

Incidence and prevalence rates for occupational contact dermatitis in an Australian suburban area

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Occupational contact dermatitis (OCD) regularly causes high levels of worker morbidity; however, this is often not reflected in available statistics. This study aimed to collect and verify OCD reports/referrals and generate disease estimates for a defined geographical area in Melbourne, Australia. Two methods of data collection were used. In the first method, 30 general practitioners (GPs), 2 dermatologists and 1 dermatology outpatient clinic within a defined area reported each worker with suspected OCD seen as part of routine practice. With the second method, workers living in the area who were referred to a tertiary referral OCD clinic were included in the study. An occupational dermatologist used a gold standard process that included diagnostic patch testing to verify suspected cases. The incidence rate for confirmed cases was 20.5 per 100 000 workers [95% confidence interval (CI): 13–32.1]. The 1-year-period prevalence rate was 34.5 per 100 000 (95% CI: 24.4–48.7). The positive predictive value (PPV) was highest for the occupational dermatology clinic referrals [63% (95% CI: 49–76%)] compared with reports from the dermatologists/dermatology outpatient clinic [55% (95% CI: 36–74%)] and from GPs [43% (95% CI: 29–59%)]. This study utilizes reports from GPs and dermatologists to provide OCD disease estimates and validation data for an OCD disease register.

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Whilst occupational contact dermatitis (OCD) may result in high levels of worker morbidity, this is often not reflected in available statistics (1, 2). Disease estimates for OCD vary significantly as occupational disease reporting systems differ between countries, as do industries and industrial occupational health and safety practices. Nations such as Germany and Finland, where well-established mandatory disease registers are in place, report an annual incidence rate of 45–68 cases per 100 000 workers (3–5). In contrast, an annual incidence rate of 12.9 per 100 000 workers (2) was reported by the voluntary reporting scheme Epiderm in the UK.

It is suspected that even the most comprehensive registers provide an underestimation of the true rate of OCD (2, 5). We hypothesize that the under reporting of OCD in the general population is partly caused by the typical presentation and treatment pathway of the disease, and the various filters to reporting that are present at each stage of the pathway (6). In Australia, if an

affected worker chooses to seek medical advice, they will initially present to a general practitioner (GP). Unless a GP specifically enquires about an individual's workplace exposures, an occupational causation may not be suspected, a worker's compensation claim will not be submitted and the occurrence of the disease may not be represented in occupational disease datasets. If a worker has dermatitis that cannot be treated successfully in the GP setting, he/she may be referred to a dermatologist. At this stage, specialist patch testing and specific occupational exposure assessment may be recommended. This may entail yet another referral and clinical consultation. Workers with OCD are lost to the reporting system at each step of this diagnostic pathway, resulting in only the most severe or persistent cases of OCD contributing to the disease rate (6).

Comparisons between rates reported by OCD disease registers are complicated because of the variety of reporters (e.g. medical or non-medical personnel) and the largely unknown accuracy of

the reported diagnoses. Reports to the OCD disease registers described above are made by a variety of individuals including dermatologists, occupational physicians, non-specified medical practitioners, occupational health nurses and employers. For some reported cases, the diagnosis of OCD is made with access to diagnostic facilities such as patch testing; however, this is inconsistent. Accuracy of reports received by disease registers has generally not been reported. As part of a study specifically looking at the prognosis for workers reported to Epiderm, physicians were asked by questionnaire to verify details of cases reported between 1994 and 1995 (7). A change of causative agent for disease was identified in 28/510 cases (6%), and a change in final diagnosis was reported in 13/512 cases (2.6%).

Our study, entitled Spot, aimed to generate incidence and prevalence rates for OCD for a population of workers within a defined Australian community setting. An attempt was made to detect cases of OCD that would usually be diagnosed and managed in the context of a general practice clinic through the inclusion of GPs as reporters. Dermatologists practising in the area were also recruited. Suspected cases from all sources went through a consistent and centralized diagnostic process with a specialist occupational dermatologist who had access to full patch testing facilities. One of the advantages of this centralized system was that the Spot study was uniquely placed to report positive predictive values (PPVs) for reports/referrals received and to compare these according to the source of the report.

Materials and Methods

Setting and study description

The city of Dandenong is located in an outer suburban area of Melbourne, Australia. Dandenong and surrounding defined areas were chosen for the Spot study because of interest expressed in the project from the local GP divisions and because of the location of a dermatology outpatient clinic in the area. The tertiary referral occupational dermatology clinic that services the area is the Occupational Dermatology Clinic at the Skin and Cancer Foundation Inc, Victoria. This clinic provides patch testing services for most workers with OCD in the state of Victoria.

