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Outcome of Nurses with Occupational Dermatitis

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Abstract

Background: Occupational dermatitis is considered as the second most common occupational disease. It accounts for 25% of all lost workdays. Several international studies reported a prevalence of occupational dermatitis in healthcare workers between 17% and 55%. This study aims to identify factors that affect the professional outcome of nurses suffering from occupational dermatitis. **Methods:** This was a multicenter cross-sectional study concerning nurses declared having occupational dermatitis in the central region of Tunisia. A synoptic sheet related to socio-professional and administrative data was completed. A self-administered Questionnaire going over medical and occupational characteristics was completed during a direct interview. **Results:** The study involved forty nurses working in four public hospitals in the center of Tunisia. Only 37 workers were included in the study. A professional reclassification was introduced among 19 workers (51% of study population). Workstation adaptation was requested in 14 cases (38%). Exposure to allergens in the workplace was eliminated in 20 cases. Two study participants were transferred to other departments (5.4%) and three people retired (8.1%). A statistically significant association was found between professional reclassification and a history of allergic manifestations ($p = 0.003$). Similarly, a significant association was found between professional reclassification and the allergic agent ($p = 0.014$). Workstation layout was significantly associated with a history of allergic manifestations ($p = 0.039$), the palm hand location ($p = 0.04$), professional eviction ($p < 0.001$) and the seniority of the declaration ($p = 0.039$). The change of workstation was significantly associated with a history

of allergic manifestations (p = 0.024) and a sensitization to nickel sulfate (p = 0.011). A multiple binary logistic regression revealed that the demand for professional reclassification was significantly correlated with a history of allergic manifestations (p = 0.008), a sensitization to nickel sulfate (p = 0.009) and the fingers location (p = 0.038). The change of workstation was significantly correlated with a history of allergic manifestations (p = 0.026). **Conclusion:** This study identified the main factors influencing the occupational outcome of nurses suffering from occupational dermatitis. This outcome depended on a history of atopy (especially allergic rhinitis) and sensitization to allergens (thiuram mix).

Keywords

Nursing, Occupational Dermatitis, Hospital

1. Introduction

Occupational dermatitis (OD) is a skin disorder caused by professional agents and/or working conditions [1]. It is one of the most widespread occupational diseases in several countries [2] [3]. It accounts for 25% of all lost workdays [4]. Most work-related dermatoses (over 95%) are subtypes of contact dermatitis (CD) [5]. Skin contact with irritants and/or allergens is the main cause of CD. The probability and severity of a reaction depend on the type and intensity of exposure. The appearance and course of dermatoses vary depending on multiple external and internal factors. The most common symptoms include itching, swelling, blisters, cracking, or skin flaking. Healthcare workers are particularly susceptible to this type of skin disorders as a function of their frequent contact with a large number of potential irritants and sensitizing agents, as e.g. rubber gloves and disinfectants [6] [7]. Several international studies reported the prevalence of occupational skin disease in healthcare workers between 17% and 55% [8]. A cross-sectional study was conducted over 12 months in Ethiopia to determine the prevalence of self-reported occupational-related contact dermatitis, indicating a prevalence of 31.5% among 422 healthcare included in the study [4]. In Tunisia, according to the latest statistics from the Caisse Nationale D'Assurance Maladie (CNAM), OD is the fourth most common occupational disease with a prevalence ranging from 6.25% in 2010 to 2.4% in 2018 [9]. Healthcare professionals are among the most likely to be affected by these conditions due to their frequent and/or prolonged exposure to many irritants, allergens and wet environments [10] [11]. In almost half of cases contact dermatitis evolves into chronicity, with a significant physical and psychic disability [12] [13]. Besides, it often has a pejorative socio-professional outcome [14] [15] [16] [17].

The aim of this study was to identify the factors that affect the occupational outcome of nurses diagnosed with occupational dermatitis.

2. Methods

2.1. Study Design, Setting, and Participants

This observational cross-sectional study was conducted from January to June 2020 in four public hospitals of the central region of Tunisia. The questionnaire was distributed to nurses suffering from OD in the following four teaching hospitals of Sousse, Monastir and Mahdia.

2.2. Inclusion and Exclusion Criteria

Nurses suffering from OD, in the four teaching hospitals, in the last twenty-five years were exhaustively included in this study. Informed consent was gained from each patient before enrollment. Recently engaged (<6 months) nurses or those having a non-occupational dermatitis were not included in this study. Nurses who refused to participate in the study or incompletely filled-in the questionnaire (<50%) were excluded.

