

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/279994868>

Prevention of healthcare-associated infections: Knowledge among dental students in seven Italian universities

Article in *Annali di igiene: medicina preventiva e di comunità* · May 2015

DOI: 10.7416/ai.2015.2046

CITATION

1

READS

146

14 authors, including:



Licia Veronesi

Università di Parma

116 PUBLICATIONS 930 CITATIONS

[SEE PROFILE](#)



Paolo Castiglia

Università degli Studi di Sassari

231 PUBLICATIONS 1,891 CITATIONS

[SEE PROFILE](#)



Daniela D'Alessandro

Sapienza University of Rome

172 PUBLICATIONS 864 CITATIONS

[SEE PROFILE](#)



Liliana Minelli

Università degli Studi di Perugia

149 PUBLICATIONS 974 CITATIONS

[SEE PROFILE](#)

Some of the authors of this publication are also working on these related projects:



IMPROVING WELLBEING AND PHYSICAL ACTIVITY IN NEIGHBORHOODS [View project](#)



ISCHIA-GISIO STUDY [View project](#)

Prevention of healthcare-associated infections: knowledge among dental students in seven Italian universities

Cesira Pasquarella^{1*}, Licia Veronesi¹, Paolo Castiglia², Daniela D' Alessandro³, Pierpaolo Legnani⁴, Liliana Minelli⁵, Maria Teresa Montagna⁶, Christian Napoli⁶, Elena Righi⁷, Laura Strohmenger⁸, Marina Tesauro⁹, Ida Torre¹⁰, Maria Luisa Tanzi¹, and SItI (Italian Society of Hygiene, Preventive Medicine and Public Health) working group "Hygiene in Dentistry"

Keyword: Healthcare-associated infections, dental practice, standard precautions, knowledge, students
Parole chiave: Infezioni correlate all'assistenza, odontoiatria, precauzioni standard, conoscenze, studenti

Abstract

Background: Lack of knowledge is the major reason for non-compliance with correct healthcare-associated infections (HAI) prevention procedures. The aim of this study was to evaluate knowledge of the Dental School (DSS) and Dental Hygiene (DHS) students with regard to the prevention of HAI, as basic knowledge for improving and harmonizing the educational content in the different Italian Universities.

Methods: A cross-sectional study was carried out using an anonymous questionnaire that was completed by DSS (I, II, III, IV, and V year) in seven Universities and DHS (I, II, and III year) in three Universities. The questions dealt with three specific areas: healthcare-associated infections, standard precautions and hand hygiene. Factors associated with an unacceptable level of knowledge (score <17.5) were analyzed using a logistic regression model. A *p* value <0.05 was considered to be significant.

Results: Five hundred and four questionnaires were collected: 81.5% for DSS and 18.5% for DHS. Mean overall score (\pm DS) achieved by the total number of students was 18.2 ± 2.93 on an overall perfect score of 25; 18.2 ± 3.04 for DSS and 17.8 ± 2.31 for DHS. Stratifying by area, the average score 2.7 ± 1.07 (53%) for HAI, 10.3 ± 1.61 (85.9%) for standard precautions, and 5.2 ± 1.44 (64.8%) for hand hygiene was observed. A significantly different level of knowledge ($p < 0.001$) between DSS and DHS was observed only for HAI (2.8 ± 1.07 for DSS vs 2.1 ± 0.96 for DHS). Significant differences among the academic years were found only for DSS concerning HAI and standard precautions. The logistic regression model showed that an age <23 years was a risk factor for lack of knowledge on HAI, but a protective factor for lack of knowledge about standard precautions and hand hygiene; attending DH degree course was associated with lack of knowledge on HAI.

