

Self-reported skin disease in hydrotherapists working in swimming pools

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The aim of our study was to investigate the risk and characteristics of self-reported skin diseases among hydrotherapists. We attempted to contact 400 adults who participated in 1 of 2 training courses. 248 were reached and 190 of them (76.6%) completed the questionnaires. The data were collected by means of a telephone interview and a detailed questionnaire sent by mail. Statistical analysis included descriptive statistics, univariate and multifactorial analysis. Of those completing the questionnaire (75.8% females and 24.2% males), 44.4% of the hydrotherapists reported on the development of skin disease for the first time after the beginning of work at the swimming pool. The most common symptoms included pruritus and erythematous patches affecting mainly the extremities and trunk. Both smoking and increased exposure hours to pool water were independently associated with skin disease, suggesting a dose–response relationship. We conclude that contact dermatitis should be recognized as an occupational disease in hydrotherapists.

Key words: contact dermatitis; hydrotherapy; irritant contact dermatitis; occupational; skin disease; smoking; swimming pools. © Blackwell Munksgaard, 2005.

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Potential chemical irritants (1–3), allergens (3–6) and infectious agents (7–12) in the occupational aquatic environment as well as the irritative effect of water itself (13) may contribute to the development of dermatological diseases through several mechanisms.

Professional swimmers, hydrotherapists, physiotherapists and swimming pool workers such as cleaners and attendants are among those involved in prolonged exposure to water in swimming pools. Contact dermatitis (CD) as a result of contact with disinfected water in swimming pools in the occupational setting has been hardly reported in the scientific literature. The majority of the reports includes case studies or investigation of groups of bathers and swimmers (1, 2, 4–6, 14, 15). Although hydrotherapists are evidently at risk of developing occupational skin diseases, no systematic clinical and prevalence studies have ever been performed in this population.

The potential hazard of exposure of hydrotherapists to swimming pool water was evaluated by means of self-reported data related to the incidence of skin diseases among hydrotherapists working in swimming pools.

Materials and Methods

The study population of hydrotherapists was selected from a cohort of 400 adults who had attended 1 of 2 formal training courses between the years 1998 and 2001 in a hydrotherapy centre. However 38% could not be reached because of address and telephone number changes. Data were collected by means of 2 questionnaires. The first of these was conducted as a telephone interview intending to collect demographic data and smoking habits, occupational history, duration of contact with pool water, self-reporting on the appearance and onset of CD after the beginning of work in the pool and existence of pre-employment skin diseases. 248 trainees were contacted through telephone, but 58 of them were excluded because they either refused taking part in the study (5 subjects) or failed to complete crucial questions on the questionnaire (53 subjects). The second specially designed core questionnaire, based on the previously developed questionnaire by Susitaival et al. (16), was sent to 190 trainees after undergoing a pilot study and validation on a group of hydrotherapists. All

returned the questionnaire. The self-reported questionnaire consisted of 3 parts, the first of which included questions about the onset and characteristics of the newly developed dermatological disease with special interest on CD. The second part comprised questions about the participants' medical history (including atopic background). The effect of the dermatological disease on the quality of life and self-evaluation of the general health condition were documented in the third part of the questionnaire. The complete second questionnaire was mailed to subjects who had reported on any kind of skin disease in the first questionnaire, while only the second part of this questionnaire including questions about the medical history of the participants was received by hydrotherapist who had no report of skin disease in the previous questionnaire.

The appearance of CD was defined as the dependent variable. The independent variables, to be tested for their effect on the dependent variable, were years of employment as hydrotherapist, cumulative work hours in the pool, age, sex, body mass index (weight in kg divided by height in meters squared), skin colour defined by ethnic origin, education and smoking habits. The cumulative work hours in the pool were defined by the product of working hours per week and the number of weeks per year (52) and the number of years of employment in the pool.

Statistical analysis was carried out using the SAS program. Differences between the affected and the non-affected group were tested for the independent variables employing Kruskal–Wallis test and the χ^2 test for continuous and categorical variables, respectively. Differences with a *P*-value of ≤ 0.05 were considered to be statistically significant. All significant variables were entered into a logistic regression model, and retained in the model if having an independent effect.

Results

Demographic data of the participants are presented in Table 1. 15% of the trainees attended

Table 1. Demographic of the study population

Variable	Subvariable	<i>n</i>	%
Sex	Males	46	24.2
	Females	144	75.8
Age	Up to 39 years	107	60.8
	40 years and over	69	39.2
Body mass index	Under 25	151	79.9
	Above 25	38	20.1
Smoking habits	Non-smokers	147	83.4
	Smokers	29	16.6

the hydrotherapy course but were never employed as hydrotherapists. About 60% of the trainees were working as hydrotherapists at the time of the study. The duration of the exposure in terms of cumulative work hours in the pool is summarized in Table 2.

There were 85 subjects (44.7%) of the hydrotherapists who reported on the development of skin disease after the beginning of the work at the swimming pool including participants who reported on having a preexisting skin disease. Of 169 hydrotherapists without preexisting skin disease, 44.4% reported on the development of skin disease after the beginning of their work in the pool.

