

An Epidemiological Study of Hand Eczema

By

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PREFACE

The present series of studies were carried out between 1988 and 1993. Collecting data for the prevalence estimates (papers I-V) was made during 1988 to 1990, with follow-up (paper VI) in 1993.

This study was initiated while I was attached to the Norwegian Research Council for Science and the Humanities (NAVF) during 1987–1989. My work has primarily been financially supported by this institution. Financial support has also been received from Anders Jahre's Funds for Promotion of Science, Borregaard Science Funds and Statoil Norway Funds for Research in Occupational Health.

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Jan-Øivind Holm, M.D.

INTRODUCTION

Recent reports indicate an increase in occupational skin diseases over the past 35 years, this increase rising sharply in the last few years (1,2). This has been particularly noticeable among hairdressers and their apprentices (1). In the United States, occupational skin diseases have, until recently, accounted for approximately 40% of all occupational illnesses recorded in the Bureau of Labor Statistics Annual Survey of Occupational Injuries and Illnesses (3), but have decreased to 30% during the last years (4). Contact dermatitis, as defined as an inflammatory reaction of skin precipitated by an exogenous chemical, accounts for more than 90% and of these ca. 80–90% are caused by contact irritation, the remaining 10–20% being caused by contact allergy (5,6).

Irritant or allergic contact dermatitis of the hands is one of the main occupational hazards for hairdressers. Irritants produce a direct toxic effect on the skin, resulting in the release of various mediators of inflammation and vasoactive substances. Allergic contact dermatitis, however, induces an immunological reaction that causes tissue inflammation mediated by lymphocytes (cell-mediated immunity).

Up to 20% of the trainee hairdressers are forced to give up their apprenticeship as a result of contact dermatitis (1), and 62% of the hairdressers affected are reported to have discontinued their profession (7).

The services performed by the hairdressers require the manual use of a number of materials for conditioning, cleansing, styling and coloring the hair. The preparations can be divided into following groups: shampoos, rinses, hair sprays, permanent waving preparations, hair dyes and bleaches (8). The chief hazard in the use of shampoos, which are composed of surfactants, is that it often results in irritant contact dermatitis of the hands. They may cause allergic contact dermatitis, but such reactions are quite rare in view of the amounts used. The two most important ingredients used in permanent waving preparations today are ammonium thioglycolate and glyceryl monothioglycolate, resulting in both irritant and allergic contact dermatitis. Hair dyes impart temporary, semi-permanent or permanent color to the hair. Permanent hair color almost always uses oxidation dyes and are the most important group of hair coloring products used by hairdressers. The primary bases include para- and orthobenzendiamines, e.g. p-phenylenediamine. Such bases are well known contact sensitizers. Bleachers destroy the pigment of the hair and are almost universally based upon hydrogen peroxide mixed with ammonium hydroxide. This mixture may be accelerated or boosted with ammonium or potassium persulfate. The latter is a well known contact sensitizer, both in contact urticaria and delayed hypersensitivity.

There is a great need for epidemiological studies on hand eczema among different occupational groups, because most of the reports published so far are based on incorrect selection criteria and methods. Controls are frequently missing. The present investigation was undertaken in order to evaluate the frequency of skin disease and atopy among hairdressers. This is the first time such a study has been carried out in Norway.

LIST OF PAPERS

This thesis is based upon the following papers which will be referred to in the text by Roman numerals (I–VI):

- An epidemiological study of hand eczema
- I: Prevalence and cumulative prevalence among hairdressers compared with a control group of teachers.
 - II: Prevalence of atopic diathesis in hairdressers, compared with a control group of teachers.
 - III: Characterization of hairdressers with and without hand eczema, regarding demographic factors and medical histories.
 - IV: Degree and pattern of eczema in prevalent hairdressers, with and without atopic symptoms, compared with a control group of prevalent teachers.
 - V: Prevalence among hairdresser trainees, compared with a general population of hairdressers.
 - VI: Follow-up of hairdresser trainees, with focus on various health complaints.

SUMMARY OF PAPERS

I. An epidemiological study of hand eczema. Prevalence and cumulative prevalence among hairdressers compared with a control group of teachers

Objective: To estimate the prevalence of dermatitis of the hands and/or forearms among hairdressers compared with a control group of teachers.

Method: Questionnaire survey by mail.

Results: Forty-two per cent of the hairdressers and 23% of the teachers suffered or were suffering from exanthema of the hands and/or forearms.

II. An epidemiological study of hand eczema. Prevalence of atopic diathesis in hairdressers, compared with a control group of teachers

Objective: To estimate the frequency of atopic dermatitis in prevalent hairdressers, compared with a control group of prevalent elementary school teachers.

Method: Personal interview.

Results: The frequency of atopic dermatitis was 13% in the group of hairdressers and 25% in the group of teachers.

III: An epidemiological study of hand eczema. Characterization of hairdressers with and without hand eczema, regarding demographic factors and medical histories

Objective: To compare subgroups of hairdressers as regards disease duration and atopic dermatitis.

Method: Personal interview.

Results: The disease duration and frequency of atopic dermatitis were significantly higher for prevalent hairdressers (point prevalence), compared to hairdressers with skin affection prior to study.

IV: An epidemiological study of hand eczema. Degree and pattern of eczema in prevalent hairdressers, with and without atopic symptoms, compared with a control group of prevalent teachers

Objective: To show degree and pattern of hand eczema in prevalent hairdressers, compared with a control group of prevalent teachers.

Method: Clinical investigation.

Results: The mean number of localizations of eczema on hands was significantly higher in hairdressers compared to teachers. This was caused by more affection of fingers in hairdressers. There was no significant difference between hairdressers and teachers as regards hands (excluding fingers) or lower arms. Finger involvement was significantly higher in hairdressers with atopic dermatitis, compared to hairdressers with only atopic mucosal symptoms or without atopic symptoms.

V. An epidemiological study of hand eczema.

Prevalence among hairdresser trainees, compared with a general population of hairdressers

Objective: To evaluate degree and pattern of hand eczema in prevalent hairdresser trainees, compared to a general population of prevalent hairdressers. To estimate the frequency of contact allergy caused by hairdressing chemicals.

Method: Clinical investigation. Patch testing.

Results: The extent of skin affection, as assessed by scores for localization and distribution of eczema, was significantly lower in trainees, compared with the general population of hairdressers. Patch tests revealed sensitization to nickel to be prominent in both groups: 34% among hairdressers and 26% among trainees. Of the hairdressers, 3% had allergy to hair dye (2,5-toluendiamine), while 8% were sensitized to glyceryl monothioglycolate. None of the trainees were sensitized to those two chemicals.

VI: An epidemiological study of hand eczema. Follow up of hairdresser trainees, with focus on various health complaints

Objective: A follow up study to show how career dropouts among young hairdressers are related to various health complaints.

Method: Questionnaire survey by mail.

Results: Twenty-one per cent of hairdressers reported to have quit work because of various health complaints, and 6.5% left because of skin problems.

DISCUSSION

Hand dermatitis is a common clinical challenge. The vexing problem of etiologies is simplified by classifying causative factors as either exogenous or endogenous. At present, techniques for determining the role of endogenous vs. exogenous factors are not satisfactory. Therefore, epidemiological studies are still needed to clarify the role of environment.

In occupational dermatology, what kind of occupation is "indifferent enough" to make adequate comparisons between groups possible? Physicians agree that hand dermatitis is "common". In fact, all manual professions will imply a certain risk regarding hand eczema.

Aside from sampling errors and other problems innate to prevalence studies, estimating the prevalence of hand dermatitis poses some special problems (9). When is a hand rash considered hand dermatitis, and when is it considered part of a more disseminated disorder such as atopic eczema or psoriasis? How much involvement of the skin other than the hands is permitted before the label of atopic hand eczema is changed to atopic eczema with hand involvement? Are such conditions as pompholyx, palmar keratoderma and psoriasis limited to hands to be grouped together with hand dermatitis or are they to be regarded as entities? What about the common and more trivial dryness of the hands? How severe must these changes be to justify a diagnosis of hand eczema?

It is difficult to overcome such approximate and partly subjective evaluations in a field work of this sort. Therefore, comparative methods in questionnaire surveys are needed (papers I,II,III). Description of eczematous hand involvement is to be as quantitative as possible (papers IV,V). Only then can precise prevalence estimates on hand dermatitis be achieved.

A prevalence estimate represents a "photograph" of extent of illness at present or in the past. The present sick persons will consist of both acute and more longstanding cases. Hence, in a group of sick persons the chronic cases will be overrepresented ("length-biased") in proportion to the share of incidence (paper I).

Prevalence means sometimes *point prevalence* ("Are you sick today?"), in contrast to *period prevalence* ("Have you been sick the last year?"). By stratification into prevalence subgroups, quite different findings are made as regards frequency of atopic dermatitis, disease duration and extent of sick leave (paper III). Despite this, the frequency of atopic dermatitis in pointprevalence hairdressers seems to be lower compared to control group (paper II). This confirms that the cross-sectional design of such prevalence studies gives no information on the way atopics manage their job. It seems probable that the presence of atopic dermatitis in childhood may have influenced the choice of occupation (pre-employment selection). Perhaps educational work is a common choice for atopics, protecting them from wet work.

It is well known that a history of atopic dermatitis favours a bad prognosis in patients with hand eczema. Despite this; prevalent hairdressers with atopic dermatitis have no more eczema than non-atopics, except for a higher finger involvement (paper IV). This finger involvement also seems to be the only thing which distinguish them from the control group of teachers, despite the heavy load of wet work, irritantia and allergens in hairdressing services.

It is generally assumed that dermatitis on the hands particularly affects young hairdressers, because of the heavy load of wet work and irritantia during apprenticeship. Some degree of dermatitis is believed to be almost universal in the early stage of career, mainly because of the continual shampooing. In contrast to this, our study reveals the extent of skin affection to be lower in prevalent hairdresser trainees, compared with the general

population of prevalent hairdressers (paper V). In the same way, the data available show no marked difference between the hairdressers affected and the total hairdressing population as regards mean age (paper II).

The main advantage of follow-up studies is to get a dynamic description of morbidity. In our study (paper VI) this description is confined to the number of young hairdressers who have to leave their job because of skin problems, compared to other health complaints.

The high prevalence rate of skin disease in hairdressers seems to be somewhat in contrast to the low figure of dropouts because of skin problems. This reflects the fact that some degree of dermatitis is to be almost obligate in this service.

The outstanding feature of the last study is the high incidence of musculoskeletal complaints, in contrast with the few studies made on this topic. A Danish review of health hazards during a ten-year period (10) gives four references on musculoskeletal complaints, compared with 82 references for dermatology.

This study should encourage to more investigation with emphasis on the following aspects: how hairdressers cope eczema (follow up); manual working conditions at the start of career (intervention); and it is certain that we need much more knowl-

edge about other occupational hazards related to hairdressing services.