¹ Department of Biomedical, Biotechnological and Translational Sciences, University of Parma, Italy

² Department of Biomedical Sciences, University of Sassari, Italy

³ Department Civil Building and Environmental Engineering, "Sapienza" University, Rome, Italy

⁴ Department of Biomedical and Neuromotor Sciences, University of Bologna, Italy

⁵ Department of Experimental Medicine, University of Perugia, Italy

⁶ Department of Biomedical Sciences and Human Oncology, University of Bari "Aldo Moro", Italy

⁷ Department Department of Diagnostic, Clinical and Public Health Medicine, University of Modena and Reggio Emilia, Italy

⁸ Department of Health Sciences, University of Milan, Italy

⁹ Department of Biomedical, Surgical and Dental Sciences, University of Milan, Italy

¹⁰ Department of Public Health, University of Napoli "Federico II", Italy

Conclusions: *Although the overall score obtained both by DSS and DHS indicated an acceptable level of knowledge, lack of knowledge was highlighted, in particular, for hand hygiene. Therefore, it is necessary to implement and validate effective teaching models in undergraduate courses in order to provide the scientific basis and the theoretical and practical preparation for the prevention and control of HAI.*

Introduction

Dental practice is associated with a high risk of infection for patients and for healthcare workers (1-6). Microorganisms can be transmitted through direct contact with blood, oral fluids, or other patient materials; indirect contact with contaminated objects or surfaces; contact of conjunctival, nasal, or oral mucosa with droplets containing microorganisms generated from an infected person and inhalation of airborne microorganisms.

Recommendations for infection prevention and control in dental practice have been published (1,2,5); however, several studies have shown poor compliance with standards precautions among dental students and healthcare workers (7-14).

A variety of factors influence the compliance with healthcare associated infections prevention procedures, the most important being the knowledge of infection control procedures. Therefore, the evaluation of level of knowledge represents the first step towards improving educational strategies and to setting up targeted educational interventions.

Since its foundation in 1996, the Italian Society of Hygiene, Preventive Medicine and Public Health (S.It.I.) working group "Hygiene in Dentistry" has been actively studying all aspects of the risk of infection in dental practice and their prevention (5,15-17). In this context, the aim of this multicentre study, was to evaluate the knowledge of healthcare-associated prevention among dental students, including both Dental School Students (DSS) and Dental Hygiene

Students (DHS), in order to improve and harmonize at a national level the educational content of the "General and applied hygiene" teaching courses in the university degree course for dental-care-workers (DSS and DHS) in the different Italian Universities.

Materials and methods

A cross-sectional study was carried out during the academic year 2010/2011. DSS attending the I, II, III, IV, and V year in seven Universities and DHS attending the I, II, and III year in three Universities were asked to compile an anonymous self administered questionnaire. A modified version of the questionnaire designed in a French study (12) was adopted. The questionnaire was first used in a previous study carried out by the Italian Study Group of Hospital Hygiene (GISIO) (7) among Medical and Nursing students. Besides information about students' age, sex, curriculum, year of the course, and location of the university, the questionnaire included 6 questions, each one with four or five true/false answers. The questions dealt with three specific areas: healthcare-associated infections (1 question, 5 answers), standard precautions (3 questions, 12 answers) and hand hygiene (2 questions, 8 answers). If all answers were correct an overall perfect score of 25 was obtained.

According to previous studies (7,12), acceptable knowledge for a specific area was arbitrarily considered to be 70%. Therefore, the minimum acceptable number of right answers was assumed to be 3.5 on a total of

5, for healthcare-associated infections; 8.4 on a total of 12, for standard precautions; 5.6 on a total of 8, for hand hygiene; 17.5 on a total of 25 for overall. The correct responses are published in the paper by Tavolacci et al. (12).

The questionnaires were handed to the students after a lesson, together with an explanation sheet describing the study and the confidentiality of the interviewee's personal data.

Statistical analyses were performed using the SPSS 21.0 statistical package (SPSS Inc., Chicago, IL, USA). The mean scores and standard deviations achieved by DSS and DHS in the different years of course were calculated. Mean scores were compared using Student's t-test and the analysis of variance, frequencies difference were evaluated using Chi-square test. To investigate independent factors associated with non acceptable knowledge level a logistic regression model was used. The variables introduced into logistic regression

were: age (≥ 23 years=1), sex (female=1), and curriculum (DSS students=1). A p value < 0.05 was considered to be significant.

