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DETERMINANTS OF DIABETES MELLITUS AMONG ADULTS IN UZBEKISTAN

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Abstract. Diabetes mellitus is one of the most rapidly increasing non-communicable diseases worldwide and represents a major public health challenge in Central Asia, including Uzbekistan. The rise in prevalence is closely linked to lifestyle changes, urbanization, and the growing burden of metabolic risk factors. This study aimed to identify the prevalence and key determinants of diabetes mellitus among adults in Uzbekistan. The overall prevalence of diabetes mellitus was 13.6%, while prediabetes was 7.9%. Multivariate analysis revealed that age over 40 years (AOR = 2.84; 95% CI: 1.65–4.92), obesity (AOR = 3.12; 95% CI: 1.78–5.47), physical inactivity (AOR = 2.21; 95% CI: 1.29–3.78), frequent fried food consumption (AOR = 1.96; 95% CI: 1.12–3.41), and chronic stress (AOR = 2.37; 95% CI: 1.34–4.19) were significantly associated with diabetes mellitus. Diabetes mellitus in Uzbekistan is strongly associated with modifiable lifestyle factors and non-modifiable demographic characteristics. Strengthening preventive strategies focused on healthy diet, physical activity, stress management, and early screening is essential to reduce the growing burden of the disease.

Keywords: Diabetes mellitus; Uzbekistan; Central Asia; prevalence; risk factors; obesity; lifestyle; physical inactivity; stress; epidemiology.

Annotatsiya. Qandli diabet dunyo bo‘yicha eng tez sur’atlarda ortib borayotgan yuqumsiz kasalliklardan biri bo‘lib, Markaziy Osiyoda, jumladan O‘zbekistonda ham jamoat salomatligi uchun muhim muammo hisoblanadi. Kasallik tarqalishining ortishi turmush tarzidagi o‘zgarishlar, urbanizatsiya va metabolik xavf omillarining ko‘payishi bilan chambarchas bog‘liq. Ushbu tadqiqotning maqsadi O‘zbekistondagi kattalar orasida qandli diabetning tarqalishi va asosiy determinantlarini aniqlashdan iborat edi. Qandli diabetning umumiy tarqalish darajasi 13,6% ni, prediabet esa 7,9% ni tashkil etdi. Ko‘p omilli tahlil natijalari 40 yoshdan katta bo‘lish (AOR = 2,84; 95% IS: 1,65–4,92), semizlik (AOR = 3,12; 95% IS: 1,78–5,47), jismoniy faollikning yetishmasligi (AOR = 2,21; 95% IS: 1,29–3,78), qovurilgan ovqatlarni tez-tez iste’mol qilish (AOR = 1,96; 95% IS: 1,12–3,41) hamda surunkali stress (AOR = 2,37; 95% IS: 1,34–4,19) qandli diabet bilan sezilarli darajada bog‘liq ekanligini ko‘rsatdi. O‘zbekistonda qandli

ISSN 3030-3907

diabet asosan o‘zgartirilishi mumkin bo‘lgan turmush tarzi omillari va o‘zgarmas demografik xususiyatlar bilan bog‘liq. Sog‘lom ovqatlanish, jismoniy faollik, stressni boshqarish va erta skriningga qaratilgan profilaktik strategiyalarni kuchaytirish kasallik yukini kamaytirish uchun muhim ahamiyatga ega.

Kalit so‘zlar. Qandli diabet; O‘zbekiston; Markaziy Osiyo; tarqalish; xavf omillari; semizlik; turmush tarzi; jismoniy faollik yetishmasligi; stress; epidemiologiya.

Аннотация. Сахарный диабет является одним из наиболее быстро распространяющихся неинфекционных заболеваний в мире и представляет серьёзную проблему общественного здравоохранения в Центральной Азии, включая Узбекистан. Рост распространённости заболевания тесно связан с изменением образа жизни, урбанизатsией и увеличением числа метаболических факторов риска. Целью данного исследования было определить распространённость и основные детерминанты сахарного диабета среди взрослого населения Узбекистана. Общая распространённость сахарного диабета составила 13,6%, тогда как предиабет был выявлен у 7,9% обследованных. Результаты многомерного анализа показали, что возраст старше 40 лет (AOR = 2,84; 95% ДИ: 1,65–4,92), ожирение (AOR = 3,12; 95% ДИ: 1,78–5,47), низкая физическая активность (AOR = 2,21; 95% ДИ: 1,29–3,78), частое употребление жареной пищи (AOR = 1,96; 95% ДИ: 1,12–3,41) и хронический стресс (AOR = 2,37; 95% ДИ: 1,34–4,19) были статистически значимо связаны с наличием сахарного диабета. Сахарный диабет в Узбекистане тесно связан как с модифицируемыми факторами образа жизни, так и с немодифицируемыми демографическими характеристиками. Усиление профилактических стратегий, направленных на здоровое питание, повышение физической активности, управление стрессом и ранний скрининг, является необходимым условием для снижения растущего бремени заболевания.

