Chapter 1
Burden of Diabetes Prevalence

It is now evident that we are living in a world of diabetes pandemic—despite the scientifically sound estimates, worldwide diabetes prevalence has been exceeding even the most pessimistic projections from the past. If we go back in history, it was estimated in 2004 that diabetes prevalence in 2030 would reach 366 million people [1]. What actually happened was that the prevalence of 366 million people with diabetes was already reached in 2011, 19 years earlier than initially predicted [2]. According to the latest projections, there would be 578 million people with diabetes in 2030, almost 60% more of what was estimated 15 years ago (Fig. 1.1) [1, 2].

Exponential rise of diabetes prevalence can also be observed from the historical data in the past 20 years. The global estimate of the total diabetes prevalence, including both diagnosed and undiagnosed cases in the age group 20–79 years, was 151 million in 2000; rising to 194 million in 2003; 246 million in 2006; 285 million in 2009; 366 million in 2011; 382 million in 2013; 415 million in 2015; and 425 million in 2017 [2].

According to the latest estimates from the International Diabetes Federation (IDF) Diabetes Atlas, approximately 463 million people in the age group 20–79 year were living with diabetes in 2019, equaling to 9.3% of the world’s population in this age group [2]. The total number is predicted to rise to 578 million by 2030 (prevalence of 10.2%); and 700 million by 2045 (prevalence of 10.9%) [2].

The number of people with diabetes is extraordinary, and the question is what places so many people in this category. Diabetes mellitus is defined as Fasting Plasma Glucose (FPG) ≥7.0 mmol/L (126 mg/dL); or 2-h Plasma Glucose (PG) ≥11.1 mmol/L (200 mg/dL) during Oral Glucose Tolerance Test (OGTT, glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water); or HbA1c ≥6.5% (48 mmol/mol) in a laboratory using a method that is NGSP certified and standardized to the DCCT assay; or if an individual presents with classic symptoms of hyperglycemia and a random plasma glucose ≥11.1 mmol/L (200 mg/dL) [3].
Diabetes mellitus is a heterogeneous entity and is classified into type 1 diabetes (autoimmune beta-cell destruction resulting in absolute insulin deficiency), type 2 diabetes (progressive loss of adequate beta-cell insulin secretion due to insulin resistance), and gestational diabetes mellitus (GDM, diabetes diagnosed during pregnancy) [3].

Other causes are less frequent, such as monogenic diabetes syndromes (neonatal diabetes and maturity-onset diabetes of the young), diseases of the exocrine pancreas (cystic fibrosis, pancreatic cancer, pancreatitis, pancreatectomy), and drug- or chemical-induced diabetes (glucocorticoid use, treatment of HIV/AIDS, or after organ transplantation) [3].

Furthermore, the burden of diabetes is not only the magnitude of people diagnosed with diabetes by any of the criteria above, but also the huge number of people with diabetes who are not diagnosed. It is estimated that 1 in 2 people with diabetes is undiagnosed; or, out of the total 463 million in 2019, 232 million people with diabetes were undiagnosed [2]. It means that for every person with known diabetes, there is another one yet to be found, tested, diagnosed and adequately treated. There are many people in the community who are not aware to be living with diabetes. Unfortunately, many of those who have diabetes, but are not diagnosed, initially present with diabetes complications that are even more difficult and costly to treat.

The vast majority of people affected by diabetes are in their most productive years. There were 351.7 million people with diabetes in 2019, or 75% of the total number, who were of working age from 20 to 64 years [2]. This number is expected to increase to 417.3 million by 2030, and 486.1 million by 2045 [2]. The magnitude of people with diabetes in their working age has an immense impact on the
economies globally. The impact is felt much stronger if the economy is weaker, as in the lower resource countries.

Diabetes is among the top ten causes of mortality in the adult population worldwide [4]. Latest estimates for 2019 suggest that it has caused 4.2 million deaths worldwide in the age group 20–79 years [2]. For this reason, it is often said that diabetes has killed more people after World War II, than both World Wars combined. It is evident that we are still counting the increasing number of casualties, with no signs of flattening the curve in the near future. The fight against diabetes has frequently been labeled by some prominent IDF leaders as the invisible World War III that is affecting the whole humanity. If people with diabetes are population of a separate country, it would be the third largest country in the world, right after China and India, and much bigger than the United States (US). Almost one percent of this country would be dying annually.

