The occurrence of leg ulcers in Auckland: results of a population-based study

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Abstract

Aim. To estimate the cumulative incidence rate and prevalence of leg ulcers in Auckland.

Methods. A cross-sectional study was conducted to identify all individuals who had or developed a leg ulcer in the North Auckland and Central Auckland health districts between 1997 and 1998. Cases were identified through multiple sources, including community-based and hospital-based health professionals and by self-notification. All ulcer types were investigated.

Results. 611 individuals with healed or current leg ulcers were identified during the study period, of whom 426 had current leg ulcers. The annual cumulative incidence rate was 32 per 100 000. The point prevalence of current leg ulcers was 39 per 100 000, with a period prevalence of 79 per 100 000 per year. Men had lower age-adjusted incidence rates than women, but a higher age-adjusted point prevalence of leg ulceration, indicating that ulcers take longer to heal in men. Annual cumulative incidence rates increased steeply with age (< 60 years = 4, 60 – 69 years = 62, 70 – 79 years = 191, 80+ years = 466 per 100 000 per year), as did point prevalence (< 60 years = 5, 60 – 69 years = 76, 70 – 79 years = 238, 80+ years = 564 per 100 000).

Conclusions. These data indicate that the risk of developing leg ulcers increases dramatically with age, with individuals aged 60 years and over particularly at risk. Given New Zealand's rapidly ageing population, the number of older people with leg ulcers each year is expected to double in the next 25 years.

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In New Zealand no published data are available on the number of individuals in the community who suffer from leg ulcers. Consequently, the planning and provision of adequate and effective health care management for such people is based on incidence and prevalence data from other countries.[1-7] The estimates from these studies, however, are

not the most appropriate to use in a New Zealand setting, given their methodological problems and population differences in sociodemographic and other variables. To address the paucity of New Zealand-specific data, a study was conducted in Auckland to obtain more reliable estimates of the occurrence of leg ulcers in this country.

Methods

The Auckland Leg Ulcer Study involved the identification of all individuals resident in the North Auckland and Central Auckland health districts who had or developed a leg ulcer over a 12-month period (1 November 1997 - 31 October 1998). Cases of all ages were included in the study, regardless of aetiology. A leg ulcer was defined as any break in the skin on the lower leg (below the knee) or on the foot, which had been present for more than six weeks. A healed leg ulcer was considered a wound that had been resurfaced with epithelium and looked pink, dry and smooth. An individual was included only once as a case, and thus a case was considered to be the person and not the ulcer.

Cases were identified through notifications from health professionals and by self-notification. Health professionals practicing within the study region, who were likely to encounter leg ulcer patients were identified from the 1997 Auckland telephone directory. These health professionals included general practitioners (GPs) and practice nurses, district nurses and nurses from the Auckland ulcer team, rest home and retirement village nurses and supervisors, specialists (including dermatologists, diabetes clinic staff, general surgeons, and vascular surgeons), podiatrists, key staff at public and private hospitals (outpatient departments and inpatient wards), key staff at accident and emergency centres, and hyperbaric nursing staff at the Royal New Zealand Navy base. Health professionals who agreed to participate in the study were asked to identify and notify the study centre (via free-post form) of each person who had a current or healed leg ulcer or who developed a leg ulcer during the study period. A self-referral pathway was also established so that cases who did not seek medical care for their ulcers could be recruited. A toll-free telephone number was advertised via monthly newspaper advertisements and poster displays throughout the community and in the offices of non-participating health professionals.

Information collected on each notification form included: the source of ascertainment (health professional or self-notified), date of birth and gender of ulcer patient; whether the case had a current or healed leg ulcer, and if current, the date of onset of the ulcer. No data were collected on ethnicity or ulcer aetiology. All notifications were cross-checked to ensure that individuals who were identified from more than one source were counted only once. Age was considered 'age at notification'.

