

Dentists Occupational Exposures to Chemicals During Hands Hygiene in the Dental Offices in Iasi

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The dental team is occupationally exposed to physical, chemical and biological hazards. Hand hygiene is the simplest, most effective measure for preventing health care associated infections. In order to evaluate occupational exposures to chemicals during hands hygiene protocols it was initiated a questionnaire-based study which included 279 dentists from Iasi, Romania. Data were analyzed using SPSS 15.0 program ($p < 0.05$). Compliance to the hand hygiene was 81.6%. Most used product for hand hygiene was the antimicrobial soap. Dentists in the 20-30 and 31-40 age group (56.6% and 61.5% respectively) use the hand rub technique with alcohol-based products. 18.4% of dentists do not wash their hands considering that using gloves is sufficient to prevent infection transmission. 36.5% of dentists reported adverse reactions to hands hygiene products like dryness, edema, redness, itching, burning and roughness. The adherence to gloves wearing was 98.9% while the prevalence of allergic reaction to latex is found to be 16%. Strategies to improve compliance to hand hygiene practices should take in account the compliance to the used products and adverse reactions prevention.

Keywords: chemical products, hand hygiene, occupational exposures

The dental team is occupationally exposed to physical agents (injuries, noise, effort, posture, light sources), chemicals (drugs, disinfectants) and biological hazards (pathogens transmitted by direct or indirect route). The complexity of dental care procedures pleads for increasing the individual awareness and responsibility for patient and health care workers safety by adopting the concepts of Universal and Standard Precautions [1,2]. Transmission of infections by contaminated hands represents the route of transmission for 30% - 40% of oral health care associated infections [3,4]. The microbial flora of the skin, described for the first time in 1938, consists of a transient flora (bacteria, fungi and viruses) which colonizes the superficial layers of the skin and is involved in the transmission of infection and a resident flora, in the deeper layers of the skin, more resistant to removal.

Hand hygiene is the simplest, most effective measure for preventing health care associated infections. The use of the protective gloves in the concept of Universal Precautions seemed to reduce the importance of this procedure ignoring the fact that hands can still be contaminated by the infectious secretions of the patient through defects or deteriorations of the gloves. The methods which can be used for hands hygiene are: routine handwash, routine hand antisepsis (antiseptic handwash and antiseptic handrub) and surgical hand antisepsis (antiseptic handwash and antiseptic handrub). One major factor in terms of the medical staff adherence to hand hygiene protocols is the acceptance of the used product in relation with factors as hypersensitivity reactions

(allergies), skin effects after prolonged contact and compatibility with protective gloves, antiseptics, dental materials or lotions for skin care [5]. The major types of adverse reactions as a consequence of work-related skin chemical exposures include multiple health effects at the zone of contact or at systemic level [6].

Experimental part

Methods

In order to assess the exposures of the oral health care medical staff to hands hygiene chemical products it was initiated a study based on a anonymous, self-administered questionnaire distributed to 279 dentists aged between 26 and 62 years, in private dental offices in the city of Iasi, Romania. The questionnaire included 12 questions regarding the products used for hand hygiene, the moment and the average duration of the hand washing, the side effects related to hand cleaning products, the equipment used for hands protection, the allergic reaction to latex (table 1).

Data were analyzed by gender, age and years of professional experience. The results were processed by the SPSS.15.0 system and Chi square test ($p < 0.05$).

Results and discussions

Out of the investigated dentists 38% were women and 62% men. The number of years of professional activity ranged between 1 and 32. Depending on age, the structure of the study group was as follows: 11.7% in the 20-30 years old group, 44.4% in the 31-40 age group, 34.7% in the 41-50 years old group and 9.2% in the over 51 years old group.

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Nr.	Question
1.	Do you wash your hands during the working day?
2.	What product do you use for hands hygiene ?
3.	What method of hand hygiene do you use ?
4.	At what moment of the clinical activity do you wash your hands?
5.	How long do you wash your hands?
6.	Have you suffered adverse effects associated to hand hygiene products?
7.	What kind of adverse reaction did you suffer?
8.	What chemical product was implied in the suffered adverse reaction?
9.	Do you use protective gloves?
11.	Do you wash your hands before donning protective gloves?
12.	Did you suffer adverse reactions to latex?

