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Work-related skin symptoms among Bulgarian dentists

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Abstract

Background: Dentists are at high risk of developing skin symptoms due to occupational contact with irritants and/or allergens.

Objectives: To assess the point prevalence of work-related skin symptoms and associated factors in Bulgarian dentists.

Methods: A cross-sectional study was performed using a self-report questionnaire.

Results: A total of 4675 dentists filled the questionnaire (response 48.1%). The point prevalence of self-reported skin symptoms was 31.6%. According to logistic regression analysis, factors significantly associated with work-related skin symptoms included a personal history of atopic dermatitis (odds ratio [OR] 2.72, 95% confidence interval [CI]: 2.24-3.31), allergic rhinoconjunctivitis and/or asthma (OR 1.85, 95%CI: 1.56-2.19), work experience >30 years (OR 2.21, 95%CI: 1.78-2.74), personal history of contact allergy (OR 1.79, 95%CI: 1.48-2.17), female sex (OR 1.87, 95%CI: 1.59-2.19), hand washing >8 times a day (OR 1.32, 95%CI: 1.03-1.69), daily contact ≥4 hours with protective gloves (OR 2.09, 95%CI: 1.64-2.67), and use >10 pairs of gloves per day (OR 1.51, 95%CI: 1.11-2.04).

Conclusion: Bulgarian dentists have a high prevalence of work-related skin symptoms. History of atopic dermatitis, prolonged work experience, and protective gloves use were the strongest risk factors.

KEYWORDS

atopic disease, dentists, frequent hand washing, protective gloves, skin symptoms

1 | INTRODUCTION

Dentists are considered to be at high risk of developing work-related skin disorders, mainly due to irritant contact dermatitis caused by wet work.^{1,2} Other occupational risks include irritation or allergic reactions related to dental materials, disinfectants, and protective gloves.³⁻⁶ The 1-year prevalence of self-reported hand eczema in dentists from various countries ranged from 13.5%-32.8%.⁷⁻¹¹ Other questionnaire studies addressed work-related skin symptoms in dentists, revealing a 1-year prevalence of 21.4%-47.0%.¹²⁻¹⁴

So far, no extensive research on work-related skin symptoms in Bulgarian dentists has been carried out. Recently, we demonstrated that one fifth of dental students in Bulgaria reported work-related skin symptoms.¹⁵ These were associated with a history of atopic dermatitis, allergic rhinoconjunctivitis and/or asthma, contact allergy, and

a high frequency of hand washing. The lack of any official national statistics on occupational skin disease in Bulgarian dentists causes difficulties in developing effective prevention strategies. The aim of this study was to investigate the prevalence of self-reported work-related skin symptoms in Bulgarian dentists, and to assess associated factors.

2 | METHODS

All dentists from the register of the Bulgarian Dental Association (BgDA) (a register of working dentists, updated in April each year) were asked to participate voluntarily in this survey. Data collection was performed in autumn 2018. The survey used a self-administered online questionnaire that was managed using Google Drive. The study was conducted with the agreement of the President of the BgDA. The

distribution of the questionnaire was organized by the members of the Managing Board of the BgDA and representatives of the BgDA Regional Colleges. The survey was sent by e-mail to all dentists registered with the BgDA and they were asked to complete the questionnaire, which included questions about the following.

- Personal and professional data (age, sex, membership by Regional College of the BgDA, years of clinical practice, working hours per day).
- Protective glove use, daily contact with protective gloves, type of glove material, number of glove pairs used per day.
- Frequency of hand washing.
- Allergic disorders such asthma, hay fever, eczema, contact allergy (including metal allergy). A history of atopic dermatitis (childhood eczema or eczema in knee and elbow flexures), hay fever, or asthma were accepted as signs of atopy.
- Work-related skin symptoms. The participants were asked whether they had any skin symptoms, which they considered work-related. In case of a positive response, the online questionnaire generated additional questions specifying the time of onset of symptoms; evolution of symptoms from onset to the present; localization (hands, wrists, forearms, face, neck, other); characteristics of symptoms (dry skin, redness, edema, rash, chapping or cracking, itching, pain, other); suspected causes from dental environment; changes in symptoms during long holidays; and career consequences.

