



Attitudes and practices of dentists treating HIV+ patients in the era of new antiretroviral therapy: A 12-year update

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ABSTRACT

During the first years of the HIV pandemic, the virus diffusion was responsible for discriminatory behavior from medical and dental care workers towards HIV-infected patients, as described by our research group in 2009. The aim of the current study was to provide an update on the previous data, investigating the presence of discriminatory behaviors, evaluating the level of dentists' knowledge about the virus and proposing strategies to be implemented to avoid professional exposure and cross-infections. This study was a cross-sectional, online, national survey on dentists, members of the main national dental associations (ANDI and AIO). The questionnaire was divided into four major sections, with the same structure as the questionnaire administered in 2009. The differences between groups were analyzed using the software program IBM SPSS Statistic, version 21.0. A total of 1054 dentists filled out the questionnaire completely. Among them 0.04% revealed a discriminatory attitude towards HIV-infected patients. The univariate analysis showed that discrimination towards HIV + patients was statistically associated with personal experiences and the level of fear associated with treating them ($p = 0.001$) and with the type of dental treatments performed ($p = 0.01$). This cross-sectional study revealed the persistence of dentists who still discriminate against HIV + patients, and the percentage of these dentists was only slightly lower than that in the previous survey (4.3% in the present survey vs. 4.5%). The survey also depicted other information worthy of consideration, such as a perceived ability to detect HIV + patients based on their appearance, complaints about not having received adequate training for treating HIV + individuals, and a lack of scientific knowledge about the virus. From the evidence reported by the present survey, it can be argued that universities, professional boards, and training institutions must increase their efforts in spreading correct knowledge about HIV among all dental care workers.

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1. Introduction

The spread of the human immunodeficiency virus (HIV) infection and its associated disease (acquired immunodeficiency syndrome—AIDS) has caused a growing feeling of fear and distrust among dental care workers (e.g., dentists, dental hygienists, and dental assistants) towards HIV-infected patients [1]. The scientific literature has clearly reported that such a distrustful attitude strongly contributes to the discrimination against HIV + patients by a number of health care workers belonging to different surgical and medical specialties, including dentists. In some studies this percentage exceeds 30% of the sample [2]. The fear and reticence in the treatment of HIV-positive patients by medical personnel could be due to the invasiveness of dental procedures. In fact, even in studies reporting the 80% of positive attitude towards seropositive patients, the same sample percentage worried about possible disease transmission in the dental office [3]. Such attitudes have even succeeded in encouraging affected patients to visit different doctors or, worse, to stop undergoing treatments. Discriminatory behavior does not necessarily produce a protective effect for health care workers, since it neither protects them from a possible professional exposure to the virus nor avoids the possibility of cross-infection. In fact, such circumstances may only be avoided if standard disinfection and sterilization procedures are meticulously applied every day during the clinical routine, and by considering each patient as potentially infected. Furthermore, ethical and forensic issues need to be considered. In fact, some individuals may not know they are infected or may not declare their health status so dental care workers may treat HIV-infected persons unknowingly [4–8]. In fact the percentage of patients unaware of their HIV status is not negligible, ranging from 15% in the USA and Europe [9,10] to more than 30% in some African areas [11]. Refusing to treat HIV-infected patients is not a strategy to avoid the infection or to prevent its spread.

It must be considered that the fear of being discriminated against and discriminatory behaviors in general may have worrying consequences in medicine. In fact, some papers have reported that such elements might act as factors that affect people's psychological and emotional state of health [12]. Social discrimination and stigmas might lead patients to avoid sharing elements with health care providers that are fundamental for the diagnosis and treatment of affecting pathologies, thus compromising their resolution [13]. It has also been pointed out that due to pressure from family, a fear of stigmatization, a fear of divorce, or a fear of an accusation of infidelity, people might psychologically perceive themselves as being discriminated against [14].

From the mid-1980s to today, many papers have been published on the rate of discrimination from dentists against HIV + patients. The data reported provide information that relates to different geographical areas and are in conflict with other information. The rate of discrimination, in fact, ranges from 67.4% of dentists in Saudi Arabia [15] to 47% in Indonesia [16], 32% in the USA [17], 20.4% in Thailand [18], and 16% in Canada [19]. Furthermore, the interest of the scientific community in the subject has undergone a fluctuating trend, as about half of the scientific contributions were published between 1985 and 2000, while only 15% were published in the following 10 years.

