PREVALENCE OF HAND DERMATITIS AMONG HOSPITAL NURSES WORKING IN A TROPICAL ENVIRONMENT

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ABSTRACT

Background:

Although hand dermatitis (HD) is a common occupational problem among hospital nurses, few epidemiological studies of this disease have been conducted in regional areas or tropical environments.

Aim:

The aim of our investigation was, therefore, to investigate HD prevalence and correlates among nurses within a unique Australian setting.

Design:

We recruited a cohort of 148 female nurses from a large tertiary hospital in north Queensland, Australia, and administered a previously validated, self-reporting HD questionnaire.

Results:

The 12-month period prevalence ranged from 43.2% to 59.3%, with an overall group mean of 50.0%. There were no statistically significant differences in HD prevalence between the different hospital wards (p=0.4238). During multiple logistic regression, a history of allergic rash was shown to increase the HD risk 5.5-fold (odds ratio: 5.5, 95% CI: 1.9–19.2, p=0.0038). The risk of HD was also related to increased hand washing frequency (OR 5.8, 95% CI: 1.1–33.4, p=0.0402).

Conclusions:

Overall, the occurrence of HD among Australian nurses was relatively consistent across the various hospital wards. Their 12-month period-prevalence of HD was, however, generally higher than previous reports from other countries.

INTRODUCTION

Hand dermatitis (HD) represents one of the most common occupational skin diseases affecting nurses and is usually caused by irritant contact dermatitis or allergic contact dermatitis (Smith et al 2002a). HD can be a serious temporary affliction or an ongoing condition, and may frequently relapse (Meding and Swanbeck 1990a). Although HD occurs community-wide (Lantinga et al 1984), nurses usually suffer this disease at rates in excess of the general population. In a previous survey for example, Smit et al (1993) documented female nurses suffering from HD at a rate three times higher than the general population. Similarly, in another community survey, Meding and Swanbeck (1990b) showed medical and nursing staff to have the highest HD prevalence of all occupations.

Hospital nurses are particularly prone to HD, but their rate seems to vary depending on the department they work in. Smith et al (2003) investigated HD among Japanese hospital nurses and found the prevalence to range from 6% in psychiatry to 48% in surgery. Overall HD prevalence rates among hospital nurses have been reported to be 26% in the United States (Larson et al

1997), 29% in the Netherlands (Smit and Coenraads 1993) and 35% in Japan (Smith et al 2003). Risk factors for HD vary from study to study; but wet work (Nilsson and Bäck 1986), hand washing frequency (Forrester and Roth 1998), latex glove usage (Larson et al 1997), previous history of allergic disease (Soter et al 2001) and department of employment (Smith et al 2003) are common predictive variables.

Hand dermatitis may result in significant ongoing trouble and excess sick leave among nursing staff. HD may also adversely affect nurses' quality of life via physical discomfort, reduced productivity and decreased employment opportunities (Fay 1991).

Despite the widespread distribution and significant morbidity potential of occupational HD among hospital nurses, studies of this disease are uncommon in regional Australia and few, if any, have been undertaken in tropical environments. Therefore, the researchers considered it necessary to conduct one of the first epidemiologic investigations of hand dermatitis among hospital nurses working within a tropical region of northern Queensland, Australia. The aim of our investigation was to thoroughly investigate HD prevalence and to establish potential risk factors for this disease within a unique Australian setting.

Medical investigation of HD is usually very expensive and often interferes with nurses' daily activities. Therefore, a self-reporting questionnaire survey was chosen as the diagnostic methodology. Previous studies have shown this particular technique to be reliable and well tolerated by staff (Smith et al 2003; Soter et al 2001; Forrester and Roth 1998; Larson et al 1997; Smit and Coenraads 1993; Smit et al 1992). Other researchers have demonstrated the relative accuracy of questionnaire surveys for hand dermatitis (Smit et al 1992; Berg 1991). For example, Smit et al (1992) showed that the sensitivity and specificity of their Dutch HD questionnaire was 100% and 64%, respectively. The merits of self-reporting skin disease symptoms with relation to clinical signs have also been documented by other authors (Simion et al 1995).

METHODOLOGY

This study was given ethics approval by the Townsville District Health Service Ethics Committee (Townsville, Australia), James Cook University Ethics Committee (Townsville, Australia) and the National Institute of Industrial Health Ethics Committee (Kawasaki, Japan). Subjects were asked to complete a structured, self-reporting HD questionnaire to elicit symptom descriptions and diagnostic criteria. The questionnaire was adapted from a tool used in previous studies conducted in other countries (Smith et al 2003; Smith et al 2002b; Forrester and Roth 1998; Larson et al 1997; Smit et al 1993, Smit and Coenraads 1993; Smit et al 1992).