Table 1
QUESTIONNAIRE FOR HANDS
WASHING COMPLIANCE

The questionnaire answers demonstrate that compliance to the hand hygiene practices was 81.6%. These results are encouraging since, despite the obvious benefic effects of this most effective procedure, compliance to recommended hand hygiene practices is still low, usually estimated as under 50%. (Gould 1994-29%, Larson 1995-41%, Slaughter 1996-41%, Pittet 2000- 48%) [7,8]. This attitude requires strategies to improve awareness about the consequences of the prolonged contact with chemical products without affecting the compliance to hand hygiene. [9,10].

The most commonly used product for hands hygiene is the antibacterial soap (71.4%), followed by alcohol-based products (36.0%), plain soap (29.7%) and chlorhexidine products (29.1%). Only 5.1% of doctors use iodophors based products. (fig.1). A significant proportion of subjects aged over 51 years (82.4%) and of those with over 25 years professional experience (84.7%) prefer the routine technique of hand washing with soap and water while the dentists in the 20-30 (56.6%) and 31-40 age group (61.5%) use the hand rub technique with alcohol-based products.

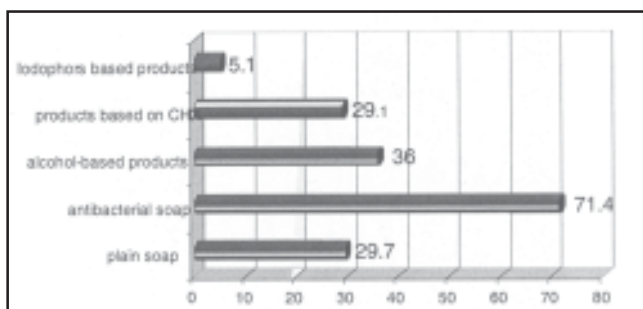


Fig. 1. Dentists compliance to hand hygiene products

The products used in performing hands hygiene protocols include plain soap, alcohols, chlorhexidine gluconate, chloroxyleneol (parachlorometaxyleneol-PCMX), hexachlorophene, iodine and iodophors, quaternary ammonium compounds, triclosan and other new agents which efficacy is still evaluated. A hand sanitizing product must be chosen by taking into account various factors including: antimicrobial activity, persistence speed of action, method of application, odor, consistency, safety of use, cost per application,. The dentists' option in

our study for the plain or antibacterial soap should be reconsidered since alcohol based products (ex. isopropanol 70%) have a higher antimicrobial activity, decrease the required time for hands washing procedure in the management of a working day, increase accessibility and have a lower irritant effect on the skin [11]. In relation to the circumstances for hand hygiene 92.1% of doctors apply this procedure before and 86.4% after treating each patient. One third of dentists wash their hands before donning gloves (fig. 2). Women showed a higher level of compliance for hands cleaning after each patient than men (87.3% and 76.3% respectively). One of two dentists begins the working day by hand washing procedure. 63.3% of doctors stated that they wash their hands several times during the same clinical procedure in case of potential contamination or deterioration of the protective gloves.

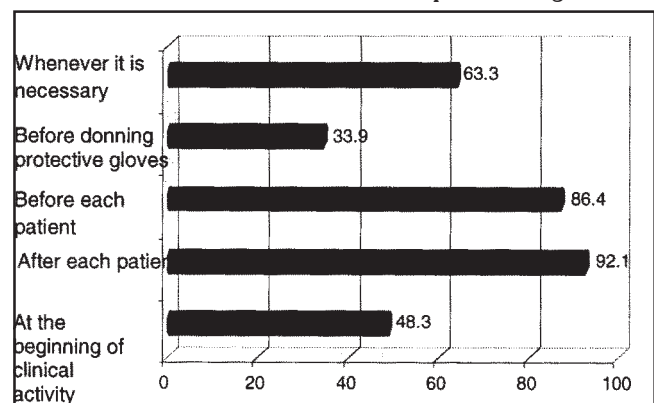


Fig. 2. Hand's hygiene circumstances

In assessing compliance to hand hygiene circumstances it is necessary to take into account the fact that this protocol must necessarily be applied at certain moments of daily work but also at any time when there is a chance of contamination: at the beginning of the working day, before and after examining each patient, before applying any type of gloves, after reaching any used instrument, after handling blood or saliva contaminated with blood, after removing any type of gloves at the end of the working day. In our study a small percentage of respondents indicate hand washing before applying gloves ignoring the fact that use of protective equipment does not replace sanitizing hands.