Cumulative incidence rates, point prevalence, and period prevalence were calculated using standard techniques.[8,9] Cumulative incidence rate refers to the number of people from the study population who developed a leg ulcer during the study period. Point prevalence refers to the number of people from the study population that had a current ulcer that developed before the study period. Period prevalence refers to the number of cases that were present at the start of the study period plus the number of new cases that developed during the study period.[9,10] Consequently, this measure combines both incidence rate and point prevalence into a single parameter. Ninety five percent confidence intervals (95% CI) were calculated for the main estimates using the standard approach for a single proportion.[8] Prevalence and cumulative incidence rates were standardised to the 1996 New Zealand population[11] using the direct method of standardisation.[8,9] Age-specific point and period prevalence data obtained in the Auckland study, in addition to data obtained in four other cross-sectional studies,[12-23] were also standardised to the Segi world population[24] using the direct method of standardisation.[8,9] Differences between unadjusted and age-standardised rates for study region and gender were investigated using Poisson methods to calculate z scores,[25] while statistical comparisons between continuous variables were made using the independent two sample t-test.[8] Negatively skewed data were transformed (cubed) before undertaking statistical analysis so that the data were more normally distributed.[8] All p-values reported are two-tailed. All statistical analyses were conducted using SAS for Windows (version 6.12) and Epi Info (version 6.04).

Results

426 health professional practices within the study region were identified from the Auckland telephone directory. The majority of health professionals (93%) agreed to be involved in the study.

Number and source of notifications. 632 notifications were received during the 12-month study period, representing 611 individuals with current or healed leg ulcers. Almost 60% (347) of cases were resident in the Central Auckland region at the time of notification. Two hundred and eighty eight (46%) cases self-notified. District nursing groups identified 212 (34%) cases and general practitioners identified 81 (13%). Less than 6% of notifications were received from each of the other health professional groups involved in the study (resthomes and retirement villages 29, specialists 6, podiatrists 7, private and public hospitals 9). Cases that self-notified were younger, more likely to be male, more likely to have healed ulcers, and to be from the North Auckland region than cases notified by health professionals (data not presented).

70% (426) of cases had a leg ulcer at the time of notification, while 30% reported healed leg ulcers only. Of the 611 cases identified, 606 (99%) provided their date of birth. Age ranged from 18 to 96 years, with an average of 73 years (median = 75 years). More than 75% of cases were aged 67 years and older. Just over 60% (374) of cases were female. The age distribution of cases was negatively skewed for both sexes, with women aged 75 years on average (median = 77 years) compared to 70 years on average for men (median = 73 years) ($p < 0.001$).

Cumulative incidence rates. Of the 426 cases with current leg ulcers, 385 (90%) provided details about when their ulcer first occurred. 174 (45%) people were identified as having incident leg ulcers. Given a population of 540 435 in the study region,[11] the cumulative incidence rate was 32 per 100 000 per year (95% CI = 27 – 37 per 100 000 per year). After adjusting for age, the North Auckland region was found to have a higher cumulative incidence rate of leg ulcers than the Central Auckland region (33 per 100 000 per year North Auckland versus 29 per 100 000 per year Central Auckland, $p < 0.001$). Age-adjusted data also indicated that women had a much higher cumulative incidence rate of leg ulcers than men (33 per 100 000 per year in women versus 26 per 100 000 per year in men, $p < 0.001$). Furthermore, cumulative incidence rates were seen to increase markedly with age (Table 1).

Point prevalence. 211 (55%) people with current leg ulcers were identified as prevalent cases, giving a point prevalence of 39 per 100 000 (95% CI = 34 – 44 per 100 000). This estimate was higher in the North Auckland region compared to the Central Auckland region, after adjusting for age (42 per 100 000 North Auckland versus 35 per 100 000 Central Auckland, $p = 0.02$). Age-adjusted data also indicated that men had a higher point prevalence than women (39 per 100 000 versus 35 per 100 000, $p < 0.001$). Point prevalence was seen to increase progressively with age for both sexes (Table 1).

Period prevalence. Overall, 426 people with current leg ulcers were identified, giving a one-year period prevalence of 79 per 100 000 (95% CI = 71 – 86 per 100 000 per year). Age-adjusted data showed that North Auckland had a higher period prevalence of leg ulcers than Central Auckland (76 per 100 000 per year North Auckland versus 75 per 100 000 per year Central Auckland, $p < 0.001$). Period prevalence was also found to increase progressively with age for both men and women (data not presented). Additionally, after adjusting for age, women were found to have a higher period prevalence of current leg ulcers than men (75 per 100 000 per year versus 73 per 100 000 per year, $p < 0.001$).