The most common symptoms included pruritus, burning and stinging (83.5%), erythematous patches (62.4%) and xerotic skin (48.2%) (Fig. 1). The most frequently affected areas were the extremities (58%), followed by face and trunk (42%) and the folds (34%).

In addition to the clinical symptoms related with CD, the participants also reported on changes in the fingernails (19% of the cases) and toenails (30%), changes in hair colour (30%) and symptoms associated with mucosal surfaces (17.7% of the cases). While about 50% of the affected participants developed skin eruption up to 6 months after starting the work in the pools, more than a third of the affected cases had a comparatively late onset of the skin eruption namely more than 1 year after starting their job as hydrotherapists.

Recurrence of the CD at least 1 more time during the period of employment at the pool

Table 2. Exposure duration

Characteristics	Subdivision of characteristics	<i>n</i>	%
Status of employment in hydrotherapy (<i>n</i> = 176)	Presently employed as hydrotherapist	103	58.5
	Worked in the past	45	25.6
	Never worked as hydrotherapist after the course	28	15.3
Cumulative work hours in the pool* (<i>n</i> = 145)	0–10 000	116	80
	>10 000	29	20

*Product of 2nd characteristic by 3rd characteristic by the number of weeks in a full year (52).

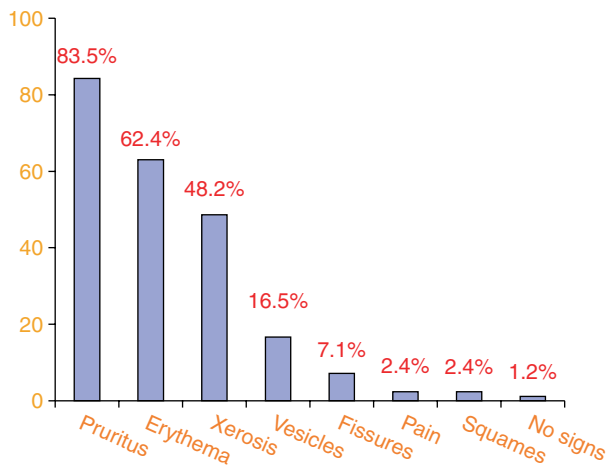


Fig. 1. Symptoms of skin disease and their frequencies within the affected group.

was reported by 59% of the newly affected hydrotherapists.

Only 21 (11.9%) hydrotherapists reported on suffering from preexisting skin disease. Atopic dermatitis was present in 6% of the affected participants and 5.6% of the non-affected ones (respectively 5 patients in each group). The frequency of preexisting skin diseases, atopic dermatitis, asthma and related conditions is summarized in Table 3. There were no statistically significant differences between a history of atopic dermatitis, seasonal rhinitis, allergic conjunctivitis or asthma in the affected versus non-affected group.

Statistically significant association was found between the cumulative incidence of CD and active employment in hydrotherapy ($P = 0.001$), cumulative hours of immersion in the pool water ($P = 0.002$) and smoking ($P = 0.015$) (Table 4). No significant difference was found between the affected and non-affected group regarding age, sex, education, BMI and ethnic origin (indicating possible differences in skin colour and characteristics).

The per cent of affected hydrotherapists increased with increasing number of hours in the pool. 49% and 72% of the hydrotherapists were affected respectively, among those who spent up to 10 000 hr and above 10 000 hr in the

water. The logistic regression model showed an independent effect of both smoking (borderline significance) and being exposed to at least 10 000 cumulative hours, with an odds ratio of 2.37 (CI 95% = 0.95–5.92) and 2.53 (CI 95% = 1.02–6.28), respectively. After excluding those with preexisting disease, the logistic regression model showed that the odds of dermatological disease was 2.81 (CI 95% = 1.07–7.37) for the higher exposure group and 2.42 (CI 95% = 0.95–6.14) for smoking. No other variable added significantly to the logistic regression model added one at a time, and no significant interaction was found between exposure time and smoking. Various impacts of the skin disease on the quality of life were reported by a part of the affected hydrotherapists. Being on sick leave was reported by 18.8%, while 9.4% had to change their job. Other negative impacts associated with the disease were a decrease in income (7.1%), sleep disturbance as a result of itch and pain (20%) and the need to use expensive creams for the treatment of the skin (34.1%) which was a serious inconvenience as well.

Discussion

This study is the first to systematically examine the risk of occupationally related skin diseases in hydrotherapists working in swimming pools.

The clinical manifestation of the skin disease, namely pruritus, burning and stinging, persistent erythematous patches and xerotic skin (Fig. 1), were compatible with CD. The lesions did not appear immediately upon contact with the water and were long lasting, thus ruling out the possibility of contact urticaria. The absence of association between the skin disease and personal or family history of atopy (Table 3) suggests but does not prove that the dermatitis was not atopic. In addition, the chronic and persistent character of the disease was not typical of infectious disease.