To better define problems that could arise in the relationship between HIV + patients and dentists, we assessed this relationship in 2009 using a questionnaire distributed among health care workers of public and private dental facilities. The results of that study revealed that about 4.5% of the dentists participating in the survey demonstrated a deliberately discriminatory attitude towards HIV-infected patients [20]. The reason that prompted the authors to conduct a survey to evaluate the behavior of dentists towards HIV + patients derives from the fact that in 2009 HAART was an already consolidated protocol and, in Italy, a study had not yet been conducted to evaluate how it could have an impact on the behavior of dentists in the treatment of affected patients.

It is necessary to point out that, after the introduction of highly active anti-retroviral therapy (HAART), the life expectancy of people living with HIV has improved [21]. The drugs that are currently available are still unable to eradicate the disease, but they do prevent its worsening, and proper drug intake and the consequent undetectability of the virus has made the infectious power of HIV + individuals virtually nonexistent. The percentage of HIV + patients who undergo dental treatments has mainly increased because of the lengthening of their life expectancy and the benefits of HAART (now known as anti-retroviral therapy—ART), which has also increased patients' self-awareness and interest in oral health [22].

The scientific evidence on the issue of discrimination suffered by HIV + subjects has mainly focused on subjects living in various geographical areas, mainly located in Africa, and the reports suggest that a variable percentage between 85% [23] and 42.7% [24] of them have experienced social stigmas. The factors that influence the generation of stigmas are gender, ethnicity, education, wealth, and cultural attitudes, such as the initial high rate of infection among drug addicts and homosexuals, the lethality of the disease, the fear of being infected, and the incurability of the disease [25]. The psychological impact that social stigmas can have on HIV-positive patients was examined by a recent systematic review, which reported that the fear of separation/abandonment (37.7%), the fear of being negatively labeled (5.0%), the fear of being isolated by partners (25.5%), the fear of physical abuse (9.2%), and other reasons (4.2%) can influence a respondents' ability to make decisions in terms of the disclosure of their seropositive status [26].

This study was a cross-sectional, online, national survey. The dentists involved received access to the survey web page through a link sent by the main national dental associations (ANDI and AIO). The questionnaire was divided into four major sections, with the same structure as the questionnaire administered in 2009 [20].

The purpose of the study was to update the data published in the abovementioned study and to provide an update on the previous data about the presence of discriminatory behaviors, particularly regarding an investigation of the stress perceived by dentists when treating HIV + patients as well as their level of knowledge about the virus and about the strategies to be implemented to avoid professional exposure and cross-infections.

2. Materials and methods

This cross-sectional study was structured as a national observational survey conducted in 2021 and involved dentists from almost

all Italian regions. A questionnaire was developed by two dentists, a specialist in infectious diseases, and a psychologist. A supportive external society (Italian Medical Research—IMR—Italian Medical Research Srl, Viale Degli Atlantici, 65/A, 82100, Benevento, Italy) dealt with the dissemination of the questionnaire with the help of the main national dental associations (ANDI—Associazione Nazionale Dentisti Italiani and AIO—Associazione Italiana Odontoiatri) through a specific link (SURVIO Web platform, <https://www.survio.com/it/>), where dentists could complete the questionnaire easily and anonymously. Greater anonymity and the best guarantees of privacy were further ensured by directly sending the access link for the web page to the dental associations to which the invited dentists belonged. In the abovementioned web page, a letter describing the purpose, giving more information about the research anonymity, and providing instructions for questionnaire completion was also present. Informed consent was not requested because it was considered indirectly given when the participants completed the questionnaire. The authors estimated that the questionnaire could be completely filled out in approximately 10 min. The data collection was performed 6 months after the questionnaire was disseminated. After such a time frame, the study was considered over.

The questionnaire was structured into four major sections that followed the same structure as our previous report published in 2009 [8]. Similarly, in order to better understand the possible discriminatory attitudes and behaviors, all respondents were divided into two groups based on their answer to the following question: “Do you think it is right not to treat someone who is HIV positive?” This dichotomous variable was used as an indicator for revealing discriminatory attitudes so that the authors could present the results and compare the characteristics of two groups: those with and those without such discriminatory attitudes.

Quantitative variables were tested for normal distribution and compared by two-tailed unpaired *t*-tests. Differences between the group proportions were assessed using a χ^2 (chi-squared) test or Fisher’s exact test. Odds ratios (ORs) were calculated to estimate the associations between discriminatory behavior against HIV-infected individuals and other study variables. To determine the statistical significance of the ORs, 95% confidence intervals (CIs) were used. Variables that were statistically associated with discrimination in the univariate analysis were introduced into a multiple regression model to assess whether the risk factors were independent. Two-tailed tests of significance at the $p \leq 0.05$ level were used to determine statistical significance. A statistical analysis was performed using the software program IBM SPSS Statistic, version 21.0 (Chicago IL, USA).