Results

Five hundred and four questionnaires were collected: 411 (81.5%) for DSS and 93 (18.5%) for DHS. Table 1 shows the sample general information. The mean age value, which was 23 years both for DSS and DHS, was used as the cut-off age for logistic regression.

Mean overall score (\pm DS) achieved by the total number of students was 18.2 ± 2.93 (72.6%) on an overall perfect score of 25 (100%); 18.2 ± 3.04 (72.8%) for DSS and 17.8 ± 2.31 (71%) for DHS being slightly higher than the acceptable score (17.5, 70%). Stratifying by area, the average scores of 2.7 ± 1.07 (53%), 10.3 ± 1.61 (85.9%) and 5.2 ± 1.44 (64.8%) were observed for healthcare associated infections,

Table 1 - Sample characteristics

		Dental School Students (DSS)		Dental Hygiene Students (DHS)	
		N.	%	N.	%
University	Bari	67	16.3%	64	68.8%
	Bologna	30	7.3%		
	Milan	88	21.4%		
	Modena	46	11.2%	26	28.0%
	Perugia	32	7.8%		
	Parma	83	20.2%		
	Sassari	65	15.8%	3	3.2%
Sex	Male	229	56.3%	22	23.7%
	Female	178	43.7%	71	76.3%
Academic year	1°	59	14.4%	38	40.9%
	2°	135	32.8%	28	30.1%
	3°	83	20.2%	27	29.0%
	4°	89	21.7%		
	5°	45	10.9%		
Age mean (standard deviation)		23 (4)		23 (5)	

Table 2 - Mean score and standard deviation (SD) by areas and curricula among dental school students (DSS) and dental hygiene students (DHS)

Questions	DSS mean (sd)	DHS mean (sd)	p (*)
Healthcare-associated infections (acceptable score=70%, 3.5/5)	2.8 (1.07)	2.1 (0.96)	<0.001
Standard precautions (acceptable score=70%, 8.4/12)	10.3 (1.66)	10.3 (1.40)	n.s. (§)
Hand Hygiene (acceptable score=70%, 5.6/8)	5.1 (1.47)	5.3 (1.28)	n.s.

(*) t Student's t-test for means difference; (§) not significant

standard precautions, and hand hygiene respectively.

Considering the mean overall score, no significant difference was observed between the two groups of students; on the contrary, stratifying by area, a significant difference ($p < 0.001$) was observed for healthcare-associated infections (2.8 ± 1.07 for DSS and 2.1 ± 0.96 for DHS) (Table 2).

Table 3 shows in detail the average scores (in percentage) obtained, by curricula and area. DSS were more aware than DHS that the environment is not the major source of bacteria responsible for the onset of healthcare-associated infections

(HAI) ($p = 0.083$) and that the extreme ages are at higher risk of HAI ($p < 0.001$). Moreover, they were more aware that the standard precautions do not recommend gloves for each procedure ($p = 0.033$), and recommend gloves when there is a risk of a cut ($p = 0.040$). As for hand hygiene, DSS achieved a higher score than DHS regarding the use of alcohol-based hand rub instead of a traditional hand washing ($p = 0.027$), while DHS showed better knowledge about the need of hand hygiene after the removal of gloves ($p < 0.001$) and the use of alcohol-based hand rub instead of a surgical hand washing ($p = 0.037$).