The study was approved by the ethics committee of the Medical University, Plovdiv, (reference number 08/2018). The information from the digital questionnaire was exported to a database file. Statistical analysis was carried out with SPSS, version 18.0 (IBM Corp., Armonk, New York). Descriptive statistics were used to evaluate the prevalence of various exposures and symptoms. Differences between dentists with or without self-reported work-related skin symptoms were examined by chi-square analysis. The level of significance was set at $P < .05$. Multiple logistic regression analysis was conducted in order to investigate the relationship between sex, work experience (years), frequency of hand washing, hours of glove use per day, pairs of gloves used per day, atopic disease, and contact allergy (included as independent variables in the model) with work-related skin symptoms as the dependent variable.

3 | RESULTS

Of 9713 dentists registered in the BgDA, 4675 responded (response 48.1%). Their ages ranged from 24–79 years with a mean age of 44.9 years ($SD \pm 12.7$) years. Of all participants, 62.9% ($n = 2939$) were female. The mean duration of working in dentistry was 19.9 ± 12.1 years (range: 0.5–55 years) and was higher in females (21.9 ± 12.9 years) than in males (16.4 ± 12.2 years, $P < .001$).

A total of 1477 (31.6%) participants reported current work-related skin symptoms. The prevalence of skin symptoms was statistically higher among females (1092, 37.2%) compared to males (385, 22.2%),

($P < .001$). The mean duration of work experience of individuals with work-related skin symptoms was greater (21.1 ± 13.0 years) than of those without (19.3 ± 12.8 years, $P < .001$).

Dry skin was the most common complaint of individuals with skin symptoms (61.5%), followed by redness (56.3%) and pruritus (51.0%) (Table 1). Hands were affected in 1415 (95.8%) dentists reporting work-related skin symptoms. A total of 1251 dentists gave detailed information on hand symptoms. The most commonly affected area was the dorsum ($n = 771$, 61.6%), followed by fingers ($n = 680$, 54.4%), finger webs ($n = 384$, 30.7%), and palms ($n = 326$, 26.1%). The symptoms were localized predominantly on both hands (81.5%), and rarely on the right or left hand only (10.4% and 8.1%, respectively).

Overall, 19.2% reported the onset of work-related skin symptoms while being student at dental school, and 65.0% reported onset up to the tenth year after graduation (Table 2). In men, the onset peaked during student education and 2–5 years after graduation. In women, the onset of work-related skin symptoms peaked 6–10 years after graduation.

Most of the participants ($n = 1007$, 68.2%) who indicated the problem reported that their symptoms improved during long holidays (lasting ≥ 3 weeks). A higher percentage of men reported improvement. More than half of the participants reported that skin symptoms did not affect their work (Table 2); 35.7% intended to consult a dermatologist while only 2.6% of the respondents considered retiring owing to skin symptoms.

The suspected causes for work-related skin symptoms reported by dentists are shown in Figure 1. The most common causes were attributed to frequent hand washing, protective gloves, and disinfectants.

Five hundred and seventy-three (12.3%) respondents reported that they did not wear protective gloves at all. The prevalence of work-related skin symptoms in these participants was lower than in dentists who did wear protective gloves (28.4% vs 32.0%, $P = .045$). Of 4102 dentists wearing protective gloves, 1358 (33.1%) used latex gloves, 3031 (73.9%) used nitrile rubber gloves, 292 (7.1%) polyvinyl chloride gloves, 10 (0.2%) used neoprene gloves, and 76 (1.9%) were unaware of the material from which their gloves were made (multiple answers were possible). Of the respondents, 926 (22.6%) used only

TABLE 1 Work-related skin symptoms reported by dentists ($n = 1477$)

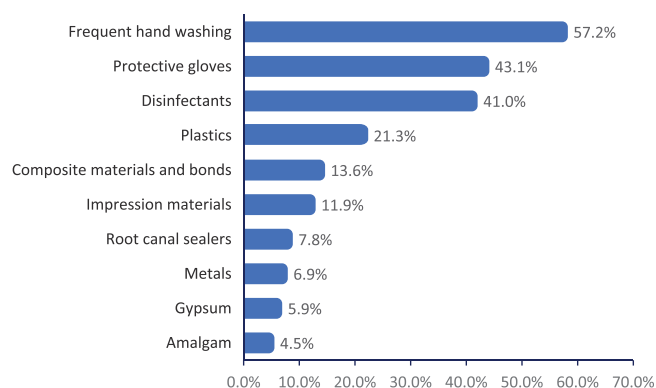
Symptoms ^a	<i>n</i>	%
Dry skin	909	61.5
Redness	832	56.3
Pruritus	754	51.0
Rash	616	41.7
Chapping or cracking	555	37.6
Pain	123	8.3
Edema	107	7.2
Paresthesia of the fingers	85	5.8

^aMultiple answers possible.