3. Results

The link for the online questionnaire was sent to 10,563 dentists. Only 8300 received the e-mail due to technical issues, mainly involving e-mail address inaccuracies. Out of these, only 1529 (18.4%) interacted with the link within a 6-month time frame: 1054 (68.9%) completely filled out the questionnaire, whereas 231 (15.1%) and 244 (15.6%) gave only a few or no answers, respectively. All the dentists answered the question “Do you think it is right not to treat someone who is HIV positive?” and 45 (0.04%) replied affirmatively. The demographic and epidemiological data of the dentists were stratified according to the answer given to the abovementioned question (Table 1). Neither the type of degree (dental degree or medical degree, which authorized the practice of dentistry until the 1990s) nor age had any effect on the difference between the two groups. In the univariate analysis, thinking it is right to refuse treatment to HIV-infected patients was statistically associated with some variables (Table 2, Figs. 1 and 2), including: the personal experience of the dentist in treating HIV-infected persons, the level of fear associated with treating them ($p = 0.001$), and the type of dental treatments performed on HIV + patients ($p = 0.01$).

Feeling a greater level of stress when treating HIV-positive patients (OR: 2.7, CI: 1.4–5.4), charging them different fees (OR: 6.6, CI: 1.9–18.9), using special precautions for dental treatments (OR: 2.5, CI: 1.2–5.3), and deliberately refusing to treat them (OR: 9.6, CI: 3.8–24.2) were independent risk factors for discrimination.

Table 3 reports the data on dentists’ scientific knowledge, methods used to increase their knowledge, suggestions for further educational efforts, and opinions on HIV infection transmission pathways, whereas Table 4 shows data on the use of precautions to prevent cross-infections, which could be considered evidence of discrimination. Only 1053 dentists answered the questions about the

Table 1

Demographic and epidemiological data of all respondents, stratified according to their opinion on whether it is right or wrong not to treat someone who is HIV positive. Data are presented as means \pm standard deviation or number (%); HIV—human immunodeficiency virus.

		Total study population	Discrimination	
			No	Yes
Total study population		1054	1009 (95.7%)	45 (4.3%)
Age (y)		48.8 \pm 12.5	48.8 \pm 12.6	49.9 \pm 10.3
Sex	Men	718 (68.1%)	689 (68.3%)	29 (64.5%)
	Women	336 (31.9%)	320 (31.7%)	16 (35.5%)
Type of degree ^a	Medicine	308 (29.2%)	290 (28.7%)	18 (40%)
	Dentistry	746 (70.8%)	719 (71.3%)	27 (60%)
Graduation year		1999 \pm 11.3	2000 \pm 10.9	1999 \pm 12.8
Area of residence	North	629 (59.7%)	600 (59.5%)	29 (64.4%)
	Center	174 (16.5%)	170 (16.8%)	4 (8.9%)
	South and Islands	251 (23.8%)	239 (23.7%)	12 (26.7%)
Practice	Public	42 (4%)	40 (4%)	2 (4.4%)
	Private	1012 (96%)	969 (96%)	43 (95.6%)

^a In Italy, a degree in dentistry was not instituted until the 1980s.

Table 2
 Characteristics of dental practice stratified according to dentists' opinions on whether it is right or wrong not to treat someone who is HIV positive.

	Discrimination	
	No	Yes
Number of valid answers	1009	45
<i>Personal experience*</i>		
Never refused to treat an HIV-infected patient	990 (98.1%)	38 (84.4%)
Refused to treat an HIV-infected patient	19 (1.9%)	17 (15.6%)
<i>Level of fear*</i>		
No fear	178 (17.6%)	2 (4.4%)
Mild	460 (45.6%)	17 (37.8%)
Moderate	293 (29%)	8 (17.8%)
High	69 (6.8%)	14 (31.1%)
Completely frightened	9 (0.9%)	4 (8.9%)
<i>Types of treatment**</i>		
Never treated an HIV-infected patient	265 (26.3%)	16 (35.6%)
All types of treatment required	398 (39.45%)	9 (20%)
Mainly operative dentistry	225 (22.3%)	11 (24.4%)
Mainly oral surgery	64 (6.3%)	7 (15.6%)
Mainly prosthodontics	3 (0.3%)	1 (2.2%)
Mainly orthodontics	21 (2.1%)	1 (2.2%)
Mainly periodontology	33 (3.3%)	0 (0%)

* χ^2 .
² $p = 0.001$; ** χ^2
² $p = 0.01$.