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An Epidemiological Study of Hand Eczema

I. Prevalence and Cumulative Prevalence Among Hairdressers Compared with a Control Group of Teachers

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The aim of this cross-sectional study was to estimate the prevalence of dermatitis of the hands and/or forearms among hairdressers compared with a control group of elementary school teachers. Questionnaires were sent to 818 hairdressers and 816 teachers. The response rates were 83% and 65%, respectively. The mean age for those completing the questionnaire, was 28 years (range: 17–71) for the hairdressers and 45 years (range: 20–70) for the teachers. The mean number of months employed in these occupations was 105 (range: 1–672) and 186 (range: 0–516), respectively.

Forty-two per cent of the hairdressers and 23% of the teachers suffered or had been suffering from exanthema of the hands and/or forearms. Sixty-one and 15%, respectively, related the skin disease to work. **Key words:** contact dermatitis; occupation; epidemiology.

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Dermatitis is one of the main occupational diseases in industrialized countries (1,2), and eczema of the hands contributes to a major part of this problem (3,4). (The term eczema is the word of choice in most reports, while the term exanthema would also include other diagnoses, which may be occupational in nature.)

Quite a number of reports have been written on eczema/allergies among hairdressers. However, it is often difficult to make precise statistical conclusions from such reports, due to different methods and selection criteria used and lack of control measures.

Most of our knowledge about contact dermatitis is based on selected out-patient registers. Furthermore, even in the general population, the prevalence of hand eczema is significant, especially among women (5). Therefore, further studies with an epidemiological approach are needed.

This report is the first in a series of communications and consists of a prevalence estimation of hand eczema among hairdressers in Oslo, Norway.

MATERIAL AND METHODS

Study population I, hairdressers

The hairdressers who participated in this study were situated in Oslo. According to official records there were 408 hairdressing salons in the Oslo region and this corresponds to approximately 1,270 man-labour years. This figure may be somewhat conservative, considering the many hairdressers operating at home. These were not included in the study population, which comprised masters, hairdressers and apprentices at registered salons.

Study population II, teachers

A total of 107 primary and secondary schools are situated in Oslo. These schools employ about 4,000 teachers, of whom 80% are women. Because of easy accessibility, this population was used when selecting the control group.

Design and sampling procedures

Since climatic factors can play a role in the development of hand eczema, data concerning temperature, relative humidity and rainfall were obtained from the Institute for Meteorology, Oslo (Table I). The winters during the sampling period were unusually mild without the dry, cold climate typical for Norway.

By simple random sampling, 184 salons with a total of 933 man-labour years were obtained. Twenty-six of these were excluded because of the inaccuracy of the national register. These salons were either closed or they were beauty shops, pedicure salons etc. The remaining 158 hairdressing salons were the basis for the survey population. A questionnaire was sent to the masters in charge of each of the salons in which they were asked to report the number of employees in the salon. The questionnaires were sent at the beginning of January, 1988, and the last written reminder seven weeks later. The response rates were 83% and 87% after the first and second written reminders, respectively.

Twenty-six out of 107 schools were obtained by simple random sampling. According to the register at the Department of Education office, this constituted 816 teaching employees.

New and more comprehensive questionnaires were sent to the salons in exactly the same numbers as the multitude of employees (cluster sampling). Almost the same questionnaires were sent to the sample of teachers. The main question read as follows: "Have you or have you had exanthema on hands and/or forearms?" For the hairdressers, the first sending was at the beginning of January 1988, with the last written reminder twelve weeks later. For the teachers, the first sending was at the beginning of August 1988, and the last written reminder fourteen weeks later.

Table I. Meteorological conditions, with mean values for temperature, relative humidity and rainfall quarterly

	1987	1988				1989
	4th quart.	1st quart.	2nd quart.	3rd quart.	4th quart.	1st quart.
Relative humid. (%)	82.6	78.8	51.8	69.5	74.1	75.2
Temp. (Celsius)	1.8	-0.7	11.4	14.4	0.3	2.8
Rainfall (mm)	97.9	111.4	32.6	172.7	44.2	46.5

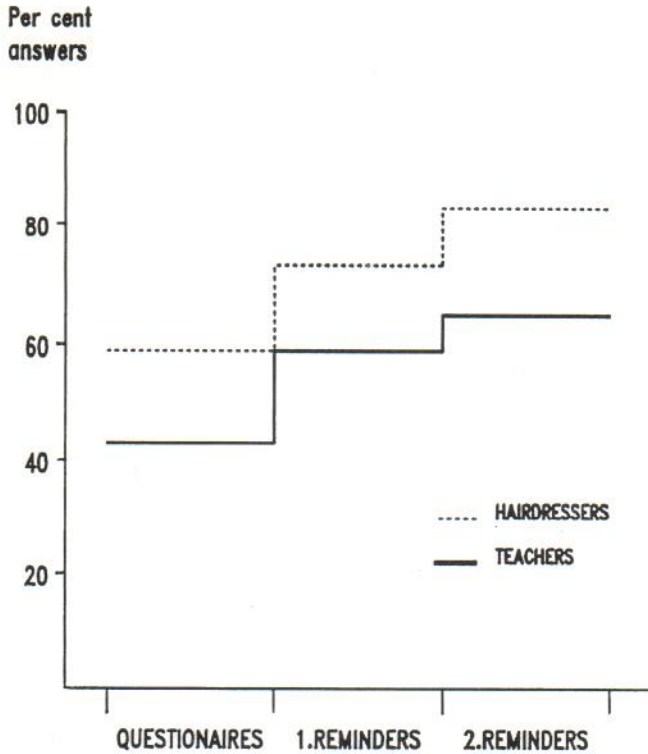


Fig. 1. Response rates following questionnaire and first and second written reminders; questionnaire survey hairdressers and control group.

The following steps were taken to ensure good cooperation by the survey population:

1. A personal letter to all salons drawing attention to the aim and ethical standard of the study.
2. A similar letter from the Head of Oslo schools to the headmasters of the sampled schools.
3. A letter to all salons, signed by the Secretary General of the Norwegian Union of hairdressers and by the masters of the Corporation for Hairdressers in the region of Oslo.
4. Nonrespondents received the mail questionnaire three times.
5. Publicity for this study was gained through presentation of the project in the professional papers for hairdressing masters.

Statistical methods

The results are expressed as mean values and standard deviations. Frequencies are expressed as a percentage with 95% confidence intervals (C.I.) constructed by using the theory of single Bernoulli sequences (7). Continuously distributed variables were analyzed by either savage (6) or Wilcoxon rank-sum test (7), depending on the shape of the distribution. Two-way contingency tables were analyzed by using a chi-square test (7). Analysis of the two-by-two tables was carried out by using the Fisher-Irwin test (7).

All tests used in this analysis were carried out two-tailed. Differences were considered significant when the p-values were less than or equal to 5%.

RESULTS

Completed questionnaires were returned from 682 hairdressers and 531 teachers. From the first-sent questionnaire to the second reminder, the response rates increased from 59% to 83% for the hairdressers and from 43% to 65% for the teachers (Fig. 1).

The two groups were significantly different with regard to age and gender ($p \leq 0.01$). The mean age in the group of hairdressers was 28 years (range: 17–71) and in the group of teachers 45 years (range: 20–70), (Fig. 2). The percentage of female employees was 82% and 72%, respectively. Furthermore, the groups were significantly different with regard to the number of months spent in their profession ($p < 0.01$), and the number of working hours per week ($p < 0.01$) (Table II).

The frequency of persons who were suffering or had been suffering from exanthema of the hands and/or forearms was significant larger ($p \leq 0.01$) among hairdressers than among teachers. Forty-two per cent (C.I.: 38.4–45.9) of the hairdressers and 23% (C.I.: 19.0–26.1) of the teachers reported exanthema.

Sixteen per cent (C.I.: 13.3–18.5) of the hairdressers were suffering from exanthema when they answered the questions, 15% (C.I.: 12.3–17.7) had suffered from this during the preceding year but not when they answered the questions, and 11% (C.I.: 8.5–13.2) suffered prior to the preceding year. The corresponding figures for the teachers were 6% (C.I.: 4.0–8.2), 9%

Table II. Comparison of hairdressers and teachers regarding total working time in the profession and no. of hours per week at work. The results are expressed as mean values with standard deviations in brackets

	Hairdressers	Teachers
No. of months spent in profession	105.4 (116.9)	185.9 (119.3)
No. of hours per week at work	36.6 (6.5)	31.3 (9.7)

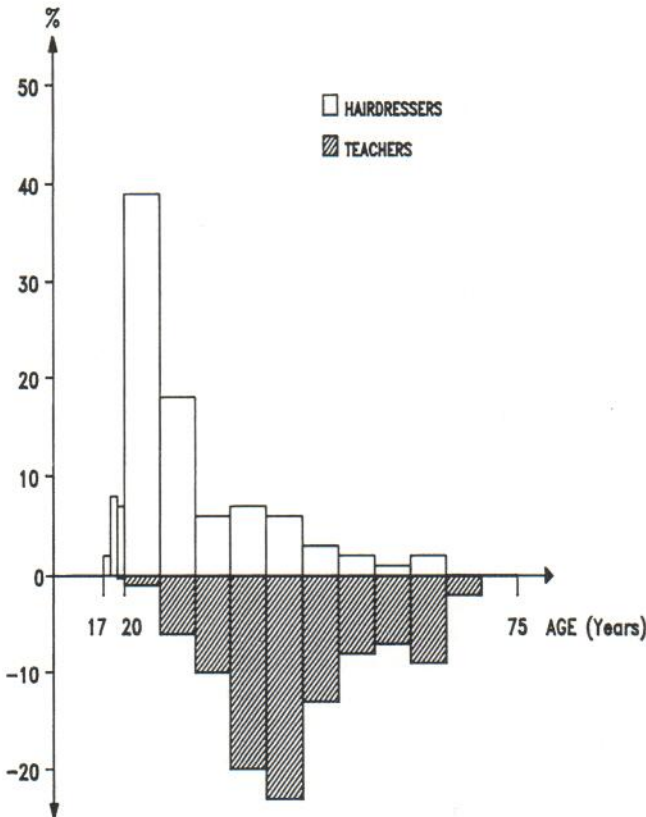


Fig. 2. Age distribution of hairdressers and teachers.

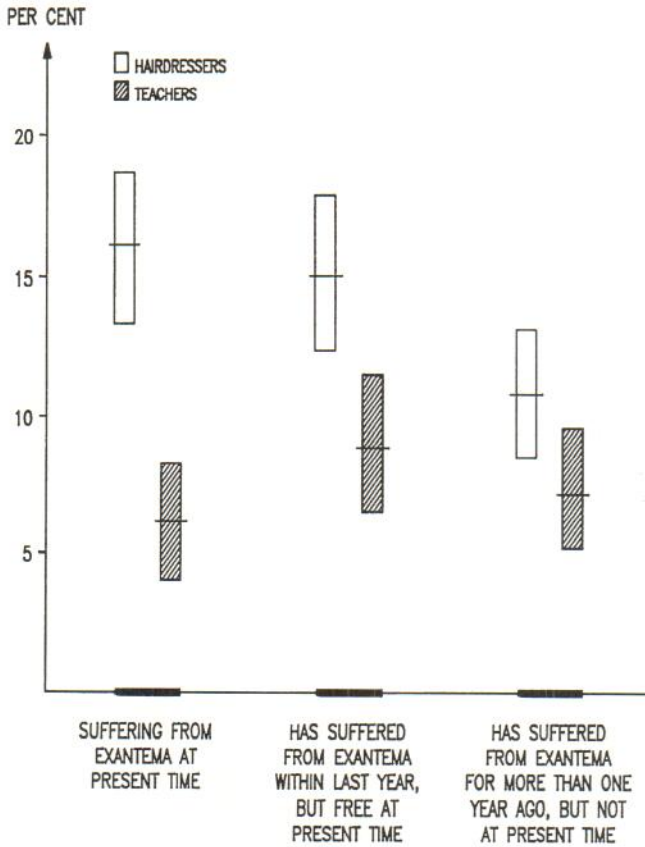


Fig. 3. Exanthema of the hands and/or forearms among hairdressers and teachers at different time intervals. The results are expressed as prevalence rates with 95 per cent confidence intervals.