Comparison of data with other studies. Four published studies were identified that provided information on the age and gender distribution of leg ulcers in their study population. These studies included the Lothian and Forth Valley Study,[16-19] the Perth Study,[13-15] the West London Study,[12] and the 1988 Skaraborg Study.[20-23] The age-standardised prevalence figures obtained in the Auckland

Table 1. Age and gender-specific cumulative incidence rates and point prevalence (current leg ulcer cases only).

Age group (years)	Male: Number of cases	Male: Cumulative incidence rate (100 000/year)*	Female: Number of cases	Female: Cumulative incidence rate (100 000/year)*	Total: Number of cases	Total: Cumulative incidence rate (100 000/year)*
0-9	0	0	0	0	0	0
10-19	0	0	0	0	0	0
20-29	0	0	0	0	0	0
30-39	2	4	1	2	3	3
40-49	2	5	2	5	4	5
50-59	6	24	6	24	12	24
60-69	5	29	17	93	22	62
70-79	26	212	30	175	56	191
80+	17	327	59	531	76	466
Missing	1	-	0	-	1	-
Total	59	22	115	41	174	32

Age group (years)	Male: Number of cases	Male: Point prevalence rate (per 100 000)*	Female: Number of cases	Female: Point prevalence rate (per 100 000)*	Total: Number of cases	Total: Point prevalence rate (per 100 000)*
0-9	0	0	0	0	0	0
10-19	0	0	1	3	1	1
20-29	1	2	0	0	1	1
30-39	2	4	1	2	3	3
40-49	4	11	1	3	5	7
50-59	7	28	5	20	12	24
60-69	15	87	12	66	27	76
70-79	35	285	35	205	70	238
80+	23	442	69	621	92	564
Total	87	33	124	45	211	39

* Based on the population of the North Auckland and Central Auckland health districts (from 1996 census data)[11]. Note: Period prevalence data are available on request from the authors.

study were on average three times lower than estimates obtained in Sweden, Australia, Scotland, and England, for cases aged 40 years and older, 55 years and older, and for all ages combined (Table 2).

Discussion

This study has shown that in the Central and North Auckland regions less than 0.1% of the population suffer from leg ulcers at any one time. However, the cumulative incidence rates, point prevalence, and period prevalence of leg ulceration were found to increase dramatically with age. While approximately one in every 21 000 people under 60 years of age will have a leg ulcer at any one point in time, the rates increase to approximately one in every 1300 people aged 60 to 69 years, one in every 400 people aged 70 to 79 years, and one in every 200 people aged 80 years and older. Men had lower age-adjusted incidence rates than women, but a higher point prevalence of leg ulceration, indicating that ulcers take longer to heal in men. A geographical difference in the occurrence of leg ulcer cases was also noted. The observed difference in estimates according to gender and study region may be partly explained by different case referral patterns, but may also be real differences due to variations in ulcer management and/or risk factors.

As with most cross-sectional studies of disease frequency, certain biases will have affected the validity of the data. It is possible that we failed to locate some leg ulcer cases due to differential selection of cases and referral bias. While exhaustive efforts were made to identify all cases, some individuals will not have been found, resulting in an under-

Table 2 Comparison of age-standardised point prevalence and period prevalence of leg ulcers from five countries, using the Segi world population[24] as the standard population.