2.3. Data Collection Tools and Techniques

Data was collected using a self-administered Questionnaire containing two parts.

The first part was about demographic features (age, sex, marital status, children, school level…), work-related questions (occupation, job hours per day, and exposure to occupational agents) and administrative details (initial medical certificate, relapses, …). This first part was collected from the medico-administrative files of the hospital staff concerned by an OCD. The data was collected in the human resources management departments of the four teaching hospitals, using a synoptic sheet.

In the second part, binary questions were used to appreciate occupational outcome. We translated the questionnaire to the local language (Arabic) by a unique investigator to avoid misconceptions. Patients enrolled in the study were directly interviewed. During this interview, written, free and informed consent was obtained and a self-questionnaire was given to them. After a week, the questionnaires were collected.

2.4. Data Management and Analysis

The data were analyzed using SPSS version 23.0. Frequencies and percentages were calculated for categorical variables and mean ± standard deviation (SD) for continuous variables. Association between categorical variables was analyzed using the chi-square test (χ^2). A p-value of ≤0.05 was considered statistically significant. A multinomial logistic regression was performed to identify the factors associated with occupational outcome in staff with a reported OD. A cut of ≤0.05 p-value was set to evaluate the significance and odds ratios (OR) with a 95% confidence interval (CI) to establish the strength of associations. All results were summarized in tables.

3. Results

The study involved 40 nurses, working in four public hospitals in the center of

Tunisia. Only 37 completed the self-administered questionnaire and were included in the study, giving response rate of 97%.

The mean age of our study population was 44.9 ± 9.5 years. A female predominance was noted (73%). In this population, 76% of participants were right-handed and 89% of them were non-smokers. Of the identified cases, 17 patients had a family history of atopy and 43% an allergic personal history. Personal medical history (other than allergic) was reported in 22% of cases (Table 1).

Most of the occupational dermatitis cases occurred in surgical departments and operating theaters (48% of cases) (Table 1).

The average job tenure was 10 ± 8.8 years. Sixty-eight percent of did not hold night shifts. Occupational dermatitis manifested as eczemas in 35 patients (96% of cases), irritation dermatitis and hives in one case each. Hands were the most common location of lesions (97%) with a predominance of bilateral location (92% of cases). The back of the hands was the most reported location (81%), followed by fingers (78%). Most of participants developed injuries after being hired (83.7%) with an average of 3.47 ± 2.2 years. The most reported occupational hazards were wearing gloves in 86% of cases and hand washing with soap and hydro-alcoholic solutions in 73% of cases. The European standard series (ESS) was performed in 34 patients (91.8% of the cases), out of whom 91% tested positive. The most common allergens were thiuram mix in 38% of cases and nickel sulfate in 35% of cases. Patch tests with the rubber series were performed in 13 patients and were found positive in 11 patients. The plastic series test was performed in one person and it was found positive to Tricresylphosphate and Triphenylphosphate. Patch tests with gloves were performed in 14 patients and were found positive in 8 patients. Patch test with used products such as latex gloves was positive in 2 cases. The patch test with the products handled was performed in 3 patients and was positive in 2 cases.

Dermatitis was reported as an occupational disease in 100% of cases, of which 23 cases (55%) are reported in Table 59 of occupational diseases (Other agents responsible for eczematic dermatitis of allergic mechanism). It was reported by an occupational physician in 34 cases (91.9%). Occupational origin was recognized in 16 cases (43.2%), rejected in one case (2.7%) and being assessed in 10 cases (27%).

A professional reclassification was introduced among 8 workers (21.6%). Workstation adaptation was requested in 14 cases (38%). Eviction of causal allergens was realized in 18 cases (24%) (Table 2).

Workstation change was requested in 14 cases (38%) and refused in 10 cases. Reducing allergen exposure in the workplace was recommended in 20 cases. This eviction was not applied in 14 cases (37.8%) due to lack of other alternative in 12 cases (32.4%), lack of personnel and an ubiquitous allergen in one case each (2.7%).

Workstation change requests were approved in 9 cases, and refused in 3 cases. Four people were removed to the outpatient clinic and 2 people to the pharmacy. Two patients (5.4%) were transferred to other departments and 3 patients retired

Table 1. Socio-demographic and occupational characteristics of nurses declared to be suffering from occupational dermatitis.

