

GADZIŃSKI, Patryk, CZECHOWICZ, Marta and MADOŃ, Joanna. The impact of demographics on the prevalence and treatment of type 2 diabetes - a literature review. *Journal of Education, Health and Sport*. 2025;86:67335. eISSN 2391-8306.
<https://doi.org/10.12775/JEHS.2025.86.67335>
<https://apcz.umk.pl/JEHS/article/view/67335>

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences). Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu). © The Authors 2025; This article is published with open access at Licensee Open Journal Systems of Nicolaus Copernicus University in Toruń, Poland Open Access. This article is distributed under the terms of the Creative Commons Attribution Noncommercial License which permits any noncommercial use, distribution, and reproduction in any medium, provided the original author (s) and source are credited. This is an open access article licensed under the terms of the Creative Commons Attribution Non commercial license Share alike. (<http://creativecommons.org/licenses/by-nc-sa/4.0/>) which permits unrestricted, non commercial use, distribution and reproduction in any medium, provided the work is properly cited. The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 11.12.2025. Revised: 08.12.2025. Accepted: 08.12.2025. Published: 19.12.2025.

The impact of demographics on the prevalence and treatment of type 2 diabetes - a literature review

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Abstract

Background Type 2 Diabetes is, without a doubt, a global health crisis. Detailed guidelines have been made to create a universal standard for prevention, screening, and therapy, but far too often, a single model proves inefficient in treating patients from all walks of life, displaying a wide variance in both clinical and lifestyle factors.

Aim This review of the existing literature attempts to showcase the main differences in the prevalence, risk factors, and therapy effectiveness of Type 2 Diabetes between a number of demographics, hopefully allowing for a more personalized approach to treatment, rather than a one-size-fits-all model.

Materials and Methods The article thoroughly reviews the existing literature on Type 2 Diabetes and the demographic factors thereof. Original studies, reviews, meta-analyses, as well as epidemiological surveys available in the PubMed and Google Scholar databases were included. The literature review and article selection process concluded in November 2025.

Results The available data backs up the hypothesis that demographic factors heavily influence the prevalence and outcomes of Type 2 Diabetes. The illness is both more prevalent and on average, more poorly controlled in women, as compared to men, resulting in a higher all-cause mortality. In terms of age, each additional year at the time of diagnosis correlates with a 4% decrease in all-cause mortality, as well as a 3% decrease in macrovascular and 5% decrease in microvascular complications. Additionally, socioeconomic factors have been found to play a significant role in therapy adherence, even in countries with a well-developed social safety net.

Conclusions The findings showcase a desperate need for a more personalized approach to Type 2 Diabetes, focusing on the elimination of negative lifestyle habits, a thorough patient education, and a choice of medication that is within an acceptable financial range, rather than simply prescribing that, which displays the highest effectiveness on paper. If possible, as much time as needed should be spent to ensure that a patient thoroughly understands their disease and its complications, and to set a realistic, achievable goal approved by both sides.

Keywords: diabetes, type 2 diabetes, personalized therapy, demographics.

Introduction

Despite increasing efforts in both treatment and prevention, Type 2 Diabetes remains one of the primary concerns in worldwide healthcare. At present, epidemiological analyses suggest an approximate number of 462 million afflicted, corresponding to over 6% of the global population [1], with forecasts indicating around 730 million living with Type 2 Diabetes by 2050 should prevalence remain unchanged [2], though civilizational challenges, such as worsening dietary habits and an increasingly sedentary lifestyle, threaten to further exacerbate the strain caused by the illness. Despite vast contrasts between afflicted individuals, many physicians continue to employ a catch-all approach to Diabetes treatment, even as studies showcase that personalized interventions and adjustments in matters such as nutrition [3], lifestyle management [4], or simply a greater consideration of individual factors in determining prescribed medication, lead to a direct improvement in patient compliance and therapy outcomes. On the larger scale, this negligence contributes to the overwhelming number of 1.66 million yearly deaths caused by Diabetes worldwide, as well as the sharp increase in Disability-Adjusted Life Years lost within the past 30 years [6], conclusively indicating the need to further our understanding of how certain characteristics impact long-term care. This literature review, therefore, aims to showcase the uneven effectiveness of Diabetes treatment between a variety of key demographics, as well as the primary pitfalls influencing the reduction thereof.

Gender

Between the sexes, Type 2 Diabetes exhibits a higher prevalence among men, with an estimated 17.7 million more worldwide cases than women, coupled with a younger average age and body weight at the time of diagnosis [7]. Research into the subject indicates that the disparity is likely a result of hormonal differences, such as the pre-menopausal protective effect of estrogens, as well as a combination of lifestyle factors such as sleep deprivation, low decision latitude, and limited access to education, which were found to disproportionately affect women [8].