(C.I.: 6.5–11.5) and 7% (C.I.: 5.1–9.5). Consequently, the hairdressers suffered significantly more than the teachers in the trial period, and both during and prior to the preceding year (Fig. 3).

Thirty-nine per cent of the hairdressers and 27% of the teachers who reported exanthema, were affected when answering the questions. Thirty-six per cent and 40% suffered symptoms during the preceding year, while the remaining groups had a rash prior to one year ago. Hence, the difference in time intervals between groups was not significant ($p=0.10$).

The groups were significantly different with regard to a possible association between their disease and their profession ($p \leq 0.01$), as judged by the employees themselves. Among the the group of hairdressers, 61% (C.I.: 55.5–66.8) believed that their exanthema was due to their profession, in comparison with 15% (C.I.: 8.8–21.7) of the teachers. Twenty-two per cent (C.I.: 17.4–27.1) of the hairdressers and 25% (C.I.: 17.6–33.3) of the teachers thought their skin disease was due partly to their profession. Eleven per cent of the hairdressers did not know if their exanthema was caused by their profession, while the corresponding figure for teachers was 22%.

DISCUSSION

One must include practical and economical considerations when choosing a control group, and then consider methodical problems. In occupational dermatology, what kind of occupation is "indifferent enough" to make adequate comparisons possible?

In epidemiological surveys of occupational medicine, the general population is often used as a control group (5). However, by selecting healthy workers, the distribution of risk factors will be distorted (8). Additionally, all manual professions will imply a certain risk regarding hand eczema. Our choice of control group is not unsuitable since there is, at least, a great difference in exposure between hairdressers and teachers. The climatic influences on the occurrence of hand eczema in Scandinavian countries can be quite impressive. For instance, would not cold and dry weather during winter time frequently provoke symptoms in atopic persons who have a predisposition to develop eczematous lesions? There were unusually mild winters during the sampling period, and the climatic factors were probably of less importance.

Many of the earlier reports on hand eczema prevalence concern unskilled occupational groups (i.e. hospital cleaning personnel) (9). However, both hairdressers and teachers are trained in their respective trades, and thus are less likely to change professions, despite the disease. Another reason for the choice of teachers as a control group was to compare working hygienic circumstances. The teaching profession implies more gentle manual working conditions, limiting both the exposure for potential allergens and the degree of "wet" work. For the teaching staff, the potential work-etiologial factors regarding hand eczema are chalk and wet sponge when blackboard writing, and special types of handwork.

In this study, it was not practicable to get precise demographic data for the hairdressers before starting the study. Hence, the difference in age distribution became more pronounced than desired.

Response rates in surveys are mainly dependent on the effort of the research team and the survey population's acceptance of the applied procedure and the aim of the study (10). A response rate of 83% among the hairdressers shows the acceptability of the method used. Sixty-six per cent among teachers does not necessarily reflect bad representation. An adequate comparison between the two occupational groups is dependent on applying the same methods; hence, possible selections appear in the same direction. As in other postal questionnaire surveys of this sort, the non-respondents may be a problem. Demographic variables for this group were not achieved because of the lack of an official register of practising hairdressers in Oslo, as mentioned earlier.

"Exanthema" can imply many diseases: dermatitis, urticaria, psoriasis, verruca, vitiligo etc. But, in providing patient information to the respondents on the aim of the study, eczema naturally will be the most common disease.

Forty-two per cent of the hairdressers suffered or had been suffering from exanthema, compared with 23% of the teachers. However, we must note the difference in time spent in their chosen occupation and the finding that only 15% of the teachers connect their skin disease solely to their work, compared with 61% of the hairdressers. Then, the job-determined difference in eczema prevalence will likely be even higher. A quite interesting finding is the insignificant difference between groups regarding the periods with exanthema, indicating the same chronicity of suffering (Fig. 3).

The high prevalence rate of hand eczema in the hairdressing

trade is not surprising. A subjective analysis carried out via questionnaires obtained from the National Hairdressers and Cosmetologists Association in the U.S.A. revealed that 50% of 405 respondents in the study had experienced dermatitis as a result of exposure to shampoos, permanent-wave solutions or hair bleach (11). Statistics from the Federal Republic of Germany indicate an incidence of two point three cases of skin disease per 1000 hairdressers (12). Of the 107 employees at the hairdressing department of a large London store studied by Cronin & Kullavanijaya (13), 30 out of 33 junior hairdressers had hand dermatitis, mostly consisting of a dry irritant dermatitis, connected with shampooing. This was revealed by personal interviews.

The prevalence estimate is a rather poor parameter on which to calculate the risk of developing illness. The estimate represents a "photograph" of multitude of illnesses both at present and in the past. The present group of affected persons will consist of acute cases, cases with a short history of illness and more longstanding cases. Hence, in a group of sick people the chronic cases will be overrepresented in proportion to the share of incidence.

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An Epidemiological Study of Hand Eczema

II. Prevalence of Atopic Diathesis in Hairdressers, Compared with a Control Group of Teachers

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The aim of this cross-sectional study was to estimate the prevalence of atopic dermatitis in hairdressers compared with a control group of elementary school teachers. Both groups consisted of employees who reported exanthema on the hands and/or forearms at the time of completing a questionnaire. The mean age for the affected hairdressers was 26 years (range: 17–63) and for the teachers 44 years (range: 28–65). The mean duration of employment was 85 months for the hairdressers (range: 2–552) and 177 months for the teachers (range: 24–360). The frequency of atopic dermatitis was 12.7% (C.I.: 6.3–19.2) in the group of hairdressers and 25% (C.I.: 7.7–42.3) in the group of teachers. No difference was observed between the groups regarding atopic mucosal symptoms or familial atopy. **Key words:** contact dermatitis; occupation; epidemiology; atopic dermatitis.

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Hand eczema has become an important occupational disease in industrialized countries. We know that the prevalence of hand dermatoses is high among hairdressers as a manifestation of both personal and occupational risk factors. Atopy represents an important personal risk factor for developing hand eczema, while external factors include wet work, irritants and allergens (1,2). In addition, we know that there is a considerable prevalence of hand eczema in the normal population, especially among women (3).

Little has been published about how atopics manage in risk occupations. However, available data indicate that individuals who are susceptible to eczema change their occupation (4). More information about this tendency is needed in estimating and interpreting prevalence rates. Hand eczema very often has a poor prognosis, and can result in permanent disability. A recent study (5), by questionnaire of 682 hairdressers and 531 elementary school teachers in a county of Norway, showed that 42% of the hairdressers and 23% of the teachers suffered or had suffered from exanthema of the hands and/or forearms. At the time of completion of the questionnaires, 16% of the hairdressers and 6% of the teachers had active exanthema of their hands or forearms. Therefore, of the total group with a history of exanthema, 39% of the hairdressers and 27% of the teachers had symptoms at completion of the questionnaire.

This report details the information gained by personal interviews of those with active dermatitis. The aim of the present study was to estimate and compare the frequency of atopic diathesis, based on medical histories, in the two occupational groups.

MATERIAL AND METHODS

Study population I, hairdressers

A total of 110 out of 682 hairdressers reported exanthema of hands and/or forearms when completing the previously mailed questionnaires. The 96 females and 14 males from 62 salons in the county of Oslo were included in this part of study.

Study population II, teachers

A total of 32 out of 531 teachers reported exanthema of the hands and/or forearms at the time of completion of the questionnaires. The 27 female and 5 male teachers from 17 elementary schools in Oslo were included in the study.

This group included one art teacher, 18 “verbal” teachers and 10 teachers who were both “verbal” and “technical”. The latter group had technical teaching duties up to a maximum of 9 hours per week. For 3 teachers there was no information available concerning involvement in handicrafts during work.

Interviews

There was a delay varying from few weeks up to 5 months between completion of previously mailed questionnaires and the personal interviews. The interviews were carried out during working hours at the place of employment. Therefore, it was not always possible to interview all respondents because of irregular working hours, change of salon, sickness, etc.

Group I: 102 (93%) of the hairdressers with active dermatitis were included in the analysis.

Group II: 24 (75%) of the teachers with active dermatitis participated in the analysis.

A standard questionnaire was used by the examining doctor during the personal interview. The interviews of hairdressers were completed between April 15 and June 15 1988. The teachers were interviewed during the last two weeks of January 1989.

Information was collected concerning earlier or present atopic dermatitis, possible allergic asthma/rhinoconjunctivitis and allergic symptoms among siblings or parents.

Additional information was also obtained, with regard to psoriasis and other skin lesions, improvement during holidays and weekends, or a seasonal variation.

Diagnostic criteria

Patients were placed in the “atopic dermatitis group” through a combination of objective findings and medical history (6,7), and not purely and simply on a basis of “counting” and grading stigmata for atopic dermatitis (8), which would not be practical in this busy interview situation. The examination consisted of simple local inspection of hands/forearms, with no access to inspection of other parts of the body (except the face), because of the lack of facilities for undressing at the working place. Eczema (eczematous dermatitis) was assessed on the presence of erythematous, maculopapulous and dry/itchy skin.

Statistical methods

Assumed continuously distributed variables were expressed as mean values with 95% confidence intervals (C.I.). The Student procedure (9) was used for calculation of the intervals. Frequencies were expressed as a percentage with 95% C.I. constructed by using the theory of single Bernoulli sequences (9).

For comparison of the groups regarding approximately continuously

Table I. Distribution of age (years), no. of months since start of exanthema, duration in work (months) and hours per working week. The results are expressed as mean values with 95% confidence intervals

	Hairdressers (n=102)	Teachers (n=24)
Age	26 (24–28)	44 (40–48)
No. of months since start of exanthema	64 (47–82)	14 (9–19)
Duration in work	85 (65–105)	177 (131–223)
Hours per working week	36 (34–37)	28 (23–32)

distributed variables, the Student's t test was used (9). The Fisher-irwin test was used for comparison of the groups with regard to frequencies (9).

All tests used in this analysis were two-tailed. Differences were considered statistically significant when p-values were less than or equal to 5%.

