European Journal of Cancer (2015) xxx, xxx–xxx

Available at www.sciencedirect.com

ScienceDirect

journal homepage: www.ejcancer.com

Similar anatomical distributions of childhood naevi and cutaneous melanoma in young adults residing in northern and southern Sweden

Maria A. Karlsson [a,*], Ylva Rodvall [b], Carl-Fredrik Wahlgren [a], Kerstin Wiklund [c], Bernt Lindelöf [a]

[a] *Dermatology and Venereology Unit, Department of Medicine Solna, Karolinska Institutet and Karolinska University Hospital, Stockholm, Sweden*
[b] *Department of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden*
[c] *Karolinska Institutet, Stockholm, Sweden*

Received 24 November 2014; received in revised form 14 June 2015; accepted 23 June 2015

KEYWORDS
Children
Epidemiology
Geographic location
Melanocytic nevus
Melanoma
Ultraviolet radiation

Abstract ***Background:*** Common melanocytic naevi are considered early biomarkers associated with risk of cutaneous malignant melanoma. We sought to investigate if residing at different latitudes in Sweden influences the population's anatomical distribution of naevi in children and melanoma in adults.

Methods: The nationwide Swedish Cancer Registry 1990–2012 gave cumulative number of invasive melanomas per body site, stratified by sex and age in northern (62–69 °N) ($n = 2823$) and southern (55–58 °N) Sweden ($n = 24{,}115$). A population-based cross-sectional study conducted in 2002 provided the allocation of naevi among 7-year-olds in northern (5695 naevi in 679 children) and southern Sweden (8392 naevi in 681 children).

Results: In 2012, northern Sweden had a two-fold lower melanoma incidence: 19.8/100.000 age-standardised population compared with 41.0/100.000 in the south. Similarly, a lower mean naevi density in children was demonstrated: 7.3 (standard deviation (SD) 5.4) in boys and 7.0 (4.7) in girls in the north versus 13.3 (8.4) in boys and 11.9 (8.5) in girls in the south. Across latitudes of residing, gender profiles and proportional body-site distributions of melanoma and naevi, respectively, were largely homogenous, but in southern Sweden slightly higher on the trunk; a body site associated with intermittent sun exposure. Childhood naevi distributions matched with melanomas in young and middle-aged adults.

* *Corresponding author at:* Department of Dermatology, Karolinska University Hospital Solna, SE-171 76 Stockholm, Sweden. Tel.: +46 851777951; fax: +46 851777851.
E-mail address: maria.karlsson@karolinska.se (M.A. Karlsson).

http://dx.doi.org/10.1016/j.ejca.2015.06.114

Conclusion: This large population-based study demonstrated that latitude of residing similarly affects the number and anatomical distribution of naevi in children and melanoma in adults. It supports a role of childhood naevi as predictors of overall and subsite risk of melanoma among young adults.

1. Introduction

Epidemiological studies worldwide have established the key role of ultraviolet (UV) exposure in childhood as a major factor influencing both the number of common melanocytic naevi (naevi) and the future risk of cutaneous malignant melanoma (melanoma) [1,2]. Being predominantly blond, blue/grey/green eyed and fair-skinned, the population in Sweden hosts phenotypic susceptibility for UV damage. Over the last decade, the increase in melanoma rates has exceeded 5% per year and melanoma incidence in Sweden is currently the 5th highest in Europe [3]. Economic prosperity in Sweden has rapidly improved since the 50ies, enabling spare time for domestic sun tanning, frequent sun travels abroad and sun bed use. This is likely to have contributed to the steadily rising melanoma rates and a multicenter on-line survey 2010 has established swedes to be among the most sun seeking populations in the world [4,5].

Beyond intentional sun tanning when on vacation at home or abroad, everyday ambient climatic conditions contribute to opportunities for UV exposure. The country of Sweden stretches over 1572 km, corresponding to the distance between Amsterdam and Madrid, and ranges from latitude 55 °N to 69 °N. The southernmost parts of Sweden have a warm temperate climate while in the north a cold temperate and arctic climate dictates the conditions. Melanoma incidence in Sweden is lower in the north and highest along the south-west coastline. Likewisely, the numbers of naevi among adults living close to the Arctic Circle in northern Sweden are comparatively low [6,7] and a population-based study performed by our research group among 7-year-old school children in 2001/2002 demonstrated a distinct north–south gradient with a significantly lower density of naevi among children in northern Sweden [8].

The aim of this study was to investigate if residing at different latitudes in Sweden has implications on anatomical subsite localisation of melanoma by gender and age and whether this matches with body-site distributions of naevi among children residing within the same geographic regions.

2. Materials and methods

2.1. Study population – Melanoma among adults in northern and southern Sweden

Sweden is divided into six major health care regions. The North health care region was depicted to represent northern Sweden and the three most southern health care regions (South, South-East and West) to represent southern Sweden. The regions were selected to geographically cover the municipalities surveyed for naevi in children and to provide a substantial number of melanoma cases.

The Swedish Cancer Registry comprises virtually all incident cases of cancer in Sweden and is linked to a statistic database held by The National Board of Health and Welfare [9]. The database gave melanoma incidence rates per 100.000 age-standardised population in Sweden in year 2000 and cumulative numbers of invasive melanoma in years 1990–2012 on four major anatomical sites selected according to the 10th revision of International Classification of Diseases (ICD-10): face (190.1 eyelids, 190.2 ears and 190.3 other parts of face); upper extremities (190.6), trunk (190.5) and lower extremities (190.7). Sites with multiple melanomas or unspecified location at diagnosis were excluded and also the scalp (including the neck) because this site lacked information on childhood naevi for comparison. The time period prior to 1990 was truncated to ensure a current status as increasing proportions of melanoma on the trunk and limbs have been demonstrated in the Swedish population [10]. Melanomas were stratified by sex and age group (0–29, 30–49, 50–69 or 70+ years). Data from the Swedish Cause of Death Register 1997–2012 gave melanoma mortality rates per 100.000 age-standardised population in Sweden in year 2000 [11].

Melanoma histogenetic characteristics included superficial spreading melanoma (SSM), nodular melanoma (NM), lentigo maligna melanoma (LMM) and acral lentiginous melanoma (ALM). Level of invasion was according to Clark and tumour thickness according to Breslow. All data were compiled from two reports based on the nationwide Swedish Melanoma Register (SMR) 1990–2008 and 2009–2012, which covers approximately 97% of all melanoma cases in Sweden [12,13].

Please cite this article in press as: Karlsson M.A. et al., Similar anatomical distributions of childhood naevi and cutaneous melanoma in young adults residing in northern and southern Sweden, Eur J Cancer (2015), http://dx.doi.org/10.1016/j.ejca.2015.06.114