In Australia, Divisions of General Practice provide co-operative activities to improve GP integration with other elements of the health system and provide GP networking. Approximately 94% of GPs are members of a division (8). Extensive community consultation with the local divisional networks was carried out to design both the Spot

study and reporting form. As well as general referral information, the Spot reporting form also collected information regarding the reporting clinician's current treatment recommendations and usual management practices, this information is reported elsewhere (unpublished data).

Study sample

Using the networks of the GP divisions and Australasian College of Dermatologists, we estimate 90%–95% of practitioners in the area were identified. Through an information evening held in Dandenong and a direct letter of invitation, 700 GPs, 4 dermatologists and 1 dermatology outpatient clinic attached to a public hospital were invited to participate in Spot.

Data collection methods

Suspected cases were ascertained using two methods. In Method 1, GPs, dermatologists and the dermatology outpatient clinic used the Spot reporting form to report all workers whom they saw as part of their routine practice suspected of having OCD. Reporters were requested to diagnose OCD based on case definitions that were currently part of their practice, whether these were intuitive or based on criteria or guidelines. In Method 2, workers were identified who lived in the Spot study area and were referred to the Occupational Dermatology Clinic within the Spot reporting period. Referrals were received from a variety of sources including GPs not formally enrolled in Spot, dermatologists with clinics outside the geographical area of Spot, allergists and occupational health nurses. These referred workers were also included in the study.

A gold standard process, which included diagnostic patch testing, was used to verify suspected cases. The same specialist occupational dermatologist (Rosemary Nixon) made each of the diagnoses. For Method 1, workers attended 4 medical appointments at clinics held in Dandenong. Workers attended an initial appointment for assessment by a dermatologist, a second appointment for the application of patches (day 1), removal of patches (day 3) and final reading and diagnosis (day 4). For Method 2, workers attended the Occupational Dermatology Clinic for dermatological assessment and application of patches (day 1), removal of patches (day 3) and final reading and diagnosis (day 6). All workers were tested to the European standard series (Chemotechnique Diagnostics, Malmö, Sweden), as well as the workers' own samples appropriately diluted. Patch tests were applied using Finn chambers®

on Scanpor[®] tape (Epitest, Tuusula, Finland). After the final consultation, a letter was sent to the participating worker's referring doctor to assist with ongoing clinical management, and in some cases, a letter was sent to the worker's place of employment.

For workers who were reported to Spot, but who did not make an appointment or attend for patch testing, attempts at contact were made by telephone and letter. After 3 initial contact attempts, workers were telephoned and given a final opportunity to attend for patch testing and diagnosis. If they decided not to be patch tested, they were classified as dropping out of Spot. The workers who dropped out were asked about the current status of their skin condition and invited to supply a reason for dropping out of the study.

Analysis

The denominator for the disease rate was derived from the working population for the defined geographical area as supplied by the Australian Bureau of Statistics (ABS) 2001 census data (9).

We report number and type of reporting clinicians and basic demographic data, including age, sex and industry for study participants. Atopic status was ascertained from the Spot reporting form or from Occupational Dermatology Clinic data.

Workers with confirmed OCD were classified as incident cases, if on initial presentation, the worker reported symptoms for less than 3 months prior to the reporting period commencement date. The disease prevalence rate was generated from the number of workers reporting symptoms for longer than this time frame, plus the number of incident cases. PPVs were calculated for reports of workers with suspected OCD from GPs, dermatologists and the dermatology outpatient clinic and for referrals to the Occupational Dermatology Clinic. A PPV is the proportion of test positives that correctly identify individuals with a specified disease (10). For the purposes of the Spot study, this was the proportion of suspected reports/referrals which were deemed to be correctly reporting OCD after diagnosis by an occupational dermatologist using patch testing techniques.

The disease rate for the Spot study was compared to a clinic-based rate from the Occupational Dermatology Clinic that was generated using data for the 12 months immediately prior to the Spot study. Through the use of available workers' compensation data for the state of Victoria and population data from the ABS, a rate of workers with OCD who received compensation

was generated for comparison with the Spot study rate. Descriptive statistics [PPVs, *P* values and 95% confidence intervals (CIs)] were calculated using STATA 7 (11).

Ethics

The Spot study was approved by the Human Research Ethics Committee based at St. Vincent's Hospital, Melbourne (HREC 030/02).

