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Original Research

Avoidable cancer cases in the Nordic countries – The impact of overweight and obesity

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Abstract ***Background:*** Several types of cancers are causally linked to overweight and obesity, which are increasing in the Nordic countries. The aim of this study was to quantify the proportion of the cancer burden linked to overweight and obesity in the Nordic countries and estimate the potential for cancer prevention.

Methods: Under different prevalence scenarios of overweight and obesity, the number of cancer cases in the Nordic countries in the next 30 years (i.e. 2016–2045) was estimated for 13 cancer sites and compared to the projected number of cancer cases if the prevalence stayed constant. The Prevent macro-simulation model was used.

Results: Over the period 2016–2045, 205,000 cancer cases out of the 2.1 million expected for the 13 cancer sites (9.5%) that have been studied, could be avoided in the Nordic countries by totally eliminating overweight and obesity in the target population. The largest proportional impact was found for oesophageal adenocarcinoma (24%), and the highest absolute impact was observed for colon (44638) and postmenopausal breast cancer (41135).

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Conclusion: Decreased prevalence of overweight and obesity would reduce the cancer burden in the Nordic countries. The results from this study form an important step to increase awareness and priorities in cancer control by controlling overweight and obesity in the population.

1. Introduction

Overweight and obesity have many health consequences, including risks of cardiovascular disease, diabetes mellitus and different types of cancer [1–3]. In part, the link to cancer may be explained by alterations in the metabolism of endogenous hormones, including sex steroids, insulin, and insulin-like growth factors, distorting the balance between cell proliferation, differentiation and apoptosis or a low-grade chronic inflammatory state promoting tumour development [4]. The increasing prevalence of overweight and obesity in the Nordic and other countries [5–7] and cancers attributable to this, make prevention of overweight and obesity an important public health approach to lower the future cancer burden in the Nordic countries.

Estimation of the cancer burden has focussed on the population attributable fraction (PAF) of overweight and obesity interpreting it as the fraction of avoidable cancer cases if the risk factor could be removed from the population [8–15]. For primary prevention purposes, it is more important to understand the impact of reducing exposure prevalence to realistic levels. The aim of this study was to quantify the fraction of the cancer burden in the Nordic countries (Finland, Denmark, Iceland, Norway and Sweden) linked to overweight and obesity and estimate the potential for cancer prevention under different scenarios.

2. Material and methods

We chose the cancer sites for our analyses based on reports by the World Cancer Research Fund (WCRF) and the International Agency for Research on Cancer (IARC) working group on the preventive effects of avoidance of excess body fatness on cancer risk [2,3,16]. All cancer sites where convincing/sufficient evidence of a causal link to body fatness exists in at least one of these sources were included, except for meningioma of the brain and prostate cancer. The cancer sites included were related to cancers of: (1) breast (postmenopausal); (2) colon; (3) rectum; (4) pancreas; (5) endometrium; (6) kidney; (7) liver; (8) oesophagus (limited to adenocarcinoma only); (9) gastric cardia; (10) gallbladder; (11) ovary; (12) thyroid and (13) multiple myeloma. Meningioma is, from a pathological point of view, a benign tumour, and recording of these in cancer registries are heterogeneous and incomplete. Also, the IARC working group had concluded with 'limited evidence for an association with fatal prostate cancer' [2] but fatal cases are difficult to define. We therefore decided not to include these two sites into our study. A link between body fatness and diffuse B-cell lymphoma is not fully established hence we did not include this cancer site either. The 13 cancer sites included account for 36% of all the cancer cases diagnosed in the Nordic countries during 2009–2013 [17].

We modelled projections of the future number of cancer cases in the Nordic countries for the next 30 years (i.e. 2016–2045). We studied different prevalence scenarios of overweight and obesity, compared to the projected number of cases estimated as to whether the age and gender-specific prevalence of overweight and obesity remained constant at the levels observed in the last year of available data. The predictions were calculated using the Prevent macro-simulation model [18,19], as adapted for the EUROCADET project [20–24], and used in several studies for estimating the impact of potential interventions on the cancer burden [25–28]. Data needed for use of the Prevent model are disease incidence, demographic data (projected population sizes), risk factor prevalence (current and historical information), relative risk (RR) estimates, and change in risk factor prevalence under the scenarios of interest.

Incidence rates, by country, sex and 5-year age groups (except 85+), of each cancer were obtained from NORDCAN [17,29]. ICD-codes defining the cancer sites and the average annual number of cases in the Nordic countries are shown in Table 1. The latest available calendar year in NORDCAN was 2013, but to reduce random variation due to small numbers within a single year, we used the average incidence for the years 2009–2013. We chose to consider cancer incidence from age 15 and above (age 50 for postmenopausal breast cancer). The reason for including incidence from age 15 (and not age 18) was to include the whole adult population, and the rates from NORDCAN are presented by 5-year age groups. To calculate the future number of cancer cases, assumptions about the future cancer incidence are needed. We assumed that the incidence rates would stay constant at the levels observed in 2009–2013, except for changes due to the changing overweight and obesity prevalence. In sensitivity analyses, the modelled trend in incidence rates based on the estimated annual percentage change was also used for future incidence rates. Data on estimated projections of