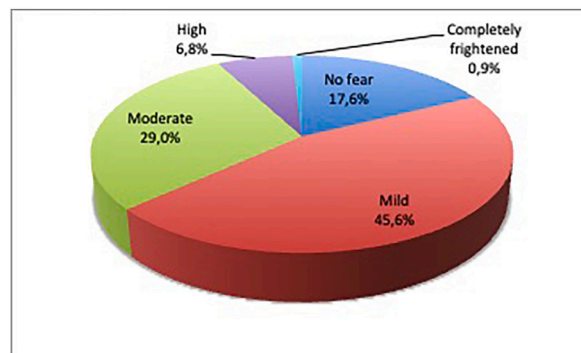


Fig. 1. Graphical presentation of the level of fear of dentists who think it is wrong not to treat HIV positive patients. Level of statistical significance: $\chi^2 p = 0.001$.

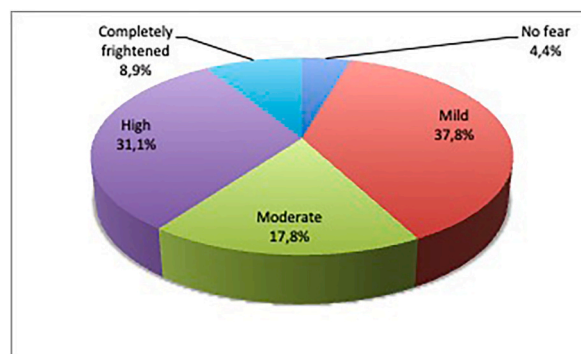


Fig. 2. Graphical presentation of the level of fear of dentists who think it is right not to treat HIV positive patients. Level of statistical significance: $\chi^2 p = 0.001$.

Table 3

Perception of dentists' scientific knowledge regarding HIV, stratified according to their opinion on whether it is right or wrong not to treat someone who is HIV positive.

Discrimination	No	Yes
Number of valid answers	1009	45
<i>Scientific knowledge</i>		
Good	791 (78.4%)	35 (77.8%)
Bad	218 (21.6%)	10 (22.2%)
<i>Ways used to further increase their scientific knowledge</i>		
Journals	138 (13.7%)	7 (15.6%)
Remote learning	64 (6.3%)	4 (8.9%)
Books	98 (9.7%)	5 (11.1%)
University courses	404 (40%)	19 (42.2%)
Colleagues	15 (1.5%)	1 (2.2%)
Internet	73 (7.2%)	2 (4.4%)
Courses from professional orders	217 (21.6%)	7 (15.6%)
<i>Opinions on HIV infection transmission pathways</i>		
Parenteral (including sex)	986 (97.7%)	43 (95.6%)
Orofecal route	8 (0.8%)	0
Through saliva	9 (0.9%)	2 (4.4%)
Through social life (excluding sex)	6 (0.6%)	0
<i>Have you ever heard of the window period?</i>		
Yes	869 (86.1%)	39 (86.7%)
No	140 (13.9%)	6 (13.3%)
<i>How many days is the window period?</i>		
0–40 days	196 (19.4%)	10 (22.2%)
40–120 days	524 (51.9%)	27 (60%)
120–365 days	143 (14.2%)	8 (17.8%)

^o This question was answered by only 908 dentists.

prevention of viral transmission, and not all participants answered every question, so the denominator changed for each question.

Almost 80% of respondents declared that they had good scientific knowledge about HIV and its way of spreading; in fact, over 97% of them answered specific questions about HIV correctly and more than 60% of them correctly knew the exact duration of the HIV window period.

Only 28 of 45 dentists answered the question about why they denied treatment to HIV-positive persons: four dentists (14.29%) stated they did so for fear of spreading the infection to other patients, for fear of becoming infected themselves, or for fear of losing patients from the practice. Three dentists (10.7%) did so for fear of spreading the infection to their staff members. Two dentists (7.14%) refused treatment by telling patients they lacked specific training, while eleven dentists (39.29%) provided different explanations.

4. Discussion

The aim of this study was to describe and analyze the behavior of a cohort of Italian dentists towards HIV-positive patients about 20 years after the introduction of HAART (now known as ART).

The reasons that prompted us to produce this survey were the persistence of discriminatory attitudes, which was also confirmed by

Table 4

The use of precautions to prevent transmission of infection, stratified according to dentists' opinions on whether it is right or wrong not to treat someone who is HIV positive.