RESULTS

The interviewed hairdressers had an average age of 26 years (range: 17–63), an average employment period of 85 months

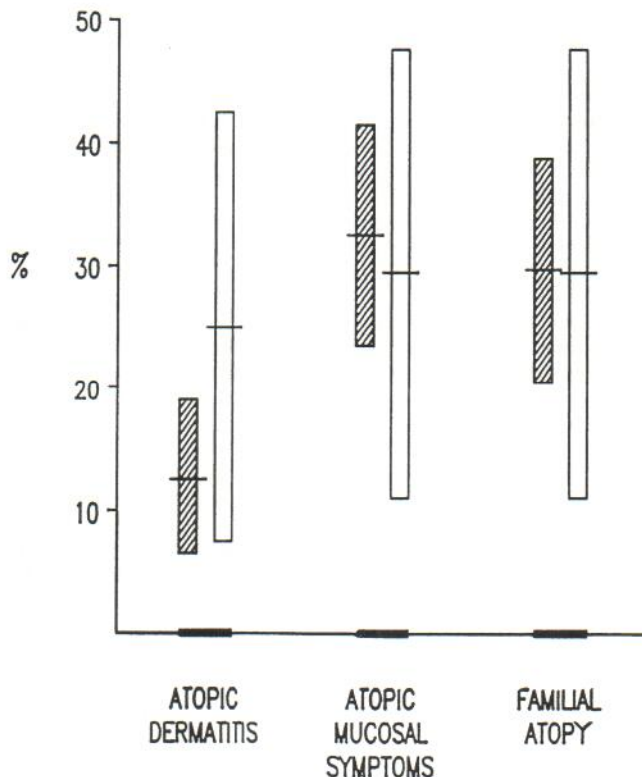


Fig. 1. Frequency of atopic dermatitis, atopic mucosal symptoms and familial atopy in hairdressers and teachers.

The results are expressed with 95% confidence intervals.

■ hairdressers
□ teachers

Table II. Comparison of hairdressers and teachers regarding contemporary psoriasis, clearing of exanthema at weekends and seasonal variation in disease activity

	Contemporary psoriasis		Clearing of exanthema at weekends/holidays		Seasonal variation in disease activity	
	Yes	No	Yes	No	Yes	No
Hairdressers	6	96	81	20	62	40
Teachers	4	20	9	15	13	11

(range: 2–552) and worked an average of 36 hours (range: 3.5–50) per week (Table I). Eighty-six per cent were women. The teachers had an average age of 44 years (range: 28–65), an average employment period of 177 months (range: 24–360) and worked an average of 28 h (range: 10–45) per week (Table I). Eighty-three per cent were women. The group of hairdressers was significantly younger ($p \leq 0.01$) and had a significantly shorter employment period ($p \leq 0.01$), but worked significantly more hours per week ($p < 0.01$).

The mean number of months since the start of exanthema was significantly different in the two groups ($p < 0.01$). The mean was 64 months (range: 0.5–552) for the hairdressers and 14 months (range: 0.5–40) for the teachers.

The frequency of atopic dermatitis was 12.7% (C.I.: 6.3–19.2) among the hairdressers and 25% (C.I.: 7.7–42.3) among the teachers (Fig. 1). However, the difference was not statistically significant ($p = 0.20$). No significant difference was detected between the groups either with regard to the frequency of atopic mucosal symptoms or of the familial atopy ($p > 0.80$). The frequency of atopic mucosal symptoms was found to be 32.4% (C.I.: 23.3–41.4) among the hairdressers and 29.2% (C.I.: 11.0–47.4) in the teachers group (Fig. 1). For familial atopy the figures were 29.4% (C.I.: 20.6–38.3) and 29.2% (C.I.: 11.0–47.4), respectively (Fig. 1).

The hairdressers experienced significantly ($p \leq 0.01$) more clearing of exanthema on weekends and holidays compared to the teachers (Table II). The frequency of contemporary psoriasis was larger in the teacher group compared to the hairdressers, but the difference was, however, not statistically significant ($p = 0.01$). Seasonal variation in the disease activity was reported by the majority in both groups (Table II) with no statistical significant difference ($p = 0.69$).

Winter was the season of the year when cutaneous disease manifestation was most marked in both groups (Table III). However, although present, the difference between the groups with regard to this variable was not significant ($p = 0.11$).

Table III. Seasonal increase in disease activity in both groups

Factor	Winter	Spring	Summer	Autumn
Hairdressers	53	6	6	8
Teachers	8	4	1	6

DISCUSSION

According to an earlier report by the authors (5), the mean age for the total group of hairdressers, including affected and non-affected cases, was 28 years, compared with a mean age of 45 years for the teachers. The available figures show no difference between this hairdresser group and the general population, with regard to mean age. This was an unexpected result, since dermatitis of the hands particularly affects young hairdressers.

The age difference between hairdressers and teachers can be important for a number of reasons. Usually, a higher age correlates with higher cumulative exposure to occupational hazards. This was also confirmed in the present study. On the other hand, the low mean age figure noted for the hairdressers may indicate that they frequently change or leave their job. Skin problems, together with other occupational diseases such as respiratory symptoms, muscle cramps, nervous fatigue etc. probably contribute to this (10). Our results show that hairdressers, although younger, work more hours each week than teachers. Hairdressers, being on piecework, compensate for low pay by working more hours.

Furthermore, in spite of the lower mean age of the hairdressers, the mean duration of disease was much longer for this group. This further confirms the high exposure for occupational hazards in the group of hairdressers.

One of our main observations was the higher, although not statistically significant, frequency of atopic dermatitis in childhood among teachers than among hairdressers. This may be consistent with earlier findings (11), showing higher prevalence of atopic hand eczema for people in educational work and lower prevalence for those in production and service work. Perhaps educational work is a common choice for atopics, thus protecting them from wet work (selection). What is not known from the present investigation is the number of persons who have changed their occupation because of eczematous lesions. The cross-sectional design of the study gives no information on the way atopics cope with their occupation in the long run, or if they are able to do so. Most researches feel that the "healthy worker effect" in general results from the selection of healthy individuals during the hiring process (12). The training program for hairdressing in Norway requires the junior hairdressers to do more shampooing during that period, and this heavy load of wet work and exposure to irritantia may favour early development of hand eczema.

Additionally, what is not known is the effect of "double work" exposure in the two groups. The teachers, being in a higher social class (academic career, higher pay), probably have

different leisure activities from hairdressers. Do they make use of more domestic help?

One additional finding is the absence of significant differences between the groups with regard to atopic mucosal symptoms and familiar atopy. This is consistent with earlier findings (1), which stated that patients with a history of respiratory allergy without atopic dermatitis were not more prone to develop hand eczema compared to controls.

There was a difference between hairdressers and teachers with regard to both clearing of exanthema at weekends and on holidays, and contemporary psoriasis. This may indicate that the hand eczema of teachers was more endogenous in nature, compared with hairdressers who seem to have a more exogenous dermatitis, whether on an atopic or non-atopic basis. The likelihood of an atopic constitution in hairdressers is supported by the fact that more hairdressers reported worsening of symptoms in winter. Consequently, it seems that these hairdressers have hand eczema, possibly on an atopic basis, as a single symptom, and that the number of hairdressers with additional skin involvement has already been reduced by selection.

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An Epidemiological Study of Hand Eczema

III. Characterization of Hairdressers with and without Hand Eczema, Regarding Demographic Factors and Medical Histories

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The aim of this study was to compare, by stratification, sub-groups of hairdressers.

Three groups were considered: Group I (102 persons) consisted of hairdressers reporting skin affection at the time of completing an earlier mailed questionnaire (point prevalence). Group II reported exanthema prior to completing, while group III reported not having had exanthema at all (51 and 50 persons, respectively).

No significant difference was found between these groups with regard to age and duration in work.

The mean number of months since start of disease was significantly higher for group I (64 (range: 0.5–552)) than group II (7 (range: 0.6–38)).

The frequency of atopic dermatitis was 12.7% (C.I: 6.3–19.2) in group I, compared with 3.9% (C.I: 0.0–9.2) in group II and none in group III. This difference between groups was significant.

A significantly higher extent of sick leave was found in group I, compared to group II. Key words: contact dermatitis; occupation; epidemiology; atopic dermatitis; sick leave.

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Hand exanthema caused by hairdressing is an important clinical entity among occupational diseases. The term "exanthema" used in this report implies all rashes affecting the hands. Naturally, eczema constitutes the majority of these.

Various factors, single or in combination, favour the development of hand eczema. Atopy represents an important personal factor (1). External factors include wet work, exposure to irritants and sensitizing agents (2). Hand eczema, once present, causes considerable problems due to its relapsing nature and to its tendency to become chronic.

A recent questionnaire study of 682 hairdressers in a county of Norway (3), showed that 42% suffered or had suffered from exanthema of the hands and/or forearms. Sixteen per cent of the hairdressers were suffering from exanthema when they answered the questions, and 26% prior to completing it. The remaining group (58%) were never affected.

This report details the information gained by personal interviews of these hairdressers with and without hand exanthema. The prime aim of the study was to make a characterization by both demographic factors and estimates of atopic diathesis, based on medical histories.

MATERIAL AND METHODS

From the recent questionnaire study of 682 hairdressers in the county of Oslo we define the following populations:

Study population I

A total of 110 hairdressers reported exanthema of the hands and/or forearms at the time of completing the previously mailed questionnaire (96 females and 14 males from 62 salons).

Study population II

Exanthema prior to completing the questionnaire, was reported by 176 hairdressers. By simple randomization, a sub-sample of 66 hairdressers was formed (60 females and 8 males from 43 salons).

Study population III

A total of 395 hairdressers reported never having had exanthema. By simple randomization, a sub-sample of 64 hairdressers was achieved (56 females and 8 males from 43 salons).

There was a time delay varying from a few weeks up to 5 months between completion of previously mailed questionnaires and the personal interviews. Therefore, it was not always possible to interview all respondents. The interviews were carried out during working hours at the place of employment, and were followed by a physical examination of hands, not reported here. The following groups of 203 hairdressers included are based on information gained by the earlier questionnaire survey, and not on the morphology of hands by physical examination.

Group I: 102 (93%) of the hairdressers with current dermatitis were included in the study.

Group II: 51 (29%) of the hairdressers with earlier exanthema.

Group III: 50 (13%) of the hairdressers with no exanthema at all.

A standard questionnaire was used by the doctor during the personal interview. The interviews were completed between April 15 and June 15, 1988. Information collected concerned earlier or present atopic dermatitis, possible allergic asthma/ rhinoconjunctivitis and allergic symptoms among siblings or parents. Additional information was collected, concerning contemporary psoriasis, clearing of exanthema at weekends or on holidays and seasonal variation in disease activity, together with, the number of months since the disease started, start of disease related to training period and extent of sick-leave.

Diagnostic criteria

Both the diagnosis of previous or present atopic dermatitis, and previous or present atopic mucosal symptoms, such as asthma or allergic rhinitis/conjunctivitis, were made by the respondents' own physician. The original diagnoses were not changed by the interviewer. The diagnoses were confirmed by the interviewer, if the symptomatology (apart from hands) or medical history was obvious. Regarding familial atopy, past or present atopic symptoms of parents and siblings were accepted, as reported by the respondents themselves. Also, psoriasis was accepted as a diagnosis only in cases confirmed by the patients own physician, or by the interviewer when symptoms were present.