Population	(N = 37) (%)
Mean age (years)	44.9 ± 9.5
Gender	
Female	27 (73)
Male	10 (27)
Marital status, n (%)	
Married	34 (92)
Widowed or divorced	3 (8)
Dependent children, n (%)	35 (95)
≥2	30 (81)
School level, n (%)	
Primary/Secondary	9 (24)
Higher	28 (76)
Body mass index, kg/m², mean ± DS	26.57 ± 4
Dominant hand, n (%): Right	28 (76)
Tobacco, n (%)	4 (11)
Sports activity, n (%)	14 (38)
Recreational activity, n (%)	4 (11)
Family history of atopy, n (%)	17 (46)
Personal history of allergies, n (%)	16 (43)
Rhinite	11 (30)
Conjunctivitis	7 (19)
Atopic dermatitis	5 (14)
Asthma	3 (8)
Personal history not allergic, n (%)	8 (22)
Hospital services, n (%)	
Surgical services and operating rooms	18 (48)
Emergency and Resuscitation Services	6 (16)
Medical Services	4 (11)
Lingerie and sterilization units	5 (14)
Laboratories	3 (8)
Maintenance Services	1 (3)
Seniority in hospital, years, median (IIQ)	10 (4.5 - 18.5)
Seniority in position, years, median (IIQ)	5 (3 - 15.5)

Continued

Working hours, n (%)	
Fixed Day	10 (27)
Fixed Night	2 (5)
Alternateday/night	25 (68)
Number of hours worked per day, average ± DS	6.8 ± 1.4
Agents, n (%)	
Latex gloves	32 (86)
Wet work	27 (73)
Soaps and hydroalcoholic solutions	27 (73)
Disinfectants and detergents	19 (51)
Metal Tools	17 (46)
Conservatives	2 (5)
Food/Cement	2 (5)

Table 2. Professional outcome of patients reported to have occupational Dermatitis.

Current Assignment	N (%)
Change of position	6 (16.2%)
Keep the same position	24 (64.8%)
Workstation change	14 (38%)
Mutation	2 (5.4%)
Retirement (legal age)	3 (8.1%)

(8.1%). No job loss due to incapacity at work was reported. Extraprofessional eviction was recorded in 4 cases (10.8%).

After reporting, clinical development was steady in 9 cases (24%), aggravated in 6 cases (16%) and improved in 22 cases (60%). This improvement was partial in 17 cases (77%) and total in 5 cases (23%).

A statistically significant association was found between professional reclassification and the presence of a history of allergic events ($p = 0.003$), in particular allergic rhinitis ($p = 0.003$) and causal agents ($p = 0.014$), in particular the presence of sensitization to Nickel sulfate ($p = 0.006$). Workstation layout was significantly associated with the presence of a history of allergic events ($p = 0.039$), reaching the palm of the hand ($p = 0.04$), the introduction of measures of occupational predation ($p < 0.001$), and post-reporting ($p = 0.039$).

The shift was significantly associated with the presence of a history of allergic events ($p = 0.024$) and the presence of sensitization to Nickel sulfate ($p = 0.011$) (Table 3).

After multiple binary logistic regression, the professional reclassification was significantly correlated with the presence of a history of allergic events ($p = 0.008$) and the presence of sensitization to Nickel sulfate ($p = 0.009$) and finger damage ($p = 0.038$). The workstation change was significantly correlated with the presence of a history of allergic events ($p = 0.026$) (Table 4).

Table 3. Univariate analysis of professional development.

Variables	p-value
Request for professional reclassification	
History of allergic manifestations	0.003
Rhinitis	0.003
Occupational agent	0.006
Nickel sulfate	0.014
Shift work	
History of allergy	0.024
Nickel sulfate	0.011

Table 4. Multivariate analysis of professional development.

Variables	OR	95% CI		p
		Terminal>	Terminal<	
Request for professional reclassification				
History of allergic manifestations	32.78	2.516	427.062	0.008
Nickel sulfate	30.7	2.33	404.39	0.009
Fingertips	35.29	1.21	1022.7	0.038
Change of workstation				
ATCDsAllergic manifestations	7.38	1.27	42.95	0.026

4. Discussion

The aim of this study was to identify the factors influencing the occupational outcome of nurses suffering from occupational dermatitis. Thus, a cross-sectional, exhaustive study was conducted among healthcare workers in the central region of Tunisia.

