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NORDIC OCCUPATIONAL SKIN QUESTIONNAIRE MIGHT BE A RELIABLE TOOL FOR OCCUPATIONAL PHYSICIANS IN THE HEALTH SURVEILLANCE OF THE DENTAL HEALTHCARE – A ROMANIAN SURVEY

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Occupational skin diseases are under-reported in many countries, especially in the Eastern Europe, including Romania. Improper healthcare legislation and regulations in the field of health and safety at work might be a few causes of developing occupational skin diseases, but also the lack of standardised diagnostic criteria and evaluation tools are common in these countries.

Dental staff is exposed to a wide range of occupational hazards, many of them being haptens, which could cause occupational skin diseases. The most common occupational skin diseases in contact dermatitis. Without a reliable diagnostic tool in place, usually the dental staff (as many other professions) overlook and underestimate the presence of occupational skin diseases, which can lead to unproper prevention, chronic skin lesions, disability and loose of efficiency and productivity.

Periodic medical examination is mandatory in many countries all over the globe, comprising in a minimum set of investigations, including clinical examination, questionnaires, blood tests and additional procedures, tailored on the occupation, workplace, industrial sector and potential exposure.

It is important to standardise the employees' periodical medical evaluation using reliable tools oriented to the skin pathology. The Nordic Occupational Skin Questionnaire (NOSQ) might represent one of these tools which might be useful for a comprehensive evaluation of the potential occupational skin diseases.

NOSQ was created by a group of experts from the Nordic countries and it is meant to assess the presence and clinical features of occupational skin diseases in the workplace.

Key words: dental healthcare, occupational diseases, skin, questionnaire

INTRODUCTION

Occupational skin diseases are under-reported in many countries, especially in the Eastern Europe, including Romania. Improper healthcare legislation and regulations in the field of health and safety at work might be a few causes of developing occupational skin diseases, but also the lack of standardised diagnostic criteria and evaluation tools are common in these countries [1].

Dental staff is exposed to a wide range of occupational hazards, many of them being haptens, which could cause occupational skin diseases. The most common occupational skin diseases in contact dermatitis. The prevalence of contact dermatitis ranges from 15% to 33% in dental staff, the most incriminating hazard being acrylates, composite resins, and latex gloves, as well as detergents, lubricants, solvents or metals [2]. But, without a reliable diagnostic tool in place, usually the dental staff (as many other professions) overlook and underestimate the presence of occupational skin diseases, which can lead to unproper prevention, chronic skin lesions, disability and loose of efficiency and productivity [3].

Periodic medical examination is mandatory in many countries all over the globe, comprising in a minimum set of investigations, including clinical examination, questionnaires, blood tests and additional procedures, tailored on the occupation, workplace, industrial sector and potential exposure. In Romania, according to the law, every employee have to perform an annual medical examination with different sets of additional procedures and investigations, i.e. ECG and blood sugar (for night shift work), hepatitis B, C and HIV screening for medical staff including dentists.

Considering the high potential prevalence of the occupational skin diseases in dental staff, it is important to standardise the employees' periodical medical evaluation using reliable tools oriented to the skin pathology. The Nordic Occupational Skin Questionnaire (NOSQ) might represent one of these tools which might be useful for a comprehensive evaluation of the potential occupational skin diseases.

NOSQ [4] was created by a group of experts from the Nordic countries and it is meant to assess the presence and clinical features of occupational skin diseases in the workplace. There are two versions of the NOSQ-2002: a short version, NOSQ-2002-SHORT and a long one, NOSQ-2002-LONG. The short version consists of a set of questions regarding demographics and occupational history, history of atopic symptoms, exacerbating factors, symptoms and general health. The long version includes the

short one and it is more detailed, suitable for a more advanced research of the patient's skin diseases.

AIM

Our study aims to estimate the prevalence of occupational skin diseases in the Romanian dental professionals (dental doctors, dental technicians and dental students) and to analyse if NOSQ-2002 might be proposed as a tool for assessment of the occupational skin diseases, as part of the periodical medical examination investigation pack.

