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Trends in the Incidence of Bowen Disease Based on a Single-Center Study in the Netherlands

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BACKGROUND  Incidence trends of nonmelanoma skin cancer show an increase. Few data have been published about the incidence of Bowen disease (BD). Three previous studies, conducted more than 15 years ago in North America, found large variation in incidence rates in Caucasians, and trends over longer periods have never been studied.

OBJECTIVE  To estimate the incidence of BD in a Caucasian population in Northern Europe (Maastricht, the Netherlands) between 2003 and 2013.

METHODS  Primary and histologically confirmed BD, diagnosed in Maastricht, the Netherlands, in the years 2003, 2008, and 2013, was retrieved from a pathology database. Age-standardized and sex-specific incidence rates per 100,000 inhabitants were calculated by using the age distribution of the European standard population of 2013.

RESULTS  A statistically significant increase in the annual age-standardized incidence rates per 100,000 people was found from 8.1 (95% confidence interval [CI] 3.7–12.5) in 2003 to 68.9 (95% CI 57.2–80.7) in 2013 ($p < .001$). For women, there was an increase from 7.7/100,000 (95% CI 2.0–13.4) in 2003 to 76.8/100,000 (95% CI 60.2–93.5) in 2013, respectively ($p < .001$). An increase from 8.8/100,000 (95% CI 1.8–15.9) in 2003 to 59.2/100,000 men (95% CI 42.8–75.6) in 2013 ($p < .001$) was found.

CONCLUSION  These findings suggest an increase in the annual age-standardized incidence rates in BD.
The authors have indicated no significant interest with commercial supporters.

Nonmelanoma skin cancer is the most common malignancy in Caucasian populations.1 A recent systematic review reported rising incidence trends in basal cell carcinoma (BCC) and squamous cell carcinoma (SCC) worldwide.1 In contrast to these 2 most common forms of nonmelanoma skin cancer, only few data have been published on the incidence of Bowen disease (BD).

Bowen disease is a cutaneous intraepithelial SCC in situ, which was first described in 1912 by Bowen.2 A low risk of progression to SCC is reported.3,4 Only a very few studies report on incidence rates of BD in Caucasians. To date, estimates of the incidence rates largely come from studies in the United States, which were conducted more than 20 years ago and showed large variation with 10-fold differences in incidence rates.5,6 A more recent study reported an average annual incidence of 22.4 and 27.8/100,000 in female and male Canadian residents, respectively, in the period between 1996 and 2000.7 Variation in the reported incidence of BD can be explained by the differences in sun exposure of the studied population groups due to differences in latitude and climate between the regions where the studies were conducted. The divergence in incidence rates stresses...
the importance of representative climate conditions when drawing conclusions about the incidence of BD.

To the best of the authors’ knowledge, there are no studies that estimate the incidence and incidence trends of BD in the Caucasian population living in Europe, and consequently, up-to-date and representative figures for the incidence trend of BD in Europe are lacking. Information about these trends is important for health care planning.

Here, the authors present the incidence and incidence trends of BD in a Caucasian population in Northern Europe.

**Methods**

Estimates of BD incidence and trends in incidence over time are based on a retrospective study using data from a pathology registry and the corresponding electronic patient files of the Maastricht University Medical Center (MUMC+) in the Netherlands. The MUMC+ is the only hospital in the district of Maastricht and a tertiary referral hospital for dermatology in the Netherlands.

**Data**

All patients with a primary BD diagnosed in 2003, 2008, and 2013 in the MUMC+ were retrospectively identified through the PALGA (Pathologisch-Anatomisch Landelijk Geautomatiseerd Archief) database, an electronic archive recording all pathological diagnoses made by affiliated pathology departments. The MUMC+ is the only hospital in the district of Maastricht. The search terms used were “Bowen’s Disease” or “Bowen” and “carcinoma in situ” combined with topography “skin.” The full pathology reports and the medical records were reviewed by 1 investigator. Included were patients living in the district of Maastricht with a histopathologically confirmed BD diagnosed by biopsy or excision. Only 1 BD per patient was included in this study, which is defined as the first BD in the studied periods. Each subsequent BD in the same patient was excluded. Also excluded were tumors with anogenital localization, recurrent tumors, and lesions that included an invasive SCC in the biopsy or the excision. Patients from other geographical areas than the district of Maastricht or slides, which were sent from other laboratories to the authors’ hospital for second opinion, were excluded. The authors excluded patients from other geographical areas because the authors matched the data retrieved from the PALGA with clinical information: Patient and tumor characteristics were obtained from the pathology reports and the (electronic) patient reports in the authors’ hospital. Recorded were age of onset, sex, tumor localization, size of the tumor, and chronic use of immunosuppressive drugs. For tumor size, the largest clinically recorded diameter in millimeters was used.

To exclude a shift in the definition of BD, a PALGA search was performed to obtain the number of lesions within the spectrum of BD (actinic keratosis [AK] and SCC), for 2003, 2008, and 2013.

**Statistical Analysis**

Age- and sex-specific incidence rates per 100,000 inhabitants in the district of Maastricht were calculated using 5-year groups. Data about the age and sex distribution of the population of the district of Maastricht were derived from the Dutch Central Bureau of Statistics. The age distribution of the European standard population of 2013 was used for calculation of age standardized incidence rates with an Excel template from the UK National Office for Statistics. Trend over time was tested for statistical significance by using the chi square test for trend in proportions.