Statistical methods

Continuously distributed variables were expressed as mean values with 95% confidence intervals (C.I.). The Student procedure (4) was used for calculation of the intervals. Frequencies were expressed as a percentage with 95% confidence intervals constructed by using the theory of single Bernoulli sequences (4). Comparison of the groups regarding continuously distributed variables were carried out by using analysis of variance (4). Fisher's Exact test was used to analyse the categorical data in two-way tables (5).

All tests used in this analysis were two-tailed. Differences were

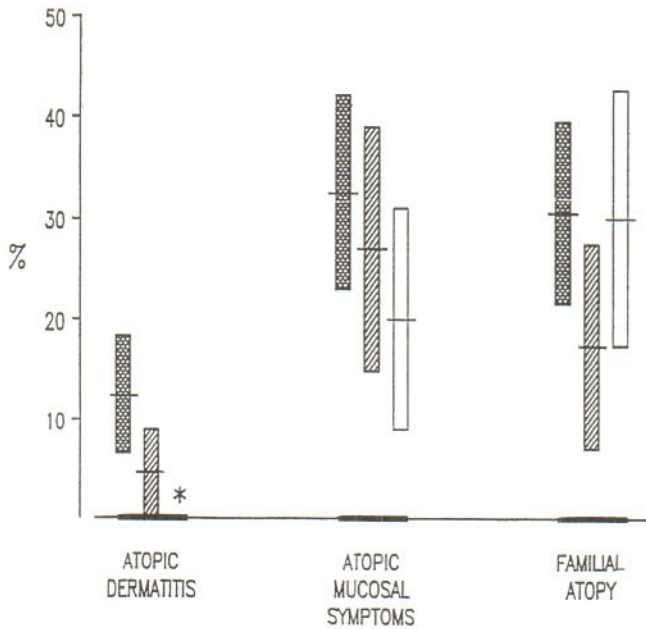


Fig. 1. Frequency of atopic dermatitis, atopic mucosal symptoms and familial atopy in hairdressers with present hand exanthema, with earlier hand exanthema and without experience of hand exanthema.

■ present exanthema
 ▨ earlier exanthema
 □ no exanthema
 * no atopic dermatitis patients

considered statistically significant when p-values were less than or equal to 5%.

RESULTS

The frequency of atopic dermatitis was 12.7% (C.I: 6.3–19.2) in group I and 3.9% (C.I: 0.0–9.2) in group II, while none of the hairdressers without skin affection reported atopic dermatitis in their medical history (Fig. 1). The difference in frequency between group I and II was significant ($p=0.01$).

Table I. Comparison of three groups regarding age (yrs.), total duration in work (months), hours per week in work and no. of months since start of exanthema. The results are expressed as mean values with 95% confidence intervals

	Without experience of hand exanthema (n = 50)	With earlier hand exanthema, but not now (n = 51)	With hand exanthema (n = 102)
Age	28 (25–31)	26 (24–28)	26 (24–28)
Total duration in work	119 (83–155)	95 (69–121)	85 (65–105)
Hours per week in work	37 (36–38)	37 (35–39)	36 (34–37)
No. months since start of exanthema		7 (5–9)	64 (47–82)

Table II. Comparison of the groups regarding contemporary psoriasis, clearing of exanthema in weekends and seasonal variation in disease activity

	Contemporary psoriasis		Clearing of exanthema in weekends/holidays		Seasonal variation in disease activity	
	Yes	No	Yes	No	Yes	No
With present hand exanthema (n = 102)	6	96	81	20	62	40
With earlier hand exanthema, but not present (n = 51)	1	50	36	11	32	18

The frequency of atopic mucosal symptoms was 32.4% (C.I: 23.3–41.4) in group I, 27.5% (C.I: 15.2–39.7) in group II and 20% (C.I: 8.9–31.1) in group III (Fig. 1). For familial atopy the figures were 29.4% (C.I: 20.6–38.3), 17.6% (C.I: 7.2–28.1) and 32% (C.I: 19.1–44.9), respectively. The three groups were not significantly different with regard to these parameters ($p=0.28$ and $p=0.20$, respectively).

The groups were found to be equal with regard to age, duration of work and hours per week in work (Table I).

The mean number of months since start of disease was 64 (range: 0.5–552) in group I and 7 (range: 0.6–38) in group II. This difference was significant ($p<0.01$). No significant difference was found between group I and II regarding clearing of skin disease on weekends and holidays, and seasonal variation in disease activity. Furthermore, there was no significant difference between all three groups regarding contemporary psoriasis (Table II).

Winter was the season of the year when cutaneous disease manifestation was most marked in group I and II (Table III).

Fifty-three per cent of the hairdressers in group I reported start of exanthema during the training period. Twenty per cent had had disease before, and 27% after the training period.

Of the hairdressers with present skin affection, 18% had experienced sick-leave because of the disease, compared to 6% among the hairdressers with earlier exanthema. The difference was significant ($p=0.05$).

Table III. Comparison of groups reporting seasons of year with greatest disease activity

	Winter	Spring	Summer	Autumn	Undecided
With present hand exanthema (n = 102)	53	6	6	8	29
With earlier hand exanthema, but not present (n = 51)	26	2	0	4	19

DISCUSSION

According to an earlier report by the authors (3), the mean age for the total group of hairdressers, including affected and non-affected cases, was 28 years. The figures for this part of the study show no difference in mean age between the subgroups of hairdressers (Table 1). This is quite unexpected because we assume that dermatitis of hands particularly affects young hairdressers. The low mean age for affected and non-affected hairdressers compared with, in an earlier study (6), a control group of teachers, may indicate that they frequently change or leave their job. Then the lack of difference in mean age between the subgroups of hairdressers, may support the view that factors other than hand eczema, probably non-medical, contribute to the low mean age.

The marked difference between hairdressers with exanthema and those who had had exanthema regarding disease duration was a significant finding of this part of study (Table I). But, surprisingly, this difference in disease chronicity, does not affect the age distribution.

It is important to state that in our study the classification of patients in the group of atopic dermatitis is not only based on the criteria of Hanifin & Rajka (7), since the interview concerns medical history, and then often retrospective evaluation. The final diagnosis of atopic dermatitis must be made on a combination of objective findings and history (8).

In an earlier report (6), there was made an indicative, but not significant, finding of lower frequency of atopic dermatitis among prevalent cases of hairdressers compared with a control group of prevalent teachers. In this part of the study, the difference between subgroups of hairdressers was significant (Fig. I). Such prevalence estimation will have to be "length-biased", i.e. in a group of sick persons chronic cases will be overrepresented

with regard to the part of incidence. In this case, we know that hand eczema on an atopic basis has a bad prognosis. On the other hand, more than half of the persons in group I reported onset of disease during the apprentice period. We probably are seeing a pre-employment selection of "non-atopics" during the hiring process ("healthy worker effect"). The Norwegian training period for hairdressers involves a heavy load of wet work and irritantia during apprenticeship; junior hairdressers especially do more shampooing than skilled hairdressers. Extent of sick-leave should indicate the severity of skin disease. In our study the significant finding of higher sick-leave among prevalent cases in group I, compared to group II, follow the finding of higher chronicity in group I, as mentioned earlier. Hence, chronicity and severity seem to correlate with each other.

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An Epidemiological Study of Hand Eczema

IV. Degree and Pattern of Eczema in Affected Hairdressers, with and without Atopic Symptoms, Compared with a Control Group of Affected Teachers

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The aim of this study was to show degree and pattern of hand eczema in affected hairdressers (n=69), compared with a control group of teachers (n=19). Both groups consisted of employees having eczema, confirmed by the visit of a doctor at the working place.

The mean age for the affected hairdressers was 27 years (range: 17–63) and for the teachers 43 years (range: 27–57). The mean duration of employment was 96 months for the hairdressers (range: 2–552) and 182 months for the teachers (range: 25–336). The localization of eczematous lesions, presence of efflorescences and extent of skin affection were recorded by constructing scores for these variables. The mean number of localizations was significantly higher in hairdressers than in teachers; this was caused by greater affection of fingers in hairdressers compared to teachers. Seventy-five percent of the hairdressers and 79% of the teachers had only modest or very moderate erythema. Fourteen percent and 5%, respectively, had vesicular dermatitis. The right upper limb was most affected in both hairdressers and teachers.

Three subgroups of hairdressers were considered: hairdressers with atopic dermatitis, those with only atopic mucosal symptoms and those without atopic symptoms. No significant differences were found between these groups, except a significant higher finger involvement in atopics compared to non-atopics. **Key words:** contact dermatitis; occupation; epidemiology; atopic dermatitis.

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Irritant or allergic contact dermatitis is one of the main occupational hazards for hairdressers. Such dermatitis, most often presenting as hand eczema, is frequently disabling, forcing many hairdressers to discontinue their career (1).

One can find numerous data on frequency of skin affection, but there are only a few reports on degree and pattern of such dermatitis (2,3).

It is suggested that there are few correlations between clinical patterns of hand eczema and their etiology (4). Unquestionably, there is a significant association between the development of occupationally induced hand dermatitis and a history of atopy, particularly atopic dermatitis (5). In spite of this, Svensson (6) showed, by investigation of 63 consecutive patients in a dermatological out-patient department, that hand eczema of those with and without atopic dermatitis differed very little.

The aim of this study was to show degree and pattern of hand eczema in affected hairdressers, compared with a control group of teachers, and to see whether an atopic constitution is of importance in this occupational setting.

MATERIAL AND METHODS

In a questionnaire study of 682 hairdressers and 531 teachers in the county of Oslo, a total of 110 hairdressers and 32 teachers reported existing exanthema on hands and /or forearms (7). By visiting their work premises 102 and 24 employees, respectively, were investigated (7).

Study sample hairdressers

Out of the 102 hairdressers reporting present exanthema at the screening, eczematous lesions were found in 69. Their mean age was 26.8 years (range: 17.2–63.0) and 58 were women. The mean number of months spent in the profession was 95.8 (range: 2–552) and the number of working hours per week was 35.7 (range: 3.5–50).

The hairdressers were subdivided into three groups: hairdressers with atopic dermatitis in their medical history (n=11); hairdressers with atopic mucosal symptoms, but not atopic dermatitis (n=19); and hairdressers without atopic dermatitis or atopic mucosal symptoms (n=39).

Study sample teachers

Out of the 24 teachers reporting existing exanthema at the screening, eczematous lesions were found in 19. Their mean age was 42.7 years (range: 27.7–56.7), and 4 were women. The mean number of months spent in profession was 181.5 (range: 25–336), and the number of working hours per week was 27.4 (range: 10–45).

Localization

The presence of eczematous lesions was recorded as:

finger tips	right extremity
finger sides	left extremity
finger webs	
dorsal fingers	1. finger
palmar fingers	2. finger
knuckles dip pip mcp	3. finger
dorsa	4. finger
palms	5. finger
hand joints	
lower arms	

A total score for localization was constructed by giving each localization score 0 (none) or 1 (present) and then summarized. This total score ranges from 0 to 17.