Therefore, in other words, it could be said that women face a higher initial risk factor burden than their male counterparts – a fact which poses considerable challenges for physicians treating female patients, often necessitating a thorough interview in order to identify all negative lifestyle elements influencing the development and progression of Type 2 Diabetes. A meticulous approach could be particularly beneficial among newly-diagnosed patients, among whom it has been found that women are less likely to achieve optimal glycemic control than men (38.9% vs 40.6%) [9].

Another factor contributing to the aforementioned gender differences is the presence of gestational diabetes mellitus, which exists as a complication in roughly 6% of pregnancies, serving as a strong predictor for the subsequent development of Type 2 Diabetes, with a measured hazard ratio of 3.87 during the first 6-15 years following an affected pregnancy. Despite an estimated reduction of 24% per each successive decade, the risk remains elevated for over 35 years [10]. Still, gestational diabetes mellitus is often treated as an isolated problem, leading to the costly cessation of further diagnosis. In a follow-up study relating to the matter, it has been found that among 220 women who suffered from gestational diabetes mellitus, 48% progressed to Type 2 Diabetes within the subsequent 5 years, while a further 5.5% had impaired fasting glucose, and 10.5% had impaired glucose tolerance. Of the patients who developed Type 2 Diabetes, 47% had been previously unaware of the fact [11]. Such a number is far from surprising, given that only a little over half of women with a history of GDM undergo T2DM screening in the first year postpartum, with the proportion screened rapidly declining in subsequent years [12]. Despite the lack of unified guidelines, regular screening, as well as non-pharmacological and pharmacological interventions have been shown to effectively hamper progression, with health-promoting lifestyle modifications leading to a 58% decreased incidence of Type 2 Diabetes compared with the placebo group despite the mean weight reduction of only 5.6kg. Additionally, natural breast-feeding has been found to have a protective effect, given the 15% decrease in the risk of T2DM for each year of lifetime lactation, even after adjusting for family history of diabetes mellitus, diet, exercise, and BMI [13].

Returning to the initial comparison, a meta-analysis of studies measuring the all-cause mortality among male and female patients with Type 2 Diabetes has found that, on average, women face a more negative prognosis, with a comparative all-cause mortality of 1.19 compared to their male counterparts, which increases to 1.30 in reviews, in which the follow-up duration is longer than 10 years. Contrasted with healthy individuals of the same sex, the ratios are 2.33 and 1.91 for women and men, respectively. A significantly different picture is painted when it comes to complications, however, which display a significant variance. While male patients are significantly more likely to develop microvascular complications - 2.42 times for multiple complications and 1.64 times for microalbuminuria, specifically [15], though coronary heart disease remains a problem primarily for women, who face a 58% greater mortality [16].

Age

In patients with Type 2 Diabetes, age can be analyzed twofold: as the age at the time of diagnosis, or simply as the patient's current age, with the interplay between these factors having a considerable impact on therapeutic objectives and long-term care prospects. Instead of lumping these two issues together, let's briefly analyze them separately.

As diabetes is a progressive illness, it is to be expected that, on average, a younger age at the time of diagnosis would lead to more negative patient outcomes. After all, an earlier diagnosis often correlates with the presence of significant adverse lifestyle factors [17], but even if that were to be overlooked, in basic terms, each successive year spent with the illness equates to more time for complications to develop and for the pancreas's remnant function to further worsen. This common-sense train of thought is corroborated by the available data, which shows that each 1-year increase in age when diagnosed is associated with a 4% decrease in all-cause mortality, as well as a 3% decrease in macrovascular and 5% decrease in microvascular complications, adjusted for current age [18], however the strength of the correlation could be a source of argument, as studies have found that while current age, age at diagnosis and diabetes duration are all independent risk factors for macrovascular complication, only the diabetes duration was independently associated with microvascular complications [19].

Yet even among freshly diagnosed patients, age plays a significant role. After all, a 40-year-old coming for their first checkup presents a notably different challenge than his 70-year-old counterpart. Just like previously, the balance remains in favor of the older demographic, which was found to be notably more likely to achieve optimal glycemic control. Taking 65 years of age as the cutoff, elderly patients reached a mean glycated hemoglobin percentage of 7,1% in both genders, while younger patients reached a percentage of 7,7% for males and 7,4% for females [20]. A large part of this difference could be explained by lifestyle factors – generally, younger people with Type 2 diabetes have poorer self-care practices than older individuals, as showcased by, for example: a greater difficulty following dietary recommendations (50% vs 32%), chance to forget medications (37% vs 22%), and a smaller proportion reporting appropriately frequent monitoring of glucose levels (60% vs 70%) [21]. Additional measures should be undertaken in the treatment of patients with frailty syndrome, which, among others, noticeably reduces therapy adherence [22].

