ABSTRACT

of the dissertation for the degree of Doctor of Philosophy (PhD) titled "Improving the health care of patients with non-alcoholic fatty liver disease and diabetes mellitus type 2," completed by SULTANOVA BALNUR PERDEKOZHAYEVNA in the specialty "6D110200 – Public Health"

Relevance of the research topic. Diabetes mellitus (DM) poses a significant socio-economic challenge, affecting 6.2% of the adult population in Kazakhstan (approximately 717,500 individuals). Type 2 diabetes (T2DM) is closely associated with non-alcoholic fatty liver disease (NAFLD), which is observed in 43–70% of patients with T2DM and significantly increases the risk of severe complications such as cirrhosis, liver failure, and hepatocellular carcinoma. Additionally, NAFLD raises the likelihood of developing T2DM by a factor of five.

Timely diagnosis and treatment of NAFLD can reverse its progression, thereby reducing complications and improving quality of life. Given the rising prevalence of T2DM and NAFLD, early diagnosis and a comprehensive approach to managing these conditions have become increasingly important.

Aim of the study: to improve the health care of patients with NAFLD and T2DM by analyzing epidemiological data, studying clinical and laboratory features and developing a model of prevention, management and treatment.

In line with the study's objective and hypothesis, the following tasks were set:

- 1. To examine the prevalence and clinical-epidemiological characteristics of NAFLD in patients with T2DM.
- 2. To assess the organization of medical care at the primary health care (PHC) level for patients with T2DM and NAFLD in the city of Almaty.
- 3. To evaluate patient awareness regarding the risk of NAFLD development in the context of T2DM and its impact on the progression of NAFLD in T2DM.
- To develop a scientifically grounded model for improving the delivery of medical and social care to patients with T2DM combined with NAFLD.
 Subject of the study

The study focuses on the relationship between T2DM and NAFLD, including their clinical-demographic and epidemiological features, risk factors, the impact of comorbidities, and patients' quality of life.

Research methods

A comprehensive research program was designed, including a systematic review of international and domestic literature (PubMed, Cochrane, Google Scholar) using the PICO methodology, alongside epidemiological data from the National Scientific Center for Health Development for the period 2012–2022. A retrospective analysis was conducted on the medical records of 4,009 patients diagnosed with T2DM and NAFLD. Additionally, 1,000 patients were surveyed to explore risk factors, treatment adherence, and satisfaction with medical care, while 721 physicians were polled to evaluate the organization of medical services.

Quality of life was assessed using standardized questionnaires, WHOQOL-BREF and EQ-5D-5L. Based on the data obtained, an algorithm for improving medical and social care was developed. Statistical analysis was performed using MS Excel and SPSS software, employing regression models, the Chi-square test, and odds ratio (OR) calculations. The study received ethical approval from the Ethics Committee of KazNMU (IRB No. A058).

Scientific novelty

This research presents the first comprehensive analysis in Kazakhstan of the prevalence and risk factors associated with NAFLD among patients with T2DM. The findings indicate a high prevalence of NAFLD in this population, which significantly exacerbates the progression of the primary disease and adversely affects quality of life. This decline is directly linked to patient age and the duration of T2DM.

The study identified key factors influencing patient adherence to treatment, including insufficient awareness among both healthcare providers and patients regarding the risks of NAFLD in the context of T2DM, the absence of a centralized patient registry, and the lack of established algorithms for disease management, prevention, and treatment.

Based on these findings, a scientifically and practically validated model for medical and social care for patients with T2DM and NAFLD was developed. This model emphasizes an individualized approach to disease management and includes a comprehensive "Management algorithm" presented in booklet format. Both printed and digital versions of the algorithm are accessible to healthcare providers and patients through the Research Institute of Cardiology and Internal Medicine, specifically within the Department of General Therapy.

Additionally, educational programs for physicians and patients have been implemented, and the establishment of an electronic registry, "Registry of patients with non-alcoholic fatty liver disease in patients with type 2 diabetes mellitus," aims to optimize the organizational framework of primary healthcare services.

Theoretical significance of the study

The study identified epidemiological indicators of the prevalence of T2DM and NAFLD, considering gender, age, and social characteristics of patients. It also provided data on the level of awareness among patients with T2DM regarding the risk of developing NAFLD, as well as the level of professional training among healthcare providers in diagnosing, treating, and preventing this comorbid condition. The findings form the foundation for improving the organization of medical care for patients with these pathologies. The developed model for enhancing medical and social care, along with the patient management algorithm for T2DM and NAFLD, is expected to improve treatment outcomes and enhance the effectiveness of personalized medical services. These findings can be applied in planning educational programs and developing national strategies for the prevention and treatment of these conditions.