METHODS

We administrated a personalized Romanian translation of the NOSQ-2002 short and NOSQ-2002 long questionnaires to collect data from a cohort of dental personnel (dentists, dental technicians and students from the Faculty of Dentistry), in order to identify occupational contact dermatitis and its features. The *questions included in the* questionnaire are categorized as open and closed, ordered or unordered and binary type ones. The aim of the questionnaire was to collect data regarding demographic issues, occupation and field of activity, occupational timespan in the current service, the presence of eczema and items which could cause/increase the risk of eczema. First, we administered the NOSQ-2002 short version to all the subjects inlcuded in the study, thereafter using NOSQ-2002 the long form only for those with NOSQ-2002 short form sugestive for occupational skin diseases.

Statistical analysis was carried out using the SPSS for Windows (v 22.0, IBM Corporation, Armonk, NY, USA) and MedCalc (v 10.3.0.0, MedCalc Software, Ostend, Belgium) software programs. In order to assess the normal distribution of continuous numerical variables, the Kolmogorov–Smirnov test was applied. The results were presented as numbers and percentages for qualitative variables and median values for quantitative variables. Data were compared using Mann–Whitney U tests (for quantitative variables) and $\chi 2$ test (for qualitative variables). A p-value of less than 0.05 was considered as statistically significant.

RESULTS

Short NOSQ-2002

The study was carried out on 168 subjects, 56% of them accounting for female. Among the assessed occupations, 18.5% were dental doctors, 16.7% dental technicians and 64.88%) dental students, divided as follows: 21.4% subjects from the second study year, 6.5% from the fifth study year and 36.9% from the sixth study year.

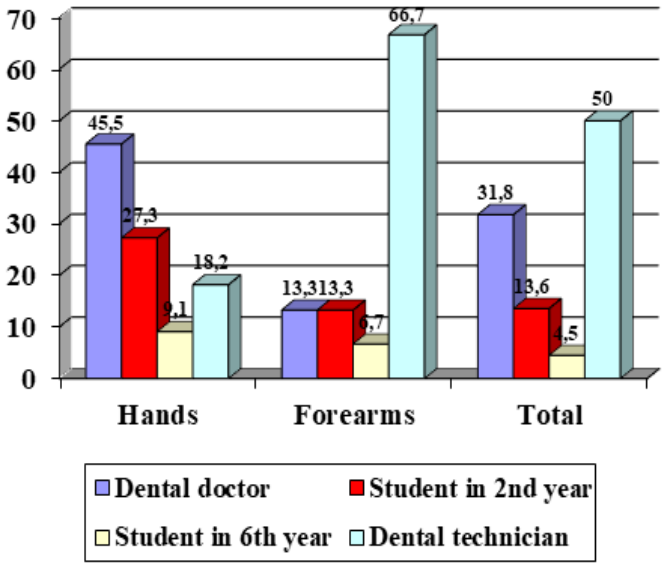
The general frequency of eczema was 13.09%, the distribution related to occupation being as follows: 22.6% in dental doctors, 39.3% in dental technicians and 3.66% in dental students.

Analysing the relationship between occupation and the presence of eczema as well as its anatomical location at the level of the upper limbs, out of the 11 cases, 5 (45.5%) were reported to dental doctors.

Concerning the location of eczema at the level of the forearms, out of the 15 cases, 10 (66.7%) were reported by the dental technicians. Students from the sixth study year (the last one) did not reported eczema at the level of the forearms (p-0.001).

Overall, half of the eczema cases were reported by the dental technicians (p-0.001), and the rest by the dentists (7 cases, respectively 31.8%) (figure 1).

Figure 1. The incidence of eczema considering the anatomical localisation



Taking into consideration the occupational history of the subjects who developed a form of eczema, a causal relationship interpreted from an anamnestic point of view by the respondents regarding potential substances/materials has resulted. Thus, acrylates are incriminated in 22.7% (5 cases), most of the cases (4 cases) being identified in dental technicians.