The questionnaire tool was a simple, two-page document containing: a) demographic items such as: age, sex, smoking habit, drinking habit and the presence of past or current allergic disease (atopic dermatitis, asthma, allergic rhinitis or hay-fever); b) employment-based questions, such as: weekly working hours, duration of employment, exposure to latex products and the number of hand washes usually performed per work-shift (the number of hand washes per work shift was assessed as a simple number and the type of hand wash was not asked; and, c) specific dermal symptoms known to be indicative of HD (Smit et al. 1992). Briefly, these symptoms included: red hands or fingers with fissures, scaling hands or fingers with fissures, red and swollen hands or fingers, vesicles on the hands or between the fingers and itching hands or fingers with fissures (Smith et al 2003; Smith et al 2002b; Soter et al 2001; Forrester and Roth 1998; Larson et al 1997; Smit et al 1993, Smit and Coenraads 1993; Smit et al 1992).

Our questionnaire specifically asked if any of these symptoms had occurred in the previous 12-month period, and if so, whether the symptoms persisted longer than three weeks or reoccurred during the 12-month recall period. The presence of HD was established according to criteria defined by Smith et al (2003), Smit and Coenraads (1993), Smit et al (1993) and Smit et al (1992). The criteria required two or more symptoms to appear in the preceding 12-months and to persist for more than three weeks or to have reoccurred during the 12-month recall time period.

A cohort of 262 nursing staff involved in clinical activities in a large teaching hospital in Townsville, Australia, was recruited. All staff worked in the hospital inpatient areas in various clinical sections on three different floors of the facility. For convenience, their locations were grouped and labelled as follows: surgical wards, medical wards, maternity/paediatrics and rehabilitation/oncology. This grouping was undertaken to ensure there were similar numbers of staff in each group. Questionnaires, together with an information sheet about the study, were distributed to nursing staff on the three floors by senior nurse management in early July 2003 (mid winter). An envelope labelled 'for completed questionnaires' was supplied to each ward at that time. A specific 10-day collection period was chosen because it was expected that all nurses would have worked at least one shift within that time. Secondly, time limitations of the principle investigator prevented a longer data collection period. The voluntary nature of the study was verbally explained to nurses and included in writing on the covering letter distributed with the questionnaires. There were no penalties for not participating in the survey and similarly, no rewards or incentives were offered for research participation. Informed consent was implied by nurses returning their questionnaires.

Data from the questionnaires was coded and entered on a spreadsheet program before being statistically analysed. Statistical significance was set at $p<0.05$ for all tests. Nurses were stratified according to the department they

worked in. Similarities and differences between the departments were calculated using the chi-square test for discrete variables such as work exposure to latex gloves; and one-way Analysis of Variance (ANOVA) for continuous variables such as age and the number of hand washes per shift. Multiple logistic regression was performed using the Cochran Mantel-Haenszel method to ascertain if there was any correlation between HD and personal or occupational factors. Hand dermatitis was utilised as the dependent variable and demographic or workplace items were selected as the independent variables. Potential risk factors were selected from those documented in previous studies, such as systemic allergy, number of hand washes per shift and hospital ward (Smith et al 2003; Soter et al 2001; Forrester and Roth 1998; Larson et al 1997; Nilsson and Bäck 1986). Results were expressed as Odds Ratios (OR) and 95% Confidence Intervals (95% CI). All Odds Ratios were adjusted for age, duration of employment and work department.

RESULTS

Completed questionnaires were obtained from 154 nurses, representing 58.8% of the total number currently employed. Responses from six males (3.9%) were excluded to help prevent statistical anomalies during data analysis, leaving a homogenous final cohort of 148 female nurses (96.1%). Their average age was consistent across the wards: range 34.3±1.7 years to 38.6±2.2 years (see table 1). Occasional alcohol consumption was relatively common, ranging from 59.1% to 69.4% per ward, and tobacco smoking ranged from 17.1% to 40.7%. Between 7.3% and 22.2% of nurses reported suffering from an allergic-type skin dermatitis or rash in the previous 12-months. Demographic variables were not statistically different between the wards (all p>0.05).

Most nurses were employed as Level 1 RNs (80.6% to 87.8%) and almost all were required to wear latex gloves on a daily basis (88.9% to 97.7%). The average length of time worked in nursing ranged from 9.2 to 13.2 years. Hand washing frequency varied significantly between the wards (p=0.0152), range: 31.0 to 46.6 hand washes per work shift (median = 30). Using previously validated diagnostic criteria, the 12-month period-prevalence of hand dermatitis among nurses in the current study ranged from 43.2% to 59.3%, with an overall group mean of 50.0% (95% CI range: 42.0% to 57.9%). Multiple logistic regression indicated a history of allergic rash increased the HD risk 5.5-fold (OR: 5.5, 95% CI: 1.9-19.2, p=0.0038), refer to table 2. The risk of HD was also related to increased hand washing frequency (OR 5.8, 95%CI 1.1-33.4, p=0.0402).