	Discrimination							
	Thinking it is wrong not to treat (1009 dentists)				Thinking it is right not to treat (45 dentists)			
	Number of valid answers		Results (%)		Number of valid answers		Results (%)	
	Yes	No	Yes	No	Yes	No	Yes	No
Gloves	993	16	98.6	1.6	44	1	97.8	2.2
Mask	997	12	98.9	1.1	45	0	100	0
Protective eyewear	960	49	95.2	4.8	42	3	93.3	6.7
Surgical vacuum	833	176	82.6	17.4	41	4	91.1	8.9
Headgear	509	500	50.5	49.5	23	22	51.1	48.9
Wrapping handpieces	740	269	73.4	26.6	30	15	66.7	33.3
Changing gloves between patients	993	16	98.5	1.5	43	2	95.6	4.4
Washing hands between patients	879	130	87.2	12.8	38	7	84.4	15.6
Washing instruments before sterilization	983	26	97.5	2.5	44	1	97.8	2.2
Double gloves while treating HIV-positive patients	551	458	54.6	45.4	28	17	62.2	37.8
Sterilization of instruments	994	15	98.6	1.4	44	1	97.8	2.2
Dental unit with automated waterline disinfection system	568	441	56.3	43.7	23	22	51.1	48.9

news reports and attested by previous publications [1,2,20], the paucity of studies on the subject conducted in Italy, both in the pre-HAART and post-HAART eras, and the need to update the data from a previous Italian survey with an overlapping design conducted about 12 years ago [20].

It is worth analyzing and commenting on the persistence of a percentage of dentists who potentially still discriminate against HIV + patients. This percentage is, unfortunately, still high and substantially similar to that found in the previous epidemiological survey (4.3% versus 4.5% in the previous study). Although there was a slight downward trend in this figure, it is worth noting that the percentage is still incompatible with the principles of social inclusion and accessibility of care. It should also be noted that recent reports in the literature on samples of dentists from Libya and India have shown much higher percentages (39.3% and 33%, respectively) [1,2]. The unprofessional attitude to HIV/AIDS patients, when connected to the inadequate knowledge of the virus, can lead the percentage of discrimination increase to levels around 50% of interviewees, as reported in a cross-sectional study conducted on a population of Saudi Arabian dental students [27]. This diversity is believed to be associated with a generally poorer knowledge of the virus, how it is spread, and how it is treated. It should also be noted that in Italian dental degree *curriculum studiorum* virology, infectious disease clinics and the procedures to avoid cross-infections are of paramount importance. This could positively influence Italian dentists' ability to control their emotions and treat patients.

When analyzing the group of dentists who stated that it is okay to refuse to treat HIV + patients, particularly interesting data emerged. Almost 65% of those interviewed practiced dentistry in the north of the country, an area in which there is a high concentration of university institutions that can provide dentists with constant updates and a good level of post-graduate training. These data, in contrast with aforementioned suppositions, could be justified by the unwillingness to invest too much time (and maybe money) in the treatment of HIV + patients, since a large part of those interviewed (about 62%) believed that additional precautions would be necessary for their treatment. This assumption was also corroborated by the fact that about 2% of respondents believed it is appropriate to apply different rates for the treatment of HIV + individuals.

Even if the data regarding geographical location did not yield statistically significant results, most of the answers came from dentists living in Northern Italy, which is a geographical area rich in information centers and universities.

The limited knowledge of the natural cycle of infection was clearly highlighted in the answers to some questions regarding the reasons that led to dentists refusing to provide dental treatment: a lack of previous experience (more than 7% replied that they had not received adequate training or had no previous experience), the level of fear associated with treating HIV + patients (more than 9% reported being afraid or terrified), and the ways in which dentists would "recognize" an HIV + patient if they were seated in a dental chair. With regard to this eventuality, in fact, more than 24% of the interviewees declared that they based their opinion on the physical appearance of a patient or on a physical examination of their oral cavity, since it is probably still believed that it is possible to identify a risky individual if they present certain physical characteristics (tattoos, piercings, etc.).

Such attitudes represent an enormous risk for the community, since the pattern of HIV spread has completely changed and the lesions traditionally associated with HIV (e.g., Kaposi's sarcoma, candidiasis, and hairy leukoplakia) are now rarely found thanks to the advent of ART. A further alarming element is the fact that, by implementing this behavior, these dentists are probably not aware of the fact that they have HIV + people among their patients and that there is a not negligible percentage of patients unaware of their HIV status that ranges from 15% in the USA and Europe [9,10] to more than 30% in some African areas [11].

The multivariate analysis also confirmed the data found above, revealing a statistically significant association between those who consider it right not to treat HIV + patients and the use of special protective clothing. Surprisingly, the level of scientific knowledge did not emerge as a significant predictor of discriminatory behavior.

With regard to the reasons that dentists used to justify their refusal to treat HIV + patients, it should be noted that almost 40% of them cited a fear of becoming infected or that the infection would spread to co-workers or other patients as a reason.

This reason implies a probable lack of adherence to the normal procedures of disinfection and the sterilization of instruments and furnishings, which should be investigated more thoroughly. Finally, the issue of perceived stress associated with the treatment of infected patients (high or very high in 13% of cases) requires more attention, because it has been shown [28] that a high level of stress increases the rate of intraoperative accidents.