In this study, workstation adaptation was requested in 14 cases and was only obtained in 10 cases. The substances responsible for the allergy in the workplace were removed in 20 cases. The change of workstation was requested in nine cases, out of wish six were accepted and three were refused. Four people were assigned to the outpatient clinic and two people to the pharmacy. Two patients (5.4%) were transferred to other departments and 3 patients retired (8.1%). No cases of dismissal were noted. These results are similar to those of other studies in Tunisia. In Brahem *et al.*'s study, eviction of allergens in patients with occupational dermatitis in the care setting was recommended in 32.8% of cases, allergen substitution in 1.4% of cases, and workstation change in 1.4% of cases [1]. Hsinet and *et al.* found that allergic contact eczema in several industries had a significant impact on ability, including the use of a shift arrangement in half of patients (50.2%), a shift mutation in 43.3% of cases, and permanent incompe-

tence in 6.5% of patients [19]. Vogel and al., in a study done in France, including 250 patients with occupational hand eczema in different sectors, showed that a third of the employees changed occupations [20]. The rates of job loss due to job abandonment or even dismissal were assessed in some studies [1] [16]. A definitive work stoppage was observed in 25.4% of patients with occupational dermatitis in the study of Aloui *et al.* [17]. Similarly, in the Malkonen *et al.* study, the loss of employment among 605 Danish workers suffering from occupational dermatitis was estimated at 25% [18]. In this study, clinical evolution was steady in nine cases (24%), aggravated in six cases (16%) and improved in 22 cases (57%). Malkonen *et al.* assessed the consequences of occupational dermatitis in 1048 patients monitored at the Finnish Institute of Occupational Diseases [18]. The injuries analysis after 60 months of diagnosis showed a healing rate of 27% for all occupations and 28% for health workers (43 patients). Recovery from occupational dermatitis was noted in 17% of patients who kept their jobs and in 34% of patients who changed their jobs. The best evolution outcome was observed in patients with contact urticarial (35%) and was found to be quite similar in patients with allergic contact dermatitis (27%) and those with irritant (23%) The risk factors for the persistence of occupational dermatitis were the absence of a shift, age > 45, diet-related occupations, respiratory atopy, and male gender [18]. A statistically significant association between the presence of allergic history, particularly allergic rhinitis, and the application for occupational reclassification ($p = 0.003$), fit-up, and workstation change ($p = 0.039$) was objectified in this study. Among participants, 46% had a family history of atopy, 43% had a personal history of allergy and 14% had a personal history of atopic dermatitis. A history of allergic events would be a risk factor for occupational dermatitis [19]. Escatha *et al.* found a significant association between the presence of co-morbidities in particular allergic histories and permanent disabilities in patients with occupational dermatitis [19].

In this population, atopic dermatitis was associated neither with job reclassification nor with job mutation. These results are contradictory with those found in the literature. Many studies have found that people working in the health sector are at a high risk of developing skin problems; several authors have confirmed that atopy is an aggravating factor in the occurrence of occupational dermatitis in this sector. This is explained by the alteration of the skin barrier allowing the penetration of allergens [20]. Rystedt *et al.* found that participants suffering from occupational dermatitis and having a history of atopic dermatitis changed jobs more frequently than participants without atopic dermatitis [21]. The age difference between patients with a history of atopy and those without might have influenced our results. The population studied by Rystedt *et al.* was younger than our population [21]. Therefore, the results are not directly comparable to those of this study. Results of this study showed that the most common ESS allergens were thiuram mix in 38% of cases, nickel sulfate in 35% of cases, potassium bichromate in 24% of cases, methyl-dibromoglutaronitrile in 24% of

cases, and cobalt chloride in 18% of cases. These results are consistent with those found by Brahem *et al.* showing that the most common allergens in study population were nickel sulfate (39.3%), chromium (18.6%), cobalt (10.7%) and thiuram mix (9.3%) [1]. Benzarti *et al.* also found that allergens responsible for hospital contact dermatitis were nickel sulfate (54.16%), chromium (33.33%), cobalt (12.5%), and rubber additives (29.16%) [22]. Nickel in hospital instruments was the most common allergen reported in the study by Lammintausta *et al.* with a prevalence of 42.6% of all patch-tested patients [23]. Chromium sensitivity was high among hospital staff, who were assigned to wet work and used chlorinated disinfectants [23]. Cobalt chloride has rarely been found as the sole sensitizer as it is most commonly associated with nickel sensitization in women or chromium sensitization in men [24] [25] [26].

A statistically significant association between the responsible agent ($p = 0.017$) (Nickel sulfate ($p = 0.03$)) and the professional reclassification for OD was found. These results are consistent with those found by Tanja *et al.*, who noted that the presence of a positive patch-test to one or more allergens (regardless the relevance) was associated with an increase in the frequency of occupational changes [27]. This indicates that a well-defined contact allergy can increase motivation or the need to change occupations to avoid exposure.