DISCUSSION

The overall prevalence of HD (50.0%), indicates the nurses in our study suffered more hand dermatitis than previously documented in a Japanese teaching hospital (35%) (Smith et al 2003). Their HD prevalence was also higher than other investigations from the United States (25.9%) (Larson et al 1997) and the Netherlands (between 29.4% and 32.0%) (Smit et al 1993). Community surveys of HD occasionally appear in scientific literature and indicate the background prevalence to range from 7.1%

Table 1: Nurse demographics and hand dermatitis prevalence by hospital ward

	Surgical ward (n=36)		Medical ward (n=44)		Maternity/paediatrics (n=41)		Rehabilitation/oncology (n=27)		
	n	(%) [a]	n	(%) [a]	n	(%) [a]	n	(%) [a]	p value [b]
Demographic items									
Age in years (mean ± SD)	35.1±1.7		35.6±1.6		34.3±1.7		38.6±2.2		0.4537
Alcohol drinker	25	(69.4)	26	(59.1)	28	(68.3)	17	(63.0)	0.7460
Tobacco smoker	8	(22.2)	10	(22.7)	7	(17.1)	11	(40.7)	0.1530
Allergic rash	8	(22.2)	9	(20.5)	3	(7.3)	6	(22.2)	0.2436
Workplace items									
Registered nurse	29	(80.6)	38	(86.4)	36	(87.8)	22	(81.5)	0.7839
Latex glove use	34	(94.4)	43	(97.7)	40	(97.6)	24	(88.9)	0.3129
Total job years (mean ± SD)	12.3±1.7		9.2±1.5		13.2±1.6		11.8±1.9		0.3100
Hand washes (mean ± SD)[c]	46.6±4.4		44.9±4.1		31.0±4.0		32.6±4.9		0.0152
Hand dermatitis	16	(44.4)	19	(43.2)	23	(56.1)	16	(59.3)	0.4238

[a] percentages of staff in each department are shown in parenthesis, [b] significant differences between departments calculated using the chi-square test for discrete variables and one-way analysis of variance for continuous variables, [c] average number of hand washes per work shift.

Table 2: Risk factors associated with hand dermatitis among hospital nurses.

		Number		Logistic regression		
Risk factor[a]	Category	n	(%) [b]	OR [c]	(95% CI)	p value
Previous allergic rash	No	129	(87.2)	1.0	-	-
	Yes	19	(12.8)	5.5	(1.9-19.2)	0.0038
Hand washes/shift[d]	All	148	(100)	5.8	(1.1-33.4)	0.0402

[a] risk factors analysed simultaneously using multiple logistic regression and expressed as adjusted odds ratios (OR) with 95% confidence intervals (95%CI), [b] percentage of all nurses in each subcategory (n=148), [c] odds ratios adjusted for age, total duration of employment and hospital ward, [d] evaluated as a continuous variable with increasing increments of one hand wash per shift

(Lantinga et al 1984) to 10.6% (Smit et al 1993) in the Netherlands and 11.8% in Sweden (Meding and Swanbeck 1990b). Comparing our nurse HD prevalence with that of general hospital staff suggests that the nurses' rates are slightly lower. For example, HD among hospital staff has been reported at 69.6% in Poland (Soter et al 2001) and 55.6% in the United States (Forrester and Roth 1998). Alternatively, the prevalence of HD among Italian hospital staff (21.2%) (Stingeni et al 1995) appears to be lower than nurses in Australia.

Differences in HD prevalence rates between our investigation and that of previous studies suggests tropical environments might influence the development of skin disease, particularly when certain occupational co-factors are involved. Cultural differences are also important to consider as there may be unknown ethnographic factors influencing nurses' self-reporting behaviour. Such a mechanism could have led the Australian nurses to report higher rates of HD than their counterparts in other countries. This phenomena has been previously hypothesised by Smith et al (2003), who studied HD among hospital nurses in central Japan. Alternatively, our nurses may have actually under-reported their HD symptoms, and the true prevalence might be even higher than 50%. As there is no concrete evidence to support or deny the issue of HD under-reporting among our nurse cohort, future researchers would need to undertake medical examinations of more comprehensive nursing groups; a prohibitively expensive task. Given the methodological similarities between our study and that of previous authors, however, we expect the error rates arising from these limitations would be roughly comparable.

