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First stratified diabetes prevalence data for Republic of Macedonia derived from the National eHealth System

Ivica Smokovski [a,b,*], *Tatjana Milenkovic* [a,c], *Nam H. Cho* [d]

[a] *University Clinic of Endocrinology, Diabetes and Metabolic Disorders, Skopje, The Former Yugoslav Republic of Macedonia*
[b] *University Goce Delcev, Faculty of Medical Sciences, Stip, The Former Yugoslav Republic of Macedonia*
[c] *University Sts Cyrillus and Methodius, Medical Faculty, Skopje, The Former Yugoslav Republic of Macedonia*
[d] *Department of Preventive Medicine, Ajou University School of Medicine, Suwon, Republic of Korea*

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ABSTRACT

Aims: To find diabetes prevalence of diagnosed cases, stratified by gender, age, and urban/rural municipalities in the Republic of Macedonia, based on data derived from the National eHealth System.

Methods: The National eHealth System was searched for all patients with ICD-10 diagnoses E10–E14 in their electronic healthcare records. Data records from the National eHealth System contained patient's gender, date of birth, place of living, and ICD-10 code.

Results: Total number of diagnosed diabetes cases was 84,568: 36,119 males (42.7%) and 48,449 females (57.3%). Diabetes prevalence of diagnosed cases in population 20–79 years was 5.0% (n = 78,233; N = 1,562,203), prevalence was higher in females than in males (4.6% vs 3.4%); in rural than in urban municipalities (5.6% vs 3.6%), and was highest in the age group 60–79 years (14.6%).

Conclusion: These were the first findings on diabetes prevalence of diagnosed cases in the Republic of Macedonia derived from the National eHealth System, stratified by age, gender, and urban/rural municipalities. These data could enable more precise estimations of the total diabetes prevalence in the country, including both diagnosed and undiagnosed cases, and further analysis of the risk factors leading to higher diabetes prevalence in females and rural municipalities in the Republic of Macedonia.

1. Introduction

The Republic of Macedonia is a country located in South Eastern Europe with a population of 2.1 million, consisting of 64.2% Macedonians, 25.2% Albanians, 3.9% Turks, and other minorities [1]. It is considered to have the second highest diabetes comparative prevalence in Europe, mainly due to the estimated high prevalence of type 2 diabetes [2].

Several factors have been cited for such high prevalence of type 2 diabetes in the country, and its sharp rise in the past 25 years, including: (1) dietary habits similar to Turkey, the country with the highest diabetes prevalence in Europe; (2)

* Corresponding author.
E-mail address: ivica.smokovski@ugd.edu.mk (I. Smokovski).
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sedentary life-style and inadequate physical activity; (3) transition from planned to market economy in the last decade of the past century, with rise of unemployment in middle-age populations, and associated psycho-social effects; (4) very high smoking prevalence [3].

Total caloric intake per person per day was estimated to have increased by 50% from 1993 to 2011 [3], with no accompanying increase in physical activity, resulting in 53% of the total population being overweight, and 20% diagnosed as obese [4]. In contrast to the high prevalence of type 2 diabetes, the Republic of Macedonia is estimated to have a very low incidence rate of type 1 diabetes as compared to other European countries [5].

A strong association between diabetes and cardiovascular disease further contributes to the complexity of the diabetes burden, given the fact Republic of Macedonia is categorized as a European country with a very high risk for cardiovascular mortality [6].

Taking into account the estimated high diabetes prevalence and exorbitant diabetes related costs, diabetes has been posing a serious threat, not only to the national healthcare system but to the society as a whole. As an illustration, cost of insulin and insulin related supplies, such as insulin needles, test strips for glucometers, glucagon, insulin pumps, and related ancillaries; not including the cost of oral anti-diabetic drugs, nor the direct or indirect costs of diabetes complications; was estimated to be 40% of the total cost of all non-hospital medications covered by the Healthcare Insurance Fund [7,8].

