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Abstract

Background: Insufficient physical activity is a risk factor for several types of cancer. Therefore, estimating the burden of cancer attributable to insufficient physical activity is essential to evaluate the effect of health promotion and prevention interventions.

Aims: We estimated the number of incident cancer cases, deaths and disability-adjusted life years (DALYs) attributable to insufficient physical activity in the Tunisian population aged 35 years and older in 2019.

Methods: We estimated the age-specific population attributable fractions by sex and cancer site to estimate the proportion of cases, deaths and DALYs that could be avoided with optimal levels of physical activity. We used data on cancer incidence, mortality and DALYs from the Global Burden of Disease study estimates for Tunisia in 2019, and data on physical activity prevalence from a Tunisian population-based survey in 2016. We used site-specific relative risk estimates from meta-analyses and comprehensive reports.

Results: The prevalence of insufficient physical activity was 95.6%. In 2019, 16 890 incident cancer cases, 9368 cancer-related deaths and 230 900 cancer-related DALYs were estimated to have occurred in Tunisia. We estimated that 7.9% of incident cancer cases, 9.8% of cancer-related deaths and 9.9% of cancer-related DALYs were attributable to insufficient physical activity. At cancer sites known to be associated with inadequate physical activity, 14.6% of cancer cases, 15.7% of deaths and 15.6% of DALYs were attributable to insufficient physical activity.

Conclusion: Insufficient physical activity contributed to almost 10% of the cancer burden in Tunisia in 2019. Reaching optimal physical activity levels would considerably reduce the burden of associated cancers in the long-term.

Keywords: cancer, exercise, physical activity, health promotion, DALY, Tunisia

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Introduction

About 30–50% of cancer cases are attributable to modifiable risk factors and are thus preventable (1). This figure varies by country, mostly according to the prevalence of exposure to different risk factors (2,3). According to a recent study, half of male cancer cases and a quarter of female cancer cases in Tunisia in 2012 were considered preventable (4).

Insufficient physical activity is a risk factor for several noncommunicable diseases including cancer. Strong evidence exists that an adequate level of physical activity is associated with a lower risk of colorectal, postmenopausal breast and endometrial cancer (5).

In 2018, breast cancer was the leading cancer type among Tunisian women in terms of incidence and the second most common cause of cancer-related deaths (6). The breast cancer burden in Tunisia is projected to rise substantially by 2030 in the absence of control interventions (7). Colorectal cancers had the fourth highest incidence (6) and an increasing trend was predicted mainly because of the epidemiological transition and the prevailing risk factors, namely physical inactivity, unhealthy diets, overweight and obesity (8).

The World Health Organization (WHO) estimates that 6% of annual global deaths are attributable to insufficient physical activity, making it the fourth leading risk factor for death after hypertension, tobacco smoking and high blood sugar (9). WHO recommends a minimum of 150 minutes of moderate physical activity a week or an equivalent regular activity (9). According to the Tunisian Health Examination survey, 57.7% of the Tunisian population aged 15 years and older did not do enough physical activity and only 8.7% engaged in moderate or vigorous intensity leisure-time physical activity (10). Estimating the burden of cancer attributable to insufficient physical activity is essential to evaluate the need for health promotion and primary prevention interventions to reduce this burden. Of the cancer cases in women attributable to preventable risk factors in the WHO Eastern Mediterranean Region in 2012, two thirds were attributable to insufficient physical activity and infections (4). This study used data from various sources to estimate the prevalence of exposures but did not provide age-specific and site-specific population attributable fractions (PAF) by country (4). Attributable deaths and years of life lost were also not considered (4).

The aim of our study was to estimate: (i) the number and proportion of incident cancer cases and cancer-related deaths attributable to insufficient physical activity among Tunisian population aged 35 years and older in 2019 and (ii) the attributable fraction of burden in terms of disability-adjusted life years (DALYs).

Methods

Data sources

To estimate the burden of cancers attributable to insufficient physical activity, the following data elements were required: age-specific cancer incidence, mortality rates and DALYs by sex; prevalence estimates for different levels of physical activity by age and sex; and relative risk (RR) estimates for insufficient physical activity by cancer site. Because of the lack of recent nationwide data from the cancer surveillance system and exhaustive national causes of death statistics in Tunisia, we used age-specific incidence data, mortality data and DALYs by sex and cancer site for Tunisia in 2019 obtained from the Global Burden of Disease study estimates for Tunisia in 2019 (11). These estimations were based on data from north and central Tunisia cancer registries. These registries record all confirmed new primary invasive cancer cases diagnosed among residents of north and central Tunisia, excluding non-melanoma skin cancers. Cancer diagnosis is based on clinical, biological, radiological and histopathological examinations.

We defined insufficient physical activity as low or moderate levels of recreational physical activity performed during a week. Prevalence estimates of the different levels of physical activity among the Tunisian population by age and sex were derived from the Tunisian Health

Examination Survey carried out in 2016 (10). In this study, recreational physical activity levels were classified as vigorous or moderate using a standardized questionnaire administered by an interviewer.

Vigorous or moderate intensity activities were defined as performing recreational physical exercises that cause a large or small increase in heart and respiratory rates respectively for at least 10 minutes continuously. The participants self-reported achieving those levels of physical activity, the number of days they performed vigorous or moderate intensity sports in a typical week and the duration of the activity in hours or minutes in a typical day.

Levels of recreational physical activity were based on the overall duration of leisure physical activity in a typical week and its intensity. Energy expenditure estimation was predicated on the assumption that 60 minutes of moderate intensity physical activity equated 6 metabolic equivalents hours (METs-h), one MET being the resting energy expenditure (4.184 J/kg) (12). We accounted for the higher level of energy expenditure in vigorous intensity activities by multiplying by a weighting factor (× 2) compared with the moderate intensity level (12). We classified levels of recreational physical activity based on the weekly energy expenditure as: high (≥ 15 METs-h a week); moderate (7.5–14 METs-h a week); or low (