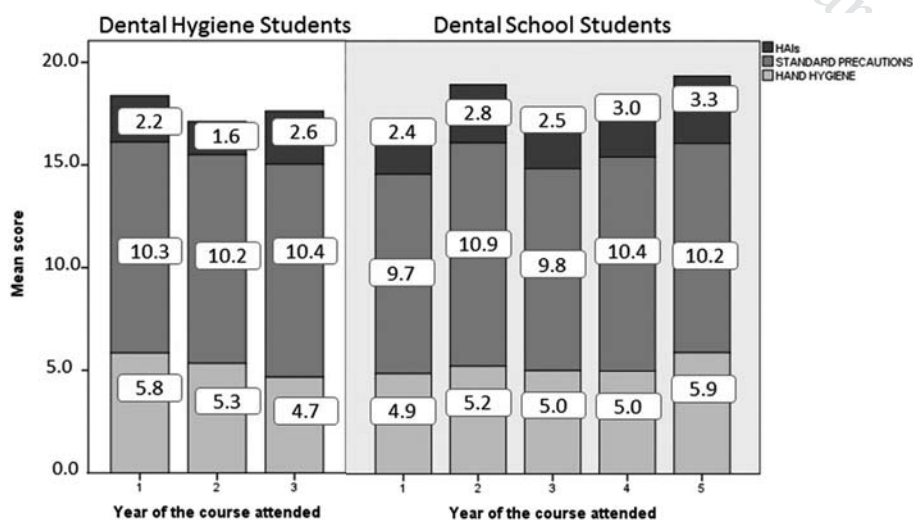


Figure 1 - Mean score by areas and curricula among dental school students (DSS) and dental hygiene students (DHS), in the different years of course (acceptable score for healthcare-associated infections, HAI = 3.5; Standard precaution = 8.4; Hand hygiene = 5.6).

Table 3 - Mean scores (in percentage) by areas and curricula (acceptable score=70%), among dental school students (DSS) and dental hygiene students (DHS)

Questions	DSS (%)	DHS (%)	p (*)
HEALTHCARE-ASSOCIATED INFECTIONS (HAI)			
The environment (air, water, surfaces) is the major source of bacteria responsible for the onset of HAI	24.3	15.2	0.083
Advanced age or very young age increases the risk of HAI	67.7	34.4	<0.001
Invasive procedures increase the risk of HAI	92.6	89.2	n.s.
HAI has a prevalence between 5 and 10% in Italy	57.8	48.3	n.s.
HAI are responsible for approximately 10,000 deaths per year in Italy	35.2	28.4	n.s.
STANDARD PRECAUTIONS			
Standard precautions:			
Include the recommendations to protect only the patients	91.2	95.7	n.s.
Include the recommendations to protect the patient and the health-care workers	94.2	96.8	n.s.
Apply for all the patient	93.2	95.7	n.s.
Apply for only healthcare workers who have contact with body fluids	92.4	94.6	n.s.
The standard precautions recommend use of gloves:			
For each procedure	24.9	14.0	0.033
When there is a risk of contact with the blood or body fluid	87.3	84.9	n.s.
When there is a risk of a cut	76.5	65.6	0.040
When healthcare workers have a cutaneous lesion	85.8	91.4	n.s.
When there is a risk of splashes or spray of blood and body fluids, the healthcare workers must wear:			
Only mask	95.6	95.7	n.s.
Only protection	95.9	96.8	n.s.
Only a gown	96.8	98.9	n.s.
Mask, goggles and gown	96.6	96.8	n.s.
HAND HYGIENE			
When is hand hygiene recommended			
Before <u>or</u> after a contact with (or care of) a patient	83.8	90.3	n.s.
Before <u>and</u> after a contact with (or care of) a patient	96.6	100.0	n.s.
Between patient contacts	92.2	94.6	n.s.
After the removal of gloves	72.4	90.1	0.001
What are the indications for the use of alcohol-based hand rub (on unsoiled hands)?			
Instead of a traditional hand washing (15 sec)	47.1	33.7	0.027
Instead of an antiseptic hand washing (30 sec)	45.6	42.4	n.s.
Instead of surgical hand washing (3 min)	27.5	39.1	0.037
A traditional hand washing must be done before hand washing with alcohol-based hand rub	50.1	48.4	n.s.

(*) Chi-square test for frequencies difference.