TABLE 2 Characteristics of work-related skin symptoms

	Total <i>n</i> (%)	Men <i>n</i> (%)	Women <i>n</i> (%)	<i>P</i> -value ^a
Onset of skin symptoms				
During student education	283 (19.2)	115 (29.9)	168 (15.4)	<.001
During the first year after graduation	131 (8.9)	15 (3.9)	116 (10.6)	
2-5 years after graduation	273 (18.5)	112 (29.1)	161 (14.7)	
6-10 years after graduation	272 (18.4)	48 (12.5)	224 (20.5)	
11-15 years after graduation	162 (11.0)	30 (7.8)	132 (12.1)	
16-20 years after graduation	112 (7.6)	16 (4.2)	96 (8.8)	
21-30 years after graduation	150 (10.2)	20 (5.2)	130 (11.9)	
>30 years after graduation	94 (6.4)	29 (7.5)	65 (6.0)	
Improvement away from work (≥ 3 weeks)				
Improvement	1007 (68.2)	279 (72.5)	719 (65.9)	.001
No change	147 (10.0)	44 (11.4)	104 (9.5)	
Not known (lack of long holidays)	323 (21.9)	62 (16.1)	269 (24.6)	
Evolution of work-related skin symptoms from the onset up to present				
Symptoms remain the same	873 (59.1)	218 (56.6)	655 (60.0)	.44
Symptoms aggravate	318 (21.5)	85 (22.1)	233 (21.3)	
Symptoms tend to decline	286 (19.4)	82 (21.3)	204 (18.7)	
Consequences on occupational activity				
These symptoms do not affect my work	800 (54.2)	227 (59.0)	573 (52.5)	.064
I am thinking of consulting a dermatologist/allergist	527 (35.7)	124 (32.2)	403 (36.6)	
I am thinking of hiring an assistant for some of the dental procedures	112 (7.6)	29 (7.5)	83 (7.6)	
I am thinking of retiring because of occupational skin symptoms	38 (2.6)	5 (1.3)	33 (3.0)	

^a*P*-value obtained with the chi-square test, comparing the sexes.

**FIGURE 1** Self-reported suspected causes for work-related skin symptoms in dentists (*n* = 1477, multiple answers possible)

latex gloves and 2620 (63.9%) only nitrile gloves. Out of the dentists who used only latex gloves, 28.3% had skin symptoms and 32.9% of the dentists who used only nitrile gloves reported skin disorders (*P* = .010). The reasons for using either latex or nitrile gloves instead of gloves made of a different material are given in Table 3.

Atopy, defined as self-reported history of atopic dermatitis, hay fever and/or asthma was present in 1659 (35.5%) of the respondents.

TABLE 3 Reasons determining the choice of glove materials (multiple answers)

	Latex gloves <i>n</i> (%)	Nitrile gloves <i>n</i> (%)
More comfortable	673 (72.7)	1893 (72.3)
Better infection control	238 (25.7)	96 (3.7)
Skin symptoms related to other gloves	47 (5.1)	618 (23.6)
Recommended by dermatologist	24 (2.6)	234 (8.9)

Dentists with an atopic constitution were more affected by work-related skin symptoms compared to those without a history of atopic disease (42.4% vs 25.7%; *P* < .001, respectively).

The prevalence of self-reported contact allergy (including metal allergy) was 13.2%. A higher percentage of work-related skin symptoms was found in dentists with history of contact allergy than where there was no history of contact allergy (50.8% vs 28.7%; *P* < .001).