Results

The initial phase of community consultation, study design, ethics approval and clinician recruitment took place from January to August 2002. For Method 1, GPs and dermatologists reported suspected cases of OCD to Spot from 30 September 2002 to 30 September 2003. For Method 2, clinic data for patients living in the geographical area covered by Spot were extracted from the Occupational Dermatology Clinic database for this period.

63/700 (9%, 95% CI: 7%–11%) GPs, 4/4 dermatologists and 1/1 dermatology outpatient clinic agreed to participate in Spot. Of these, 30 GPs, 2 dermatologists and the dermatology outpatient clinic reported one or more suspected cases and were classified as active reporters. 123 reports of suspected OCD were received by Spot, including 79 from GPs and 44 from the dermatologists/dermatology outpatient clinic. Of the GP reports, 20 were confirmed and 12 of these were incident cases. 16 of the dermatologist/dermatology outpatient reports were confirmed, and 9 of these were incident cases (Table 1).

48/123 (39%) workers reported to Spot dropped out prior to final diagnosis/case confirmation by the specialist occupational dermatologist. Attempts were made to contact all of these workers, 30/48 (63%) were successfully contacted by telephone. 14/30 (47%) who did not want to be patch tested had moved away from the area or were too busy to participate. 11/30 (37%) reported that their skin condition had improved, and they no longer sought medical attention. 5/30 (17%) supplied another reason for drop out including change of job (2), current pregnancy (1), hospital admission (1) or change of treating clinician (1).

For Method 2, a search was made of the Occupational Dermatology Clinic database. After matching for postcode, 58 patients were identified who had been referred to the clinic with suspected OCD, none of whom had been reported through Spot. 33 (including 20 incident cases) had been diagnosed with OCD and were added to the study

Table 1. Spot study: reports and referrals, cases and positive predictive values

	GP reports	Dermatologist and dermatology outpatient clinic reports	95% CI difference between proportions, <i>P</i> value	Occupational dermatology clinic referrals
<i>n</i> active reporters ^a /total practitioners in area (%)	30/700 (4.2%, 95% CI: 2.7%–5.8%)	3/5 (60%)	–	–
Workers with suspected OCD	79	44	–	58
Workers dropping out prior to case confirmation/diagnosis (%)	33 (42)	15 (34)	–11%–24%, <i>P</i> = 0.25	6 (10)
Confirmed: incident cases (all cases, %)	12 (20, 60%)	9 (16, 56%)	–19%–9%, <i>P</i> = 0.77 ^b	20 (33, 61%)
Positive predictive value ^c (95% CI)	43% (29%–59%)	55% (36%–74%)	–	63% (49%–76%)

GP, general practitioner; CI, confidence interval; OCD, occupational contact dermatitis.

^aActive reporters: GPs and dermatologists who submitted one or more reports to Spot.

^bIncident cases: GP reports compared to dermatologist reports.

^cExcluding workers dropping out prior to case confirmation.

total. Worker participation in Spot and origin of reports and clinic referrals, by sex, age, duration of symptoms and atopic status is summarized in Table 2.

A total of 182 reports/referrals of suspected OCD were received from Methods 1 and 2. Spot identified 69 cases of OCD, 41 of these incident cases, once case confirmation had been completed using the process described above. According to 2001 ABS census data, approximately 200 000 workers live in the area (9). Thus, the Spot study 1-year incidence rate was 20.5 per 100 000 (95% CI: 13–32.1), and the 1-year period prevalence rate was 34.5 per 100 000 (95% CI: 24.4–48.7).

Cases presented by origin of reports and clinic referrals are summarized in Table 1. PPVs for reports from GPs and dermatologists and for referrals received by the Occupational Dermatology Clinic had overlapping 95% CIs for each source. For reports from GPs, there was a PPV

of 43% (95% CI: 29–59%), for dermatologists 55% (95% CI: 36–74%) and for referrals received by the Occupational Dermatology Clinic 63% (95% CI: 49–76%). The small sample size, reflected by the large 95% CIs, has contributed to this overlap.

Workers with confirmed OCD were employed in 15 different industry groups. The most commonly affected industries were health care (17/69 workers, 25%), manufacturing (10/69, 14%) and construction (8/69, 12%). Other affected industries included the automotive industry (*n* = 7), food handling (*n* = 7), science (*n* = 4), engineering (*n* = 3), horticulture (*n* = 2), cleaning (*n* = 2) and hairdressing (*n* = 2). Final diagnoses, atopic status and other characteristics are summarized in Table 2.

