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Report

**Epidemiology, education, and care for patients with diabetes in Belarus**

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**Abstract**

More than 64 million people in the World Health Organization European Region are living with diabetes, and Belarus is no exception to the diabetes epidemic. This study was conducted as a part of the Joint Usage/Research Projects program for promoting collaborative research in regions affected by environmental radiation exposure. We reviewed locally available documents on the epidemiology and management of diabetes in Belarus. Over the past 20 years, there has been a 2.8-fold increase in the number of patients with diabetes mellitus in Belarus, and in response, an integrated approach for prevention and treatment has been implemented. Strategies unique to Belarus include the establishment of a diabetes registry, the monitoring of patients at local outpatient units called dispensaries, and the upgrading of diabetes education provided at Diabetes Schools. Despite the strategic developments made to diabetes services, further improvements are warranted, including better quality assurance of services at dispensaries, revision of patient education to take into consideration new treatments and technologies, and more epidemiological research.

**Keywords:** diabetes mellitus, treatment adherence, prevention, barriers, diabetes medical care

## **Introduction**

The increasing prevalence of diabetes mellitus is a serious problem around the world. Regions affected by environmental radiation exposure have seen particularly large increases in diabetes prevalence. In Fukushima, analyses of data collected through the Fukushima Health Management Survey showed a distinct increase in the prevalence of diabetes in the years following the 2011 Fukushima nuclear disaster, especially among residents who were forced to evacuate [1]. In this study, we review the epidemiology and management of diabetes in Belarus, a country that was severely affected by the 1986 Chernobyl nuclear power plant accident. This study was conducted as a part of the Joint Usage/Research Projects program established and coordinated by Hiroshima University, Nagasaki University, and Fukushima Medical University to promote collaborative research in regions affected by environmental radiation exposure. Our overarching goal is to share information and promote collaboration to minimize the long-term effects of nuclear disasters on people's health.

## **Epidemiology of diabetes in Belarus**

In the Republic of Belarus, as of January 1, 2021, a total of 356,945 patients with diabetes mellitus were registered at dispensaries, and the most prevalent type was type 2 (94%) [2]. Over the past 20 years, there has been a 2.8-fold increase in the number of patients with diabetes mellitus, and the diabetes incidence rate in 2017 was 4.4 times higher than that in 1995. In response, an integrated approach to prevention and treatment was implemented. This included the establishment of a national registry of diabetes and the introduction of careful assessment by district physicians (general practitioners) before prescribing insulin therapy. These efforts were highly evaluated by World Health Organization experts in 2014 [3].

As a result, the mortality of patients with diabetes over the past 10 years decreased from 4.7 to 3.3 per 100 patients [2]. According to national registry data from 2007 to 2016, the average life expectancy among patients with type 2 diabetes mellitus was 72.8 years (70.0 years for men, 74.6 years for women), which was higher than the general population. There was an observed increase in chronic complications relating to diabetes until around 2000, which was followed by a rapid decline: the proportion of patients with complications was 75% in 2000, which decreased to 46% by 2015. Moreover, the severity of complications has changed; for example, in the past, lower-extremity amputations were predominantly at the level of the thigh or lower leg, but now, 64% of such amputations are of the foot or toe.

## **Background factors**

Besides common complications of the disease, such as diabetic nephropathy and retinopathy, diabetic foot, and cardiovascular disease, recent studies point to the acceleration of biological aging, cognitive decline, and carcinogenesis in patients with diabetes [4]. To solve these issues, it is important not only to understand the etiology and pathogenesis of diabetes, but also the problems associated with adherence to treatment and possible barriers to effective control of the disease. According to our recent study conducted in the Gomel region of Belarus

[5], the main barriers to a healthy lifestyle were financial difficulty and a lack of knowledge and motivation. We also found that more than half of patients with prescribed medication did not take it for fear of side effects, financial difficulty, and a lack of knowledge about the benefits of drug therapy.

