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Prevalence of hyperglycemia in women living in Kabul in 2022

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ABSTRACT

Introduction: Diabetes is a multifaceted metabolic disorder characterized by increased levels of blood glucose, resulting from several factors that impede proper glucose regulation in affected individuals. This study aims to investigate the relationships between age and blood glucose levels in non-pregnant women in Kabul in 2022.

Materials and Methods: A retrospective cross-sectional descriptive study was conducted in Kabul, Afghanistan, involving patients attending the City Medical Complex in 2022. Blood samples were collected after fasting, and blood glucose levels were assessed using the enzymatic approach. Hyperglycemia was defined using the criteria of the American Diabetes Association. Data were analyzed using SPSS V.18, with a chi-square test for quantitative data, an independent t-test, and an analysis of variance for qualitative data.

Results: The study involved 5102 participants aged 5 to 88 years, with a mean FBS level of 153.18 ± 70.315 mg/dl. 30.5% had normal FBS, 15.8% were pre-diabetic, and 53.7% had diabetes. Age distribution varied significantly across FBS groups, with diabetics having the highest age range (54.68 years) and normals having the smallest (44.07 years).

Conclusion: The correlation between aging and diabetes is intricate and diverse. Numerous elements contribute to this association, encompassing the heightened occurrence of diabetes as individuals grow older and the influence of diabetes on the aging progression itself.

Keywords: Hyperglycemia, Non-pregnant women, Aging, Kabul.

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1. Introduction

Diabetes, or hyperglycemia, is a complex metabolic disorder characterized by elevated blood glucose levels, known as hyperglycemia. This condition arises due to various factors that hinder the proper regulation of glucose in individuals affected by diabetes (1). Hyperglycemia occurs as a result of insufficient insulin secretion, inadequate insulin action, or a combination of both (2). Prolonged elevation of blood glucose levels in diabetes can lead to damage, dysfunction, and ultimately failure of multiple organ systems, including the eyes, kidneys, nerves, heart, and blood vessels. The underlying cause of this metabolic disorder lies in the incomplete effectiveness of insulin on target tissues, which can be attributed to either insufficient secretion of insulin or reduced responsiveness of tissues to the hormone within the intricate pathways of hormonal action (3). The global prevalence of diabetes is steadily increasing, with 541 million reported cases in 2017 and an estimated projection of 693 million cases by 2045 (4). Currently, the most common forms of diabetes are type 1 and type 2. Type 1 diabetes is characterized by a deficiency in insulin secretion, triggered by the immune system's response to pancreatic insulin cell proteins (5). Additionally, the death of beta cells plays a role in the development of type 1 diabetes (6, 7).

The uncontrolled state of diabetes can lead to severe and life-threatening consequences. These include hyperglycemia accompanied by ketoacidosis and non-ketonic hyperosmolar syndrome. Furthermore, individuals with diabetes are at risk of developing long-term complications such as retinopathy, which can potentially result in blindness. Nephropathy, another complication, can lead to kidney failure. Peripheral neuropathy poses a risk of leg ulcers, amputation, Charcot joints, and autonomic neuropathy affecting the gastrointestinal, genitourinary, cardiovascular, and sexual functions (8). It is worth noting that individuals with diabetes are more prone to cardiovascular diseases, atherosclerosis, and peripheral artery and cerebral vessel disorders compared to those without diabetes (9). Additionally, high blood pressure and lipoprotein metabolism disorders are frequently observed in individuals with diabetes (10). This study aims to investigate the correlation between age and blood glucose levels in non-pregnant women in Kabul in 2022.

2. Material and methods

A retrospective cross-sectional descriptive investigation was conducted in Kabul, Afghanistan, in 2023. The cohort encompassed all patients who attended the City Medical Complex in Kabul, Afghanistan. Blood samples were collected after 8–12 hours of fasting. The enzymatic approach was used to assess blood glucose levels. Blood glucose levels were measured using the enzymatic method. The American Diabetes Association (FDA, 2004) criteria were used to define hyperglycemia as follows: normal blood glucose (FBS >100 mg/dL), pre-diabetic (FBS 100 to 125 mg/dL), and diabetic (FBS >126 mg/dL) (18).

We implemented various exclusion criteria in our study. These criteria encompassed pregnancy and hepatic disorders characterized by Alanine Aminotransferase levels surpassing the reference range by fivefold. Additionally, we excluded patients with ailments other than diabetes, such as kidney disease, ulcers, rheumatoid arthritis, osteoporosis, and osteomalacia, as well as individuals undergoing treatment with corticosteroids and other medications that interfere with vitamin B12 and blood glucose. The data were analyzed in SPSS V.18 statistical software. Qualitative variables are shown as relative frequencies, and the results of quantitative variables are shown as mean and standard deviation. A chi-square test was used for quantitative data between two or more

variables, and an independent t-test and analysis of variance were used to compare quantitative data between two or more independent groups, respectively. The significance level of the tests was considered to be less than 5%.