Chromium is incriminated in the development of eczema in 27.2% (n = 6) of all the subjects, out of which 5 cases were identified in dental technicians. Among other substances / materials incriminated in the manifestation of eczema are gypsum powder - 18.2% (n=4), latex - 18, 2% (n=4), disinfectant - 13, 6% (n=3), chlorine - 4, 54% (n=1) and porcelain powder - 4, 54% (n=1).

Of the 22 subjects with eczema, 18 confirmed that symptoms subsided outside the workplace or during weekends or holidays (63,6%). A particular aspect - out of the 11 dental technicians with severe eczema, 45.5% (n = 5) did not show any significant improvement However, in dental doctors, out of the 7 subjects with severe eczema, 85.7% (n = 6) reported significant improvement in such circumstances (p-0.04).

For those with eczema, the total occupational timespan was significantly higher than for those without the disease (p-0.01) (figure 2).

For those with eczema, the number of working hours/ week was significantly higher than for those without eczema (p-0.04) (figure 3).

Figure 2. The influence of the total occupational timespan in the occurrence of the contact eczema

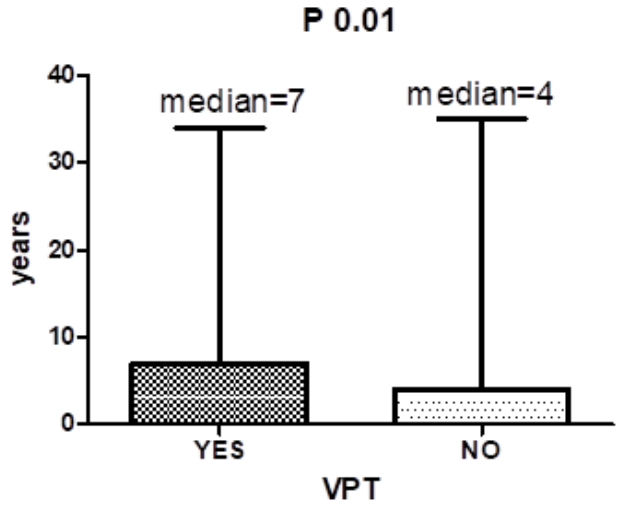
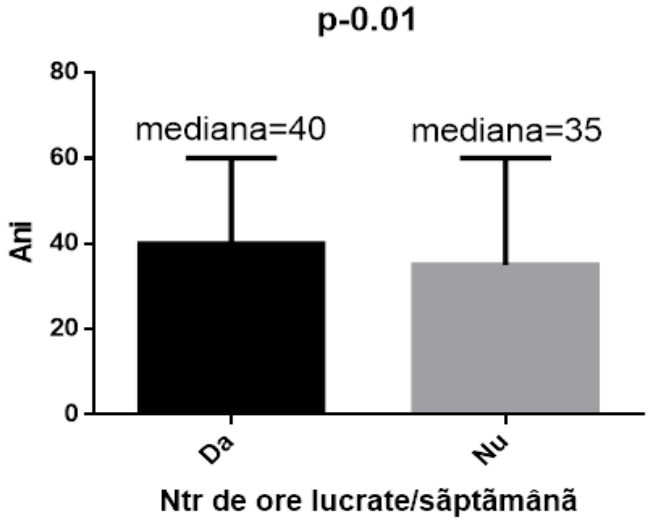
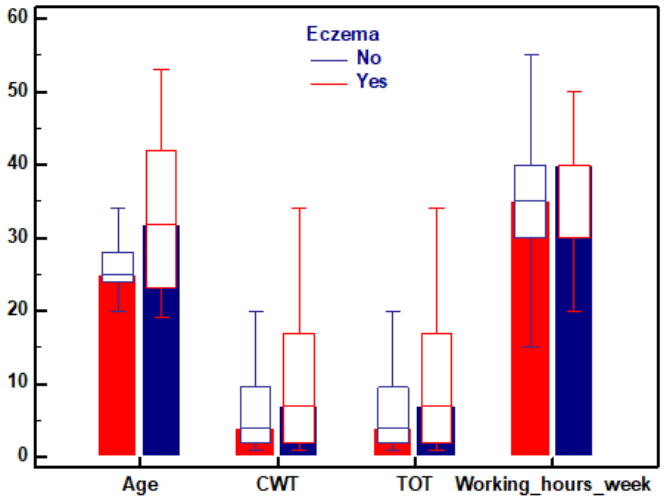