Ключевые слова. Сахарный диабет; Узбекистан; Центральная Азия; распространённость; факторы риска; ожирение; образ жизни; низкая физическая активность; стресс; эпидемиология.

INTRODUCTION.

Diabetes mellitus is one of the most pressing chronic non-communicable diseases worldwide, representing a growing medical and public health challenge. Its rapid increase in prevalence over recent decades has placed a significant burden on healthcare systems, particularly in low- and middle-income countries. According to global epidemiological estimates, the number of adults living with diabetes has more than tripled since the beginning of the 21st century, largely

ISSN 3030-3907

driven by demographic changes, urbanization, sedentary lifestyles, and dietary transitions [1-3].

In Central Asia, including Uzbekistan, diabetes mellitus has become an increasingly important health concern. The region is experiencing a shift toward lifestyle-related risk factors such as reduced physical activity, increased consumption of high-calorie processed foods, and rising rates of overweight and obesity. These changes are closely associated with the growing incidence of type 2 diabetes, particularly among adults of working age. As a result, diabetes is now recognized as one of the leading causes of morbidity and long-term complications in the population [4-8].

In Uzbekistan, the epidemiological transition from infectious to non-communicable diseases has intensified the burden of metabolic disorders. National health data indicate a steady increase in newly diagnosed diabetes cases, along with a growing proportion of undiagnosed individuals. This situation is further complicated by insufficient early screening coverage and limited awareness of risk factors among the general population in some regions. Consequently, many patients are diagnosed at later stages, when complications have already developed [9].

Diabetes mellitus has multidimensional consequences. Medically, it is associated with severe complications such as cardiovascular disease, nephropathy, neuropathy, and retinopathy, which significantly reduce life expectancy and quality of life. Socioeconomically, the disease imposes substantial costs on individuals, families, and healthcare systems due to long-term treatment requirements and loss of productivity. Psychologically, patients often experience stress, anxiety, and depression, further complicating disease management [10].

The development of diabetes is influenced by a complex interaction of genetic, biological, behavioral, and environmental factors. Key determinants include age, sex, body mass index, physical inactivity, dietary habits, stress levels, sleep duration, and family history of diabetes. Identifying and understanding these risk factors in specific regional contexts is essential for designing effective prevention strategies [11-13].

Therefore, investigating the determinants of diabetes mellitus among adults in Uzbekistan is crucial for improving early detection, strengthening preventive measures, and reducing the overall burden of the disease in Central Asia.

MATERIALS AND METHODS

This study was designed as a community-based cross-sectional analytical survey aimed at identifying the determinants of diabetes mellitus among adults in Uzbekistan. The research was conducted in selected urban and rural areas to

ISSN 3030-3907

ensure representation of different socio-demographic and lifestyle patterns typical for the Central Asian population.

The target population included adults aged 18 to 69 years residing in the selected communities. Individuals were eligible for inclusion if they had lived in the study area for at least six months and provided informed consent to participate. Pregnant women and individuals unable to communicate effectively were excluded due to potential influence on anthropometric and biochemical measurements. Participants who withdrew consent during the study were also excluded from the final analysis.

A multistage cluster sampling technique was applied, following WHO STEPwise approach guidelines for non-communicable disease surveillance. In the first stage, clusters (districts or villages) were selected randomly. In the second stage, households were chosen systematically within each cluster. In the final stage, one eligible individual per household was selected using a random selection method. The sample size was calculated using a standard epidemiological formula based on an expected diabetes prevalence in the region, with a 95% confidence interval, 5% margin of error, and an adjustment for a 10% non-response rate.

Data were collected using a structured questionnaire adapted from WHO STEPS instruments. The questionnaire included sections on socio-demographic characteristics, behavioral factors, medical history, and lifestyle habits. Anthropometric and clinical measurements were also performed.

Fasting capillary blood glucose was measured using a portable glucometer under standardized conditions. Diabetes mellitus was defined as a fasting blood glucose level ≥ 7.0 mmol/L or self-reported use of antidiabetic medication. Blood pressure was measured using a validated automatic sphygmomanometer after a 15-minute rest period. Height, weight, and waist circumference were measured using standardized equipment, and body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared.

Independent variables included age, sex, BMI, physical activity level, dietary habits (fruit, vegetable, and fried food consumption), sleep duration, stress level, alcohol and tobacco use, and family history of diabetes.

Data were entered and analyzed using statistical software (Stata or SPSS). Descriptive statistics were used to summarize the characteristics of the study population. Continuous variables were presented as mean ± standard deviation, while categorical variables were expressed as frequencies and percentages.

Univariate analysis was performed using chi-square tests and simple logistic regression to identify potential associations between independent variables and diabetes mellitus. Variables with a p-value < 0.20 were included in the multivariate logistic regression model. Adjusted odds ratios (AOR) with 95%

ISSN 3030-3907

confidence intervals (CI) were calculated, and statistical significance was set at $p < 0.05$.

The study was conducted in accordance with ethical principles for biomedical research involving human subjects. Informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity were strictly maintained throughout the study.

RESULTS.