Study name and year started	Country of study	Method of case identification	Time period of study	Minimum duration of ulcer	Case definition: Foot ulcers included?	Case definition: Ulcer status	Age-standardised data (>=40 years): Male	Age-standardised data (>=40 years): Female	Age-standardised data (>=55 years): Male	Age-standardised data (>=55 years): Female	Age-standardised data (all ages): Male	Age-standardised data (all ages): Female
Point prevalence (per 100 000)												
Skaraborg Study (1988)[20-23]	Sweden	HP referral	6 weeks	6 weeks	Yes	Current	–	–	575	802	103	134
Auckland Study (1997)	New Zealand	HP referral and self referral	12 months	6 weeks	Yes	Current	–	–	139	117	24	20
Three month period prevalence (per 100 000/3months)												
Perth Study (1989)[13-15]	Australia	HP referral and self referral	3 months	4 weeks	Yes	Current	169	203	–	–	56	67
Auckland Study (1997)	New Zealand	HP referral and self referral	3 months	6 weeks	Yes	Current	70	70	–	–	24	22
Three month period prevalence (per 100 000/3 months)												
Lothian and Forth Valley Study (1981)[16-19]	Scotland	HP referral	3 months	Not stated	Yes	Current	–	–	283	553	61	99
Auckland Study (1997)	New Zealand	HP referral and self referral	3 months	6 weeks	Yes	Current	–	–	136	142	23	23
One-year period prevalence (per 100 000/year)												
West London Study (year not stated[12]	England	HP referral	12 months	Not stated	Not stated	Current	–	–	243	306	43	56
Auckland Study (1997)	New Zealand	HP referral and self referral	12 months	6 weeks	Yes	Current	–	–	135	162	26	29

HP=Health professional. Note: The Auckland study refers to the study described in this paper.

estimation of disease frequency. Furthermore, some patient groups are more likely to have been notified than other groups. For example, people with significant comorbidity, pain or mobility problems may receive more intensive follow-up and therefore be more likely to be notified. By comparison, the low proportion of notifications received from specialists may be due to the reluctance of this group to refer cases to the study, although it is more likely to be a reflection of the fact that most care is community-based.

Recall bias is also likely to have occurred. Recall of dates in particular, would have resulted in misclassification bias, such that some prevalent cases may have been misclassified as incident cases and vice-versa. Reporting delays would also have led to the misclassification of prevalent and incident cases and healed or current leg ulcer cases. The number of false positive cases was not determined in this study. However, the number was likely to be small given that a false positive rate of only 5% was observed when 241 cases from this study were interviewed for a subsequent case-control study. The presence of recall and misclassification bias will have resulted in either an under- or over-estimation of the observed estimates.

Although trends in the age and gender distribution of leg ulcer cases in the Auckland region were similar to those observed in previous studies,[6,20-23,26] results are not directly comparable due to the wide variability in study methodology and case definitions used. However, the age-standardised prevalence figures obtained in the Auckland study do appear to be lower than estimates obtained in other countries. As well as a true difference in occurrence rates, the observed disparity may be an indication that the Auckland study was less successful at identifying leg ulcer cases than the other studies.

The Auckland study is unique since it provides some of the first detailed cumulative incidence rate data in the world on leg ulcers. Although cumulative incidence rates were published from the Basle study,[27,28] the Malmo study[6] and the London Study,[29] detailed age- and gender-specific cumulative incidence rate data were not available from these studies. Using data from all three published studies, the unadjusted cumulative incidence rate of leg ulcers for all ages is estimated to be between 0.3 and 3.4 per 1000 per year. The rate obtained in the Auckland study lies at the lower end of this range. As with the prevalence data from this study, it is not known whether this rate is a true reflection of the number of incident cases in Auckland or whether there was significant under-reporting of incident cases in this study.

This study was conducted on an urban population with a very similar age and gender distribution to the overall New Zealand population. It would be reasonable to assume, therefore, that the data obtained are broadly generalisable to the New Zealand population as a whole. However, both cumulative incidence rates and prevalence are likely to vary geographically around New Zealand as a result of differences in the prevalence of risk factors for leg ulceration and variations in ulcer management across regions. Information from this study does, however, have important implications for the provision of health care funding throughout New Zealand. Prevalence information will be useful for assessing the current needs of this population, while cumulative incidence rate data will enable the needs of future cases to be taken into account. For instance, population projections indicate that the number of people aged 65 years and older in New Zealand will almost double in the next 25 years, with the proportion of people in this age group increasing from 12% to approximately 20% of the total population.[30] Using data from the Auckland study, the cumulative incidence rate of leg ulcers in people aged 65 years and older is 222 per 100 000 per year. If this rate remains constant over the coming years, one can assume that the number of new leg ulcer cases in New Zealand each year will also double in the next 25 years. This finding has important implications for allocation of health care resources for the management of leg ulcers.

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