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Original Research Article

Utilization of cardiovascular medicines and cardiovascular mortality in Lithuania, Sweden and Norway in 2003–2012

Ingrida Lisauskienė [a,*], Kristina Garuolienė [a,b], Jolanta Gulbinovič [a,c]

[a] Department of Pathology, Forensic Medicine and Pharmacology, Faculty of Medicine, Vilnius University, Vilnius, Lithuania
[b] The Ministry of Health, Vilnius, Lithuania
[c] State Medicines Control Agency under the Ministry of Health, Vilnius, Lithuania

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ABSTRACT

Purpose: The aim of this ecological study was to evaluate whether any changes in cardiovascular (CV) medicines utilization, population, socioeconomic and health system factors are associated with CV mortality in Lithuania, Sweden, and Norway in 2003–2012.
Methods: CV drug utilization was calculated using Anatomical Therapeutic Chemical/Defined Daily Dose (DDD) methodology and expressed as a number of DDD per 1000 inhabitants per day (DDD/TID). CV age-standardized death rate (CV-SDR) and risk factors data were obtained from WHO, EUROSTAT, FAOSTAT databases. The multiple linear regression model was used for modeling outcome measures – the relationship between the CV-SDR and CV medicines utilization including variables: socioeconomic (GDP, unemployment and divorce rate), population (alcohol consumption, smoking and amount of kcal per day, consumption of fruit and vegetables, health status self-evaluation) and health system factors (number of hospital beds, practicing physicians and health care expenditure).
Findings: The higher CV medicines utilization in Sweden (307-455 DDD/TID, $P < 0.001$) and Norway (306-394 DDD/TID, $P < 0.001$) was associated with definite decline in CV-SDR (Norway 215-146, Sweden 233-174). In Lithuania, the increasing but lower consumption of CV medicines (135-360 DDD/TID, $P < 0.001$) and twice higher CV-SDR (541-447) was registered. Significant inverse correlation was observed between CV-SDR and DDD/TID. We found a strong association between the DDD/TID and the CV-SDR: $R^2 = 0.67$ ($P < 0.001$). There was a strong correlation between CV-SDR and nine factors ($P < 0.05$), except number of physician, amount of kcal per day. There was a strong correlation between DDD/TID and nine factors ($P < 0.05$), except unemployment rate and amount of kcal per day. Association between increase in the use of medicines and decrease in CV-SDR was stronger in the case of higher alcohol consumption, higher number of available beds in hospitals and the lower unemployment rate.
Conclusion: We confirmed the strong negative correlation between CV medicines utilization and CV mortality in all countries. The strong correlation was found between CV-SDR and nine factors, also between the use of CV medicines and nine factors. The impact of factors on

* *Corresponding author at*: Department of Pathology, Forensic Medicine and Pharmacology, Faculty of Medicine, Vilnius University, M. K. Čiurlionio 23, 03101 Vilnius, Lithuania.
E-mail address: ingrida.lisauskiene@santa.lt (I. Lisauskienė).
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the medicines induced decrease in CV-SDR showed the stronger influence in case of lower unemployment, higher alcohol consumption and higher amount of beds for hospitalization.

1. Introduction

Although cardiovascular (CV) disease remains a leading cause of mortality globally, a decrease in CV mortality has been observed in Europe during the last 30 years [1]. This decrease is a result of reduction in major risk factors, improved treatment and strengthened prevention measures. However, great regional differences in death rates from CV disease are observed in Europe, generally being higher in Central and Eastern Europe than in Northern, Southern and Western Europe [2,3]. It is reported that mortality from CV disease is more than twice and mortality from coronary heart disease and cerebrovascular disease is more than 3–5 times higher in Lithuania than in Scandinavian countries [4,5]. Despite significant increase in the use of CV medicines, the mortality rate remains high in Lithuania.

The use of CV drugs has not been studied in Lithuania, and it is unknown what utilization pattern of CV medicines is, and what impact the use of these medicines makes on CV mortality.

The main objective of this ecological study was to examine an association between the use of CV medicines and CV mortality in Lithuania and in geographically neighboring countries of Northern Europe – Sweden and Norway.

We have also analyzed possible associations between the changes in utilization of CV medicines and risk factors related to life style, socioeconomic status, health system, and mortality from CV disease, and the influence of these risk factors on association between the use of CV medicines and CV mortality. In addition, we will discuss possible actions to optimize risk factors and treatment of CV disease based on the results of this study.

2. Materials and methods

2.1. Sources of data

In this ecological study, we analyzed drug utilization data from Lithuania, Sweden and Norway over the period from 2003 to 2012 (2004–2012 for Norway). The data on the use of CV medicines was retrieved from national databases. For Lithuania, the database of Lithuanian National Health Insurance Fund ''SVEIDRA'' was used. This database contains information on all dispensed prescriptions of reimbursed medicines, and covers up to 100% of insured population (about 98% of population is covered by health insurance) [6].

For Norway, the data was extracted from the Norwegian Prescription Database (NorPD) at the Norwegian Institute of Public Health. The NorPD monitors drugs dispensed by prescription in Norway and cover 100% of population [7].

For Sweden, the data was obtained from the database of the National Board of Health and Welfare under the Ministry of Health and Social Affairs (Socialstyrelsen). This database contains information on prescription medicines dispensed by community pharmacies and covers 100% of outpatient visits [8].

Age-standardized CV death rate per 100,000 population (CV-SDR) was obtained from the World Health Organization database: WHO Health for All: European Mortality Indicator Database (WHO HFA-MDB) [9].

Eleven risk factors that may influence CV mortality have been chosen in this study. Selection of factors was based on European guidelines on CV disease prevention in clinical practice (version 2012), which includes tobacco use, an unhealthy diet, physical inactivity, and excessive stress, which all together result in obesity, arterial hypertension, dyslipidemia, and elevated blood glucose [10].

We use corresponding data from publicly available databases, such as the WHO, the EUROSTAT, the Food and Agriculture Organization of the United Nations (FAO) databases, which directly or indirectly reflects the above-mentioned risk factors [11–18].

These databases contain the aggregated comparable data at the population level over the period of 2003–2012. We divided the factors into three categories: population related factors, socioeconomic factors and health care system related factors. Population related factors include alcohol consumption, smoking, energetic value of consumed food per day, consumption of fruits and vegetables, and personal perception of health condition. Socioeconomic factors include gross domestic product [GDP], unemployment rate and crude divorce rate. Health care system related factors are number of beds in hospitals, number of practicing physicians and health care expenditure per capita. Detailed description of the factors and data sources is presented in Table 1. There is no publicly available data on obesity and adequate physical activity. We replaced these factors by indirect factor, such as self-reported health status of the population. Despite the subjective nature, this factor could be used as relevant and reliable estimators of the health status of populations as well as good predictors of health care needs [19].

2.2. Methods and statistical analysis

Drug utilization was calculated using the Anatomical Therapeutic Chemical/Defined Daily Dose (ATC/DDD) methodology and ATC/DDD Index, 2014. The results were expressed as a number of Defined Daily Doses per 1000 inhabitants per day (DDD/TID) [20].

The utilization of CV medicines was analyzed regardless of the indication. The following ATC groups were included to the analysis: C01, cardiac therapy; C02, antihypertensive drugs

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