	174 (70.4)	73 (29.6)	1.42 (0.93-2.16)	0.1034	1.53 (0.99-2.36)	0.0550
	21-30 years	103 (64.0)	58 (36.0)	1.90 (1.20-3.00)	0.0076	1.96 (1.23-3.13)	0.0047
	Over 30 years	28 (59.6)	19 (40.4)	2.29 (1.18-4.46)	0.0401	2.74 (1.36-5.52)	0.0049
Time since specialist certification	0-10 years	334 (73.1)	123 (26.9)	Ref			
	11-20 years	102 (65.0)	55 (35.0)	1.46 (0.99-2.16)	0.0670		
	21-30 years	30 (61.2)	19 (38.8)	1.72 (0.93-3.17)	0.1307		
	Over 30 years	1 (50.0)	1 (50.0)	2.72 (0.17-43.74)	0.5917		
Orthodontists may be at risk for HIV contamination	No	113 (66.9)	56 (28.3)	2.31 (0.90-5.91)	0.1129		
	Do not know	28 (82.4)	6 (17.6)	Ref			
	Yes	326 (70.6)	136 (29.4)	1.95 (0.79-4.81)	0.2036		
Feels able to treat HIV-positive patients	No	54 (83.1)	11 (16.1)	2.34 (0.81-6.74)	0.1143	2.45 (0.84-7.18)	0.1013
	Do not know	69 (92.0)	6 (8.0)	Ref		Ref	
	Yes	344 (65.5)	181 (34.5)	6.05 (2.58-14.20)	<0.0001	5.39 (2.26-12.86)	0.0001
Orthodontists may request HIV test	No	24 (64.9)	13 (35.1)	1.50 (0.70-3.18)	0.2958		
	Do not know	127 (73.4)	46 (26.6)	Ref			
	Yes	316 (69.4)	139 (30.6)	1.21 (0.82-1.80)	0.3312		
Orthodontic treatment is contraindicated in HIV-positive patients	No	275 (65.3)	146 (34.7)	2.58 (1.58-4.23)	0.0002	1.92 (1.13-3.24)	0.0155
	Do not know	112 (83.0)	23 (17.0)	Ref		Ref	
	Yes	80 (73.4)	29 (26.6)	1.76 (0.95-3.28)	0.0715	1.40 (0.74-2.67)	0.3030
Knows the oral manifestations of HIV infection	No	50 (74.6)	17 (25.4)	1.00 (0.46-2.18)	1.000		
	Do not know	50 (74.6)	17 (25.4)	Ref			
	Yes	367 (69.1)	164 (30.9)	1.31 (0.74-2.35)	0.3559		

*Reference category for the outcome variable; §Odds ratio; #Confidence interval.

Discussion

This study surveyed the attitude, knowledge, and clinical conduct of Brazilian orthodontists regarding treating HIV/AIDS patients. Our findings confirmed the hypothesis that orthodontists need further training on the implications of treating HIV-positive patients.

Our findings indicated that more extended work experience and knowledge about the risks of contamination by HIV, oral manifestations of the infection, and means of viral transmission, were associated with a greater likelihood of orthodontists feeling able

to perform orthodontic treatment in patients with HIV/AIDS or have knowingly done so. These findings are consistent with other studies conducted with different oral health-related populations, such as dentists and dental students^{7,11,12,22}. Hence, more extended work experience and more knowledge on the topic seem to increase self-confidence for the oral care of HIV-positive patients.

The presence of orthodontic devices may directly affect the composition and quantification of the oral microbiome, particularly increasing the prevalence of microbial species such as *Streptococcus mutans*, *Candida albicans*, among others^{18,19}. Knowing the oral manifestations of HIV infection is an important predictive strategy for detecting and tracking the evolution of the infectious condition^{14,23-25}. For instance, the presence of oral candidiasis and severe periodontitis, among other manifestations of HIV infection, may raise doubts as to whether orthodontic therapy should be contraindicated for patients with HIV/AIDS. To date, there are no studies in the literature that provide evidence to contraindicate orthodontic therapy for patients with HIV/AIDS. Nevertheless, the indication of orthodontic treatment in these cases requires an individualized analysis of the patient's systemic health, especially with regard to the CD4 count, an indicative of the patient's immune status. Individuals with low CD4 counts (severe immunosuppression) are more likely to experience oral manifestations of HIV infection than those with higher CD4 counts^{23,24}.

The orthodontists who reportedly indicated that patients with HIV/AIDS might undergo orthodontic therapy were more likely to have already treated HIV-positive patients. In contrast, orthodontists who either indicated or contraindicated orthodontic therapy for HIV-positive patients showed a greater chance of considering themselves able to perform orthodontic treatment in these patients.

In our study, 75.5% of the orthodontists believed that saliva is not a means of HIV transmission. Although there is no evidence that saliva alone may transmit HIV – as salivary glands inhibit the virus's infectivity, it can be contaminated with HIV-infected blood and therefore contain biological hazard⁷. Therefore, it is recommended to comply with universal precautions concerning exposure to saliva in dental offices. According to the literature, dentists and dental students are aware of contamination risks when treating patients with HIV/AIDS, especially concerning contact with infected blood²².

Our findings showed that orthodontists who were aware of the risk of contamination when treating patients with HIV/AIDS had a greater probability of considering themselves able to treat them. This result is in line with previous literature reports^{7,22}, indicating that dentists and dental students who were aware of the risks of contamination when treating HIV/AIDS patients were more willing to treat these patients. However, our study also revealed that orthodontists who reported having no risk of contamination when treating HIV-positive patients were more likely to feel able to treat these patients, which may lead us to reason that they need more information concerning HIV/AIDS. This point may be explained by the fact that being more knowledgeable about the condition is associated with having greater availability and increased ability to treat HIV-positive patients.

Among the orthodontists who answered the questionnaire, 68.4% stated that they could request an HIV test. According to the previous studies^{9,26,27}, many HIV-in-

ected patients are unaware of their infectious state. However, recent studies have highlighted a need for cultural change among dentists regarding their responsibility towards the patient's systemic health^{9,27}. Raising awareness through the integration of medical and dental workforces may be necessary for dentists to be held responsible for preliminary medical examinations. While 78.9% of the participants considered themselves able to perform orthodontic treatment in patients with HIV/AIDS, less than 30% (29.8%) of them had knowingly done so.

The inclusion of additional information on orthodontic treatment in patients with HIV/AIDS to the program content of dental schools could help minimize the lack of knowledge while improving professional attitude and clinical conduct and increasing orthodontists' willingness to treat these patients. Our study revealed that 92.9% of the orthodontists reported feeling a need to obtain more information related to HIV/AIDS care. Especially at the present moment, in the face of the COVID-19 epidemic, knowledge about biosafety methods and prevention of dentist activities is essential.

The study has limitations. The cross-sectional design shows information about the knowledge of orthodontists only at a specific period. Also, the data were collected by a structured electronic questionnaire, with the possibility of subjectivity. Thus, qualitative clinical studies are essential to expand the analysis of the results reported here. However, we highlight that our findings contribute to determining training strategies for orthodontists concerning HIV infection. In addition to bringing a critical reflection on biosafety methods and prevention of clinical activities in Orthodontics.

In conclusion, although orthodontists reported feeling able and qualified to provide dental care to patients with HIV/AIDS, gaps in their knowledge need to be addressed with further training.

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