According to logistic regression analyses, atopic disease history was the most significant risk factor for work-related skin symptoms. Atopic dermatitis (odds ratio [OR] 2.61, 95% confidence interval [CI]:

2.16-3.16; $P < .001$) was more strongly associated with work-related skin symptoms than only allergic rhinoconjunctivitis and/or asthma (OR 1.84, 95%CI: 1.56-2.17; $P < .001$). In addition, female sex, work experience >30 years, frequent hand washing (>8 times per day), wearing protective gloves (>3 hours per day), use of >10 pairs of gloves per day, and a history of contact allergy were all associated with work-related skin symptoms (Table 4).

4 | DISCUSSION

This large questionnaire study was the first national investigation of the prevalence of self-reported work-related skin symptoms and associated factors in Bulgarian dentists. It was conducted with the support

of BgDA that allowed fast and easy contact with the dentists in all 28 Regional Colleges and ensured the participation of a significant number of dentists (4675, response 48.1%). Items in the digital questionnaire were formulated to avoid invalid questions and increase the reliability of statistical analysis.

The self-reported prevalence data indicate that 31.6% of Bulgarian dentists suffer from current work-related skin symptoms. This proportion is substantially higher than the epidemiological study reported by Munksgaard et al¹² in which 27.2% of dentists considered their skin symptoms to be caused by occupational factors, resulting in a point prevalence of 9.6%. Most of the questionnaire studies address 1-year prevalence of work-related skin symptoms, and reveal variation in different countries. A study conducted among dentists in Thailand revealed a 1-year prevalence of 21.9%,¹³ which was lower than in

TABLE 4 Association between work-related skin symptoms and potential risk factors

Risk factor	Total n (%)	Skin symptoms N (%)	OR (95%CI) crude	P-value	OR (95%CI) adjusted	P-value ^a
Sex						
Male	1736 (37.1)	385 (26.1)	1		1	
Female	2939 (62.9)	1092 (73.9)	2.08 (1.81-2.38)	<.001	1.87 (1.59-2.19)	<.001
Work experience (years)						
<5	922 (19.7)	268 (18.1)	1		1	
6-10	559 (12.0)	160 (10.8)	0.98 (0.78-1.23)	.86	1.01 (0.79-1.30)	.91
11-15	516 (11.0)	159 (10.8)	1.09 (0.86-1.37)	.49	1.14 (0.88-1.48)	.31
16-20	412 (8.8)	107 (7.2)	0.86 (0.66-1.11)	.25	0.70 (0.52-1.03)	.11
21-25	516 (11.0)	162 (11.0)	1.11 (0.88-1.41)	.36	1.14 (0.88-1.48)	.31
26-30	506 (10.8)	140 (9.5)	0.93 (0.731-1.19)	.58	1.18 (0.89-1.56)	.24
>30	1244 (26.6)	481 (32.6)	1.54 (1.28-1.85)	<.001	2.21 (1.78-2.74)	<.001
Frequency of hand washing per day						
<8	494 (10.6)	124 (8.4)	1		1	
8-16	2075 (44.4)	577 (39.1)	1.15 (0.92-1.44)	.23	1.32 (1.03-1.69)	.028
>16	2106 (45.0)	776 (52.5)	1.74 (1.40-2.17)	<.001	1.78 (1.39-2.27)	<.001
Wearing protective gloves (hours per day)						
1-3	701 (17.0)	157 (11.7)	1		1	
4-6	1945 (47.1)	640 (47.9)	1.70 (1.39-2.08)	<.001	2.09 (1.64-2.67)	<.001
>6	1483 (35.9)	540 (40.4)	1.98 (1.61-2.44)	<.001	2.44 (1.85-3.21)	<.001
Pairs of gloves per day						
1-5	960 (23.3)	276 (20.8)	1		1	
6-10	2739 (66.4)	870 (65.7)	1.15 (0.98-1.36)	.082	0.98 (0.80-1.21)	.88
>10	423 (10.3)	179 (13.5)	1.82 (1.43-2.31)	<.001	1.51 (1.11-2.04)	.009
Atopic disease						
No	3012 (64.4)	770 (52.1)	1		1	
AD	1003 (21.5)	384 (26.0)	2.79 (2.35-3.32)	<.001	2.72 (2.24-3.31)	<.001
ARC and/or A	660 (14.1)	323 (21.9)	1.80 (1.55-2.10)	<.001	1.85 (1.56-2.19)	<.001
Contact allergy (incl. metal allergy)						
No	4059 (86.8)	1164 (78.8)	1		1	
Yes	616 (13.2)	313 (21.2)	2.57 (2.16-3.05)	<.001	1.79 (1.48-2.17)	<.001

Abbreviations: AD, history of atopic dermatitis with or without allergic rhinoconjunctivitis and/or asthma; ARC and/or A, history of allergic rhinoconjunctivitis and/or asthma only. CI, confidence interval; OR, odds ratio.