Practical significance of the study

The findings on the epidemiology of NAFLD among patients with T2DM in Almaty can be applied to develop healthcare management strategies aimed at the early detection and prevention of this comorbid pathology. The implemented "Registry of Patients with Non-Alcoholic Fatty Liver Disease in Patients with Type 2 Diabetes Mellitus" serves as a system for tracking and monitoring this patient group. This registry enhances the efficiency of diagnosis and treatment, thereby improving the quality of medical care.

The study results have been integrated into residency training programs in the specialty "Endocrinology" and are used at the Research Institute of Cardiology and Internal Medicine. This contributes to improving the training system for medical specialists and enhancing their qualifications in both academic and practical settings.

Provisions submitted for defense

The study revealed an increasing prevalence of NAFLD among patients with T2DM in Kazakhstan. Analysis showed that among hospitalized patients with T2DM, the prevalence of NAFLD reached 84.4%, indicating a high prevalence of this comorbid condition and the necessity for a comprehensive approach to its detection and treatment.

Data from the official registry indicated a steady rise in the incidence of T2DM and NAFLD across adults, children, and adolescents after 2020. This increase is attributed to the aftermath of the COVID-19 pandemic, including reduced physical activity, poorer diet quality, and restricted access to medical monitoring. Patients with comorbid conditions — T2DM, NAFLD, and obesity — experienced more severe viral infections, increasing the risk of complications and disease progression.

Key factors contributing to the high prevalence of NAFLD among patients with T2DM include low patient awareness and compliance, insufficient professional knowledge among healthcare providers regarding the prevention and treatment of these conditions, and the absence of clinical protocols addressing the management of comorbid pathologies.

The developed model and algorithm for managing patients with T2DM and NAFLD represent an innovative approach to handling these conditions. The introduction of the "Registry of Patients with Non-Alcoholic Fatty Liver Disease in Patients with Type 2 Diabetes Mellitus" provides systematic monitoring and improved patient management, enhancing disease control and preventing complications.

Personal contribution

The dissertation's results were obtained with the author's direct involvement. The author independently conducted a literature review on the research topic, carried out practical work, analyzed and processed the obtained data, and wrote and prepared the dissertation manuscript.

Main research results and conclusions

1.The prevalence of T2DM and NAFLD in Almaty has significantly increased. From 2012 to 2022, T2DM cases more than doubled, reaching 55,082, with a projected rise to 65,000 by 2025. The incidence of NAFLD tripled from 2017 to 2022, with a 170% increase. Both diseases are becoming more common among children and adolescents, posing a serious threat to public health. Among patients with T2DM, NAFLD prevalence is 84.4%, and they are more prone to complications

such as diabetic retinopathy (DR), nephropathy, and cardiovascular diseases.

2. The organization of medical care for patients with NAFLD and T2DM at the primary healthcare level in Almaty is insufficiently effective for several reasons. Major barriers include a lack of knowledge about NAFLD among physicians (60.2%), insufficient time for comprehensive patient management (44.7%), high costs of diagnosis and treatment (37.9%), and low patient adherence to treatment regimens (49.5%).

3.The study confirms the necessity of improving patient awareness about NAFLD, particularly among individuals with T2DM. Among 1,000 respondents, nearly half (49.6%) reported familiarity with the term "fatty liver disease" or "NAFLD," although most patients (72.7% of men and 65.7% of women) had not received information about NAFLD from their doctors.

4. The developed model for improving medical and social care fully addresses the tasks of enhancing the quality of medical services for patients with NAFLD and T2DM. It includes the implementation of precise clinical protocols, development of educational programs for physicians and patients, and the creation of registries and information systems.

Dissertation approval

The main results of the dissertation were presented at the following scientific events: Conference "Diabetes mellitus in the Republic of Kazakhstan," KazNMU named after S.D. Asfendiyarov (Almaty, November 17–18, 2017); V International Farabi Readings (Almaty, April 3–13, 2018); Fourth International Conference of the European Academy of Science (Bonn, Germany, January 20–30, 2019).

Publications related to the dissertation

A total of 13 works have been published based on the dissertation, including: 3 articles in journals recommended by the Committee for the Control of Education and Science of the Ministry of Education and Science of the Republic of Kazakhstan; 2 publications in the proceedings of international conferences; 2 publications in the proceedings of foreign conferences; 1 article in a journal indexed in the international Scopus database: the article was published in the Electron Journal of General Medicine (Scopus, ISSN: 2516-350, CiteScore 0.19, General Medicine Percentile: 29, 2019). Additionally, 4 certificates of state registration of copyright have been obtained: No. 39914 (October 27, 2023), No. 43636 (March 12, 2024), No. 51005 (November 1, 2024) and No. 52997 (December 26, 2024).

Volume and Structure of the Dissertation

The dissertation is presented on 155 pages and includes an introduction, 4 chapters, a conclusion, findings, practical recommendations, and appendices. The work is illustrated with 9 tables and 84 figures. The reference list consists of 9 domestic and 109 foreign sources.