Nonetheless, taking the aforementioned limitations into account, it appears that Australian nurses working in a regional, tropical environment report HD at rates higher than Japanese, American and Dutch nurses. Furthermore, the HD rate in these nurses could be higher than the background community levels elucidated in other investigations. Seasonal factors also need to be considered when exploring the development of skin diseases and excess levels of HD among Australian nurses. Hot environments usually cause excessive sweating (Fay 1991), which may, in turn, increase the presence and severity of HD. However, because we utilised a 12-month recall period, the end result should have captured all cases over time and thus, accounted for the relative influence of each individual season on HD development. It would be interesting to repeat the study in a different season, such as mid-summer, to evaluate seasonal effects on HD prevalence more thoroughly. As our questionnaire did not specifically ask nurses when their HD symptoms occurred nor how long each episode lasted, the inclusion of such questions may also be a useful addition for future HD surveys.

Identifying allergic skin rashes and increased hand washing frequency as risk factors for HD is consistent with previous reports (Smith et al 2003; Smith et al 2002b; Soter et al 2001; Forrester and Roth 1998; Larson et al 1997; Stingeni et al 1995; Meding and Swanbeck 1990c; Nilsson and Bäck 1986). Allergic rashes are commonly associated with systemic allergy, which may enhance skin susceptibility to irritation and prolong the dermal recovery period (Smith et al 2003). Atopic individuals may also have more severe acute symptoms than non-atopics (Forrester and Roth 1998), thereby increasing their chance of developing chronic HD. Hand washing is a regular feature of nursing work and the irritant properties of water and disinfectants are well known (Tsai and Maibach 1999; Larson et al 1997; Nilsson and Bäck 1986).

Previous authors have suggested that the actual number of hand washes performed per work shift directly influences the risk of developing HD (Smith et al 2003; Forrester and Roth 1998; Larson et al 1997). Similarly, we found that HD risk increased linearly with increased hand washing frequency. That is, the more often nurses washed their hands the more likely they were to develop hand dermatitis. However, unlike Smith et al (2003), Forrester and Roth (1998) and Larson et al (1997), we were unable to pinpoint a definitive cut-off threshold for the phenomena. In this regard, the number of hand washes per shift deemed to be a HD risk factor is known to vary widely, ranging from 15 (Smith et al 2003) to 35 (Forrester and Roth 1998) per work shift. Our result also suggests that a truly 'safe' threshold is difficult to define with respect to hand washing frequency.

It is fair to acknowledge that the current investigation had certain limitations. First, all diagnoses of HD were based on data gained from a self-reported questionnaire. Although such methods cannot always substitute for medical diagnosis by a dermatologist, other research has shown that they may provide an estimate accurate enough for epidemiologic research (Smit et al 1992; Berg 1991). Furthermore, we believe that hospital nurses, as educated health professionals, have a reasonable understanding of skin disease symptoms and would be fairly accurate in their self-reporting behaviour. Cultural differences may have affected symptom reporting behaviour among the nurses in Australia compared to nurses from other countries such as Japan. This latter point is a particularly important consideration when comparing international studies and will not be rectified until standardised HD testing methods can be made available throughout the world.

Response rate may also have resulted in selection bias. It may have occurred for various reasons (including time constraints, unexpected short-term leave, deployment and other organisation factors), even though many strategies to improve response rates were used (Edwards et al 2002). Most importantly, these strategies included: a) the use of a short questionnaire; b) an anonymous questionnaire; c) covering a topic which was of interest to the participants; and, d) the fact that this study clearly originated from a university rather than a commercial enterprise.

Nevertheless, our eventual low response rate may have influenced the overall reported HD prevalence, although it is unwise to speculate in what direction (lower or higher) this may have occurred. To rectify the issue, future studies need to be conducted over longer periods of time to ensure that larger and more inclusive cohorts are sampled. A further issue that may have contributed bias was the exclusion of six male staff. This measure was considered necessary to avoid statistical confounding during data analysis. If male nurses were significantly different from females, the end result may not truly reflect the overall situation of HD within this particular hospital. However, as the excluded group comprised less than 3% of the total hospital nurse demographic, we considered it appropriate to undertake this exclusion.

CONCLUSION

Overall, our study indicates that HD is relatively common among nurses in Australia working in a tropical environment, and that its prevalence is relatively stable across hospital wards. The burden of HD within this unique setting appears to be higher than that reported in other international reports. A history of allergic skin rashes and regular hand washing at work were identified as statistically significant risk factors, both of which are consistent with previous investigations. Despite the limitations of our research methodology, we have documented the prevalence of HD among hospital nurses in Australia working in a regional tropical environment for what appears to be the first time. Further research is required to establish the nature and distribution of HD among nurses in other geographical locations within Australia and in regional and tropical environments.

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