

Abstract

The aim of this study was to investigate the hygienic quality of dental practices on the basis of the self-awareness expressed by dentists respondents to a self-reported questionnaire about the health/hygiene characteristics of practice, the knowledge of biologic/toxicological risks and the preventive procedures and devices improvements in professional practice.

Materials and methods

Of the 127 practitioners contacted, 108 (85%) agreed to participate. The knowledge of infective risks was self-evaluated as “good” only in 24%; even if vaccinated, most of the dentists (57%) considered HBV the main infective agent to fear, not giving the same importance to the air-borne transmission of diseases. The presence of a single dental unit per surgery (90%) was considered an index of good health/hygiene education but, in spite of the use of disposable gloves, caps and masks, the dentists do not always change their coats or wash their hands between patients yet. The management of dental instruments can be considered efficient as long as they are sterilised in an autoclave (97%) and undergo periodic sterilization efficacy tests (76%).

Results and conclusion

The results indicate a good structural and organisational status, but there is the need for continuous education concerning the prevention of cross-infections.

Keywords: Infective risk, Cross-infections, Surveillance, Dental practices.

Introduction

The concept of “infection control”, in the past fundamentally based on the identification of high-risk patients and the implementation of additional preventive strategies, has recently been reviewed and extended by the American and British Dental Associations, the Centers for Disease Control (CDC) and the WHO [American Dental Association, 1998; Vignarajah et al., 1998]. In particular, it has been noted that dental surgery environments (air, surfaces, main water supply and unit water and instruments) show excessive microbial contamination [Fabiani and Giuliani, 1999].

The contamination of a dental surgery is favoured by the large number of users, which leads to a qualitative and quantitative increase in air-borne microorganisms, subsequently contaminating all of the surfaces. The use of high speed rotating instruments on infected tissues leads to aerosols and nebulisations that increase the risk of cross-infections.

The guidelines drawn by the Centers for Disease Control and Prevention (CDC) aim at the divulgation of recommendations in order to control and prevent cross-infections so to ensure the quality of the intervention and the safety of the personnel and patients, both in dental surgeries and any other area pertinent to dental treatments [Quirke, 2001; Kohn et al., 2003]. They recommend the use of spray or liquid disinfectants, whose contact times are set by the manufacturers, and other different disinfection/sterilisation measures in order to prevent the transmission of infectious diseases [Kugel et al., 2000].

All the patients undergoing dental surgery must be considered potential carriers of infectious diseases because even with negative serological test results, the possibility that they are in the so-called window period cannot be excluded. This requires the implementation of universal preventive systems [Vignarajah et al., 1998; Kugel et al., 2000]. Patients and staff may be exposed to pathogenic microorganisms such as CMV, HBV, HCV, HSV (types 1 and 2), HIV, Mycobacterium tuberculosis, Staphylococcus spp. as well as other viruses and bacteria (e.g. Legionella, Pseudomonas, Klebsiella, etc., isolated in the waters of dental units) [Milss, 2000; Smith et al., 2002; Porteus et al., 2003] which colonise or infect the oral cavity and airways in various ways (blood-borne, airborne and water-borne infections):

1) direct contact with blood and/or oral fluids;
2) direct contact with contaminated objects (e.g.
instruments or various surfaces);
3) the contact of the conjunctivae, or oral and/or nasal mucosa with micro-organism containing Flugge droplets emitted at a short distance (e.g. when coughing or simply conversing), or the inhalation the micro-organism contained in the droplet nuclei that may remain suspended in the air [McCarthy et al., 1998; Fabiani and Giuliani, 1999; Kohn et al., 2003; Molinari, 2003; Williams et al., 2003].

Previous Italian studies have highlighted the poor adherence of private dentists to the guidelines, although the data published over the last few years based on the same or similar questionnaire surveys involving large numbers of healthcare workers are more optimistic [McCarthy et al., 1998; Fabiani and Giuliani, 1999; Kohn et al., 2003; Molinari, 2003; Williams et al., 2003]. The comparison of questionnaires repeated at intervals allow survey studies and may be a good indicator of the level of knowledge of all infection-related questions in dentistry.