Figure 3. The influence of the number of working hours / week on the occurrence of the contact eczema



Applying a multivariate regression where the dependent variable consisted of the presence or absence of the eczema, we have found that this condition is dependently influenced by the total length of professional activity/total occupational timespan (TOT), OR=1.29, CI95% (1.09-2.11), p-0.048. On the other hand, the multivariate analysis does not highlight the influence of the number of hours worked, sex and age of subjects on the occurrence of eczema. (table 1)



The 22 patients with eczema were questioned using the long-form of the NOSQ-2002 questionnaire, the male-female ratio being 6- 16.

In terms of occupation, 11 subjects were dental technicians, and the others were dental doctors (n = 7) and dental students (n = 4).

The analysis highlights that the symptoms described by the subjects occurred in the form of an eruption (12 cases), ocular allergy (1 case), allergic rhinitis (1 case) and asthma (1 case).

The location of the lesions are presented in the following way: all subjects reported at least one lesion at the level of the upper limbs and 4 at the level of the forearms.

At the level of the forearm, eczema occurred at least twice a week in half of those monitored.

However, the injuries at the level of the upper limbs appeared at a frequency of twice per week in 8 of the 22 cases.

Taking seasonality into account in 19 of the 22 cases, eczema onset is season independent, two cases occurred only in spring and one only in summer.

Full resolution of the skin lesions was observed in 13 cases, while 3 subjects reported partial resolution and the other 6 reported no resolution or improvement of these lesions.

Urticaria was reported in 14 individuals, dry skin in 3 subjects and pruritus in 3 cases.

Skin protection was performed only by 10 subjects out of the 22, by the regular use of gloves.

The frequency of hygienic measures such as hand washing was conducted as follows: 14 subjects washed their hands 5-10 times a day, 5 subjects used to wash their hands 11-20 times a day and 2 individuals used to wash their hands extensively, more than 20 times per day.

In order to identify the relation

Table 1. Multivariate analysis used to determine the presence of eczema NOSQ-2002 long

	B	S.E.	Wald	Sig.	OR	95% C.I.for OR	
						Lower	Upper
TOT	0,052	0	2,903	,048	1,293	1,092	2,118
NO. OF WEEKLY WORKING HOURS	0,022	0,023	0,885	0,347	1,022	0,977	1,070
SEX (FEMALE)	0,956	0,548	3,042	0,081	2,601	0	7,615
AGE	-0,090	0,073	1,524	0,217	0,914	0,792	1,054

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between a specific occupation and the types of symptoms, we have applied the chi-square test. We have found that there is no relation between a specific occupation (among the 3 occupations included in the study) and the occurrence of urticaria, dry skin and pruritus, but we have found a significant relationship between all these symptoms, defined as a whole (p-0.009).

An association between an occupation and the protective measures by the use of gloves is significant (p-0.009), most of the students and doctors (4 out of 7) use gloves, while only 2 out of 11 technicians do apply this protective measure.

The analysis regarding the frequency of hand washing versus occupation reveals that one-third of the doctors wash their hands more than 20 times a day, while 9 out of 11 technicians wash their hands 5-10 times during the working hours.

The influence of hand washing on eczema amelioration exposes that most of the subjects who wash their hands 5-10 times a day or less report improvements of the skin lesions while in most of the subjects washing their hands 11-20 times a day improvements of the lesions are not visible.

DISCUSSIONS

According to our knowledge, this is the first study undertaken in Romania concerning the prevalence of the skin diseases in dental professionals. The study group covers the 3 pillars of the dental sector: dental doctors, dental technicians and dental students.

Different types of research performed in the last years provide reliable data with respect to the high incidence of occupational skin diseases in dental medicine, but a comprehensive picture regarding the best method for assessing and managing these occupational conditions is still missing. For example, The Register of Occupational Diseases in Finland [5] shows dentists to have the highest risk of developing allergic contact dermatitis compared to the general working population.