In order to address this situation, several activities have been undertaken recently, including: (1) addition of diabetes, as a specifically designated medical condition, in the amendments on the Law on Healthcare; (2) adoption of international guidelines for diabetes care that were published in the Official Journal of the country, where laws and by-laws are published, to ensure adherence by all stakeholders; (3) formation of a National Diabetes Committee to monitor the implementation of national guidelines for diabetes care [9,10].

Diabetes care in the country has been organized across all three levels of healthcare: primary, secondary, and tertiary. Primary care physicians are responsible for regular diabetes screening in their own patients, ensuring timely diagnosis and treatment. Primary care physicians could initiate treatment of type 2 diabetes patients with oral anti-diabetic drugs, and if more intensive treatment is needed, or in case of type 1 diabetes, patients are referred to secondary care. Secondary care consists of 41 Diabetes Centers throughout the whole country where more comprehensive diabetes care and education is provided, including insulin treatment. Currently, the only institution at tertiary healthcare level is University Clinic of Endocrinology, Diabetes and Metabolic Disorders in Skopje.

The National eHealth System was introduced in the country since 01–July–2013, covering all citizens across primary, secondary, and tertiary healthcare levels in the country [3]. Implementation of the National eHealth System has been praised internationally as a key platform for improving the performance of national healthcare systems [11].

The National eHealth System has been essential resource for the monitoring of diabetes care in the country, while preserving the sustainability of the healthcare system. Diabetes related data have been integrated into the National eHealth System, thus enabling various analyses, including calculations of stratified diabetes prevalence by gender and place of living in diagnosed diabetes cases, for the total population of the Republic of Macedonia.

Precise diabetes prevalence figures have been of critical importance for the national healthcare system, taking into account the estimated high diabetes prevalence, limited healthcare resources available, resulting huge socio-economic burden, and the need to create cost-effective strategies to tackle diabetes. All national diabetes plans and programs have so far been based upon the International Diabetes Federation Diabetes (IDF) Diabetes Atlas figures for diabetes national prevalence and diabetes age-adjusted comparative prevalence for the Republic of Macedonia [2,12].

Nevertheless, such prevalence figures have so far been estimated and published in the IDF Diabetes Atlas based upon extrapolation of diabetes prevalence from other countries in the region, as no published data sources have been available for the Republic of Macedonia [2].

This is the first study to estimate the diabetes prevalence of diagnosed cases, stratified by gender, age and urban/rural municipalities in the Republic of Macedonia, based upon data derived from the National eHealth System.

2. Subjects, materials and methods

The National eHealth System, covering the total population of the Republic of Macedonia, was searched for all alive patients with ICD -10 (Tenth Revision of International Classification of Diseases) codes E10-E14 in their electronic healthcare records as confirmed diagnosis (diagnosed diabetes cases, *n*), setting a cut-off date as 20–July–2015 [13].

Data records derived from the National eHealth System contained patient's gender, date of birth, place of living (urban or rural municipalities), and ICD-10 code.

Diagnosed diabetes cases were stratified in the following age groups: below 20 years, 20–39 years, 40–59 years, 60–79 years, 80 years or older; and were further sub-stratified by gender and place of living.

Prevalence of diagnosed cases in populations 20–79 years was also determined in relation to reported diabetes prevalence in the IDF Atlas for this age group, and was further sub-stratified by gender and place of living [2,12].

Official data from the State Statistical Office of the Republic of Macedonia were used for the total number of individuals in the defined age groups, sub-stratified by gender and place of living (total number of cases, *N*) [14].

3. Results

Population diagnosed with diabetes and stratified by age, gender and urban/rural municipality, is presented in Table 1; *n* is the number of diagnosed diabetes cases in the group, and *N* is the total number of cases (with and without diagnosed diabetes) in the group.

Genders were evenly distributed in the total population of the Republic of Macedonia: 1,055,311 (50.1%) males, and 1,050,405 (49.9%) females; whereas the majority of the