The steep rise in diabetes prevalence discussed above has mainly been attributed to the increased prevalence of type 2 diabetes [2]. Type 2 diabetes is estimated to account for more than 95% of all cases of diabetes globally. Not only the absolute number, but also the proportion of people with type 2 diabetes is increasing worldwide.

When facing pandemics of different nature, such as the recent infectious COVID-19 pandemic, that are contagious, spreading fast and globally, we see whole societies taking immediate action, building up hospital and ICU capacities, governments discussing nationwide strategies and solutions. The life of whole countries changes over night. The question is why we are not seeing this sense of urgency when facing the diabetes pandemic, claiming multiple times more lives than the recent infectious pandemic with COVID-19?

The answer could be the insidious course of diabetes that lasts for years before it is even diagnosed. We are not talking about days or weeks of incubation, but often about years for diabetes to develop. And when something is explosive in nature, as in infectious pandemics, we don’t have difficulties modifying our lifestyle abruptly, adapting to the new circumstances. We are afraid that the healthcare system will not respond to the overwhelming number of infectious cases. However, when something develops slowly over the course of years, people seem to be reluctant to modify their lifestyle to delay it or prevent it. That may explain why the challenge of flattening the curve of diabetes prevalence is so burdensome.

When we talk about the burden of diabetes prevalence, we also have to think of the diabetes related complications. It is well established that people with diabetes have increased risk for coronary artery disease, stroke, congestive heart failure, peripheral vascular disease, retinopathy, nephropathy, and neuropathy, among the most common [2, 3]. Less recognized, however, equally important, are the increased prevalence of depression, erectile dysfunction, or functional disability [2, 3].

Cardiovascular diseases, leading cause of morbidity and mortality worldwide, are two to four times more common in people with diabetes compared to people with no diabetes [2, 3]. Diabetes remains the leading cause of the new cases of blindness among adults, and the leading cause of end-stage renal failure requiring
The enormous impact of diabetes related complications will be discussed in more detail in the following chapters.

Diabetes has been a major healthcare issue for the lower resource, developing countries. Developing countries include low-income countries, with Gross National Income (GNI) per capita of USD 1,025 or less, and middle-income countries, with GNI per capita between USD 1,025 and USD 12,375 in 2018 [5]. Developed, high-income countries are those with GNI per capita of USD 12,376 or more in 2018 [5].

Developing countries are sometimes referred to as LMICs, or Low and Middle Income Countries. It is estimated that only 15% of the world population lives in developed countries and the remaining majority lives in developing, lower resource countries.

The trend of rising prevalence of type 2 diabetes in both developed and developing countries can be attributed to ageing, sedentary lifestyle and increased calories intake, resulting in overweight, obesity and insulin resistance. In 2019, 310.3 million people with diabetes were living in urban areas (prevalence of 10.8%), compared to 152.6 million in rural areas (prevalence of 7.2%) [2]. Number of people with diabetes in urban areas is expected to increase to 415.4 million (prevalence of 11.9%) in 2030, and to 538.8 million (prevalence of 12.5%) in 2045, as a result of the global migration from rural to urban areas [2]. The urbanization is more intensive in developing countries, and could lead to even sharper increase in diabetes prevalence in those countries.

Earlier diagnosis, treatment and reduction of premature complications and mortality additionally contribute to the increased diabetes prevalence, due to the better survival of people with diabetes [2]. Diagnosing type 2 diabetes at an earlier age in recent years also contributes to the increase of diabetes prevalence.

While the prevalence of diabetes becomes less steep in higher resource parts of the world, it is expected to explode in the years to come in the lower resource countries. It further aggravates the situation with the already scarce healthcare resources in developing countries, and poses additional challenges for the healthcare authorities to prioritize and adequately allocate the limited resources.

Healthcare systems of developing countries have already been struggling with the existing healthcare issues and have certainly not been prepared to face the approaching diabetes tsunami. Most of these countries have not been able to provide the currently recommended standard diabetes treatment or glucose monitoring supplies to the already diagnosed people with diabetes. The economic meltdown from the recent global pandemic with COVID-19 would only aggravate the financial situation in the healthcare systems of developing countries.