## **Referral system**

Endocrinological care in Belarus has a multilevel structure [6]. Outpatient care is provided at the district and inter-district level (polyclinics at central district hospitals and city polyclinics), regional level (regional endocrinological dispensaries, regional hospitals, and regional medical and diagnostic centers), and national level (Republican Center for Endocrinology and Republican Center for Medical Rehabilitation and Balneotherapy). Similarly for inpatient care, there are beds at district, inter-district, and regional level hospitals and at the national level (Republican Research Center for Radiation Medicine and Human Ecology and 2nd City Clinical Hospital) [7].

Primary diagnosis for diseases of the endocrine system is carried out at outpatient examinations by general practitioners, pediatricians, or endocrinologists. For detailed diagnosis and to receive the appropriate level of care, patients are referred to specialized endocrinological care. Subsequent monitoring and treatment are conducted at the primary care or specialist level in accordance with the recommendations of the endocrinologist [8].

A unique characteristic of the system in Belarus is the monitoring of patients with diabetes by dispensaries. A dispensary is a medical institution that provides specialized and preventive medical care to certain groups of the population and systematically monitors their health. Dispensaries identify patients at an early stage of their disease by mass preventive and targeted examinations of the population. Patients in need of treatment are registered for a thorough examination and receive special medical assistance, health status monitoring, and periodic assessments of working conditions and daily living. These assessments are carried out in order to promote better disease control and healthy lifestyles among patients and to boost their awareness of and responsibility for their own health. In collaboration with sanitary and epidemiological stations, dispensaries attempt to mitigate factors that adversely affect the health of registrants and of those living and working with them. Treatment at the dispensary is carried out either on an outpatient or inpatient basis [9,10]. Patients are assigned to dispensaries according to their place of residence, work, or study. The procedures performed and the frequency at which the assessments are conducted differ depending on age group: there are two adult population groups (those aged 18–39 years and those aged 40 years and over) and two child population groups (those aged up to 1 year and those aged 1–17 years). If the dispensary's medical assessment identifies risk factors for disease development, arrangements are made to provide detailed medical counseling, healthy lifestyle promotion, and, when necessary, further diagnostic tests (including cancer screening) and referral to a specialist. This referral system is defined by the Decree of the Ministry of Health of the Republic of Belarus, August 9, 2022, No. 83 [11].

## **Disease monitoring and patient education**

To keep records of the prevalence, morbidity, mortality, life expectancy, and complications of diabetes mellitus, the national Diabetes Mellitus registry was established in 2006 [12]. The objectives of the registry, besides collecting epidemiological data, are to better manage the health of patients, to secure sufficient quantities of medicines and medical devices, and to examine the quality of medical care and pharmacoeconomic efficiency [13].

To control diabetes effectively, prevent complications, and improve quality of life, it is essential to gain an adequate understanding of the disease and its treatment among patients. Previous research showed that self-management education for patients with type 2 diabetes improves their disease control [14]. In Belarus, Diabetes Schools were first established in 1987, and have contributed to a reduction in hypoglycemia [15]. However, the education system faced difficulties due to a lack of testing equipment and teaching materials and a traditional didactic teaching method. As a result of the development of new technologies, including tools for self-monitoring and insulin administration, the education needs of patients are changing. For this reason, new guidelines in Belarus recommend a personalized (patient-centered) approach to help patients make treatment decisions, in accordance with the order of the Ministry of Health of the Republic of Belarus, January 2020, No. 47: “On improving the education system for patients with diabetes mellitus.”

The upgraded Diabetes Schools serve a variety of purposes: to increase patient motivation for disease management; to equip patients with basic knowledge of the disease, its treatment, and its impact on health; to enable patients to self-monitor glycemic level and inject insulin; to provide patients with nutrition and physical activity instructions; to provide emergency care in various situations; to prevent the development and progression of complications of diabetes; and to facilitate discussions with patients on the impact of diabetes on their life and future choices (mental health, career, family planning, the ability to drive a car, etc.) [16]. In terms of teaching methods, in addition to applying traditional didactic techniques, these schools promote interactive communication between instructors and patients, as well as among patients themselves. This interactive method requires instructors to have the ability to involve patients in activities, to listen to patients’ ideas and opinions, and to provide support to those in need.