The aim of this study was to investigate the quality of dental surgeries on the basis of the personal awareness of respondents to a questionnaire covering health/hygiene conditions, infectious and toxicological risks, and preventive measures concerning professional practice.

Materials and methods

Between 2001 and 2002, a cross-sectional study was carried out involving the population of physicians and dentists in the province of L'Aquila included in the Professional Register in 2001.

After a previous direct or telephonic agreement, private practitioners were sent an anonymous self-report questionnaire accompanied by a description of the project and consent forms to permit the use of the collected data.

The questionnaire contained 53 closed, validated and used in other studies [Shulman and Brehm, 2001; Monarca et al., 2000; Montagna et al., 2003] open and semi-open questions, divided into seven parts.
1. Personal data: age, sex, type of degree (medicine or dentistry), years of clinical practice, number of hours per week devoted to professional work.
2. Characteristics of the dental surgery: the number of dental units, the presence of purifiers and conditioners, and areas for decontamination, disinfection, sterilisation and material stocks; the type of taps and the means used to dry one's hands.
3. Disinfectants and chemical compounds used to clean surfaces and instruments.
4. Data related to the risk of infection: knowledge of transmissible diseases, risk procedures for patients and staff, vaccinations and diagnostic investigations.
5. Prevention of the risk of infection: personal protection (i.e. the use of disposable gloves, masks and coats); methods of capping and disposing of needles; indications concerning hand-washing (i.e. frequency and the product used);
6. The management of the equipment: characteristics of the dental unit, disinfection and sterilisation protocols.

The completed questionnaires were returned to the research group. After being carefully verified, the collected data memorised in electronic form were analysed using the program Statistics Data Analysis [STATA, 1999] in order to describe the findings and assess any relationship between individual characteristics and behaviours.

Results

Of the 127 dentists contacted, 85% (108) agreed to participate and 65% (82) returned the questionnaire: the refusal rate was therefore 15% (19) and the rate of unreturned questionnaires was 20% (26).

Personal data. The mean age of the respondents was 41 years (SD 8; range 26-78), and there was a prevalence of males (80.5%). The percentage distribution of the type of degree was homogeneous: 43 respondents (53%) graduated in medicine, 15 of whom (34.9%) had specialised in dentistry; 39 (47%) graduated in odontology and dental prosthesis. The mean duration of professional practice was 13 years (SD 7; range 1-51). Eleven subjects (13.5%) declared they worked in their surgeries about 20 hours/week, 64 (78%) between 20 and 49 hours/week, and the remaining seven (8.5%) more than 50 hours/week.

Characteristics of the practice. As a whole, the examined dental surgeries are equipped with 157 dental units, an average of two per surgery (58.54%), 90% of which are located in different rooms. About three-quarters (75.6%) of the units are equipped with an antireflux valve and only 30.5% with circuit self-purification systems. The mean surface area of the surgeries is 83.2 m² (SD 39; range 25-250). Most surgeries also have special rooms for storage (90.2%); instrument decontamination, disinfection and sterilisation (97.6%); the storage of sterile materials (64%); and dental laboratory (57.3%). Of the pratices
examined, 90.1% have a waiting room, 83.4% a tiled or marble floor, and 76.8% easily cleaned wall coverings. The sink taps are principally activated by equally distributed pedal (56%) or lever systems (55%); only 5% have photocellular systems and 2.7% hand-operated systems.

Of the saliva aspiration plants, 65.5% are low speed and 87.8% high speed; only 8% of the surgeries have air purifiers. Almost all of the dentists (91.5%) use disposable means for hand drying, and only a small percentage cloths/towels: none of the surgeries is equipped with hot air hand dryers.

The most widely used means of communication is a fixed telephone, and hands-free telephony is used by a small number (16.5%); the sum of the percentages does not reach 100% because the questions allowed multiple answers.

Disinfectants. Table 1 lists the most widely used disinfectants, although the majority of dentists use more than one product and indicated the trade names of those purchased more frequently.