^aP-values in bold type are significant.

studies from Norway and New Zealand with a 1-year prevalence of 45%¹⁶ and 47%,¹⁴ respectively. The 5-year prevalence of skin reactions among Greek endodontists was estimated to be 32.5%, while 82.1% of endodontists considered the reactions to be associated with the dental occupation.¹⁷ Although most of the studies do not present data on point prevalence, making the comparison difficult, it seems that the rate of work-related skin symptoms in Bulgarian dentists is high. Overestimation of the prevalence should be considered in the present study as 10% of symptomatic dentists did not report improvement of skin symptoms during long holidays (Table 2). It is possible that skin symptoms caused by non-occupational factors or atopic hand eczema had been misinterpreted as work-related. In addition, affected individuals are more prone to participate in a questionnaire study concerning a health problem. Despite the participation of a large number of Bulgarian dentists, bias as regards an uneven distribution of work-related skin symptoms among respondents and non-respondents may be present. On the other hand, this high prevalence is in accordance with recently published results from a questionnaire study among Bulgarian dental students, in which 21.2% of the respondents reported current work-related skin symptoms.¹⁵

In the present study, work-related skin symptoms among dentists were more common in women. The higher prevalence of hand dermatitis among women was reported by other authors and might be related to a lower threshold for reporting adverse reactions in women.^{18,19} Our study showed that work-related skin symptoms may occur early in the career or even while at dental school, which was reported by approximately one fifth of symptomatic dentists (Table 2). Although skin symptoms may occur as soon as students start dental work, sometimes there is a long period between exposure and onset of disease. According to logistic regression analysis, clinical experience >30 years was significantly associated with work-related skin symptoms. Cumulative effects resulting from long-term repetitive exposure to irritants and sensitizers are one possible explanation. On the other hand, degenerative skin changes with increasing age should be taken into consideration. Cumulative extrinsic factors combined with structural and physiological changes intrinsic of ageing can produce a marked susceptibility to dermatological conditions.²⁰

A higher percentage of men with work-related skin symptoms reported improvement during long holidays compared to women. A possible explanation is that women are more frequently occupied with housework and wet work, therefore, contact with other non-dental irritants may continue during holidays.

More than half of the affected dentists (54.2%) reported that work-related skin symptoms did not have affect their occupational activity, although 21.5% reported aggravation of skin symptoms since they appeared (Table 2). Only one third of affected dentists reported the intention to consult a dermatologist and less than 10% considered the appointment of an assistant. This may indicate that the work-related skin symptoms were rather mild in most dentists. In line with this, only a minority (2.6%) considered change of profession due to work-related skin symptoms. However, it should also be borne in mind that the dental profession is highly specialized and requires investments in a continuing professional development or continuing

dental qualification and dental practice equipment. This, and the insecurities on the labour market, may render the decision of career reorientation very difficult, even if more severe symptoms occur. Planning a consultation with a dermatologist (mentioned by 35.7%) demonstrated that many dentists were not prone to visiting a dermatologist or allergist immediately after the skin symptoms had appeared. In addition, only one fifth of the dentists reported aggravation of work-related skin symptoms from the onset up to the time of the study (Table 2). Most of the affected dentists reported no change of symptoms. A possible explanation is that affected dentists may prevent aggravation by protective behaviour or restricting exposure to culprit agents.

Frequent hand washing was the most commonly suspected cause for work-related skin symptoms in our study. Dental professionals do wash their hands frequently, which makes them particularly prone to irritant skin reactions.^{2,21} Frequent hand washing causes damage to the skin barrier that can result in dry skin and hand eczema.^{1,2} In our study, hand washing >16 times per day was associated with work-related skin symptoms (OR 1.74, 95%CI: 1.40-2.17). In line with the current results, a high frequency of hand washing was associated with self-reported work-related skin symptoms in dental students in the previous study (OR 2.42, 95%CI: 1.06-5.52).¹⁵ When adjusting for other factors in the logistic regression model, the impact of frequent hand washing increased, and even hand washing ≥ 8 times per day became significantly associated with work-related skin symptoms (OR 1.41, 95%CI: 1.11-1.80).