	No.	%
Dryness	35	34.3
Edema	46	45.0
Redness	78	76.4
Itching	44	43.1
Burning	34	33.3
Roughness	22	21.5

Table 2
ADVERSE REACTIONS SYMPTOMS CAUSED BY
HANDS HYGIENE PRODUCTS

The time for this procedure represents a factor which also affects the adherence to hand hygiene procedures. In our study the duration of the hand washing procedure proved to be variable, from 1 or 2 min (18.5%, 22%, respectively) to 5 min (35.8%) for each washing procedure and 10 min to 15 min (24.6, 42.6%, respectively) per working day. A prolonged time for hand washing favors the adverse reactions to the used products. Experimental studies demonstrate that the sufficient and recommended time is from 15 s (which has the effect of reducing the bacterial counts on the skin by $0.6-1.1 \log_{10}$) to 30 seconds (bacterial counts reduction by $1.8-2.8 \log_{10}$) for simple hand washing with soap and water and 3-5 min in case of surgical wash. It has been demonstrated that a prolonged hand washing has no obvious effects on removing bacteria but can cause severe skin irritation. One way of solving this problem is the replacement of the washing with soap and water with hand rub with an alcohol-based product.

36.5% of dentists reported adverse reactions related to occupational chemical exposures of the skin to hands hygiene products. The most common symptoms were: dryness (34.3%), edema (45.0%), redness (76.4%), itching (43.1%), burning (33.3%) and roughness (21.5%). 17 dentists (16.9%) claimed serious allergic dermatitis manifested by blisters, fissures and intense soreness.

As expected the 41-50 years and the over 51 years old group dentists were more affected by those symptoms through repeated and constant exposures to hands hygiene chemicals. Women reported significantly more symptoms suggesting contact dermatitis than men (28.4, 10.2%, respectively) possibly because associated use of lotions and cosmetic creams.

The most commonly chemicals incriminated in adverse reactions were iodine and iodophores (21.5%), chlorhexidine (19.7%) and alcohols (12.2%).

Contact allergic reactions to products applied to the skin by health care workers may present as immediate or delayed type reactions. The ingredients contained by liquid soaps, hand lotion, cosmetic or medical creams or ointments may induce contact allergies caused by fragrances and preservatives or, less common, by emulsifiers [12]. Beside iodophors and chlorhexidine, triclosan and chloroxylenol can also induce allergic reactions. Our results confirm the literature findings regarding the allergic reactions to alcohol-based handrubs which are less common and can be determined by product constituents (alcohol, aldehyde) or other chemicals like fragrances, parabens, benzalkonium chloride or stearyl [13]. Compared to other hand hygiene products alcohol-based products are well tolerated and therefore accepted by medical staff [14]. Certain hand hygiene practices like washing hands regularly with soap and water immediately before or after using an alcohol-based product can increase the risk of skin irritation and should be avoided [15].

Regarding the exposure to latex during the use of protective equipment dentists answers prove a compliance of 98.9% for rubber gloves as a main measure to protect hands during clinical activity. 13.4% of dentists do not wash their hands considering that using gloves is sufficient to prevent infection transmission. Gloves should be worn during all dental procedures in accordance with Universal Precautions to avoid contact with blood or other body fluids but this protection does not replace the hand hygiene procedures. In our study dentists demonstrate a high compliance to protective gloves but seem to neglect the option to change them in case of deterioration during the treatment of the same patient. Hypersensitivity reactions represent an important factor that influences the acceptance of protective gloves by medical personnel and may take different clinical forms from simple irritation and itching to severe anaphylactic reactions [16]. In our study dentists reported hypersensitivity reactions caused by rubber gloves in proportion of 16.1% manifested as irritation, redness, itching, swelling or blistering, results comparable to those presented by Bollinger in 2004 (5% - 18%) [17, 18].

The recommended strategies for minimizing hand hygiene-related adverse reactions as allergic dermatitis refer to choosing efficacious and less irritating hand hygiene products, avoiding procedures which favor the skin irritation (frequent simultaneous use of antibacterial soap and alcohol products or donning gloves on the wet hands) and using products for skin care after hand cleansing like creams and lotions which contain emollients, oils and humectants, for skin hydration and skin structure restoring [19, 20].

Conclusions

In the domain of oral health care chemical exposures of the hands skin by prolonged contact with hygiene products represents an important occupational hazard. The dental team should be trained in the domain of hand hygiene protocols in order to increase the efficiency and reduce the possible adverse reactions.

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