It is striking that in 2019, 79% of adults with diabetes, or 367.8 million (prevalence of 9.0%) were living in developing countries, compared to 95.2 million (prevalence of 10.4%) in developed countries (Fig. 1.2) [2]. Unstoppable diabetes tsunami is coming for the developing countries which could easily be realized from the projections for 2030 and 2045, if current trends are not changed.

In 2030, it is estimated that 82% of the total number of people with diabetes will be coming from developing countries [2]. Estimated 470.1 million people with
diabetes will be living in developing (prevalence of 10.0%), compared to 107.9 million in developed countries (prevalence of 11.4%) (Fig. 1.2) [2]. In 2045, it is estimated that 84% of the total number of people with diabetes will be coming from developing countries [2]. Estimated 587.6 million people with diabetes will be living in developing (prevalence of 10.8%), compared to 112.4 million in developed countries (prevalence of 11.9%) (Fig. 1.2) [2].

Diabetes prevalence is projected to increase by 51% from 2019 to 2045 worldwide—from 463 million in 2019, to 700 million in 2045 [2]. This rise is largely due to the increase in low- to middle-income regions, such as in Africa (except North Africa) by 143%, Middle East and North Africa by 96%, South East Asia by 74%, and South and Central America by 55% [2].

We should never forget how bad we have been in predicting diabetes prevalence. No matter how tremendous those numbers may appear, all historical projections have so far resulted in significant underestimation of the diabetes prevalence. Therefore, we should only consider future estimates as the most conservative ones.

The proportion of people with undiagnosed diabetes is also higher in low-income (66.8%, 9.7 million) and middle-income (52.6%, 185.8 million), compared to high-income countries (38.3%, 36.4 million) [2]. Expected improvement of diagnostic rates in developing countries would result in additional number of people with diagnosed diabetes that the healthcare systems have to cope with.

Financial burden of diabetes and related complications has been overwhelming for the healthcare systems across the world. It is estimated that diabetes caused at least USD 760 billion of healthcare expenditure in 2019, which is approximately 10% of the total spending on adult healthcare [2]. This figure is projected to rise to USD 825 billion in 2030, and USD 845 billion in 2045 [2]. If indirect costs are added, as explained in the following chapters, total diabetes related costs become even higher.

**Fig. 1.2** Diabetes prevalence in developed and developing countries, 2019–2045, data adapted from [2]
Diabetes pandemic is of such magnitude that it threatens even the most developed healthcare systems in the world, such as the National Health Service (NHS) in the United Kingdom (UK). Some experts predict that due to the spiraling costs, diabetes alone could bankrupt the NHS and should be declared as a ‘national crisis’. Mass media from the UK have alarmed that the number of people with diabetes in the UK has doubled in 20 years, due to the rise in prevalence of type 2 diabetes [6]. Another frightening fact is that, although traditionally considered as a diagnosis of the older population, type 2 diabetes is more often diagnosed at an earlier age due to the growing prevalence of obesity in children and adolescents [6].

The cost of diabetes treatment in the NHS has doubled in only a decade, from 2008 to 2018 [6]. Furthermore, diabetes was responsible for almost 26,000 cases of premature mortality annually in the UK [6]. Total diabetes related cost in the UK was estimated at USD 17 billion in 2019 [2].

If there is a risk of bankruptcy of the NHS due to diabetes, it could certainly have a huge impact on the total UK and global economy. It is well validated that diabetes is the largest contributor to healthcare costs, not only in the UK, but also in the rest of Europe, exerting huge pressure on the already stretched healthcare resources.

It is no surprise that diabetes is one of the costliest conditions in the most developed country of the world, the US. The Center for Disease Control and Prevention (CDC) Report from 2020 estimated that more than 1 in 10 US adults—about 34.1 million—have either type 1 or type 2 diabetes, and 7.3 million of them are undiagnosed [7].

Total diabetes related health expenditure in the US in 2019 was estimated at USD 294.6 billion, the largest amount spent on diabetes by a single country [2]. It is three times more than the diabetes related health expenditure of China, which occupies the second place and has four times more people with diabetes than the US. It is estimated that cost to the economy of diabetes related premature deaths in the US was USD 19.9 billion annually, and a total of USD 90 billion was indirectly lost due to diabetes [2, 8].