For descriptive purposes, tumor and patient characteristics are presented as numbers and percentages for categorical variables and as mean (±SD) or median with range for continuous variables. The distribution of variables in the years 2003, 2008, and 2013 was compared, and differences were tested for significance using the chi square test for proportions and analysis of variance or the nonparametric Kruskal–Wallis test for continuous variables. Analyses were performed using SPSS version 23.0 (IBM, Corp., Armonk, NY) or R version 2.15.1. A p-value ≤.05 was considered to indicate statistical significance.
Results

The search in the PALGA database for “Bowen’s Disease” or “Bowen” or “carcinoma in situ” combined with topography “skin” resulted in 677 records. As illustrated in Figure 1, excluded were double records coding for 1 tumor (e.g., biopsy and excision) (186 records), patients with missing data (20 records), tumors diagnosed in the previous year (10 records), tumors that were wrongly labeled with the diagnosis BD (102 records), tumors that were located in the anogenital region (14 records), recurrent tumors (14 records), slides of patients from geographical areas outside the district of Maastricht (90 records), and records of subsequent tumors from patients who were already included in the study (20 records).

In total, 221 primary and histologically confirmed BDs were retrieved from the PALGA database: 13 patients in 2003, 76 patients in 2008, and 132 patients in 2013.

Patient and tumor characteristics are presented in Table 1. Most patients were female, and most tumors were located in the sun-exposed areas (head and neck region and extremities). No statistical difference in sex, age, and localization of the tumor between the 3 year groups was found. A statistically significant decrease was observed with respect to the proportion of immunocompromised patients (p < .001) between 2003, 2008, and 2013. A trend toward decrease of the median maximal tumor size was observed, from 10 mm in 2003 and 2008 to 8 mm in 2013 (p = .06).

The number of valid search hits for 2003, 2008, and 2013 increased for AK from 256 to 391 and 432, respectively, and for SCC from 124 to 188 and 259, respectively.

Incidence and Incidence Trend

The absolute number of patients with a histologically confirmed first BD in the district of Maastricht increased from 13 in 2003 to 76 in 2008 and to 132 in 2013. For women, a statistically significant increase in

![Figure 1. Overview of search records from PALGA database in Maastricht for “Bowen’s Disease” or “Bowen” or “carcinoma in situ” combined with topography “skin” for the years 2003, 2008, and 2013 and the selection of valid records. BD, Bowen disease.](image-url)
annual age-standardized incidence rates per 100,000 was observed from 7.7 (95% confidence interval [CI] 2.0–13.4) in 2003 to 56 (95% CI 41.3–70.7) and 76.8 (95% CI 60.2–93.5) in 2008 and 2013, respectively (p < .001). Also, a significant increase of the annual age-standardized incidence rates per 100,000 men was observed from 8.8 (95% CI 1.8–15.9) in 2003 and 26.1 (95% CI 14.6–37.5) in 2008 to 59.2 (95% CI 42.8–75.6) in 2013 (p < .001). For both sexes combined, the annual age-standardized incidence rates per 100,000 inhabitants increased significantly from 8.1 (95% CI 3.7–12.5) in 2003 to 44.9 (95% CI 34.8–54.9) in 2008 and to 68.9 (95% CI 57.2–80.7) in 2013 (p < .001). Trends are visualized in Figure 2.

**Discussion**

This retrospective study reports age-standardized incidence rates for histologically verified BD and trends in incidence in Maastricht, the Netherlands. The results showed a statistically significant trend with a substantial increase of histologically confirmed BD between 2003 and 2013.

There are several possible explanations for the increasing trend found in the authors’ study. As seen in other skin malignancies, the observed trend may reflect an actual increase in incidence of BD. Sun exposure is an important risk factor for BD as it is for other nonmelanoma skin cancer. The increase of affordable sun exposure may result in higher incidence of BD, which is supported by the higher proportion of patients with BD located on areas exposed to the sun during leisure time (trunk) (Table 1). Both the increased incidence and the shift to preferential localization on the trunk have been observed in other sun-related skin neoplasms (e.g., superficial BCC).

The observed trend may also be the result of more frequent histological examination of clinically suspected skin lesions. Furthermore, a rising awareness can be an explanation for the increased number of biopsies taken by physicians. A PALGA search for lesions in the spectrum of BD for 2003, 2008, and 2013 also showed an increasing trend in the number of AK and SCC.

There is limited literature on the incidence rates and trends in BD. Previous studies on the incidence of BD were performed in different countries and in different periods, and the incidence rates varied a lot. The study of Reizner and colleagues is the only study that...
reports on the incidence trend in BD. Fluctuations were found, but no trend was observed in this 5-year study period. Notably, this study was performed in a different population in a sunny climate. Similar to the authors’ findings, an increase in the incidence of SCC since 1989 was found in a different study performed in the Netherlands, with an accelerated increase in incidence rates of SCC in females and males since 2002 and 2003, respectively.15 Furthermore, a previous study that addressed the incidence rates of BCC in the same region as the authors between 1991 and 2007 in a comparable population as the authors’ population found an increase in the incidence of BCC, especially sBCC.14

Bowen disease is not registered in the Dutch cancer registries. Therefore, these data had to be derived from a hospital-based registry. A limitation is that the authors’ data was derived from 1 hospital, the MUMC+. This is a referral center for dermatological oncology, and therefore, the tumors of BD diagnosed could represent a selected sample. To reduce selection bias, the authors only included the patients who live in the adherence area of the MUMC+. It seems reasonable to assume that the observed changes in the MUMC+ adherence region represent a realistic trend. In conclusion, the results of this study based on histologically verified diagnoses of BD indicate an increase in the annual age-standardized incidence rates of BD in the Netherlands.

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References


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