3. Results

A total of 5102 subjects were included in our study. The participants' mean age was 50.70 ±13.585 years, and the median age was 52.00 years. The age range of participants ranged from 5 to 88 years. The mean FBS level of participants was 153.18 ± 70.315 mg/dl, with a median of 131.00 mg/dl, ranging from 11 to 485 (Table 1). Table 2 and Figure 1 show that 1555 (30.5%) of the patients had normal FBS levels (>100 mg/dL), whereas 806 (15.8%) were pre-diabetic (FBS 100 to 125 mg/dL), and 2741 (53.7%) had diabetes (FBS >126 mg/dL). Table 3 shows the relationship between age and fasting blood glucose. The distribution of age varies significantly across the different FBS groups, as indicated by a p-value of 0.001 and a chi-square value of 589.285 (x2 (2)). Among these groups, the diabetic group has the highest age range with a mean of 54.68 years. On the other hand, the normal group has the smallest age range with a mean of 44.07 years (Table 3 and Fig. 2).

Table 1. Statistical analysis of Age and FBS

Variable	Mean ± S.d	Median
Age (years)	50.70 ± 13.585	52.00
FBS (mg/dl)	153.18 ± 70.315	131.00

4. Discussion

Age-related hyperglycemia is a state characterized by elevated glucose levels in the blood that is specifically associated with the natural progression of aging. This phenomenon is frequently observed in the elderly population and can serve as an antecedent to the onset of type 2 diabetes. Age-related hyperglycemia is influenced by an amalgamation of genetic predisposition, lifestyle decisions, and the inherent aging process (11). In this study, we evaluated the relationship between age and blood glucose levels in non-pregnant women living in Kabul in 2022. The results indicate a clear correlation between age and blood glucose levels, suggesting that blood glucose levels rise as individuals grow older. The average age of the participants was 50.77 ± 13.585 years. The participants had an average age of 50.77 ± 13.585 years. Data analysis showed that 53.7% (n = 2741) of the subjects had higher levels of blood glucose. Our findings indicated that the diabetes group consisted of individuals who were notably older than the normal blood glucose group (p-value = 0.001).

The elderly population faces an increased susceptibility to age-related hyperglycemia as a result of the confluence of genetic predisposition, behavioral patterns (including suboptimal dietary choices and sedentary habits), and the intrinsic deterioration of insulin sensitivity and beta-cell functionality that accompanies the aging process (11). Age-related hyperglycemia frequently serves as a precursor to the emergence of type 2 diabetes. The occurrence of type 2 diabetes is rooted in the insufficiency of insulin production or its ineffective utilization by the body. It is crucial to note that this particular form of diabetes is most prevalent among older individuals. Indications of age-related hyperglycemia may consist of heightened thirst, frequent urination, fatigue, impaired vision, and delayed wound healing. Nevertheless, it should be acknowledged that certain individuals may not encounter overt symptoms, thereby underscoring the significance of regular monitoring of blood glucose levels (12). According to studies, the prevalence of diabetes, impaired fasting glucose, or impaired glucose tolerance in 20- to 39-year-olds in the United States was 20.9%, whereas the prevalence in individuals 40 to 59 years old

Table 2. Prevalence of dispersion of blood glucose (FBS)

Variable	Group	N (%)	FBS (mean±SD)
FBS	Normal (<99)	1555 (30.5)	87.94 ± 10.755
	Pre-Diabetic (100-125)	806 (15.8)	111.55 ± 7.236
	Diabetic (>126)	2741 (53.7)	202.43 ± 61.412

Table 3. Correlation between age and study variables

		Mean age ± Sd	Mean Rank	*p*-value*
FBS Levels	Normal	44.07 ± 15.399	1859.29	0.001
	Pre-Diabetic	49.98 ± 10.964	2411.68	
	Diabetic	54.68 ± 11.525	2985.31	