Table 4 - Logistic regression analysis of factor associated with non acceptable knowledge by areas

	Healthcare-associated infections		Standard precautions		Hand hygiene	
	OR	(CI95%)	OR	(CI95%)	OR	(CI95%)
Age	≥ 23 yy	1	≥ 23 yy	1	≥ 23 yy	1
	<23 yy	2.41 (1.53-3.78)	<23 yy	0.40 (0.24-0.67)	<23 yy	0.66 (0.45-0.98)
Sex	Female	1	Female	1	Female	1
	Male	0.72 (0.45-1.13)	Male	0.88 (0.51-1.51)	Male	0.62 (0.45-1.32)
Attending course	DSS	1	DSS	1	DSS	1
	DHS	2.77 (1.31-5.85)	DHS	0.68 (0.32-1.43)	DHS	1.03 (0.63-1.67)

DSS: dental school students; DHS: dental hygiene students

Figure 1 shows the score stratified by course and year. Significant differences were found only for DSS: as for healthcare-associated infection, the highest score (3.3) at the 5th year and the lowest (2.4) at the 1st year was observed; as for standard precautions, the highest score (10.9) was achieved at the 2nd year, while the lowest at the 1st year; as for hand hygiene, the highest score (5.9) was achieved at the 5th year of course, while the lowest (4.9) at the 1st year. DHS achieved the highest score both for HAI (2.6) and for standard precautions (10.4) at the 3rd year of course, when the lowest score for hand hygiene (4.7) was observed, being the highest at the 1st year (5.8).

In the different Universities, the score obtained in DHS ranged from 2.3 to 3.4 for HAI, from 9.2 to 11.2 for standard precautions, from 4.6 to 6.3 for hand hygiene. One University reported the highest score for all three areas.

The logistic regression model showed that an age <23 years was a risk factors for lack of knowledge on HAI (OR: 2.41, 95% CI 1.53 to 3.78), but protective for lack of knowledge about standard precautions (OR: 0.40, 95% CI 0.24 to 0.67) and hand hygiene (OR: 0.66, 95% CI 0.45 to 0.98) (Table 4). Attending DH degree course was associated with lack of knowledge on HAI (OR: 2.77, 95% CI 1.31 to 5.85) (Table 4).

Discussion and conclusions

Prevention of healthcare-associated infections is a crucial aspect of dental practice, and dental-care-workers must be aware of the risk both for the patients and for themselves and strictly adhere to standardized infection control procedures. Although scientific evidence and recommendations for infection control have been made available (1,2,5), published literature reveals poor compliance with healthcare standard procedures (6-14).

In our study, the mean overall score for knowledge of infection control principles among both DSS and DHS students was acceptable (18.2 of 25, being 17.5 the minimum acceptable score). However, only for standard precautions an acceptable score was obtained, even though the great majority of students incorrectly answered that standard precautions recommend gloves for each procedure and many of them did not know that gloves should be used when there is a risk of a cut. Although standard precautions include also hand hygiene, a specific area of the questionnaire investigated this topic. Knowledge about general recommendations for hand hygiene were acceptable; nevertheless, more than half of students showed poor knowledge about alcohol-based hand rub. Knowledge about HAI was the weakest of the three areas. A high percentage of students thought

that the environment is the major source of bacteria responsible for the onset of HAI, and did not know the prevalence and the approximate number of deaths associated with HAI.

It is worth noting that in some cases students of higher academic years showed less awareness about the topic investigated. As for example, the lowest score in hand hygiene knowledge was achieved among DHS attending the last year of course. Among DSS a decrease of knowledge for all the areas investigated was observed from the second to the third year course, with a subsequent increase up to the fifth year.

Standard precautions, including hand hygiene, are the bases for the prevention of HAI (18,19); therefore, it is unacceptable that at the end of the degree course, lack of knowledge still persists.