Character

Efflorescences were recorded as:

erythema
vesicles
scaling
fissuring
itch
pitted nails
dystrophic nails

These variables were given scores 0/1 and a total score for character was constructed by summarizing these scores. This sumscore ranges from 0 to 7.

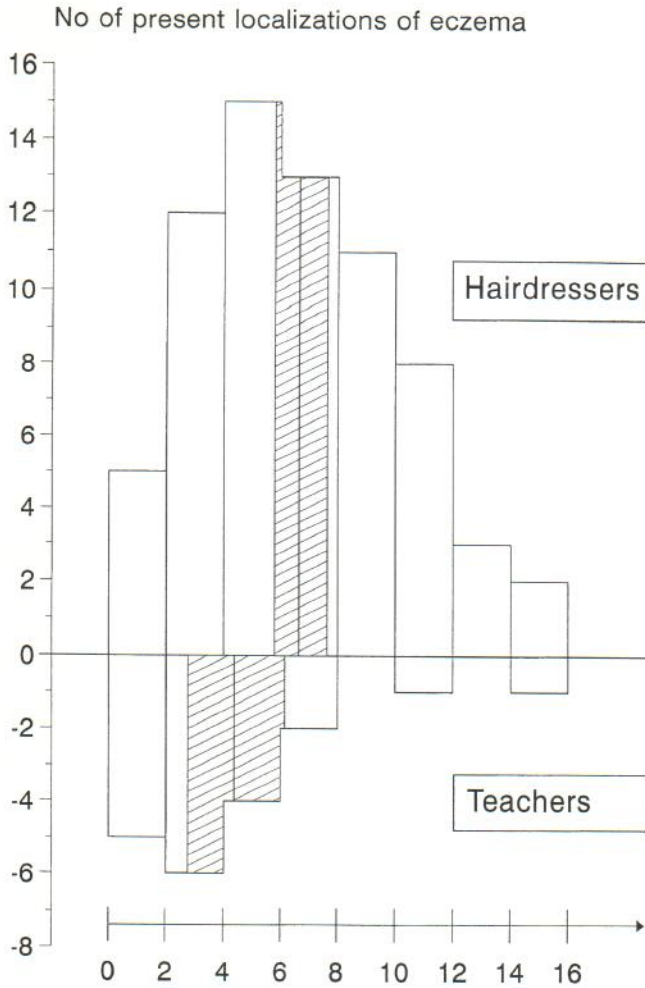


Fig. 1. Distribution of number of present localizations of eczema for hairdressers above the x-axis and teachers below. The mean values, with 95% confidence intervals shaded.

Erythema, vesicles, scaling, fissuring and itch was recorded on a fix point scale with 5 possibilities from 0 to 4:

- 0 – none
- 1 – modest
- 2 – very moderate
- 3 – moderate
- 4 – severe

Distribution

The presence of skin affection was recorded as:

- left hand
- left lower arm
- right hand
- right lower arm

These localizations, if present, were scored, according to skin area affected, as follows:

- 1 = <10%
- 2 = 10–30%
- 3 = 30–50%
- 4 = 50–70%
- 5 = 70–90%
- 6 = 90–100%

The scores of the four variables were summarized and this total score ranges from 0 to 24.

Statistical methods

Scores are expressed as mean values with 95% confidence intervals. The Student procedure (8) was used for calculation of the intervals. Frequencies are expressed as percentages with 95% confidence intervals, constructed by using the theory of single Bernoulli sequences (8).

Two way contingency tables were analyzed by using a chi-square test (8). Analysis of the two-by-two tables were carried out by using the Fisher-Irwin test (8).

Students t-test was used when comparing the hairdressers and teachers scores (8). Kruskal-Wallis test was used when comparing the sub-groups of teachers with regard to their scores, but these results must be interpreted with caution due to the small groups involved (8).

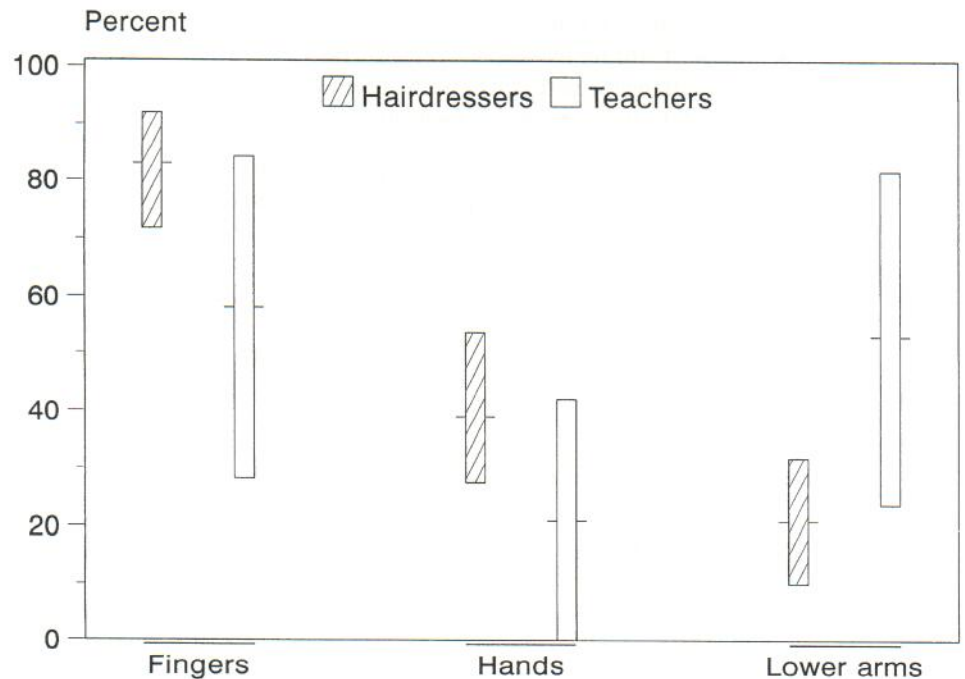


Fig. 2. Comparison of hairdressers and teachers with regard to eczema on the fingers, hands and lower arms. The results are expressed as mean values with 95% confidence intervals.

Table I. Comparison of hairdressers (n = 69) and teachers (n = 19) regarding degree and types of efflorescences. The results are expressed as percentages with 95% confidence intervals

	Degree of efflorescences				
	None	Modest	Very moderate	Moderate	Severe
ERYTHEMA					
Hairdressers	11.6 (2.4–20.3)	42.0 (29.0–55.1)	33.3 (20.3–45.6)	11.6 (2.4–20.3)	1.4 (0–9.4)
Teachers	15.8 (0–36.8)	15.8 (0–36.8)	63.2 (36.8–89.5)	5.3 (0–22.1)	0 –
VESICLES					
Hairdressers	85.5 (75.4–94.2)	8.7 (0.7–15.9)	4.3 (0–11.6)	1.4 (0–9.4)	0 –
Teachers	94.7 (73.7–100)	0 –	0 –	5.3 (0–22.1)	0 –
SCALING					
Hairdressers	15.9 (6.1–25.4)	34.8 (23.2–47.8)	40.6 (27.5–53.6)	8.7 (0.7–15.9)	0 –
Teachers	21.1 (0–44.7)	21.1 (0–44.7)	42.1 (15.8–71.1)	15.8 (0–36.8)	0 –
FISSURING					
Hairdressers	81.2 (71.7–91.3)	17.4 (8.0–27.5)	0 –	1.4 (0–9.4)	0 –
Teachers	78.9 (56.8–1.0)	21.1 (0–44.7)	0 –	0 –	0 –
ITCHING					
Hairdressers	78.3 (65.2–88.4)	20.6 (10.1–31.9)	1.4 (0–9.4)	0 –	0 –
Teachers	63.2 (36.8–89.5)	36.8 (11.6–64.2)	0 –	0 –	0 –

All tests were carried out two-tailed with a significance level of 5%.

RESULTS

Localization hairdressers vs. teachers

The mean number of localizations was 6.7 (range: 1–15) for the hairdressers and 4.4 (range: 1–16) for the teachers (Fig. 1). The groups were significantly different with regard to the number of localizations ($p=0.02$), and the main reason was more affection of fingers among the hairdressers ($p=0.03$, Fig. 2). Eighty-three per cent of the hairdressers had finger involvement. Sixty-three per cent had affection of dorsal fingers, 19% had palmar changes, while only 4 hairdressers (6%) had dermatitis on finger tips.

Table II. Comparison of hairdressers and teachers with regard to skin involvement of overextremities. The results expressed in percentage with 95% confidence interval

	Overextremities			
	Left hand	Left lower arm	Right hand	Right lower arm
Hairdressers (n = 69)	66.7 (55.1–79.7)	17.4 (8.0–28.3)	78.3 (66.7–87.7)	18.8 (8.7–30.4)
Teachers (n = 19)	31.6 (7.4–58.9)	47.4 (18.4–76.3)	58.0 (28.9–84.2)	26.3 (2.1–53.7)

Thirty-nine per cent had affection of the hands (excluding fingers). This affection of hands was palmar in 26% and dorsal in 10%. Lower arms were involved in 20% of the hairdressers.

The figures for teachers as regards fingers, hands and lower arms were 58%, 21% and 53%, respectively.

There was no significant difference between hairdressers and teachers with regard to affection of the hands or lower arms.

Character hairdressers vs. teachers

Sixty-seven per cent of the hairdressers and 53% of the teachers had two or three efflorescences present, and no significant difference was found between the groups ($p=0.62$).

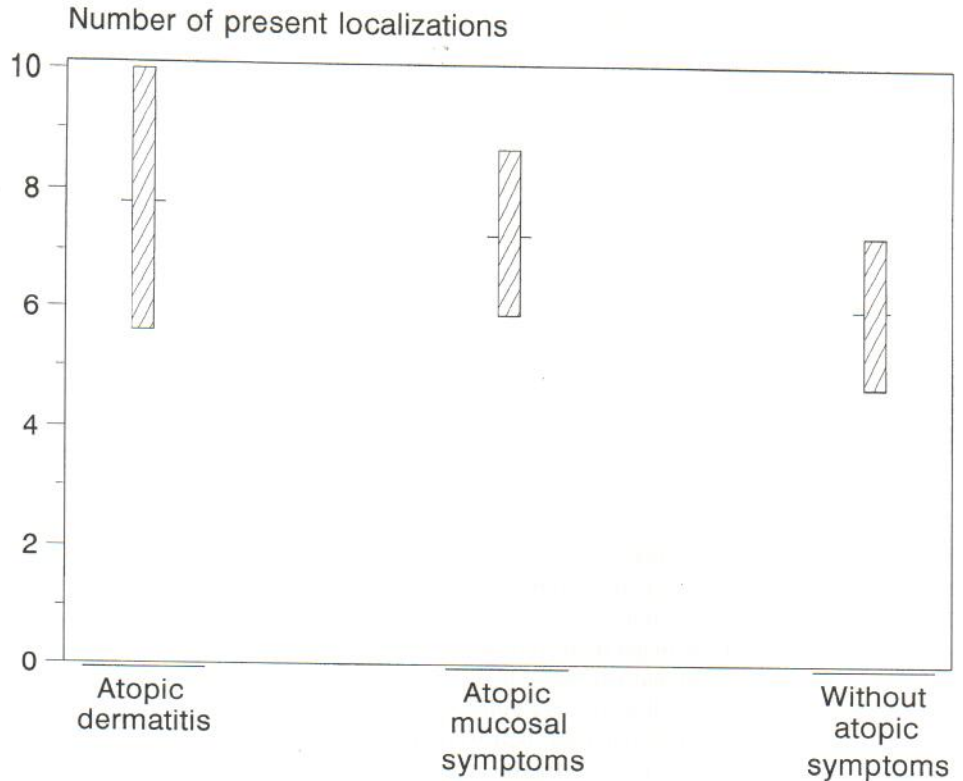
Seventy-five percent of the hairdressers and 79% of the teachers had only modest or very moderate erythema, while 14% and 5% respectively had a vesicular dermatitis (Table I). Thirty-four per cent of the hairdressers and 16% of the teachers showed dystrophias of the nails. Pitted nails were found in 9% and 16%, respectively.