A general analysis of the entire sample of interviewed dentists revealed details worthy of further investigation. Only 78.4% of the dentists believed that they had good scientific knowledge about HIV and the modalities of its diffusion; despite this, about 2% were convinced that it is transmitted through the orofecal circuit or through (nonsexual) social interactions, and they did not use the normal procedures aimed at preventing the spread (for example: sterilization of all instruments, changing gloves between patients, and washing and decontaminating instruments before sterilizing them). If these data are read while considering the normal tendency of respondents to give answers that put them in a good light, even if they did not respond according to their actual habits, the result is particularly alarming because it reveals that not all colleagues put routine protocols in place that are aimed at minimizing the incidence of cross-infection.

The use of an anonymous questionnaire that could be filled out online certainly overcame some selection bias that is typical of the mode of distribution and return of questionnaires via traditional mail, which was used in the previous survey. Moreover, despite the online method, the total response rate was about 18.4% lower than the previous survey (about 25.7%) [20] and lower than similar questionnaires in other European countries [29]. The low response rate may have also been due to the high number of e-mails that are now received daily and to which it is not always possible to give proper attention, along with the absence of a reminder [30]. Moreover, due to the completely anonymous nature of the survey, the authors were completely prevented from knowing which recipients did not answer or from understanding why they left the survey unanswered. Such limitations made it impossible to carry out a population-based study or send a reminder to those who did not answer.

The study suffered from some other limitations connected to the distribution of the sample population, which was not

homogeneous from the point of view of geography, university education, or, above all, practice location. In fact, only 4% of the dentists practiced in a public setting, as opposed to over 95% of dentists that worked in a private practice.

It was very interesting to note that, among those who said it was right not to treat HIV + patients, only 15.6% (seven dentists) actually implemented discriminatory behaviors. This would suggest the existence of two categories of discrimination, namely beliefs and behaviors, but given the small number of behaviors, it was not possible to detect the precise characteristics that would identify these colleagues.

It should also be noted that the survey also asked about previous experience in the treatment of HIV + patients, so that the risk that personal experience could contradict the discriminatory behavior is avoided.

Another consideration was represented by the absence of investigations about the baseline psychological status of the dentists, which may have influenced the eventual discriminatory behavior towards HIV + patients. Such elements were not considered, since professional and university-degree training is assumed to be able to eliminate every fear by making it clear that compliance with defined protocols protects against cross-infections. Another reason for this was the fact that the present paper is an update of a previous survey conducted in 2009, in which the psychological area was not assessed. However, the analysis of some factors, such as fear and disgust, which are understood to promote all types of prejudice, should be considered relevant for future reports.

The present study is the third in Italy to investigate the behavior of dentists towards HIV + patients, and the second in the post-HAART era. Unfortunately, it has been noted that the percentage of dentists who carry out discriminatory behaviors has substantially remained above 4%. This evidence requires targeted and punctual interventions by universities, training institutions, and professional boards that must intervene in order to enhance the offer of training related to the treatment of patients with special needs. In addition, a greater emphasis should be placed on the use of post-prophylactic exposure (PPE), the sterilization of instruments, and the disinfection of environments and surfaces.

The main professional associations in the dental sector (ANDI and AIO) should invest more in postgraduate training by promoting regular professional refresher courses. This need clearly emerged from our study since, although the percentages are low, some dentists believe that HIV is transmitted through the fecal-oral circuit but many do not know that there is a window period (Table 3) and around 3% of respondents do not use gloves during clinical practice or do not change them between patients (Table 4). Moreover, as HIV infection has faded from a media perspective and ceased to be of major media interest, efforts to avoid cross-infection may have declined. It would therefore be appropriate to carry out studies similar to this one in other countries as well.

5. Conclusions

The previous study [20] concluded with the hope that incidents of discrimination would gradually decrease in the future. Unfortunately, we obtained similar results to the data recorded 12 years ago. Therefore, it is worth remembering that discriminatory attitudes, since they are often linked to a lack of scientific knowledge of HIV, may paradoxically increase the risk of cross-infection. Repeating the warning issued by the World Health Organization about the prohibition of denying treatment to HIV + patients, it should be noted that in the ART era, infected individuals now lead normal lives and are more likely to need dental care. Moreover, it has now been incontrovertibly proven that proper drug intake and the undetectability of the virus has made the infectious power of HIV + individuals virtually nonexistent. For these reasons, adequate knowledge of the matter and a greater ethical and moral understanding regarding the treatment of HIV + patients on the part of dental professionals are required in order to prevent further discriminatory episodes. Future research could focus on other factors, which could be connected to discriminatory behavior (i.e. trait anxiety, disgust, conservative political beliefs, etc.) that have not been assessed in the present study.