Our study is a further confirmation of the need of implementing effective teaching models in order to provide students with the scientific basis and the theoretical and practical preparation for the prevention and control of healthcare-associated infections. Setting up a rigorous infection control education and training prior to graduation, by using a combination of lectures and practical training, in order to build knowledge and skills, is crucial in shaping future health professionals (20-22). Moreover, it is of paramount importance that competencies for infection prevention and control be reinforced at postgraduate level taking into account both scientific evidence and technical acquisition.

Riassunto

La prevenzione delle infezioni correlate all'assistenza: le conoscenze degli studenti dei Corsi di laurea in odontoiatria e protesi dentaria e Igiene dentale di sette università italiane

Introduzione: La mancanza di conoscenze è il più importante fattore associato alla mancanza di adesione alle procedure di prevenzione delle infezioni correlate

all'assistenza (ICA). Scopo di questo lavoro è stato quello di valutare le conoscenze degli studenti del Corso di Laurea in Odontoiatria e Protesi dentaria (CLOPD) e del Corso di Laurea in Igiene dentale (CLID) relativamente alla prevenzione delle ICA, come base conoscitiva per il miglioramento del percorso formativo e l'armonizzazione dei contenuti dei corsi nelle diverse sedi universitarie.

Metodi: Un questionario anonimo è stato distribuito nel corso dell'anno accademico 2010/2011 agli studenti del CLOPD in sette sedi universitarie e agli studenti del CLID in tre sedi universitarie. Le domande riguardavano: infezioni correlate all'assistenza, precauzioni standard, e igiene delle mani. I fattori associati ad un non accettabile livello di conoscenze (punteggio <17,5) sono stati analizzati utilizzando un modello di regressione logistica. E' stato considerato significativo un valore di $p < 0,05$.

Risultati: Sono stati raccolti 504 questionari: 81,5% nel CLOPD e 18,5% nel CLID. Considerando tutti gli intervistati, il punteggio medio (\pm DS) è stato $18,2 \pm 2,93$ su un punteggio totale di 25; $18,2 \pm 3,04$ per gli studenti CLOPD e $17,8 \pm 2,31$ per gli studenti del CLID. Stratificando per area, il punteggio medio è stato $2,7 \pm 1,07$ (53%) per le ICA, $10,3 \pm 1,61$ (85,9%) per le precauzioni standard, and $5,2 \pm 1,44$ (64,8%) per l'igiene delle mani. Una differenza statisticamente significativa ($p < 0,001$) è stata evidenziata solo per le conoscenze relative alle ICA ($2,8 \pm 1,07$ per CLOPD e $2,1 \pm 0,96$ per CLID). Differenze significative tra gli anni di corso sono stati osservate solo per negli studenti del CLOPD relativamente alle ICA e alle precauzioni standard. Il modello di regressione logistica ha mostrato che l'età <23 anni rappresenta un fattore di rischio per la mancanza di conoscenza sulle ICA, ma un fattore protettivo per mancanza di conoscenze relative alle precauzioni standard e igiene delle mani; la frequenza del CLID è risultato un fattore di rischio per le conoscenze relative alle ICA.

Conclusioni: I risultati ottenuti evidenziano come in entrambi i corsi di laurea sia stato raggiunto un livello accettabile di conoscenze; tuttavia, sono emerse carenze conoscitive relativamente alle conoscenze generali sulle ICA e all'igiene delle mani in particolare. E', quindi, necessario implementare e validare efficaci modelli didattici nei corsi di laurea al fine di fornire le basi scientifiche e la preparazione teorico-pratica per la prevenzione e il controllo delle infezioni correlate all'assistenza.