Above grave examples of the diabetes impact on the most developed countries illustrate the potential it has to collapse the healthcare systems of the developing, lower resource countries. An example of a developing country struggling with one of the highest diabetes prevalence in Europe is the Republic of North Macedonia, located in South East Europe, with an estimated population of 2.06 million [9]. The increasing prevalence of type 2 diabetes in the past three decades has been alarming and had a significant impact on the healthcare system in the country.

The estimated total diabetes prevalence, of both diagnosed and undiagnosed cases, in the Republic of North Macedonia was approximately 80,000 people in 2004 [9]. Diabetes prevalence has more than doubled in only 15 years, and the latest estimate of total diabetes prevalence was 175,100 in 2019 [2].

Both diabetes national and age-adjusted prevalence in the Republic of North Macedonia were higher compared to Europe as a region. Diabetes national prevalence in adults 20–79 years in 2019 was estimated at 11.2%, compared to 8.9% in Europe [2]. Diabetes age-adjusted comparative prevalence (20–79 years) in 2019 was estimated at 9.3%, compared to 6.3% in Europe [2].
It was estimated there were 2,300 people with type 1 diabetes in the Republic of North Macedonia in 2015, or 2.7% of all diagnosed cases [9]. The Republic of North Macedonia is considered a ‘cold spot’ for type 1 diabetes in Europe with a low incidence rate [9]. On the other hand, the prevalence of type 2 diabetes in the country is strikingly high. Basic diabetes data for the Republic of North Macedonia are presented in Table 1.1 [2, 9, 10].

Table 1.1 Basic diabetes data for the Republic of North Macedonia, data adapted from [2, 9, 10]

| Description | Data |
|-------------|------|
| Total population | 2,058,539 |
| Diabetes national prevalence (20–79 years) (2019) | 11.2% |
| Diabetes age-adjusted comparative prevalence (20–79 years) (2019) | 9.3% |
| Total number of people with diabetes (diagnosed and undiagnosed) (2019) | 175,100 |
| People with diagnosed diabetes (2015) | 84,568 |
| People with diabetes on insulin treatment (2015) | 37,011 (43.8% of diagnosed cases) |
| People with type 1 diabetes (2015) | 2,300 (2.7% of diagnosed cases) |
| Women/men with diagnosed diabetes (% prevalence) (2015) | 48,449 (4.6%)/36,119 (3.4%) |
| Urban/rural population with diagnosed diabetes (% prevalence) (2015) | 59,586 (3.6%)/24,982 (5.6%) |

Diabetes has been a huge healthcare and socio-economic burden for the Republic of North Macedonia. National diabetes prevalence data have been of utmost importance for the policy makers, healthcare authorities, healthcare providers, and patient organizations. Nevertheless, it is interesting that until recently, there were only external estimates of the diabetes prevalence for the country. Those estimates were based on extrapolations of diabetes prevalence from other countries in the region, as there were no reliable data sources for the national diabetes prevalence [10]. Using extrapolated data for estimation of diabetes prevalence has been common for most of the developing countries, lacking their own, good quality epidemiological data [2].

It was also interesting that up to the latest, ninth edition of IDF Diabetes Atlas, the same age-adjusted (20–79 years) comparative prevalence of 10.1% was reported not only for the Republic of North Macedonia, but also for the other countries from the region with no own data, such as Albania, Bosnia and Herzegovina, Montenegro and Serbia [10, 11].

Those estimates were based upon the extrapolation of diabetes prevalence in geographically close countries with high quality data for diabetes prevalence, such as Croatia, Cyprus, Greece, Slovenia and Turkey [10, 11]. However, not all of those reference countries, although geographically close, share similar dietary and lifestyle patterns with the Republic of North Macedonia and the other countries with no own data [10].

First step for the developing countries is to know their own diabetes prevalence of diagnosed cases, as precisely as possible. In other words, if we are talking about fighting a war against diabetes, we have to know the strength of our enemy in every single country, including the ones with limited resources. Additionally, it is not
sufficient only to know the total number of diagnosed cases, but also to know the stratification of those cases by age, gender and place of living, urban or rural. This information is of great value for explaining the prevalence and helps for planning of future activities.

After determining the prevalence of diagnosed cases, it would be beneficial to know the prevalence of undiagnosed cases through a national epidemiological study. If the prevalence of diagnosed and undiagnosed cases is known, the total diabetes prevalence could be calculated, as well as the diagnostic rate for the country.