Data relating to potential risk factors. The most highly transmissible infectious disease was indicated as being hepatitis B by 47 dentists (57%), followed by hepatitis C (13%), acquired immunodeficiency (AIDS) (10%), influenza (5%), herpes (5%) and tuberculosis (1%) (Table 2). According to the respondents, the infectious agents, both for themselves and the patients, are transmitted by surgical manoeuvres. In reply to the question concerning the level of awareness of the risk of infection, only 24.4% of the respondents declared to be well informed; the others considered their knowledge sufficient: in both cases, they declared that they had obtained their information from Italian and international specialized journals, as well as training courses.

The most frequent accidents in dental surgeries are needle punctures or wounds caused by sharp instruments: 50% of the respondents declared that they had injuries at least once during the previous five years.

Eighty-two percent (67) of the respondents declared that they had been vaccinated against HBV, 70% of them also underwent a seroconversion test.

Furthermore, many respondents said they underwent periodic diagnostic serological tests: 76.5% (63) for HBV, 78% (64) for HCV and 69.5% (57) for HIV. The means used to prevent infections are disposable gloves (93.9%), which are changed between patients (97.6%); safety glasses or visors (86.6%, 35.4%); disposable double- and triple-layered masks (respectively 56.1% and 47.6%), replaced after every observation by 37.5%; caps (20.7%), dams (54.9%), protective surgical sheets (58.5%) and disposable jackets (21.9%); after each treatment, 69.5% wash their hands with generic cleanser, and 29.3% with disinfectants.

When faced with patients affected by AIDS, hepatitis B, hepatitis C or herpes, respectively 11%, 12.2%, 9.8% and 13.4% of the respondents behave as if they were healthy subjects.

Dental practice equipment instruments and management. The water supplied to the dental units is filtered (58.5%), demineralised (29.3%), disinfected (12.2%) and sterilised (11%); the units are equipped with antireflux valves (76.9%), filters (71%) and self-cleaner systems (22%). Only 24.3% of the respondents periodically disinfect the circuits (glutaldehyde, phenols, chlorhexidine, etc.).

Sterilisable contaminated instruments or equipment are first cleaned and then sterilised in 69.5% of cases, only disinfected in 36.6%, and manually cleaned in 22%; no UV procedure was recorded. The non-sterilisable instruments with mechanical devices are first cleaned and then disinfected in 78% of cases, or

<table>
<thead>
<tr>
<th>Disinfectant</th>
<th>Surfaces</th>
<th>Handles</th>
<th>Instrum.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen peroxide</td>
<td>1.2</td>
<td>1.2</td>
<td>4.9</td>
</tr>
<tr>
<td>Ethyl alcohol</td>
<td>6.1</td>
<td>3.6</td>
<td>-</td>
</tr>
<tr>
<td>Sodium hypochlorite</td>
<td>8.5</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td>Chlorhexidine</td>
<td>8.5</td>
<td>14.6</td>
<td>28.0</td>
</tr>
<tr>
<td>Glutaraldehyde</td>
<td>7.3</td>
<td>9.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Quaternary ammonium salts</td>
<td>37.8</td>
<td>30.4</td>
<td>21.9</td>
</tr>
<tr>
<td>Others</td>
<td>30.6</td>
<td>45.3</td>
<td>47.7</td>
</tr>
</tbody>
</table>

TABLE 1- Relative frequency (%) of the disinfectants used in dental practices.

<table>
<thead>
<tr>
<th>Infectious diseases</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatitis B</td>
<td>57%</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>13%</td>
</tr>
<tr>
<td>AIDS</td>
<td>10%</td>
</tr>
<tr>
<td>Influenza</td>
<td>5%</td>
</tr>
<tr>
<td>Herpes</td>
<td>2%</td>
</tr>
<tr>
<td>TBC</td>
<td>1%</td>
</tr>
<tr>
<td>Other</td>
<td>12%</td>
</tr>
</tbody>
</table>

TABLE 2- Relative frequency (%) of the infectious diseases most worrying the dentists (multiple responses).
first disinfected and then sterilised in 12.2%, although a small percentage of dentists clean them with detergents (12.2%) or disinfectants (4.9%).