In our study population, the hand was the most common location of lesions (97%) with a predominance of bilateral involvement (92% of cases). The back of the hands was the most reported location (81%), followed by the fingers (78%). The palm of the hand location was significantly associated with workstation layout ($p = 0.04$). In the literature, contact dermatitis in hospitals has been reported to affect the hands in 90% to 100% of cases [1]. Hands had the highest prevalence among occupational dermatitis cases according to the majority of articles. Hands represent the main working tool. Therefore, a direct and frequent contact with a multitude of irritating and allergic substances is noticed. Besides, many co-factors contribute to these injuries, mainly working in a humid environment, the occlusive effect of protective gloves and the intensive and repeated hand washing mainly among healthcare workers [15] [28]. In the series of Brahem *et al.*, the hand, more readily the dorsal face, had the leading position among locations of contact dermatitis [1].

In their study conducted in public hospitals in the central region of Tunisia, Henchi *et al.* showed that hands were the primary site of involvment in 92.4% of cases of occupational dermatitis [11].

In this study, workstation accommodation was significantly associated with the introduction of means of protection ($p < 0.001$) and post-reporting ($p = 0.039$).

Various studies have examined the influence of a change in employment on the prognosis of occupational dermatitis. Most of them indicate that a change in employment does not significantly affect the prognosis [27]. In a Danish study, the proportion of cases that improved was similar in the group reporting a

change in occupation during the following 12 months, and in the group that did not [27]. However, some studies suggested a favorable effect, at least for certain occupations [27]. In a Finnish study, keeping the same workstation was associated with an increased risk of eczema persistence between 7 and 14 years after diagnosis (OR = 1.55; [IC 95 = 1.03; 2.34]) [27]. The authors concluded that avoidance of contact with the allergen greatly improved the prognosis of occupational eczema [29] [30].

In this study, age and level of education were not associated with job reclassification or job change. In the study conducted by Tanja *et al.*, job change was more common among young people (52% of those who changed jobs were under 25 years of age) and among those with less education [27]. These results can be explained by the small size of the workforce that weakens the results.

In this study, the multitude and severity of injuries were not associated with job reclassification or job change. These results are contradictory to those found in the literature. Indeed, the severity of skin lesions appears to play a significant and motivating role in the decision of changing profession [31].

Tanja *et al.* found that the severity of hand eczema was significantly associated with the change in occupation [27].

Although occupational change and job loss are serious consequences of occupational dermatitis, literature on this specific topic is rare. Indeed, the social repercussions and the consequences on the professional development of subjects with occupational contact dermatitis, gives prevention a central place in the real treatment of this disease and in order to reduce the impact of this disease on the quality of life of nurses. Measures to prevent occupational contact dermatitis are similar to those applied to various occupational diseases [1].

Limitations

This study has some shortcomings. The major challenge may be the retrospective design that increases the risk of data loss. Some reported occupational dermatitis files may be missing or misclassified at the jurisdictional level. Thus, during the study period, only 27 nurses meeting the inclusion criteria were identified with only one case of refusal to participate. However, this low number could also be explained by the phenomenon of under-reporting of health-related dermatitis. Which may be the consequence of under-diagnosis due to technical difficulties in determining the occupational origin of the disease [32]. This could be the case in the current study, given the unavailability of patch tests in some university hospitals and the need sometimes to refer staff to another hospital, which could thus demotivate them.

This under-reporting could also be due to the specificities of the occupational disease reporting system based on a voluntary approach by the victim, which may have only an interest in the recognition of the professional character of his or her pathology [32]. This is particularly true in the Tunisian legislative framework in the public sector [33].

5. Conclusions

Occupational dermatitis is common disease in the workplace environment, which has become a serious public health concern in many countries. Occupational contact dermatitis is a common cause of occupational diseases in hospitals. This study identified the main factors influencing professional outcome of nurses suffering from occupational dermatitis. In fact, a statistically significant association was found between the application for professional reclassification and the presence of a history of allergic manifestations and the causal agent. Workstation layout modification was significantly associated with the presence of a history of allergic events, the palm of the hand being the affected side, the introduction of job eviction measures, and post-declaration developments. Job changing was significantly associated with the presence of a history of allergic events and sensitization to nickel sulfate.

This chronic, relapsing morbidity also affects professional outcome. It causes a considerable handicap linked to the recurrent nature of the disease and its evolving chronicity.

Conflicts of Interest

The authors do not declare any conflict of interest.

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