Background
Atherothrombotic diseases impose a large burden on Czech society, mainly because of the high prevalence of risk factors compared to other countries. The Czech Republic has some of the worst mortality figures for heart disease and stroke. Death rates from these diseases are 20.4/100,000 population – more than double the OECD average of 11.5/100,000, where the rate is 10.4/100,000 population, compared to an OECD average of 8.1/100,000 population.

Although secondary prevention strategies, such as aspirin, have proven to be more effective in preventing cardiovascular events, aspirin results in 19% lower risk of major cardiovascular treatment, are available, up to 10% of patients with cardiovascular disease receive recurrent events each year. When used for secondary prevention, aspirin results in 19% lower risk of major atherothrombotic events and 5% lower risk of cardiovascular death compared to placebo (2).

However, innovative treatment alternatives, such as selective direct factor Xa inhibition (e.g., rivaroxaban) combined with aspirin, proved to be more effective in preventing cardiovascular events in patients with coronary artery disease (CAD) and peripheral artery disease (PAD). According to the COMPASS trial (3) (rivaroxaban 2.5 mg twice daily) plus aspirin significantly reduced the incidence of cardiovascular death, stroke, or myocardial infarction compared to aspirin alone (1.1% vs. 5.4%, p = 0.0017).

To acquire reimbursement from public health insurance in this new indication and assure these potential benefits, it was necessary to evaluate the economic burden of the indicated population (currently using only aspirin as a secondary prevention) in order to critically assess the economic impact of the prospective new intervention.

Objectives

1. To evaluate both direct and indirect costs associated with CAD and PAD in the Czech Republic, where available evidence supports aspirin secondary prevention.

2. To determine the future health policy decision concerning possible reimbursement of innovative treatment (e.g. rivaroxaban 2.5 mg).

Methods

1. The prevalence of CAD combined with PAD was estimated based on the published prevalence figures for year 2019 and 2020 provided by the fifth largest health insurance fund (700 000 insured, i.e. 7% of the population) and expert opinion from KOLs.

2. A global Markov model was adopted to predict the number of subsequent cardiovascular events in the indicated population. Markov model cycle length was 3 months.

3. A global Markov model with 3-months cycle length was developed in Microsoft Excel. Model settings are shown in Table 1.

4. The health states considered in the model included event-free health state, myocardial infarction (MI), stoke (ischaemic stroke (IS) and intracranial haemorrhage (ICH) and death). Each of these main events were implemented as acute and post-acute states.

5. Tables 1 to 4 and 6 present the transition probabilities for main events, Table 2 and 5 second main events and Table 4 other health events. These are derived from the results of the COMPASS trial for aspirin arm (5).

6. Healthcare costs were provided by corresponding reimbursement tariffs and approved previous pharmacoeconomic analyses (4-6). The costs presented in Table 5 and 6 correspond to one cycle length, i.e. 3 months.

7. Indirect costs of atherothrombotic disease were calculated based on claims from the Czech Social Security Administration database.

8. Costs of invalidity pensions were derived directly from the database.

9. The productivity losses were calculated a product of the average Czech salary in 2018 (i.e. 27 419 € per year) and the incidence which was derived from the database.

Results

- A total number of 9 215 patients suffering from both CAD and PAD was estimated in the Czech Republic.
- Figure 2 presents the total number of events which will be developed by these patients in a lifetime horizon (30 years).
- 18 786 myocardial infarctions,
- 7 439 ischaemic strokes,
- 6 023 cases of extracranial haemorrhage,
- 1 525 cases of intracranial haemorrhage,
- 5 315 cases of acute limb ischaemia,
- 4 648 amputations
- 3 008 cases of venous thromboembolism.
- 22 292 cardiovascular deaths.

- From a healthcare payer perspective, all these events will be associated with total costs of 303.7 million (€) in 2019 (i.e., 25 877 € per patient).
- Figure 3 shows indirect costs incurred by atherothrombotic diseases in Czech Republic.

- According to Social Security Administration database, atherothrombotic diseases induce 1 946 cases of invalidity per year, corresponding to € 5.9 million of invalidity pensions and € 24.7 million of productivity loss per year.

- Moreover, treatment costs led to 6 457 euros losses each year, corresponding to annual productivity loss of € 155 million.

- In sum, these indirect costs equal to €87.6 million per year.

Conclusions

The cost associated with atherothrombotic diseases is substantial. Our analysis was designed to support future health policy decisions concerning various prevention and intervention priorities. Indeed, it served as a valuable source of evidence for optimal decision-making strategy, more specifically in supporting the negotiation with local public health insurance companies. As a result of these negotiations, rivaroxaban (Xarelto 2.5mg twice/day) combined with aspirin received reimbursement in this sub-population of patients. The projected impact of this decision on health patients’ outcomes is illustrated in Figure 4.

To our knowledge, this is the first Czech study evaluating the economic burden of atherothrombotic diseases from a societal perspective.