



Original Research

The burden of malignant melanoma – Lessons to be learned from Austria



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Abstract *Aim of study:* Incidence rates of melanoma, generated by cancer registries (CRs), are susceptible to reporting inconsistencies due to increasing decentralisation of diagnosis. We therefore independently assessed the burden of melanoma in Austria.

Methods: We collected histopathological reports on melanoma of all patients diagnosed in Austria in 2011. Demographic and clinical characteristics, histopathological tumour stages were assessed. Their regional distributions and incidence rates were analysed and compared with data of national and international CRs.

Results: A total of 5246 patients were diagnosed with 1951 *in-situ* and 3295 invasive melanomas in Austria in 2011 (population 8.4 million). Age, sex and anatomic distribution corresponded to findings in other European countries, however, the incidence of 25/100,000 (world age-standardised rate) for invasive melanomas was two-fold higher than published by the

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Austrian CR (12/100,000). Varying frequencies in diagnosing thin melanomas (≤ 1 mm; $n = 4415$) accounted exclusively for significant regional disparities, while advanced tumours (> 1 mm; $n = 761$) were evenly distributed. Western Austria showed the highest rates (36/100,000). Patients from eastern Austria whose melanomas were diagnosed in laboratories in western Austria ($n = 76$) showed significantly higher proportions of *in-situ* lesions ($n = 43$; 57%) compared to those whose tumours were diagnosed in eastern Austria ($n = 4014$; *in-situ* = 1369; 34%) ($p < 0.0001$).

Conclusions: In Austria, the melanoma burden and its potential socio-economic implications are significantly underestimated. Similarities of incidences indicate this could affect other European countries with well-established CRs and compromise international comparability of data. Austrian regional disparities suggest overdiagnosis of thin melanomas due to the variability of pathologists' thresholds for the diagnosis of early stage tumours.

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1. Introduction

The burden of melanoma has been dramatically increasing since the 1950s [1–6]. Worldwide, population-based cancer registries (CRs) generate incidence rates and databases for epidemiological research, cancer prevention, and control [7–10]. Data quality of CRs entirely depends on the completeness of case ascertainment, which is estimated by a variety of standard methods [3,4,7,8,11,12]. However, little is known about the relative merits and weaknesses of such methods, and studies on case completeness (CC) at the level of facilities, where the diagnosis and treatment occurs, are lacking [8,11,13,14].

In Austria, the federal statistics agency “Statistics Austria” runs the national Cancer Registry (CR) and hospital-based facilities are legally obliged to report all newly diagnosed cancer cases (Cancer Statistics Act 1969 and Cancer Statistics Ordinance 1978). Since 1983 the Austrian CR has annually published absolute numbers, incidence rates and trends of malignancies and investigated its CC on national and regional levels with internationally recommended methods [15–18]. In 2007 the International Agency for Research on Cancer (IARC) classified the Austrian data quality as high and in 2012 the Austrian CR estimated an 94% overall CC for 2005 [16,19]. In contrast to hospitals, Austrian clinicians in private practice and non-hospital-based pathology laboratories are not legally obliged to report cancer cases. This might lead to reporting inconsistencies of melanoma cases as those are frequently diagnosed in non-hospital settings [13,14]. Still, Statistics Austria, although suspecting that underreporting influences incidences of various cancer types, assumes that melanoma patients diagnosed in outpatient settings would require subsequent hospital-based treatment leading to their registration [15]. However, this might not apply to thin melanomas.

The Austrian CR published an incidence rate of 12 new melanoma cases/100,000 (world age-standardised rate

[WSR]) for 2011, implying a 2.5 fold increase since 1983 similar to increments seen in many Western countries [4,6,15,20,21]. Apart from a true rise in numbers, better documentation by CRs and raised dermatological surveillance may underlie this so called “melanoma epidemic” [17,18,21,22]. On the other hand, the increased detection of early tumours associated with rising skin biopsy and stable disease-specific mortality rates are suggestive of overdiagnosis of melanoma – defined as diagnosing a condition that although fulfilling the pathological criteria for cancer would not go on to cause symptoms and death – and/or false-positive diagnosis – that is overcalling benign lesions as malignant [1,2,22,23]. However, research into these complex and contentious issues on a national level is challenging and evidence remains scarce.

In this population-based study, we obtained complete nationwide numbers of all primary melanomas diagnosed in Austria in 2011. We quantified the exact magnitude of melanoma underreporting to the CR and analysed regional disparities in incidence rates of early and late stage tumours.

2. Methods

2.1. Study population and data collection

The institutional review board of the city of Vienna approved the study, a joint-effort of the Austrian Societies of Dermatology and Pathology. We retrieved all histopathological reports from the year 2011 containing the term “melanoma” in their diagnosis section directly from all hospital- and non-hospital-based pathological and dermatopathological institutes, registered with the Austrian Medical Chamber and the Austrian Economic Chamber, either as hard copies or electronically.

2.2. Inclusion and exclusion criteria

We included only primary melanomas and excluded all patients with residence abroad, reports on metastases,

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