The principal outcomes highlighted by the study are the sequent.

1. A discriminatory behavior in more than 4% of study population was detected;
2. Feeling a greater level of stress when treating HIV-positive patients, charging them different fees, using special precautions for dental treatments and deliberately refusing to treat them were independent risk factors for discrimination;
3. Although there was a slight downward comparing data about discrimination of the previous survey, the percentage is still incompatible with the principles of social inclusion and accessibility of care;
4. Since not all of the study population demonstrated adequate scientific knowledge of HIV infection, it is advisable to intensify the postgraduate training offer on this topic.

Author contribution statement

Michele Giuliani: conceived and designed the experiments.

Romeo Patini: performed the experiments.

Lorenzo Lo Muzio: contributed to the analysis of data.

Giuseppe Troiano: analyzed and interpreted the data.

Vito Carlo Alberto Caponio: analyzed and interpreted the data.

Daniela Adamo: contributed to the analysis of data.

Francesca Conti: performed the experiments.

Patrizia Gallenzi: contributed to the analysis of data.

Carlo Lajolo: conceived and designed the experiments.

Data availability statement

Data will be made available on request.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.heliyon.2023.e18751>.

References

- [1] R.S. Dhanya, V. Hedge, S. Anila, G. Sam, R.R. Khajuria, R. Singh, Knowledge, attitude, and practice towards HIV patients among dentists, *J. Int. Soc. Prev. Commun. Dent.* 7 (2) (2017) 148–153.
- [2] A. Arheiam, M. El Tantawi, A. Al-Ansari, M. Ingafou, A. El Howati, K. Gaballah, W. AbdelAziz, Arab dentists' refusal to treat HIV positive patients: a survey of recently graduated dentists from three Arab dental schools, *Acta Odontol. Scand.* 75 (5) (2017) 355–360.
- [3] Y.S. Wimaradhani, Y.F. Ossa, Wardhany II, D.A. Maharani, C. Lee, Indonesian dental students' attitudes, knowledge, preparation, and willingness to treat HIV/AIDS patients, *Eur. J. Dermatol.* 16 (4) (2022) 867–874.
- [4] D.E. Vance, Olfactory and psychomotor symptoms in HIV and aging: potential precursors to cognitive loss, *Med. Sci. Mon. Int. Med. J. Exp. Clin. Res.* 13 (10) (2007) 1–3.
- [5] P.M. Sfikas, HIV and discrimination: a review of the Waddell case and its implications for health care professionals, *J. Am. Dent. Assoc.* 133 (2002) 372–374.
- [6] L.L. Patton, R.P. Strauss, R.G. McKaig, D.R. Porter, J.J. Eron Jr., Perceived oral health status, unmet needs, and barriers to dental care among HIV/AIDS patients in a North Carolina cohort: impacts of race, *J. Public Health Dent.* 63 (2003) 86–91.
- [7] A. Dobalian, R.M. Andersen, J.A. Stein, R.D. Hays, W.E. Cunningham, M. Marcus, The impact of HIV on oral health and subsequent use of dental services, *J. Public Health Dent.* 63 (2003) 78–85.
- [8] M. Giuliani, C. Lajolo, G. Rezza, C. Arici, S. Babudieri, P. Grima, C. Martinelli, E. Tamburrini, J. Vecchiet, M.S. Mura, R. Cauda, T. Mario, BSAHOD Study Group, Dental care and HIV-infected individuals: are they equally treated? *Commun. Dent. Oral Epidemiol.* 33 (2005) 447–453.
- [9] F.F. Hamers, A.N. Phillips, Diagnosed and undiagnosed HIV-infected populations in Europe, *HIV Med.* 9 (2008) 6–12.
- [10] M. Chen, P.H. Rhodes, I.H. Hall, et al., Prevalence of undiagnosed HIV infection among persons aged ≥ 13 years—National HIV Surveillance System, United States, 2005–2008, *MMWR Morb. Mortal. Wkly. Rep.* 61 (2012) 57–64.
- [11] C.A. West, G.C. Chang, W.D. Currie, R. Bray, S. Kinchen, S. Behel, Unawareness of HIV infection among men aged 15–59 Years in 13 sub-saharan african countries: findings from the population-based HIV impact assessments, 2015–2019, *J. Acquir. Immune Defic. Syndr.* 87 (2021) S97–S106.
- [12] S.E. Rutledge, J. Whyte, N. Abell, K.M. Brown, N.I. Cesnales, Measuring stigma among health care and social service providers: the HIV/AIDS provider stigma inventory, *AIDS Patient Care STDS* 25 (2011) 673–682.
- [13] I.T. Katz, A.E. Ryu, A.G. Onuegbu, C. Psaros, S.D. Weiser, D.R. Bangsberg, A.C. Tsai, Impact of HIV-related stigma on treatment adherence: systematic review and meta-synthesis, *J. Int. AIDS Soc.* 16 (2013), 18640.
- [14] J.D. Seacat, M.D. Litt, A.S. Daniels, Dental students treating patients living with HIV/AIDS: the influence of attitudes and HIV knowledge, *J. Dent. Educ.* 73 (2009) 437–444.
- [15] E.N. Alshouibi, W.S. AlAlyani, Human immunodeficiency virus related discrimination in general dentistry, *Saudi Med. J.* 39 (2018) 1148–1153.
- [16] I. Sufiawati, M.A. Rafi, F.M. Putri, Evaluating knowledge, attitude, and behavior of dentists on HIV/AIDS in west java, Indonesia, in the COVID-19 era, *Int. J. Dent.* 23 (2021), 1901887, 2021.
- [17] M.E. Bennett, R.J. Weyant, J.M. Wallisch, G. Green, Dentists' attitudes toward the treatment of HIV-positive patients, *J. Am. Dent. Assoc.* 126 (1995) 509–514.
- [18] S. Rungsyanont, A. Lam-Ubol, P. Vacharotayangul, K. Sappayatosok, Thai dental practitioners' knowledge and attitudes regarding patients with HIV, *J. Dent. Educ.* 77 (2013) 1202–1208.
- [19] G.M. McCarthy, J.J. Koval, J.K. MacDonald, Factors associated with refusal to treat HIV-infected patients: the results of a national survey of dentists in Canada, *Am. J. Public Health* 89 (1999) 541–545.