The use of protective gloves was reported as another suspected cause by 43.1% of dentists. The use of protective gloves has been recommended in regulation for infection control for the last three decades. This has resulted in significant exposure to potential allergens, including natural rubber latex proteins and other chemical agents (accelerators and antioxidants), used in the manufacture of protective gloves.²²⁻²⁴ Latex gloves are known for their sensitizing potential. However, the introduction of low protein powder-free latex gloves recently resulted in a marked reduction of immediate-type hypersensitivity reactions.²⁵ Surprisingly, a higher prevalence of skin symptoms was reported by dentists wearing nitrile gloves in our study. Nitrile gloves are not hypoallergenic and may cause both allergic and irritant reactions.^{4,26} In our study almost a quarter of dentists used nitrile gloves because of skin symptoms to other previously used gloves (Table 3), which may explain the high prevalence of skin symptoms in nitrile-glove users. Furthermore, many dentists are not aware that low molecular substances, such as acrylic monomers and disinfectants, may penetrate through glove materials and that, therefore, wearing of protective gloves may not always prevent direct skin contact with these hazardous substances, even after changing the type of gloves. Moreover, wearing protective gloves for ≥ 4 hours per day has been identified as a factor associated with skin symptoms in our study. Prolonged contact of gloves with skin make the epidermal barrier more susceptible to allergens and irritants, while the glove itself may cause skin irritation by occlusive effects,^{27,28} both when using latex and nitrile gloves. Cumulative occlusive effects of gloves could be a possible explanation for the lower incidence of skin symptoms in

dentists not wearing protective gloves compared to those using protective gloves in our study. On the other hand, dentists with adverse skin symptoms in the workplace are more likely to use protective gloves in order to restrict or avoid contact with hazardous substances. Accordingly, glove use may be interpreted as a consequence, not a cause, of the higher prevalence of skin symptoms in dentists wearing gloves. The cross-sectional design of the study does not allow us to establish the causality, but merely associations.

Other suspected causal agents reported by the participants were plastics, composite materials and bonds (21.3%, plastics and 13.6%, composite materials and bonds). The irritant and sensitizing potential of acrylic resins have been proven in several studies.^{29,30} The pattern of most common causative agents has changed in Bulgaria. Three decades ago, work-related skin symptoms were mainly attributed to amalgam and formaldehyde.³¹ Amalgam has been replaced by composite materials recently, which increased significantly the exposure to acrylic monomers. The use of formaldehyde-containing root canal sealers is no longer recommended by the European Society of Endodontology because of the low biocompatibility,³² which has restricted their previously extensive use and reduced dentists' exposure. Independently of the changes in type of dental materials used for definitive obturation, occupational exposure to other haptens, such as rubber components, acrylic monomers, and disinfectants, has continued. This may explain the association between self-reported contact allergy (including metal allergy) and work-related skin symptoms in dentists, according to the logistic regression analysis in our study. According to the univariate analysis of Minamoto et al, a history of metal allergy was associated with the lifetime prevalence and 1-year prevalence of self-reported hand eczema among dental workers.¹⁰ In a Danish population-based twin sample study, contact allergy was significantly associated with hand eczema, and the association was related to the strength of the contact allergy.³³

Skin symptoms occur as a result of exposure to irritants and allergens, but endogenous factors are also of importance. In our study, a history of atopic dermatitis was the most important predictor of work-related skin symptoms with an OR of 2.61 (95%CI: 2.16-3.16) after adjustment for sex, frequency of hand washing, protective gloves use (hours and pairs per day), and history of contact allergy. The previous study conducted among Bulgarian dental students also showed that self-reported work-related skin symptoms were significantly associated with a history of atopic dermatitis with an OR of 3.92 (95%CI: 1.99-7.72).¹⁵ Atopic dermatitis is characterized by skin barrier deficiency rendering the skin more susceptible to irritation and thus, increasing the risk of work-related irritant contact dermatitis.³⁴⁻³⁶

