



Contents available at [ScienceDirect](#)

Diabetes Research
and Clinical Practice

journal homepage: www.elsevier.com/locate/diabres



International
Diabetes
Federation



Cost of diabetes in Norway 2011



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ARTICLE INFO

Article history:

Received 25 August 2015

Received in revised form

9 October 2016

Accepted 10 October 2016

Available online 19 October 2016

Keywords:

Direct medical costs

Indirect medical costs

Diabetes

Complications

Cost-of-illness

Norway

ABSTRACT

Aims: To quantify the excess cost of diabetes in Norway in 2011.

Methods: A national cross-sectional cost-of-illness analysis of direct and indirect diabetes-related healthcare costs, based on pseudonymised data from six public national registers, international studies, and clinical expertise. Direct medical costs are estimated from primary and secondary health care registers and the national prescription database. Indirect costs include social and productivity costs.

Results: The total excess cost of diabetes in Norway in 2011 was €516 million. Direct costs amounted to €408 million and indirect costs amounted to €108 million. Scenario analysis proposes an upper boundary of total cost at €575 million, direct costs at €428 million and indirect costs at €161 million. Expenditure on blood glucose lowering agents was €71 million and expenditure on blood glucose monitoring strips was €55 million. Blood glucose lowering agents-, lipid lowering agents, and antihypertensives represented 28% of the direct costs. Loss of productivity (€0.9 million) scored highest among the indirect costs.

Conclusions: The cost implications of diabetes in Norway in 2011 were high and comparable to previous studies in Scandinavia. Prevention of complications contributed to a higher cost than treating diabetes-related complications. The more than five-fold higher expenditure in other countries might be due to differences in budget priorities, efficacy of healthcare, indirect healthcare cost applications, or research methodology.

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1. Introduction

Diabetes is a major public health challenge and the treatment costs are high and increasing [1,2]. There are approximately 220,000 people with known diabetes in Norway, of which 25,000 have Type 1 diabetes and about 25% are undiagnosed [3]. One study estimated the cost of diabetes in Norway at €293 million in 2005 [1], representing 1.4% of the national health budget. Since then, the number of patients using

glucose lowering agents has risen by 29% [2] due to, among other reasons, an aging population, life style changes, and obesity [4]. These changes support the necessity for a re-evaluation of the burden diabetes imposes on Norwegian society.

Type 2 diabetes is associated with reduced workforce participation, increased workday absence, and reduced productivity at work. This has been reported by the American Diabetes Association (ADA), which estimates the annual

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<http://dx.doi.org/10.1016/j.diabres.2016.10.012>

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productivity loss per person with diabetes to be nearly half that of the direct medical costs [5]. A study of cost, burden, and treatment of diabetes in France, Germany, Italy, Spain, and Great Britain showed that record keeping of diabetes prevalence, complications, and direct and indirect costs are inadequate in Europe [6]. Their estimation of the total direct and indirect costs of diabetes across all five countries was €90 and €98.4 billion, respectively. Also, the prevalence of diabetes has been predicted to rise by 35% in European countries between 2010 and 2030, further increasing costs [7].

In the U.S., approximately 58% of patients with diabetes have at least one vascular complication [8]. The World Health Organization (WHO) stated in 2001 that diabetes is the leading cause of blindness, renal failure, heart disease, and lower limb amputations in Europe [9]. Cost estimates provided by the ADA from 1998 to 2012 show that the economic and societal burden of diabetes is growing in the U.S., as annual medical expenditure is approximately 2.3 times higher in subjects with diabetes compared to those without [5,10,11]. This was also seen in Europe by the German Cost of Diabetes Mellitus (CoDiM) study from 2007, where it was found that direct diabetes-related costs increased considerably with the onset of diabetes-related complications [12]. Cardiovascular disease has been shown to contribute to more than half of the mortality-related costs in both the U.S. and Europe [9,11] and it has been shown to increase per-person annual costs by more than 50% when cardiovascular complications appear and by 360% when a major cardiovascular event occurs [13]. In a Canadian province, the five-year cost of diabetes has recently been shown to increase with the worsening of kidney function, the presence of proteinuria, and suboptimal glycaemic control [14].

Diabetes and its often co-existing chronic vascular diseases challenge the traditional methods of calculating healthcare costs [15]. In order to tailor the prevention of diabetes complications, there is an urge to understand what elements of expenditure particularly increase the costs, the most common co-morbidities, and how multi-morbidity influences healthcare costs in diabetes.

The primary objective of this study was to assess the direct and indirect costs attributable to diabetes in Norway in 2011.

2. Subjects and methods

This cost-of-illness analysis displays aggregated figures of resource consumption related to the direct and indirect costs of diabetes in the financial year of 2011. Comparative data primarily obtained from national secondary research sources or historic costs were extrapolated. Patient and cost data was extracted from national registers to quantify the additional value of resources entailed during 2011, irrespective of disease onset. The values are expressed in 2011 Euros (€1 ≈ 8.0 Norwegian Kroner).

Register data is used in calculating costs, as it is the most straightforward approach and minimizes the risk of double counting. However, this method has the potential to underestimate the cost of complications specifically related to diabetes patients. Accordingly, a defined proportion of the treatment costs related to cardiovascular- and cerebrovascu-

lar disease, as well as diabetes retinopathy, -nephropathy and -neuropathy, is included. The attribution of cost is relatively weighted on the basis of the causal pathway and underlying cause or complication factor (see Appendix I for the included International Classification of Diseases [ICD-10] codes and the cost contribution algorithm). As an example, costs accrued by inpatient- and outpatient stays for chronic nephritic syndrome (ICD-10: N03.0) in patients with diabetes where diabetes is not registered as the primary cause of contact were included by all of its costs.

2.1. Direct and indirect costs

The direct medical costs of diabetes represents the economic burden that may be avoided if the disease was absent and includes the number of services, unit prices, charges of hospital and physician inpatient days, nursing home- and rehabilitation care, diagnostics, medical supplies and drug expenses. To obtain the added health care costs of a patient with diabetes, direct costs were compared to the mean spending in the population.

Indirect cost represents the value of lost output due to productivity-loss caused by diabetes-related morbidity or premature mortality as compared to the average population.

To estimate the costs related to social benefits, we have included the tax financing cost of sickness and disability benefits, which is 20% of the income that the patient receives. This is in line with the Norwegian guidelines for economic analysis [16]. Remaining productive years and consequences of premature death are calculated from data published by the Norwegian Welfare Administration [17]. This is multiplied by the average Norwegian annual income. It is estimated that one third of the real diabetes-related premature deaths (death before retirement) are not reported [17], and these costs are calculated as lost earnings with an expected value of each individual's future earnings, gender, and age taken into account according to the human capital approach [18]. Two cost scenarios were developed based on the friction costs methodology and the human capital approach [19]. The final estimate is an average of the two cost scenarios.

2.2. Data sources

Patients were identified through the Norwegian Control and Distribution of Health Reimbursement (KUHR) database, the Norwegian Patient Register (NPR), the Norwegian Prescription Database (please see Table 1 for a description of included registries and data sources). Identified patients and their use of health services were followed through one calendar year. Their use of over-the-counter (OTC) medications was not included.

Data on sick leave money, disability pension, and attendance are collected from The Norwegian Labor and Welfare Administration (NAV), Statistics Norway (SSB) and Haga and Lien (2011) [17].

2.3. Defining patient population and cost attribution

The population of interest includes patients with diabetes as a principal and secondary diagnosis, defined by selecting a set

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