Distribution hairdressers vs. teachers

The mean sum score for hairdressers was 2.5 (range: 0–9), compared to 2.1 for teachers (range: 0–11). This difference was not significant ($p=0.36$).

The right hand (including fingers) was the most affected part of the overextremities in both groups (Table II). For this hand, 46% of the hairdressers had less than 10% involvement of skin, 28% had 10–30% affection and only three hairdressers (4%) had

Fig. 3. Number of present localizations in hairdressers, expressed as mean values with 95% confidence intervals.



more than 30% involvement of skin. Six hairdressers (8%) had more than 10% affection of lower arms.

Localizations in hairdresser subgroups

The mean number of present localizations was 7.8 for hairdressers with atopic dermatitis, 7.3 for those with only atopic mucosal symptoms and 6.0 for those without atopic symptoms (Fig. 3). No significant difference was found between the groups ($p=0.11$).

The three groups were significant different with regard to affection of fingers ($p=0.03$). All hairdressers in the atopic dermatitis group had their fingers affected. In the atopic mucosal group, 95% had finger involvement, while 72% of hairdressers without atopic symptoms had affection of fingers. No differences were observed with regard to the hands (excluding fingers) or lower arms ($p>0.27$).

Table III. Comparison between hairdressers with atopic dermatitis, atopic mucosal symptoms and patients without atopic symptoms with regard to efflorescence and distribution score. The results are expressed as mean values with standard deviations in brackets

	Atopic dermatitis	Atopic mucosal symptoms	Without atopic symptoms
Efflorescence score	3.3 (0.9)	2.7 (1.0)	2.5 (1.1)
Distribution score	2.9 (2.2)	2.6 (1.3)	2.4 (2.1)

Character hairdresser subgroups

No differences were found between the hairdresser groups with regard to the number of efflorescences (Table III, $p=0.13$).

Distribution hairdressers subgroups

No differences were found between the hairdresser groups with regard to the distribution score of eczema (Table III, $p=0.28$).

A statistical appendix

Using the logistic regression analysis, both with the localization and character as dependent variables, age, duration in work and weekly working time did not give significant effects to this model. This concerned both comparison of hairdressers and teachers, and the study of subgroups of hairdressers.

DISCUSSION

The major finding of this part of study was a higher number of localizations of eczema (Fig. 1) among hairdressers compared to our control group of teachers. But, this difference between groups is quite minor, taken into consideration the difference in harmful exposition of the skin between the groups. The difference in finger affection seems to be the decisive characteristic (Fig. 2).

The literature on pattern of hand eczema is not abundant. In an earlier study of hand eczema in women (4) the palmar pattern was the commonest, with finger affection only in 19%. Our study population shows a rather different pattern with finger affection in 83% of the hairdressers, mostly dorsal in nature. But, conversely, the affection of hands (excluding fingers) was

mostly palmar. The teachers also, as a control group, were mostly affected on the fingers.

It is generally thought that in the early stages of hand dermatitis, there are recognizable patterns that may help to delineate the cause, whether endogenous, irritant or allergic. Irritant dermatitis often starts on dorsa, as in junior hairdressers (2), while in palmar affection endogenous eczema or psoriasis is more likely the cause (9). Characteristic patterns for allergens occur rather infrequently, but finger tip dermatitis is the most common pattern of contact dermatitis produced from permanent waves. In our study few hairdressers had such dermatitis on finger tips.

The age difference between hairdressers and teachers can be important for a number of reasons. Usually, a higher age correlates with higher cumulative exposure for occupational hazards. On the other hand, the low mean age figure for the hairdressers may indicate that they frequently change or leave their job. The cross-sectional design of this study gives no information of how hairdressers with hand eczema cope later. Of hairdressers affected, as many as 62% are reported to abandon their career (1). Despite such selection, our study shows, in two quite different occupations, a high rate of finger dermatitis, which is generally less amenable to treatment and has generally a poor prognosis (2). Potential work-etiological factors regarding teachers' hand eczema may be chalk and wet sponge used when blackboard writing, and special types of handwork (10).

Taken into consideration the heavy load of wet work, irritantia and allergens in hairdressing services, it is quite surprising that this does not affect the character and extent of hand eczema, compared with the control group. This may be a result of selection. Similarly, both hairdressers and teachers had quite moderate clinical scores on their dermatitis (Table I).

Hand eczema is significantly more common in people with a history of atopic dermatitis (10,11). Comparisons between patients with and without atopic dermatitis have not revealed a specific pattern of atopic hand eczema (4,6). In our study, the

insignificant trend toward higher number of localizations in hairdressers with atopic dermatitis may be accidental because few persons with atopic dermatitis participated (Fig. 3). This reduces the strength of the tests used. Despite this, there was a significant higher prevalence of finger involvement of those with atopic dermatitis, compared to non-atopics. Hence again, finger dermatitis seems to be of vital importance in determining the bad prognosis connected with atopic hand dermatitis, although our study did not find more affection as regards character and extent of eczema (Table III).

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An Epidemiological Study of Hand Eczema

V. Prevalence Among Hairdresser Trainees, Compared with a General Population of Hairdressers

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The aim of this study was to show degree and pattern of hand eczema in affected hairdresser trainees (n = 52), compared with a general population of affected hairdressers (n = 69).

The mean ages were 18 years (range: 16–25) for the trainees and 27 years (range: 17–63) for the hairdressers. For the latter group, the mean number of months spent in profession was 96 (range: 2–552) and the number of working hours per week was 36 (range: 4–50).

Twenty-seven per cent of all trainees (67/246) were reported to have had initial of eczematous lesions on the hands and/or forearms during their apprenticeship.

The extent of skin affection, as assessed by scores for localization and distribution of eczema, was significantly lower in trainees, compared with the general population of hairdressers. Patch test revealed sensitization to nickel to be prominent in both groups; 34% among affected hairdressers and 26% among affected and non-affected trainees. Of the hairdressers, 3% had allergy to hair dye (2.5-toluenediamine), while 8% were sensitized to glyceryl monothioglycolate. None of the trainees were sensitized to those two chemicals. **Key words:** contact dermatitis; occupation; pattern; hand eczema; patch test.

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Recent reports from central Europe indicate an increase in occupational skin diseases during the last years (1). In particular, this has been seen among the hairdressers and apprentices, and of these, two-third concerned 16–21 years old trainees (2).

The services performed by the the hairdressers require manual use of a number of materials for conditioning, cleansing, styling and colouring of the hair (3). A chief hazard is the extensive use of shampoos, resulting in irritant contact dermatitis of hands.

The present investigation was undertaken in order to evaluate the frequency of skin disease among hairdressers during apprenticeship. This is the first time such a study has been carried out in Norway.

MATERIAL AND METHODS

A cross-sectional design was selected.

Study population – hairdresser trainees

In Oslo there are two schools for training hairdressing apprentices. At both schools, there are two models for this apprenticeship, both with training periods of three years. One model involves being at school the first year, while training as an apprentice in a salon the second and third year. The other alternative is to be an apprentice in a salon from the start, with one day weekly at school during the three years. At time of this investigation, these schools comprised 286 pupils.

Study population – control group

From a questionnaire study of 682 hairdressers in salons in the county of Oslo, a total of 110 hairdressers reported current exanthema on the hands and/or forearms. By visiting the work premises 102 employees were investigated. These employees comprised trainee hairdressers and certified hairdressers.

Study sample – hairdresser trainees

This part of the study comprised 246 trainees. In the first class there were 123 trainees, 98 in the second class, and 25 in the third class. Eczematous lesions were found in 52 trainees. Their mean age was 18.3 years (range: 16–25) and 49 were women.

Study sample – control group

Out of the 102 hairdressers reporting current exanthema during the screening, eczematous lesions were only found in 69. These affected hairdressers had a mean age of 26.8 years (range: 17.2–63.0) and 58 were women. The mean number of months spent in the profession was 95.8 (range: 2–552) and the number of working hours per week was 35.7 (range: 3.5–50).

Personal standard interview and examination

The interview and examination of the trainees were carried out at school. For the control group, these were carried out during working hours at the place of employment.

It was not possible to interview all respondents because of irregular working hours and school hours, change of salon, sickness, etc.

A standard questionnaire was used by the examining doctor during the personal interview. Information was collected concerning earlier or present atopic dermatitis, possible allergic asthma/rhinoconjunctivitis and allergic symptoms among siblings or parents. The examination consisted of simple local inspection of hands/forearms, with no access to inspection of other parts of the body (except the face), because of the lack of facilities for undressing at the working place. Eczema was assessed on the presence of erythematous, maculopapulous and dry/itchy skin.

Patch testing

All trainees at one of the two schools were patch tested, whether affected or not. Only affected hairdressers were tested.

Patch testing was done with the hairdressing series of Chemotechnique Diagnostics AB (Malmö, Sweden), supplemented with four substances from the European standard series and series of various allergens, namely thiuram mix (1% pet.), mercaptomix (2% pet.), carbamix (3% pet.), and fragrance mix (8% pet.).

The tests were applied to the back for two days, using Finn Chambers (Epitest Ltd., Helsinki, Finland) on Scanpor (Norgesplaster a/s, Oslo, Norway). Readings were made at three days, except for 11 trainees, for whom readings were made at two days. The readings were according to recommendations by the International Contact Dermatitis Research Group (ICDRG).

Localization

The presence of eczematous lesions was recorded as:

finger tips	
finger sides	right extremity
finger webs	left extremity
dorsal fingers	



Fig. 1. Scores of localization, character and distribution in hairdressing trainees and a control group. The results are expressed as mean values with 95% confidence intervals.

- palmar fingers
- knuckles dip pip mcp
- dorsa
- palms
- hand joints
- lower arms

- 1. finger
- 2. finger
- 3. finger
- 4. finger
- 5. finger

- 4 = 50–70%
- 5 = 70–90%
- 6 = 90–100%

The scores of the four variables were summarized and the total score ranges from 0 to 24.

A total score for localization was constructed by giving each localization score 0 (none) or 1 (present) and when summarized, the total score ranges from 0 to 17.