Our findings must be interpreted in light of the study's strengths and limitations. A strength of the study is the large sample size and involvement of dentists from all Regional Colleges of the BgDA, causing it to be a national investigation that collected information on the prevalence and determinants of work-related skin symptoms in dentists. The cross-sectional design is a limitation of the study. The measurement of work-related skin symptoms was through self-reporting and the result may not be as accurate as findings confirmed by clinical diagnoses of trained dermatologists. Moreover, self-assuming that skin symptoms are work-related and ignoring endogenous causes of skin symptoms, such as atopic dermatitis or non-work-related causes

such as exposure to non-occupational hazardous substances, may overestimate the true prevalence of work-related skin symptoms. A questionnaire investigation alone cannot differentiate properly between irritant and allergic contact dermatitis or between immediate- and delayed-type hypersensitivity reactions. Factors causing skin symptoms were based only on the dentists' subjective assessments without objective evaluation regarding the link between symptoms and exposures. A significant number of the dentists with self-reported work-related skin symptoms had a history of contact allergy, but the lack of patch testing did not allow identification of the corresponding sensitizers to determine their occupational relevance.

5 | CONCLUSION

From the present cross-sectional study, Bulgarian dentists have a high prevalence of self-reported work-related skin symptoms. History of atopic disease and contact allergy, as well as prolonged work experience, frequent hand washing, prolonged use of protective gloves, and female sex were factors associated with these symptoms. Although half of the affected dentists claimed not to be compromised in their occupational activities by the reported skin symptoms, protective measures should be promoted, ideally during dental school training.

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CONFLICT OF INTEREST

The author declares no conflict of interests.

AUTHOR CONTRIBUTION

I.S. conceived of the presented idea, created the online questionnaire, contacted the President of Bulgarian Dental Association, performed the statistical analysis of the data and discussed the results.

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REFERENCES

1. Fartasch M. Wet work and barrier function. *Curr Probl Dermatol*. 2016;49:144-151.
2. Behroozy A, Keeghel TG. Wet-work exposure: a Main risk factor for occupational hand dermatitis. *Saf Health Work*. 2014;5(4):175-180.
3. Leggat PA, Kedjarune U, Smitj DE. Occupational health problems in modern dentistry: a review. *Ind Health*. 2007;45(5):611-621.
4. Hamann CP, Rodgers PA, Sullivan KM. Occupational allergens in dentistry. *Curr Opin Allergy Clin Immunol*. 2004;4(5):403-409.
5. Amin A, Palenik CJ, Cheung SW, Burke FJ. Latex exposure and allergy: a survey of general dental practitioners and dental students. *Int Dent J*. 1998;48(2):77-83.