For example, in 2021, a medical and social project called “Tell your story about self-control” was implemented by members of the public association “Support for People with Diabetes” with the support of the Belarusian Public Medical Association: Endocrinology and Metabolism [17, 18]. In the sessions held as part of this initiative, patients of different ages, professions, and disease durations first share their own history of disease control and then explore the role of a new self-control method: a continuous glucose monitoring system. Another example is an information campaign in Minsk, entitled “Live to beat diabetes,” conducted for pediatric endocrinologists, children with type 1 diabetes mellitus, and their parents [19]. The campaign was initiated by the City Children’s Endocrinological Center of the 2nd City Children’s Clinical Hospital, with support from specialists of the Belarusian Public

Medical Association: Endocrinology and Metabolism. The first stage of the project comprised a scientific seminar for specialists in the field of pediatric endocrinology to share their experiences and discuss modern approaches to treatment. The second stage comprised psychological training sessions for children with type 1 diabetes and their parents. Participants were divided into three target groups: 8–12 years old, 13–18 years old, and parents. Children and adolescents were able to learn about positive examples of life with diabetes and to communicate with peers who have the same disease. Parents of children with diabetes also had the opportunity to communicate with each other, exchange information, and support each other. As a third example, on November 14, 2022, World Diabetes Day, the Gomel State Medical University (GSMU) initiative group conducted outreach campaigns at businesses in Gomel (Figure 1) [20]. This was a joint initiative by the Belarusian Union of Women of GSMU, the Public Health Department and Public Health Services, and the Departments of Internal Diseases No. 1 and No. 2 dedicated to the prevention and treatment of diabetes mellitus. Professionals and medical students conducted consultations to identify risk factors for type 2 diabetes and gave recommendations for risk reduction.

### **Medical care and technologies**

In accordance with the existing regulatory framework in Belarus, patients with diabetes are supplied with insulin and hypoglycemic tablets free-of-charge with insulin funded nationally and hypoglycemic tablets funded from local budgets [21]. The national Diabetes Mellitus registry described above provides data for supply management as well as monitoring complications of the disease. Of note, the proportion of patients with type 1 diabetes using insulin analogues in treatment was 53% (children under 18 years old) in 2021, increasing from 31% in 2019. The country thus aims to increase the domestic production of the medication, which should be accompanied by wider patient education to use the therapy effectively. To optimize hypoglycemia prevention, continuous glucose monitoring became available at all endocrinological dispensaries [22] as part of the implementation of the National Demographic Safety Program for 2011–2015. To improve the quality of the three-level care system, advisory assistance is available, such as through the Republican Telemedicine Consulting System, which provides consultations, and through endocrinology courses at medical universities and at the Belarusian Medical Academy of Postgraduate Education.

### **Future improvements**

Despite the presence of a clear multilevel system for diabetes services, including services unique to Belarus (as summarized in Table 1), there is a need for further development. As mentioned above, mortality and complications due to diabetes are decreasing, yet our recent report indicates a need to improve the public and patients' knowledge, attitudes, and practices relating to diabetes prevention and treatment [5]. The quality of services provided at dispensaries should be carefully assessed, and more research on the epidemiology and management of diabetes in Belarus is warranted. Along with the changing epidemiology of the disease and the introduction of new treatments and technologies, patient education requires

constant revision. As part of the implementation of the State Program “Public health and demographic safety” for 2021–2025 for both patients and medical workers, a methodological guideline for patient education entitled “School of patients with diabetes: the basics of self-control and disease management” was published, and distance learning is currently under development.

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**Table 1. Diabetes prevention and care services unique to Belarus**

Service	Description
Polyclinic	District- and inter-district-level outpatient care provided by general practitioners, district pediatricians, and endocrinologists. Services include primary diagnosis and subsequent monitoring, and if necessary, referral to specialized endocrinological care.
Specialized endocrinological care	Hospital-based inpatient care provided by endocrinology specialists. Services include detailed diagnosis, individual prescriptions for hypoglycemic therapy, and diagnosis and treatment of complications.
Dispensary	Specialized and preventive medical institution for the early identification and subsequent monitoring and assessment of patients with diabetes.
National Diabetes Mellitus registry	A national database on diabetes used for disease monitoring and treatment management.
Diabetes Schools	A patient education system recently revised to provide interactive patient-centered learning opportunities.



**Figure 1. An example of a Diabetes School: Outreach event for identification and reduction of diabetes risks**