Remarkably high incidence of reported skin symptoms compatible with CD was found in this study. In fact, skin eruptions have been

Table 3. Distribution of characteristics of medical history and atopic background in affected and non-affected hydrotherapists

Characteristics*	n	Incidence	
		Affected group (%)	Non-affected group (%)
Preexisting skin disease before starting work	176	11.8	12.2
Preexisting atopic dermatitis	188	6	5.6
Preexisting seasonal rhinitis	176	39.7	36.9
Preexisting allergic conjunctivitis	190	15.3	17.8
Preexisting asthma	186	10.7	11.5

The differences between the two groups were not significant for all the characteristic variables.

Table 4. Univariate analysis of the association between the cumulative incidence of CD after the beginning of the work in the pool and personal variables

Variable	Affected group			Non-affected group			<i>P</i>
	<i>n</i>	Mean $\pm$ SD	Range	<i>n</i>	Mean $\pm$ SD	Range	
Age (years)	84	37.2 $\pm$ 9.3	21.0–55.0	90	36.7 $\pm$ 9.2	22.0–55.0	0.77
Body mass index (kg/m ²)	73	23.0 $\pm$ 3.0	17.7–30.9	82	22.7 $\pm$ 2.9	17.8–33.1	0.47
Education (years)	82	15.9 $\pm$ 2.3	11.0–22.0	89	15.7 $\pm$ 2.1	12.0–22.0	0.44
Active pool hours ^a per week	79	17.0 $\pm$ 11.0	4.0–46.0	65	11.7 $\pm$ 10.0	4.0–40.0	0.0004
Cumulative work ^a hours in the pool	79	5537 $\pm$ 22880	208–22880	65	3723 $\pm$ 5579	208–22880	0.002
	<i>n</i>	%		<i>n</i>	%		<i>P</i>
Maternal origin fair skin	50	58.8		47	52.2		0.38
Paternal origin fair skin	51	60.0		47	52.2		0.30
Sex – male	24	28.2		20	22.2		0.36
Active employment ^b as hydrotherapist	61	71.8		42	47.2		0.001
Smoking ^b	20	23.8		9	10.0		0.015

^aContinuous variables – Kruskal–Wallis test.^bCategorical variables – χ^2 test.

noted as a common problem in physiotherapists working in hydrotherapy pools by other authors too (15). It should be noted that the great majority of the study population had no preexisting dermatological pathology. The evident large number of affected hydrotherapists (44.4%) who developed skin disease for the first time after starting their work at the pool is in favour of CD due to primary irritation as also reported in literature (1, 2). The effect of water as an irritant has been addressed especially in the setting of occupational dermatology (13). Ramsing and Agner (17) studied the effect of repeated water exposure without occlusion on experimentally irritated skin in healthy volunteers. Water exposure of 30 min daily for 2 weeks caused an increase in blood flow on irritated skin. Thus, exposure to water per se probably has an influence on the development of irritant CD in hydrotherapists, who have repeated and prolonged contact with water. The long latency period of several months up to 1 year, which has been observed in about 70% of the affected hydrotherapists, supports an irritant mechanism as the mechanism of choice of the CD. In this type of dermatitis, a long cumulative period of exposure to low-potency irritants is needed to produce the effect. Extracutaneous symptoms, involving hair discoloration reported in 30% of the hydrotherapists, have also been observed in swimmers (18). In addition, changes in the fingernails and toenails as well as irritation and drying of the oral and genital mucosa as reported by the hydrotherapists should not be overlooked,

although such changes have not been mentioned in other professions with prolonged exposure to water in swimming pools.

On logistic regression, both smoking and higher exposure were independently associated with dermatological disease. The dose–response relationship lends support for a causal relationship between the exposure to pool water and its contents and the appearance of dermatological pathology with features of CD. Consistent with our study, others (19) found that CD among pool users appeared only when the frequency of occasional bathing was raised to several times a week.

The significant association between the incidence of the self-reported skin disease and smoking (Table 4) is consistent with previous studies. Association of contact allergy to nickel allergy and a smoking history of more than 15 pack-years was reported by Linneberg et al. (20). Our findings suggest an existing relationship between smoking and irritant CD. Thus, smoking could be a risk factor not only in the development of allergic CD but also for irritant CD as well.

Data on the impact of the dermatological disease on the quality of life revealed a significant negative impact of the skin disease on the participants' quality of life demonstrated by job loss, change in profession, sick leave, decreased income, expensive treatments and the appearance of sleep disturbances. Nevertheless, the self-perception of general health was good to very good in 85% of the affected hydrotherapists.

Our study has several limitations. Patch testing was not done. Although the clinical presentation

suggests irritant dermatitis, some of the cases might have been due to atopic dermatitis. Also it is possible that some workers forgot episodes of skin pathology. Such misclassification would not change our overall conclusion that CD is an occupational disease in hydrotherapy workers. We were able to include only around 50% of the cohort. Although selection bias is possible, even if all those not contacted did not suffer from CD, the risk of disease would still be high. A directional bias however seems unlikely. Prospective studies are warranted to confirm our results and to determine the risk in such workers.

The risk of CD in hydrotherapists and its serious impacts on the quality of life demand further research regarding the nature of the water disinfectant and its contribution to the development of the CD as well as to the development of efficient preventive measures including reduction of the time spent in the pool and skin care before and after work. Our study supports the recognition of CD as an occupational disease in hydrotherapists.

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