* Kruskal-Wallis test

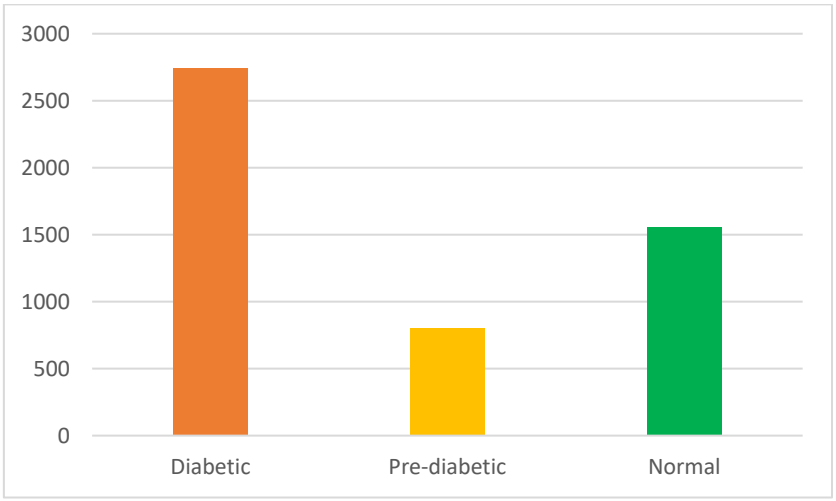

Figure 1. Prevalence of dispersion of blood glucose changes

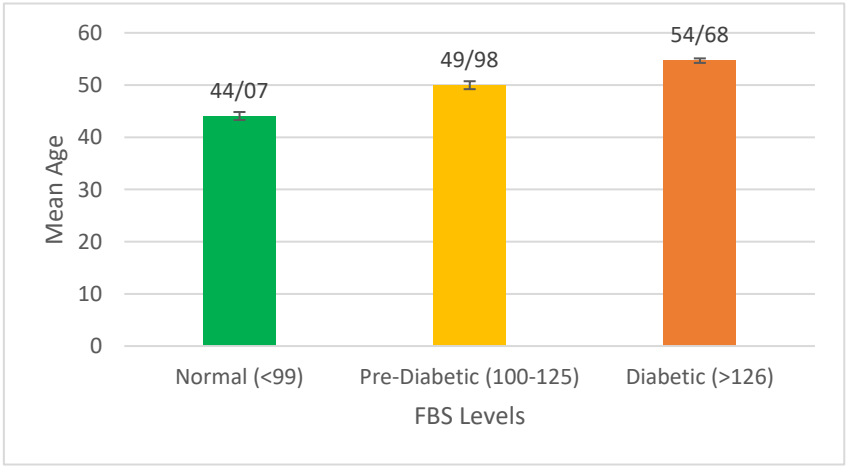

Figure 2. Correlation between age and fasting blood glucose. Data presented as mean ± Sd

was 46.9%, 67.4% in individuals 40 to 59 years old, and 75.6% in individuals 75 years old (13). Furthermore, as one gets older, insulin sensitivity declines, the body's capacity to regulate glucose declines, and muscle atrophies (12). According to research, elderly

guys (65–70 years old) had worse glucose metabolism and lower expression of the skeletal muscle glucose transporter 4 (GLUT4) than younger males (30 years old) (12). In addition, older people have reduced insulin-stimulated Akt activity (14), altered insulin signaling, and decreased skeletal muscle insulin sensitivity. Furthermore, in elderly mice, skeletal muscle insulin sensitivity is diminished, and insulin resistance develops (15).

Studies show that aging is a major risk factor for insulin resistance, prediabetes, and diabetes. Insulin resistance is defined as decreased insulin sensitivity, which results in higher blood glucose levels (16). The reduction in insulin synthesis by the pancreas is another factor associated with aging and hyperglycemia. The pancreas may generate less insulin, resulting in increased blood glucose levels over a longer period of time (17). Changes in body composition associated with aging, such as a loss of muscle mass and an increase in fat deposits, can lead to insulin resistance and increased blood glucose levels (18). Skeletal muscle is essential for absorbing glucose from the circulation, and a loss in muscle mass can result in decreased glucose absorption (19). Additional age-related variables that can contribute to insulin resistance and hyperglycemia include inflammation, oxidative stress, mitochondrial dysfunction, and an overactive renin-angiotensin system (20).

5. Conclusion

There is a significant relationship between aging and hyperglycemia. Aging can lead to a decline in insulin sensitivity and beta-cell function, making it more challenging for the body to regulate blood glucose levels. Additionally, diabetes can impact the aging process itself, potentially accelerating biological aging and increasing the risk of complications. However, adopting a healthy lifestyle, including regular exercise, a balanced diet, and weight management, can help mitigate these risks and improve overall health outcomes, regardless of age. It is important for individuals, especially older adults, to be aware of the relationship between aging and diabetes and take proactive steps to prevent and manage the condition.

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Conflict of interest

We declare that we have no conflict of interest.

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