Character

Efflorescences were recorded as:

- erythema
- vesicles
- scaling
- fissuring
- itch
- pitted nails
- dystrophia nails

These variables were given scores 0/1 and a total score for character was constructed by summarizing these scores. This total score ranges from 0 to 7.

Distribution

The presence of skin affection was recorded as:

- left hand
- left lower arm
- right hand
- right lower arm

These localizations, if present, were scored, according to skin area affected, as follows:

- 1 = <10%
- 2 = 10–30%
- 3 = 30–50%

Statistical methods

The total scores are expressed as mean values with 95% confidence intervals. The Student procedure was used for calculation of the intervals (4).

Students t-test was used when comparing the groups with regard to the sumscores. All tests were carried out two-tailed with a significance level of 5%.

RESULTS

Personal interview-trainees

Sixty-seven (27.2%) of the 246 trainees reported having had the initial onset of eczematous lesions on the hands and/or forearms during apprenticeship. Forty of the 67 trainees reported initial symptoms during the first year of training, 24 the second year, while none reported disease onset in the last year. Three trainees were uncertain of the date of onset.

Localization trainees vs. hairdressers

The mean score for localizations in trainees was 4.7 (C.I.: 4.09–5.31), with a maximum score of 10 localizations (Fig. 1). This was significantly different ($p < 0.01$) from the control group, which had a mean score of 6.8 (C.I.: 5.95–7.65), and a maximum score of 15 localizations.

Character trainees vs. hairdressers

The mean score for character in trainees was 3.65 (C.I.: 3.18–4.12) with maximum all efflorescences recorded at the same individual (Fig. 1). This was not significantly different from the

Table I. Frequency of positive patch test reactions in affected and non-affected trainees, compared with affected hairdressers

	Trainees (n = 74)	Hairdressers (n = 75)
2,5-Diaminotoluene sulfate 1.0% pet	0	2 (2.7%)
Ammonium persulfate 2.5% pet	1 (1.4%)	3 (4.0%)
Formaldehyde 1.0% aq	1 (1.4%)	
Nickel sulfate 5.0% pet	19 (25.7%)	26 (34.7%)
Cobalt chloride 1.0% pet	4 (5.4%)	6 (8.0%)
Perubalsam 25.0% pet	0	2 (2.7%)
Glyceryl monothioglycolate 1.0% aqb	6 (8.0%)	
Cocamidopropylbetaine 1.0% aq	0	1 (1.4%)
Kathon CG 0.02% aq	0	1 (1.4%)
Thiuram mix 1.0% pet	0	1 (1.4%)
Carba mix 3.0% pet	0	
Fragrance mix 8.0% pet	2 (2.7%)	6 (8.0%)

control group ($p=0.95$), which had a mean score of 3.63 (C.I.: 3.23–4.03).

Distribution

The mean score for distribution of exanthema in trainees was 1.67 (C.I.: 1.41–1.93) with a maximum score of 6. This was significantly different ($p<0.01$) from the general population of hairdressers which had a mean score of 2.56 (C.I.: 2.10–3.02) with a maximum score of 9 (Fig. 1).

Patch testing

In Table I are listed the substances giving positive patch test results either in trainees or control group. Nickel sulfate and cobalt chloride were the main allergens common for both groups, and the most important allergens for trainees. For the general hairdressing population, additional common allergens were glyceryl monothioglycolate and fragrances.

The positive patch test reactions were found in 22 of the 74 trainees, and in 39 of 75 hairdressers. Skin changes were present in 6 of 22 trainees at the time of patch testing.

DISCUSSION

The hairdressing apprentices have to learn the manual use of a number of materials for conditioning, cleansing, styling and colouring of the hair. The first year trainees placed in salons may have to do more than 20 shampoos every day, while second year trainees often have long-time monotonous manual work, e.g. styling hair with a permanent (5). Hairdressers with a craft certificate will likely have more variable and dryer manual work.

Therefore this study emphasises the skin problems among trainees, compared to a general population of hairdressers, acting as a control group. But, what kind of population is "indifferent enough" to justify the label "control group", and thus make adequate comparisons possible? This aspect of the study has a weakness making the comparison between our two groups less than perfect. Our control group will likely include an unknown number of trainees stationed in salons. Nevertheless, our choice of a control group is not unsuitable since there is, at least, a great

difference in mean age and number of months spent in profession between our groups.

This study shows that 60% of those trainees who developed skin complaints, did so in the first year of training. This is consistent with earlier findings by Cronin (6). In her study, 62% of 84 hairdressers with hand eczema developed their skin manifestations during the first year of training.

In contrast, our study reveals a lower morbidity among affected trainees, compared to affected hairdressers with a longer career. The skin affection is nevertheless moderate in both groups, quantitatively assessed with our scoring system.

Not only are hairdressers regularly and frequently exposed to water and detergents and to irritant hairdressing chemicals, but they are also exposed to several potent allergens. Most of our knowledge on allergic contact dermatitis among hairdressers concerns hairdressers who seek medical advice. On the other hand, our study refers to affected hairdressers, not selected in any way.

In recent years, the incidence of dermatitis due to hair dyes containing p-phenylenediamine (or derivatives) appears to have decreased (6). None of our trainees and 3% of our hairdressers had allergic contact dermatitis from 2,5-toluenediamine. A recent study (7) confirms that this chemical is still a problem for some hairdressers.

Allergy to glyceryl monothioglycolate is reported with increasing frequency over the past decade (8). In our study also, this chemical seems to be the main sensitizing allergen for hairdressers after fragrances and metals, but not for our trainees.

Among trainees, metal allergy seems to be pronounced, as noted also in our study. However, sensitization to nickel may be independent of occupational exposure (9). It is difficult to estimate the relevance of such metal allergy in trainees and hairdressers, and whether or not such sensitization is occupational or domestic in nature. Therefore, the crucial questions formulated by Wahlberg in 1981 (10) remain unanswered.

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An Epidemiological Study of Hand Eczema

VI. A Follow-up of Hairdresser Trainees, with the Focus on Various Health Complaints

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The aim of this follow up study was to show how career drop-outs among young hairdressers are related to various health complaints. Questionnaires were sent to 286 hairdressers, who had been registered as trainees three to five years earlier. The forms were returned from 124 hairdressers, of whom 26 (21%) reported that they stopped working as hairdressers because of various health complaints. Eight (6.5%) left their job because of skin conditions. **Key words:** *contact dermatitis; epidemiology.*

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Dermatitis is one of the main occupational diseases in industrialized countries, and constitutes between 20 to 70 per cent of all registered work-related diseases (1). About 90% of the work-related eczemas are localized to the hands, and hand dermatitis often carries a bad prognosis with permanent disability (2).

Several surveys confirm that most hairdressers sooner or later develop skin complaints. In one study (3) about 55% of young hairdressers had skin affection. In a recent study (4) of 246 trainees, 67 (27%) reported eczematous disease of the hands and/or forearms during apprenticeship. Of these, 40 had skin affection in the first year. One study (5) showed that 25% of the trainees abandoned their career; but, how many of these stopped because of skin complaints was uncertain.

The present investigation was undertaken in order to show the extent of career drop-outs among young hairdressers, and to what extent skin problems are reported as a cause of such drop-outs, compared to other health complaints.

MATERIAL AND METHODS

Study population-hairdresser trainees

There are two schools situated in Oslo for training hairdressing apprentices, comprising 286 trainees. These comprised the basis for an investigative study (4) in 1988 and to a lesser extent in 1990. The mean age of the study sample at that time was 18 years; 93% were women.

Follow up- hairdresser trainees

The population of 286 trainees, defined as a cohort, was followed up by this questionnaire survey.

A search for the participants' addresses was made through The national register of residents in Norway.

Questionnaires

The questionnaires (Table I) were sent out in April 1993. In accordance with the Norwegian law of registration of persons, reminding non-respondents was attempted only once. This was done June 1993.

Non-responders

Of a non-respondent group of 157 trainees, 32 were sampled (Fig. 1). By phone-call, the subjects were asked if they had resigned their job or not, and whether the resignation was caused by health complaints.

RESULTS

Questionnaires

124 trainees out of 286 responded to the primary inquiry (43%). Forty-six of these (37%) had finished in their career. Twenty-six (21%) had given up because of health complaints, some of whom had several complaints (Fig. 1). Muskulo-skeletal disease was by far the most common cause of career drop-outs (16%), followed by headache and fatigue. Eight trainees (6.5%) stopped because of skin affection; three of whom had other health complaints.

Twenty hairdressers including five full time housewives stopped because of non-medical reasons. Five hairdressers reported loss of job satisfaction as a reason for dropping their career.

Non-responders

Thirty-two persons were sampled from 157 non-responders (Fig. 1). Twenty-two were reached by telephoning. Nine trainees (41%) had finished; three of them because of musculo-skeletal complaints (14%) and six for non-medical reasons.

DISCUSSION

On the basis of the present data a descriptive analysis of how young hairdressers manage their careers can be given. The weak point in this study is the low response rate, which is mainly due to the lack of permission to make additional reminders. The survey of non-responders nevertheless confirms the broad outlines of the findings.

The outstanding feature of the present study is the high

Table I. *Questionnaire investigation. The formulation of questions*

a. Name
b. Address
c. Do you still work as hairdresser? yes no
If "no", have you finished because of complaints from
 skin
 nose/throat
 airways
 muscles
 head (pain, fatigue)
d. Have you finished because of other reasons? If so; describe these:

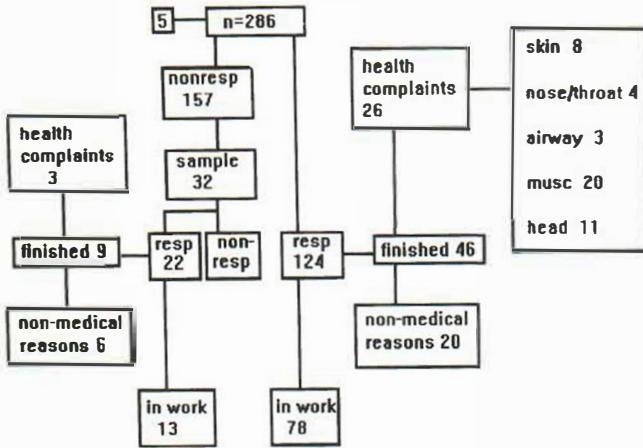


Fig. 1. Design of study with incidence of various health complaints.

incidence of musculo-skeletal complaints, compared with the few studies made on this topic (6,7). A Danish review (8) of health hazards during a ten-year period has four references on musculoskeletal problems, compared with 82 references for dermatology. It seems obvious that hairdressers have unsuitable work positions, based on a standing position with inappropriate rotations of the body.

The high incidence of headache and fatigue may reflect the heavy musculo-skeletal load in this work. There are no reported occurrences of central nervous system symptoms, related to work, among hairdressers (8).

Some complaints in our study were respiratory. Hairspray may disturb the tracheal and nasal mucociliary transport, thereby also affecting the lung function (9). The use of persulfates in

hairdressing services is also reported as a health risk, both in precipitation of asthma, and cutaneous symptoms of eczema or urticaria (10,11).

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