According to the Romanian National Registry of Occupational Diseases, the prevalence of occupational skin disorders in the Romanian dental field tends to zero (unpublished report), while many international studies suggest that the prevalence of skin diseases in this occupational sector is very high. For example, in the United Arab Emirates, the prevalence of contact dermatitis in dentists is 18% [6].

The relationship between an occupation and the incidence of eczema reveals that most of the cases were reported by dental doctors in our study, which lead to the conclusion that they are more likely to develop occupational eczema of the 3 study groups. The fewest cases reported were in the students' group, thus emphasising that they are more "protected" from developing occupational eczema but at the same time they are likely to develop this condition at any time in their carrier. An interesting finding of our study is that the prevalence of skin lesions has a decreasing trend with the increasing of the study years, which might be explained by a new perspective of the personal protection, potentially acquired over the study years.

Another interesting finding of our study consists of the anatomical localisation of eczema related to the occupation. While in the dental doctors' group the most frequent localisation of eczema is on the upper limbs, the dental technician' are more likely to develop eczema at the level of the forearms (figure 1).

In our study, we have registered a higher frequency of hand eczema in dental technicians (39.3%) compared to data reported by other authors, i.e. Estlander [7], who accounted a frequency of 19%, while Meding [8] reported a frequency of 3.3%.

Despite the high prevalence of occupational skin diseases in dental staff, many studies have reported that there are still unknown barriers in the notification of these conditions. A Danish study [9] reveals that only 12 percent of the cases concerning contact dermatitis are officially notified.

NOSQ-2002 has also provided us with valuable data concerning the most important materials (agents) responsible for the development of eczema, as it is illustrated in the results section of our study. Our results are comparable with Rustemeyer's [10] research, who found that the most incriminated agent for the development of hand eczema in dental technicians is plastic (35.7%), followed by plasters (25%) and metals (15%). Another research carried out in Sweden by Wrangsjo [11] on a mixed group of dental personnel reveals that the most common allergen in developing contact dermatitis is nickel (37%), followed by cobalt (17%), fragrance mix (12%), colophonium (8%) and thiuram mix (8%).

It is well known that the development of contact dermatitis usually involves prolonged contact with the incriminated hapten, but there is not enough evidence of how long is the minimum exposure time, required for the development of the lesions. In our study, we have found that an average of 7 years of employment in the current service might be considered as a risk factor for the development of contact dermatitis in dental personnel. An Indian study [12] suggested an average of 10 years of exposure as a cut off for the manifestation of contact dermatitis in cement workers.

As far as we know, contact dermatitis is a chronic disease with a long-term impact, frequent exacerbations and relapses. According to the Irish Health and Safety Authority [13], 10 years after the emergence of contact dermatitis, up to 50% of the affected workers will still have some skin problems, which means that the impact on labour productivity can be extremely powerful. Thus, a proper recognition of the occupational skin diseases by the occupational physicians is crucial, whereas a reliable tool is needed for this purpose.

A Finnish study reported that hand dermatoses are the second most common health problems in the dental profession, the back of the hand and the fingers being the most common affected sites. But, most of the time `it seems that these disorders are overlooked as occupational diseases` [14].

Regarding seasonal influences on skin lesions, no too much influences have been found in our study, in contrast with other published research which reveals that cold and dry weather increase the prevalence and risk of

flares in patients with atopic dermatitis, as showed in a very detailed review published by Engebretsen [15].

Hand washing, which is absolutely necessary for the activity of the dental personnel, can be both, an important mean of hygiene but also, an important factor that favours occupational contact eczema.

Excessive hand washing could also be an influencing factor for the development of occupational skin diseases in our study group of dental practitioners, but the negative impact of this habit on the skin is well-known. According to Kampf's review [16], 'hand washing should be the exception, to be performed only when they are visibly soiled or contaminated with proteinaceous material, or visibly soiled with blood or other body fluids'. Otherwise, the use of an alcohol-based hand rub for decontamination is sufficient. This recommendation is also included in the CDC Guideline for Hand Hygiene in Health-Care Settings [17], which stated that an alcohol-based hand sanitizer is a preferred method for cleaning one's hands when they are not visibly dirty, unlike the use of soap and water.