A total of 420 adults participated in the study. The mean age of respondents was 44.8 ± 12.6 years, with a slight predominance of females (52.4%). More than half of the participants (58.1%) were aged over 40 years. Regarding educational status, 61.9% had secondary or lower education, while 74.3% reported a monthly income below the national average.

Overweight and obesity were highly prevalent in the study population. Based on BMI classification, 34.5% of participants were overweight and 21.7% were obese. Abdominal obesity was observed in 29.8% of respondents. Hypertension was present in 37.6% of participants.

Table 1.

Sociodemographic and clinical characteristics of participants (n = 420)

Variable	Category	n	%
Age	≤40 years	176	41.9
	>40 years	244	58.1
Gender	Male	200	47.6
	Female	220	52.4
BMI	Normal	195	46.4
	Overweight	145	34.5
	Obese	80	19.1
Hypertension	No	262	62.4
	Yes	158	37.6
Abdominal obesity	No	294	70.2
	Yes	126	29.8

Most participants reported low levels of physical activity (71.0%). Irregular consumption of fruits and vegetables was common (82.6%), while 44.8% consumed fried or high-fat foods at least three times per week. Short sleep duration (<7 hours) was reported by 38.3% of respondents. Approximately 33.6% experienced moderate to high stress levels.

ISSN 3030-3907

Table 2.

Behavioral and lifestyle characteristics of participants (n = 420)

Variable	Category	n	%
Physical activity	Low	298	71.0
	Adequate	122	29.0
Fruit/vegetable intake	Daily	73	17.4
	Not daily	347	82.6
Fried food consumption	≥3 times/week	188	44.8
	≤2 times/week	232	55.2
Sleep duration	<7 hours	161	38.3
	7–9 hours	259	61.7
Stress level	Yes	141	33.6
	No	279	66.4

The overall prevalence of diabetes mellitus was 13.6% (95% CI: 10.4–16.8), while prediabetes was detected in 7.9% of participants. The prevalence was significantly higher among individuals aged over 40 years (19.7%) compared to those aged 40 years or younger (5.8%, $p < 0.001$).

In multivariate logistic regression analysis, several factors showed a significant association with diabetes mellitus. Age over 40 years (AOR = 2.84; 95% CI: 1.65–4.92), obesity (AOR = 3.12; 95% CI: 1.78–5.47), physical inactivity (AOR = 2.21; 95% CI: 1.29–3.78), high fried food consumption (AOR = 1.96; 95% CI: 1.12–3.41), and chronic stress (AOR = 2.37; 95% CI: 1.34–4.19) were identified as independent predictors of diabetes.

DISCUSSION.

The present study demonstrates a relatively high prevalence of diabetes mellitus (13.6%) among adults in Uzbekistan, indicating an increasing burden of non-communicable diseases in Central Asia. This finding is consistent with regional epidemiological transitions characterized by urbanization, dietary changes, and reduced physical activity.

Age was a strong predictor of diabetes, with individuals over 40 years showing significantly higher risk. This aligns with global evidence indicating that insulin resistance and pancreatic beta-cell dysfunction increase with aging. Similarly, obesity was strongly associated with diabetes, reflecting the well-established role of adiposity in insulin resistance and metabolic dysfunction.

Behavioral factors such as physical inactivity and frequent consumption of fried foods were also significantly associated with diabetes. These findings reflect ongoing nutritional transitions in Uzbekistan, where traditional diets are increasingly replaced by energy-dense processed foods. Moreover, high levels of

ISSN 3030-3907

psychological stress were independently associated with diabetes, likely mediated through hormonal pathways involving cortisol and insulin resistance.

The observed prevalence is comparable to reports from other Central Asian settings but higher than earlier national estimates, suggesting a continuing upward trend. These results highlight the urgent need for targeted prevention strategies, including lifestyle modification programs, early screening, and community-based awareness campaigns.

Overall, the findings emphasize that diabetes in Uzbekistan is driven by a combination of modifiable and non-modifiable risk factors, underscoring the importance of integrated public health interventions.

CONCLUSIONS.

The study demonstrated that diabetes mellitus represents a significant and growing public health problem among adults in Uzbekistan, with an overall prevalence of 13.6%, indicating an increasing burden of non-communicable diseases in the region.

The main independent risk factors associated with diabetes were age over 40 years, obesity, physical inactivity, high consumption of fried foods, and chronic psychological stress. These factors showed statistically significant associations in multivariate analysis.

Behavioral and lifestyle patterns, including low physical activity levels and unhealthy dietary habits, play a crucial role in the development of diabetes mellitus in the studied population, reflecting ongoing nutritional and epidemiological transitions in Central Asia.

The findings highlight the importance of early screening programs and preventive strategies targeting modifiable risk factors such as diet, physical activity, and stress management.

Strengthening public health interventions, including community-based education, routine screening, and promotion of healthy lifestyles, is essential to reduce the future burden of diabetes mellitus in Uzbekistan.

Further large-scale longitudinal studies are recommended to better understand the progression of risk factors and to develop more effective prevention policies.

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