Socioeconomic factors

Despite the noble intention to provide equal quality healthcare to patients of all cultural and financial backgrounds, socioeconomic factors continue to play a significant role even in countries with a highly developed social safety net. Lower education and income levels correlate closely with negatively patient lifestyles, such as dietary habits, with a higher average carbohydrate intake. In contrast, higher education is linked with notably lower odds of uncontrolled hyperglycemia (OR of 0.63), while a higher income significantly lowered the odds of diabetic retinopathy (0.59) [23]. Just like before, the key could potentially lie in therapy compliance. When tested for rates of initiation and 24-month persistence, patients with lower education, the unemployed, and those belonging to migrant communities scored worse than other demographics. [24].

Additionally, access to optimal medication is far from universal. An epidemiological study of over 100000 households in 22 countries revealed that while insulin was available in 93.8% of pharmacies in high-income nations, the rate is wildly different in those of middle (40.2%) and low-income (10.3%) [25]. With a high financial barrier of entry preventing many from adhering to an optimal therapy, primarily affecting insulin, SGLT2 inhibitors, and GLP-1 receptor agonists, TZDs were found to be the most likely to serve as a cost-effective strategy in low willingness-to-pay thresholds, and therefore should receive priority consideration for patients, for whom the cost of therapy remains the primary concern [26].

Race

The racial distribution of Type 2 Diabetes is far from universal, resulting from a wide variety of primarily socioeconomic factors, as listed before. Said disparities are most clearly visible in multi-ethnic societies, which allow for a certain standardization of results that provides a sufficiently clear overview of existing dynamics. For example, in the UK, those of White ethnicity experience diabetes at a lower overall percentage (5.04%) than those of Asian (7.69%) or Black (5.58%) ethnicity [27]. A similar trend emerges in American studies measuring differences in glycemic control achievement, where a HbA1c level of >8.0% was determined to be most common in African-American women (50%) and Mexican-American men (45%), while patients of White ethnicity were most likely to achieve a score of <6.5% (26%) [28]. The divergence in results continues into old age, with mean HbA1c levels decreasing among the White population while increasing in African-American and Mexican-American populations, along with the risk of morbidity, mortality, and disability [29].

Comorbidities

Diseases do not exist in a vacuum. Nowadays, a single diagnosis is often a rare sight, and in many cases, patients with type 2 diabetes can be expected to carry severe comorbidities. In fact, 97.5% percent of patients have at least one comorbid condition in addition to type two diabetes, and 88.5% have at least two, with the most prevalent being hypertension, present in 82.1% [30]. From a lengthy list of potential illnesses, retinopathy, heart diseases, and abdominal atherosclerosis were reported by diabetic patients as having the most severe negative impact on the physical quality of life [31]. The link between comorbidities and glycemic control is tenuous, however. While certain studies show that their presence does not limit patients' ability to achieve optimal results [32], others have found that the presence of musculoskeletal diseases displays a negative effect after a 5-year follow-up period, despite a lower average HbA1c level at the time of diagnosis [33].

Discussion

The available data backs up the hypothesis that demographic factors heavily influence the prevalence and outcomes of Type 2 Diabetes. The illness is both more prevalent and on average, more poorly controlled in women, as compared to men, resulting in a higher all-cause mortality. In terms of age, each additional year at the time of diagnosis correlates with a 4% decrease in all-cause mortality, as well as a 3% decrease in macrovascular and 5% decrease in microvascular complications. Additionally, socioeconomic factors have been found to play a significant role in therapy adherence, even in countries with a well-developed social safety net.

Conclusions

Research indicates that disturbances in the proper functioning of the immune system, including elevated levels of proinflammatory cytokines, microglial activation, and the presence of autoantibodies, can affect neuronal function, synaptic plasticity, and the integrity of the blood-brain barrier. Although the results of some studies remain uncertain due to methodological differences and clinical heterogeneity, a growing body of evidence suggests that immunological mechanisms may play a significant role in the pathogenesis of mental illness.

DISCLOSURES

Author's contribution:

Conceptualization: Patryk Gadziński, Marta Czechowicz, Joanna Madoń

Methodology: Patryk Gadziński, Marta Czechowicz, Joanna Madoń

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All authors have read and agreed with the published version of the manuscript.

Funding Statement:

This Research received no external funding.

Institutional Review Board Statement:

Not applicable.

Informed Consent Statement:

Not applicable.

Data Availability Statement:

The authors confirm that the data supporting the findings of this study are available within the article's bibliography.

Conflicts of Interests:

The authors declare no conflict of interest.

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