For the 12 months immediately preceding the Spot reporting period (September 2001–2002), the 1-year incidence rate amongst workers attending

Table 2. Spot study: worker participation, origin of reports/clinic referrals, diagnoses and demographic data

	GP reports			Dermatologist reports			Dermatology clinic patients	All
	WDO ^a	WA ^b	confirmed	WDO	WA	confirmed	confirmed	confirmed
Number of workers	33	46	20	15	29	16	33	69
Males (%)	17 (53%)	27 (59%)	14 (70%)	8 (53%)	20 (71%)	10 (63%)	13 (42%)	37 (54%)
Age range (mean)	20–59 (32)	19–64 (42)	19–64 (45)	21–52 (34)	21–63 (40)	24–63 (42)	22–61 (39)	19–64 (42)
Duration of symptoms in weeks range(mean)	1–936 (79)	3–1560 (162)	3–312 (80)	3–520 (67)	6–1352 (104)	6–1352 (135)	2–1456 (137)	2–1456 (120)
Atopics (%)	12 (38%)	24 (52%)	10 (50%)	10 (67%)	14 (48%)	8 (50%)	25 (76%)	43 (62%)
ICD	–	–	12	–	–	11	20	43
ACD	–	–	5	–	–	4	11	20
CU	–	–	1	–	–	1	2	4
Other WR	–	–	2	–	–	0	0	2

^aWDO, workers who dropped out; ^bWA, workers attending all appointments; ICD = irritant contact dermatitis; ACD = allergic contact dermatitis; CU = contact urticaria.

the Occupational Dermatology Clinic who lived in the Spot geographical area was 6 per 100 000, and the 1-year period prevalence rate was 12.5 per 100 000. A rate of 6.55 per 100 000 for 'Skin diseases' for 2001–2002 was generated using available data from the Victorian WorkCover Authority (VWA) (12) and the ABS (13). Incidence and prevalence classification was not reported by the VWA for this data, and details regarding criteria for disease diagnoses were unavailable.

Discussion

The Spot study utilized reports and referrals from GPs and dermatologists in conjunction with a consistent process of patch testing and OCD diagnosis. Spot generated an incidence rate of 20.5 per 100 000 (95% CI: 13–32.1) and a 1-year period prevalence rate of 34.5 per 100 000 (95% CI: 24.4–48.7). Although Spot was of a smaller scale and shorter duration, the incidence rate may be compared with the Epiderm incidence rate of 12.9 per 100 000 (2). The true Australian rate of OCD is a matter of speculation, as at present, there is no comprehensive and compulsory national reporting system. Data from Spot build on information from other available Australian OCD datasets such as VWA workers' compensation datasets (6.55 per 100 000) and OCD clinic-based data from 2001/2002 (incidence rate of 6 per 100 000). The inadequacy of these datasets as proxy disease surveillance is highlighted by the Spot study.

A feature of Spot was the deliberate recruitment of GPs as reporters. As a result, Spot has detected a proportion of workers with OCD who would normally be managed solely by GPs in an Australian context. This finding may be compared to a study of hand dermatitis by Smit et al. (14) that used workplace-based questionnaires to characterize OCD in an occupational setting. This methodology detected a number of OCD cases that were less severe compared with those requiring medical attention or qualifying for workers' compensation. Less severe and/or more acute cases might be expected when comparing presentations of workers with OCD to GPs, with presentations to dermatologists or to a tertiary referral OCD clinic. Workers in Spot who presented to GPs had a shorter mean duration of disease. These workers also had a slightly higher (but not statistically significant) proportion of incident cases of OCD.

The Spot study is limited because of poor GP participation (9% of eligible GPs enrolled in the study) and low attendance by workers for the 4

appointment confirmation process (38% of workers reported through Method 1 did not attend for patch testing). There was also an inability to measure disease in individuals living in the area who presented to clinicians practising elsewhere. An attempt was made to identify some of these cases through inclusion of workers seen at the Occupational Dermatology Clinic. Although this clinic sees the majority of workers in Victoria who require patch testing, this method of case ascertainment still only detects the most severe cases.

In order to estimate the number of additional cases that were detected by Spot, the Occupational Dermatology Clinic rates of OCD were calculated. The Occupational Dermatology Clinic incidence rate for the Spot period (10 per 100 000) was similar to the clinic incidence rate for the previous 12 months (6 per 100 000). Cases reported to Spot (via Method 1) have detected a higher number of cases than would have normally been seen through the usual referral process by the Occupational Dermatology Clinic.