The next thing every developing country should consider is mapping the network of diabetes care services provided across the national healthcare system. In the case of the Republic of North Macedonia, diabetes care services are provided across all three healthcare levels, primary, secondary and tertiary. Around 1,600 primary care physicians are involved in the screening, diagnosing and treating people with type 2 diabetes with oral antidiabetic medication. In addition, there are 41 Diabetes Centers with around 120 specialists (Endocrinologists, Diabetologists, Internists) which are functional units at secondary level where further diabetes care is provided, including prescription of insulin treatment and other novel injectable (e.g. GLP-1RA) and non-injectable (e.g. DPP-4i, SGLT2i) diabetes medications. Finally, there is one institution at tertiary level, the University Clinic of Endocrinology, Diabetes and Metabolic Disorders in the capital of Skopje. If not in possession of those basic metrics, any war against diabetes is predestined to fail.

The first comprehensive, stratified diabetes prevalence data derived from the National e-Health system in the Republic of North Macedonia with a cut-off date 20-July-2015, were published in 2018 [10]. These first actual data on the national diabetes prevalence discovered certain differences compared to the previously reported extrapolations [10]. Diabetes prevalence data of diagnosed cases were stratified by age, gender and place of living [10].

Latest, ninth edition of IDF Diabetes Atlas used the first stratified, national data of diagnosed cases derived from the National e-Health System (NeHS), for the estimates of total diabetes prevalence for the Republic of North Macedonia in 2019 [2]. Those are the first results without extrapolation of data from regional countries, and are considered more accurate than the estimates from the previous versions of the IDF Diabetes Atlas.

The Republic of North Macedonia was recognized in the latest IDF Diabetes Atlas from 2019, as one out of only 12 countries worldwide having a diabetes prevalence study conducted within the past 5 years [2]. Hence, it is possible even for a developing country with limited resources to report the national diabetes prevalence, at least of diagnosed cases.

From the first stratified analysis of diabetes prevalence it was found that genders were evenly distributed in the total population of the Republic of North Macedonia, whereas the majority of the population lives in urban municipalities (78.9%), mimicking the global distribution of population [10].

The total number of diagnosed cases was 84,568; of those 36,119 men (42.7%) and 48,449 women (57.3%) (Table 1.1) [10]. Mean age of all diagnosed diabetes
cases was $62.6 \pm 12.5$ years. It was reported that prevalence of diagnosed cases in the total population was $4.0\%$ with the highest prevalence in the age group 60–79 years, followed by groups 80 years or older, 40–59 years, 20–39 years, and below 20 years (Fig. 1.3) [10]. This is in accordance with the global estimates of increasing diabetes prevalence towards older age groups [2].

The prevalence of diagnosed cases was higher in women compared to men in the total population ($4.6\%$ vs $3.4\%$) (Fig. 1.3) [10]. This was a surprising result in contrast to the global estimates of higher prevalence in men ($9.6\%$) than in women ($9.0\%$) in 2019, but also in the future projections ($10.4\%$ and $10.0\%$ in 2030, and $11.1\%$ and $10.8\%$ in 2045, in men and women, respectively) [2].

From the study, the total number of diagnosed cases was higher in urban ($n = 59,586$) compared to rural municipalities ($n = 24,982$); however, the prevalence of diagnosed cases was higher in rural compared to urban municipalities ($5.6\%$ vs $3.6\%$) across all age groups, except for the age group below 20 years, where the majority of diagnosed cases ($99.1\%$) were from urban municipalities (Fig. 1.3) [10]. This was also in contrast to the global trends of higher diabetes prevalence in urban compared to rural areas [2, 10].

The process of urbanization has been very intensive in the Republic of North Macedonia in the past 50 years with significant migration from rural to urban municipalities. Higher diabetes prevalence of diagnosed cases in rural municipalities contradicts the established views of higher diabetes prevalence associated with urbanization [2, 10].

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**Fig. 1.3** Diabetes prevalence of diagnosed cases in the Republic of North Macedonia, total population and population 20–79 years [10]
Diabetes prevalence of diagnosed cases in the population 20–79 years was 5.0%, 4.4% in urban municipalities, and 7.5% in rural municipalities. Diabetes prevalence of diagnosed cases in this age group was 4.3% in men and 5.7% in women (Fig. 1.3) [10].