- [20] M. Giuliani, C. Lajolo, A. Sartorio, M.G. Lacaíta, S. Capodiferro, R. Cauda, G. Rezza, M. Tumbarello, Attitudes and practices of dentists treating patients infected with human immunodeficiency virus in the era of highly active antiretroviral therapy, *Med. Sci. Mon. Int. Med. J. Exp. Clin. Res.* 15 (6) (2009) 49–56.
- [21] S. Teeraananchai, S.J. Kerr, J. Amin, K. Ruxrungham, M.G. Law, Life expectancy of HIV-positive people after starting combination antiretroviral therapy: a meta-analysis, *HIV Med.* 18 (4) (2017) 256–266.
- [22] L. Williams-Wiles, A.R. Vieira, HIV status does not worsen oral health outcomes, *J. Clin. Periodontol.* 46 (6) (2019) 640–641.
- [23] E. Small, S.P. Nikolova, Y. Zhou, M. Okumu, Exploring factors associated with HIV secondary stigma among adolescents and young adults in Uganda: a cross-sectional study, *Glob. Public Health* 17 (2022) 526–537.
- [24] Y.A. Chekole, D. Tarekegn, HIV-related perceived stigma and associated factors among patients with HIV, Dilla, Ethiopia: a cross-sectional study, *Ann. Med. Surg. (Lond.)* 8 (2021) 71, 102921.
- [25] A. Geter, A.R. Herron, M.Y. Sutton, HIV-related stigma by healthcare providers in the United States: a systematic review, *AIDS Patient Care STDS* 32 (2018) 418–424.
- [26] D.I. Adeoye-Agboola, H. Evans, D. Hewson, Y. Pappas, Factors influencing HIV disclosure among people living with HIV/AIDS in Nigeria: a systematic review using narrative synthesis and meta-analysis, *Publ. Health* 136 (2016) 13–28.
- [27] F.M. Alali, B. Tarakji, A.S. Alqahtani, N.R. Alqhtani, A.B. Nabhan, A. Alenzi, et al., Assessment of knowledge and attitude of dental students towards HIV and its oral manifestations in Saudi arabia-A cross-sectional study, *Healthcare (Basel)* 10 (2022) 1379.
- [28] A. Plessas, M. Nasser, Y. Hanoch, T. O'Brien, M. Bernardes Delgado, D. Moles, Impact of time pressure on dentists' diagnostic performance, *J. Dent.* 82 (2019) 38–44.
- [29] F. Scheutz, Dental care of HIV-infected patients: attitudes and behavior among Danish dentists, *Commun. Dent. Oral Epidemiol.* 17 (1989) 117–119.
- [30] R. Jones, N. Pitt, Health surveys in the workplace: comparison of postal, email and World Wide Web methods, *Occup. Med. (Lond.)* 49 (1999) 556–558.