Clark [18] concluded in a review that alcohol-based waterless hand sanitizers cause less irritation than soap and water, therefore these products could be used as a replacement for hand washing in the health care field.

Using gloves (like nitril rubber ones) is one of the most important preventive measure to provide an adequate protection of the dental personnel [19], which is also demonstrated in our study, but the dental staff should be aware this does not provide complete protection against dermal exposure, as methacrylates can permeate protective disposable gloves and latex itself could be one of the triggers. As well as most skin irritants or allergens, small molecular acrylates can permeate gloves quite rapidly. Therefore, it is important to develop no-touch techniques to avoid skin exposure to these chemicals, according to Alanko [14].

According to a study conducted in dentists in Thailand [20], over one-fifth of the dentists reported occupational contact dermatitis, allergy to latex gloves being the most frequently reported cause of occupational dermatitis

The high incidence of occupational dermatitis in dental personnel requires adequate prevention. Both, primary and secondary programs would be beneficial for reducing the incidence of occupational contact dermatitis. These programs should be tailored to the specific needs of the dental personnel, including education and individual counselling based on allergy testing [21], in order to be effective.

The limitation of our study refers to the evaluation of knowledge of dentists regarding their awareness of the risk of their workplace hazards and their prevention which is not included in NOSQ questionnaires, but as Mehta [22] concluded, preventive measures have not been followed properly in his research by the dentists, which means there is a need to improve the knowledge of dentists regarding these hazards and their prevention.

Sometime, dental students could be prone to leave their study [23], due to many reasons. One of the reasons might be due to the development of the hand eczema. This is a supplementary reason for implementing educational preventive programs in dental students. But, to avoid such personal tragedy, dental students should be trained properly in the field of occupational medicine, in order to be able to recognize the potential occupational hazards, especially those related to the occupational skin diseases. Additionally, we suggest that medical students should undertake periodical medical examinations (including the administration of NOSQ-2002) as any other worker. We have also found a similar conclusion in a study related to occupational accommodative asthenopia in medical students [24].

As we have observed, there is a lot of useful clinical information that could be obtained via the NOSQ-2002 questionnaire. But the question is if this would be an efficient tool used by the occupational physicians during the periodical medical examination in dental personnel, in order to identify an occupational skin disease? According to Shamout's research [25], who compared the validity of NOSQ self-reported hand eczema questions with the gold standard of clinical examination, NOSQ has a 70.3% sensitivity, 99.8% specificity, 96.3% positive predictive value and 98.5% negative predictive value.

So, using NOSQ as a screening tool with the occasion of the periodical medical examination of the dental personnel, the occupational physician might be able to identify the workers with potential occupational skin diseases, to refer these cases to the (occupational) dermatologist and to propose adequate preventive measures, including medical measures, preventive interventions including training and technico-organizational measures at the workplace.

CONCLUSIONS

The incidence of eczema in dental personnel in Romania is as high as in other developed countries (some of 20%), but this condition is dramatically under-recognized and underreported, compared to those countries.

In the light of our study results, as we have found many similarities between our data collected by using NOSQ-2002 and data collected through other means, we can conclude that NOSQ-2002 is a very reliable tool for assessing occupational skin diseases in dental personnel, in all its 3 pillars - dental doctors, dental technicians and dental students.

We recommend the use of the NOSQ 2002 – short questionnaire as a reliable tool for periodical medical examination in dental personnel (dental doctors, dental technicians, nurses and dental students) in order to obtain a good medical history of the occupational skin diseases. This will be of utmost benefit for all the stakeholders: the occupational physician, the employees and the employer alike. NOSQ 2002 is a reliable tool for identifying the presence and the features of occupational skin diseases in dental staff, the causal factors and the application of preventive means, which can lead to the final purpose – prevention of occupational skin diseases. Further studies are required in order to validate our Romanian translation of the NOSQ questionnaires.

NOSQ-2002 might be a powerful tool for the occupational physician for accomplishing their main responsibilities in monitoring the health status of dental professionals.

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