Table 3 shows the percentage preferences for disinfection versus sterilisation for the different instruments. The instruments are protected by a pvc film between patients in 32.5% of cases.

Sterilisable burrs are preferred over disposable ones by 83.4% (69) of the respondents; impressions and prostheses are disinfected in respectively 84% and 74.4% of cases.

All of the surgeries are equipped with autoclaves, 97% of which are based on distilled water and 3% chemiclaves; despite this, 35.4% have a dry furnace, 51% use quartz ball sterilisers, 22% UV lamps, and only 1% micro-wave ovens and/or kettles.

Most of the surgeries (76%) periodically check the sterilisation devices by means of indicators.

Once sterilised, the material is stored in closed cupboards (83%), on open shelves (4%), or in a UV box (13%).

Thirty-nine percent (32) of the respondents use specific disinfection and sterilisation treatments (e.g. separately) for the instruments used on patients considered at risk.

Information and education concerning occupational risks. Twenty-four percent of the respondent said that they have a high level of information concerning occupational risks and the prevention of transmissible infectious diseases in a dental surgery.

Discussion and conclusion

Participation in the survey was high, with 75.6% of the questionnaire being completed and returned, although 15% of the dentists contacted refused to even read the questionnaire, possibly because they saw it more as a control measure than an opportunity for training and professional growth. There are still some gaps regarding the awareness of transmissible infectious diseases in a dental surgery: in fact, HIV, HBV and HCV are considered the greatest risks, without taking into account that influenza virus and the tuberculosis bacillus are more frequently transmitted [Kohn, 2003].

About 20% (16) of the respondents could not precisely indicate the names of the disinfectants used; however, it is comforting to discover that the use of individual passive means of protection is widespread, although attention should be drawn to the habit of not washing one’s hands regularly between one patient and another (before and after gloves removal).

The habit of not touching needles with bare hands has certainly improved [Boyce and Pittet, 2002; Molinari, 2003], but the practice of covering the point holding the cap between the fingers remains widespread despite the fact that it increases the risk of injury in 50% of cases. Similarly widespread is the lack of immunoprophylaxis against the risk of infection, and so it is important to draw dentists’ attention to the value of active prophylaxis since the number of operators vaccinated against HBV and who have undergone serological assays is still low, not to mention the other recommended vaccinations (e.g. influenza).

The water circuits of the dental units are decontaminated by almost all respondents, but only a small percentage (28%) do so daily. The incoming water is frequently filtered and demineralised despite the fact that, unless the filtration devices are adequately maintained, this increases the risk of water contamination.

A small percentage of practices (5%) have more than one dental unit in the same room, which favours aerosol spread from one chair to another; this situation is improved by high-speed aspirators to reduce the nebulisation.

In terms of instrument management, an optimal percentage of surgeries are equipped with steam autoclaves and checked in their efficacy. In most of the surgeries, the surfaces are protected by polyethylene film. Structurally, the surgeries are adequate in terms of the prevention of cross-infections, as similarly underlined by others studies [McCarthy and McDonald, 1988; Williams et al., 2003].

Although complex, this survey has made it possible to collect important information for improving the awareness of dentists by means of the implementation of health education plans and the identification of priorities for continuing medical training, as well as for purposes of quality accreditation. The research could therefore be completed by measuring...

<table>
<thead>
<tr>
<th>Instruments</th>
<th>Disinfection</th>
<th>Sterilisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micromotor</td>
<td>74.4</td>
<td>14.6</td>
</tr>
<tr>
<td>Turbine</td>
<td>72.0</td>
<td>14.6</td>
</tr>
<tr>
<td>Air/water syringe</td>
<td>77.0</td>
<td>8.5</td>
</tr>
</tbody>
</table>

Table 3- Relative frequency (%) of declared “preference for disinfection vs sterilisation”.
environmental contamination in order to develop a monitoring system that guarantees the safety of surgeries in a more than episodic way.

References