A particular strength of Spot was that a case was classified as confirmed after application of gold standard clinical tests and specialized interpretation (15). The lack of a consistent definition for OCD from the various disease registers has been noted (1, 16). Through the centralized OCD verification process, the Spot study was able to generate PPVs for GPs and dermatologists. Although patch testing is reported to have a sensitivity and specificity of approximately 70% (17), PPVs in this study were determined assuming a high degree of patch testing accuracy. PPVs were highest for the Occupational Dermatology Clinic referrals [63% (95% CI: 49–76%)] compared with reports from the dermatologists/dermatology outpatient clinic [55% (95% CI: 36–74%)] and from GPs [43% (95% CI: 29–59%)]. Although the small sample size limits any conclusions, the lower GP PPV may be associated with a screening effect from the referral process of GPs to dermatologists. Another possibility may be an increased recognition of OCD by dermatologists.

Conclusions

Although Spot has its limitations, the study is the first to provide more extensive disease estimates for OCD in an Australian setting than are currently available. Spot has also highlighted the differences between the PPVs of reports from different settings, information that may potentially be generalizable to other systems that use a range of reporters. Whilst comparisons between Epiderm and Spot are restricted because of the different study designs, the data suggest that

Australian OCD disease rates may be consistent with those in the UK. Rather than disease surveillance which aims to provide a systematic compilation of disease morbidity or mortality (18), the Spot study provides information that through a process of triangulation with other datasets, may contribute to a better understanding of the epidemiology of OCD.

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References

1. Diepgen T L. Occupational skin-disease data in Europe. *Int Arch Occup Environ Health* 2003; 76: 331–338.
2. Cherry N, Meyer J D, Adishes A, Brooke R, Owen-Smith V, Swales C, Beck M H. Surveillance of occupational skin disease: Epiderm and Opra. *Br J Dermatol* 2000; 142: 1128–1134.
3. Kanerva L, Jolanki R, Toikkanen J, Tarvainen K, Estlander T. Statistics on occupational dermatoses in Finland. *Curr Probl Dermatol* 1995; 23: 28–40.
4. Dickel H, Kuss O, Blesius C R, Schmidt A, Diepgen T L. Occupational skin diseases in Northern Bavaria between 1990 and 1999: a population-based study. *Br J Dermatol* 2001; 145: 453–462.
5. Dickel H, Bruckner T, Bernhard-Klimt C, Koch T, Scheidt R, Diepgen T L. Surveillance scheme for occupational skin disease in the Saarland, FRG. First report from BKH-S. *Contact Dermatitis* 2002; 46: 197–206.
6. Azaroff L S, Levenstein C, Wegman Dh. Occupational injury and illness surveillance: conceptual filters explain underreporting. *Am J Public Health* 2002; 92: 1421–1429.
7. Adishes A, Meyer J D, Cherry N M. Prognosis and work absence due to occupational contact dermatitis. *Contact Dermatitis* 2002; 46: 273–279.
8. Australian Divisions of General Practice. *Australian Divisions of General Practice: Annual Report*. Canberra, 2004.
9. Australian Bureau of Statistics. Census of population and housing: selected education and labour force characteristics for statistical local areas, Victoria 2001. Canberra: Australian Bureau of Statistics, 2003.
10. Greenland S. Basic methods for sensitivity analysis. In: *Modern Epidemiology*, Rothman K (ed.): Philadelphia, Lippincott Williams & Wilkins 1998.
11. StataCorp. *Stata Statistical Software: Release 7.0*. College Station, TX, Stata Corporation 2001.
12. Victorian WorkCover Authority. *2002–2003 Statistical Summary* (available from www.workcover.vic.gov.au). Melbourne, 2003.
13. Australian Bureau of Statistics. *Basic Community Profile, 1996 Census of Population and Housing (Victoria)*. Canberra: Australian Bureau of Statistics, 2000.
14. Smit H A, Burdorf A, Coenraads P J. Prevalence of hand dermatitis in different occupations. *Int J Epidemiol* 1993; 22: 288–293.
15. van der Valk P G, Devos S A, Coenraads P J. Evidence-based diagnosis in patch testing. *Contact Dermatitis* 2003; 48: 121–125.
16. Diepgen T L, Coenraads P J. The epidemiology of occupational contact dermatitis. *Int Arch Occup Environ Health* 1999; 72: 496–506.
17. Nethercott J. Practical problems in the use of patch testing in the evaluation of patients with contact dermatitis. *Curr Probl Dermatol* 1990; 2: 4.
18. Last J. *A Dictionary of Epidemiology*. New York: Oxford University Press 1988.

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