6. Burke FJ, Wilson NH, Cheung SW. Factors associated with skin irritation of the hands experienced by general dental practitioners. *Contact Dermatitis*. 1995;32(1):35-38.
7. Lindberg M, Silverdahl M. The use of protective gloves and the prevalence of hand eczema, skin complaints and allergy to natural rubber latex among dental personnel in the country of Uppsala, Sweden. *Contact Dermatitis*. 2000;43(1):4-8.
8. Ortengren U, Andreasson H, Karlsson S, Meding B, Barregård L. Prevalence of self-reported hand eczema and skin symptoms associated with dental materials among Swedish dentists. *Eur J Oral Sci*. 1999;107(6):496-505.
9. Wallenhammar LM, Ortengren U, Andreasson H, et al. Contact allergy and hand eczema in Swedish dentists. *Contact Dermatitis*. 2000;43(4):192-199.
10. Minamoto K, Watanabe T, Diepgen TL. Self-reported hand eczema among dental workers in Japan – across-sectional study. *Contact Dermatitis*. 2016;75(4):230-239.
11. Sinclair NA, Thomson WM. Prevalence of self-report hand dermatoses in New Zealand dentists. *N Z Dent J*. 2004;100(2):38-41.
12. Munksgaard EC, Hansen EK, Engen T, Holm U. Self-reported occupational dermatological reactions among Danish dentists. *Eur J Oral Sci*. 1996;104(4):396-402.
13. Chowanadisai S, Kukiattarakoon B, Yaping B, Kedjarune U, Leggat PA. Occupational health problems of dentists in southern Thailand. *Int Dent J*. 2000;50(1):36-40.
14. Ayers KM, Thomson WM, Newton JT, Morgaine KC, Rich AM. Self-reported occupational health of general dental practitioners. *Occup Med*. 2009;59(3):142-148.
15. Stoeva I, Dencheva M, Georgiev N, Chonin A. Skin reactions among Bulgarian dental students: a self-report questionnaire survey. *Contact Dermatitis*. 2019;81(4):274-279.
16. Jacobsen N, Aasenden R, Hensten-Pettersen A. Occupational health complaints and adverse patients reactions as perceived by personnel in public dentistry. *Community Dent Oral Epidemiol*. 1991;19(3):155-159.
17. Zarra T, Lambrianidis T. Skin reactions amongst Greek endodontists: a national questionnaire survey. *Int Endod J*. 2015;48(4):390-398.
18. Burke FJ, Wilson NH, Cheung SW. Factors associated with skin irritation of the hand experienced by dental practitioners. *Contact Dermatitis*. 1995;32(1):35-38.
19. Nilsson E. Individual and environmental risk factors for hand eczema in hospital workers. *Acta Derm Venereol Suppl*. 1986;128:1-63.
20. Farage MA, Miller KW, Berardesca E, Maibach HI. Clinical implications of ageing skin: cutaneous disorders in the elderly. *Am J Clin Dermatol*. 2009;10(2):73-86.
21. Diepgen TL, Coenraads PJ. The epidemiology of contact dermatitis. *Int Arch Occup Environ Health*. 1999;72(8):496-506.
22. Garcia JA. Type I latex allergy: a follow-up study. *J Invest Allergol Clin Immunol*. 2007;17(3):164-167.
23. Garabrant DH, Schweitzer S. Epidemiology of latex sensitization and allergies in health care workers. *J Allergy Clin Immunol*. 2002;110(2 Suppl):S82-S95.
24. Hamann CP, Turjanmaa K, Rietschel R, et al. Natural rubber latex hypersensitivity: incidence, prevalence of type I allergy in the dental professional. *J Am Dent Assoc*. 1998;129(1):433-454.
25. Clayton TH, Wilkinson SM. Contact dermatoses in healthcare workers: reduction in type I latex allergy in a UKcenter. *Clin Exp Dermatol*. 2005;30(3):221-225.
26. Cao LY, Taylor JS, Sood A, Murray D, Siegel PD. Allergic contact dermatitis to synthetic rubber gloves: changing trends in patch test reactions to accelerators. *Arch Dermatol*. 2010;146(9):1001-1007.
27. Ramsing DW, Agner T. Effect of glove occlusion on human skin (II). *Contact Dermatitis*. 1996;34(4):258-262.
28. Tiedemann D, Clausen ML, John SM, Angelova-Fischer I, Kezic S, Agner T. Effect of glove occlusion on the skin barrier. *Contact Dermatitis*. 2016;74(1):2-10.
29. Ramos L, Cabral R, Gonalo M. Allergic contact dermatitis caused by acrylates and methacrylates a 7-year study. *Contact Dermatitis*. 2014;71(2):102-107.
30. Spencer A, Gazzani P, Thompson DA. Acrylate and methacrylate contact allergy and allergic contact disease: a 13-year review. *Contact Dermatitis*. 2016;75(3):157-164.
31. Stranski L, Kisselova A. Contact dermatitis as an occupational disease among dental staff. *Problems Dentistry*. 1993;21(3):19-24. (in Bulgarian).
32. European Society of Endodontology. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int Endod J*. 2006;39(12):921-930.
33. Bryld LE, Hindsberger C, Kyvik KO, Agner T, Menn  T. Risk factors influencing the development of hand eczema in a population-based twin sample. *Br J Dermatol*. 2003;149(6):1214-1220.
34. Dickel H, Bruckner TM, Schmidt A, Diepgen TL. Impact of atopic skin diathesis on occupational skin disease incidence in a working population. *J Invest Dermatol*. 2003;121(1):37-40.
35. Kezic S, Visser MJ, Verberk MM. Individual susceptibility to occupational contact dermatitis. *Ind Health*. 2009;47(5):469-478.
36. Nettis E, Colanardi MC, Soccio AL, Ferrannini A, Tursi A. Occupational irritant and allergic contact dermatitis among healthcare workers. *Contact Dermatitis*. 2002;46(2):101-107.

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