References

1. Centers for Disease Control and Prevention (CDC). Guidelines for Infection Control in Dental Health-Care Setting, 2003.
2. Centers for Disease Control and Prevention

- (CDC). Guidelines for Environmental Infection Control in Health-Care Facilities, 2003b.
3. Laheij AMGA, Kistler JO, Belibasakis GN, Valimaa H, de Soet JJ, and European Oral Microbiology Workshop (EOMW). Healthcare-associated viral and bacterial infections in dentistry. *J Oral Microbiol* 2012; **4**:10.
 4. McCarthy GM, Ssali CS, Bednarsh H, Jorge J, Wangrangsimakul K, Page-Shafer K. Transmission of HIV in the dental clinic and elsewhere. *Oral Dis* 2002; **8**: (Suppl 2): 126-35.
 5. Napoli C, Gallé F, Montagna MT, Liguori G, Gruppo di Lavoro Igiene in Odontoiatria. Guidelines for infection control practices for dentistry. *Ann Ig* 2007; **19**: 417-27.
 6. Szymanska J. Microbiological risk factors in dentistry. Current status of knowledge. *Ann Agric Environ Med* 2005; **12**: 157-63.
 7. D'Alessandro D, Agodi A, Auxilia F, et al. Prevention of healthcare associated infections: Medical and nursing students' knowledge in Italy. *Nurs Educ Today* 2014; **34**(2): 191-5.
 8. de Souza RA, Namen FM, Galan J Jr, Vieira C, Sedano HO. Infection control measures among senior dental students in Rio de Janeiro State, Brazil. *J Public Health Dent* 2006; **66**(4): 282-4.
 9. King TB, Muzzin KB. A national survey of dental hygienists' infection control attitudes and practices. *J Dent Hyg* 2005; **79**(2): 8.
 10. Oostuysen J, Potgieter E, Blignaut E. Compliance with infection control recommendations in South African dental practices: a review of studies published between 1990 and 2007. *Int Dent J* 2010; **60**(3): 181-9.
 11. Singh A, Purohit BM, Bhambal A, Saxena S, Singh A, Gupta A. Knowledge, attitudes, and practice regarding infection control measures among dental students in Central India. *J Dent Educ* 2011; **75**(3): 421-7.
 12. Tavalacci MP, Ladner J, Bailly L, Merle V, Pitrou I, Czernichow P. Prevention of nosocomial infection and standard precautions: knowledge and source of information among healthcare students. *Infect Control Hosp Epidemiol* 2008; **29**(7): 642-7.
 13. Yengopal V, Naidoo S, Chikte UM. Infection control among dentists in private practice in Durban. *SADJ* 2001; **56**(12): 580-4.
 14. Wood PJ. Infection control practices of Rhode Island dental hygienists and certified dental assistants. *J Dent Hyg* 1995; **69**(5): 212-2.
 15. Castiglia P, Liguori G, Montagna MT, et al. Italian multicenter study on infection hazards during dental practice: control of environmental microbial contamination in public dental surgeries. *BMC Public Health* 2008; **8**: 187-93.
 16. Pasquarella C, Veronesi L, Castiglia P, et al. Italian multicentre study on microbial environmental contamination in dental clinics: a pilot study. *Sci Total Environ* 2010; **408**: 4045-51.
 17. Pasquarella C, Veronesi L, Napoli C, et al. Microbial environmental contamination in Italian dental clinics: a multicenter study yielding recommendations for standardized sampling methods and threshold values. *Sci Total Environ* 2012; **420**: 289-99.
 18. Pittet D. Infection control and quality health care in the new millenium. *Am J Infect Control* 2005; **33**: 258-67.
 19. World Health Organization Guidelines on Hand Hygiene in Health Care, 2009.
 20. Agodi A, Auxilia F, Brusaferrero S, et al. Education and training in patient safety and prevention and control of healthcare associated infections. *Epidemiol Prev* 2014; **38**(6 Suppl 2): 153-7.
 21. ECDC Technical Document. Core competencies for infection control and hospital hygiene professionals in the European Union, 2013.
 22. Brusaferrero S, Arnoldo L, Cattani G, et al. Harmonizing and supporting infection control training in Europe. *J Hosp Infect* 2015; **89**: 351-356.

Corresponding author: Prof. Cesira Pasquarella, Department of Biomedical, Biotechnological and Translational Sciences, University of Parma, Via Volturmo 39, 43125 Parma, Italy
e-mail: ira.pasquarella@unipr.it