Since more than three quarters of the population currently live in urban municipalities, a possible explanation could be that rural municipalities, mainly inhibited by ethnic Albanian population, share cultural, religious, dietary, and lifestyle habits more closely with the Turkish population, having the highest diabetes prevalence in Europe, as compared to the ethnic Macedonian population, mainly inhabiting the urban municipalities [10].

In addition, higher prevalence in women compared to men, especially in rural municipalities (7.0% vs 4.3%), could be explained by the fact that men are more physically active, and more intensively engaged in agriculture and farming. On the other side, women traditionally stay at home, being responsible for maintaining the households and less physically active while sharing the same dietary pattern. This surprising finding of higher diabetes prevalence in rural women only confirms the necessity of determining the stratified diabetes prevalence in developing countries [10].

It was found that almost every third woman and every fifth man in the age group 60–79 years in rural municipalities were diagnosed with diabetes [10]. Possible reason for such a high prevalence could be the limited access of rural population to Diabetes Centers which are located exclusively in urban municipalities, where activities are directed also towards diabetes prevention [10].

The Republic of North Macedonia could still be considered a ‘cold spot’ for type 1 diabetes in Europe, as only 549 individuals (0.6% of all diagnosed cases) were below the age of 20 years, with equal gender distribution, and all but one individual coming from urban municipalities. This finding further strengthens the importance of environmental factors arising from urban municipalities in initiation of autoimmunity in type 1 diabetes.

Taking into account the estimated high diabetes prevalence and exorbitant 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 related supplies, test strips, glucagon, insulin pumps and ancillaries; not including the cost of oral antidiabetic drugs, was 40% of the total cost of all non-hospital medications covered by the Healthcare Insurance Fund and Government Programs in 2014 (Fig. 1.4) [9, 10].

In order to manage the burden of diabetes prevalence, especially in lower resource countries, numerous activities need to be undertaken. Those activities have to be endorsed by the top policy decision makers in order to be implemented.

Examples of activities undertaken at institutional level to address the diabetes burden in the Republic of North Macedonia, include: (1) adoption of National Diabetes Plan at the level of Ministry of Health, strategic document describing the current situation and the proposed activities on diabetes treatment, education, prevention; (2) addition of diabetes as a specifically designated medical condition in the Law on Healthcare; (3) adoption of international guidelines for diabetes care as National Diabetes Care guidelines, published in the Official Journal of the country.
where laws are published, to ensure adherence by all stakeholders; (4) formation of a National Diabetes Committee, body for monitoring of adherence to the National Diabetes Care guidelines; (5) creation of NeHS to monitor the diagnosis and treatment of people with diabetes [10, 12, 13].

These activities comply with the World Health Organization (WHO) recommendations for establishing National Diabetes Plans and providing Universal Healthcare Coverage (UHC) by 2030, as well as reduction of premature death from non-communicable diseases (NCDs), including diabetes, by 25% by 2025 [2, 14].

The findings from the national analysis in a small, severely affected, lower resource country, such as the Republic of North Macedonia, further strengthen the need that each developing country should be in possession of its real-world, stratified, diabetes prevalence data, instead of using extrapolations.

The analyses of the national, stratified diabetes prevalence were performed with very limited financial resources, confirming it is possible to generate numerous diabetes related reports in a setting of a lower resource country, if the NeHS is in place.

**What should be done to manage the burden of diabetes prevalence in developing countries?**

Each developing country should …

- … know its numbers—as a minimum, the prevalence of diagnosed cases, stratified by age, gender and place of living, urban or rural;
- … consider epidemiological study to find the prevalence of undiagnosed diabetes cases;
- … map the diabetes care services across all healthcare levels;
- … have a National Diabetes Plan, and consider designating diabetes as a specific medical condition in the laws;

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**Fig. 1.4** Cost of insulin and related supplies as a percentage of the total cost for non-hospital reimbursed medications [10]. *OAD* Oral Antidiabetic Drugs, *HCIF* Healthcare Insurance Fund
• ... adopt international guidelines as National Diabetes Care guidelines, requiring adherence by all stakeholders;
• ... form a national body, National Diabetes Committee, overseeing the adherence to the National Diabetes Care guidelines;
• ... implement a national, centralized, integrated electronic healthcare system covering the total population across all healthcare levels.

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