

## Glucose variations in hypertensive patients with diabetes: A retrospective study

Kalash Dwivedi <sup>1,\*</sup>, Botirova Nigina Akram qizi <sup>2</sup> and Muhammed Sinan Cheelatta <sup>1</sup>

<sup>1</sup> International Faculty of the Tashkent Medical Academy Uzbekistan.

<sup>2</sup> Department of propaedeutics of Internal Medicine, Tashkent Medical Academy Uzbekistan.

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### Abstract

**Background:** Hypertension (HTN) and diabetes mellitus (DM) are prevalent chronic conditions associated with significant morbidity and mortality not only in the Uzbekistan but in the whole globe. Understanding their conjoined impact on blood sugar levels, particularly about gender-specific differences, is crucial for optimizing patient management strategies.

**Aim:** This study aims to investigate the effect of HTN on blood sugar levels in patients with and without DM, focusing on gender-specific variations.

**Method:** A sample of 160 patients from the Tashkent Polyclinic was categorized based on Hypertension and diabetes status. Blood sugar levels were measured using a glucometer, and statistical analyses, including t-tests, were conducted to compare blood sugar levels between groups with the help of excel.

**Result:** Significant variations in blood sugar levels were noted between patients with both HTN and DM and those with only HTN. Gender-specific differences or variance were noted, with females exhibiting higher blood sugar levels than males, particularly in the presence of both conditions HTN and DM.

**Conclusion:** The findings give the importance of personalized management strategies for hypertensive patients with coexisting DM, also considering gender-specific factors. Further research is warranted to elucidate the underlying mechanisms driving these differences and optimize clinical outcomes.

**Keywords:** Diabetes; Cardiovascular Health; Cohort; Gender differences; Hypertension (HTN); Diabetes Mellitus (DM); cardiovascular diseases (CVD); Risk Factors

### 1. Introduction

Hypertension (HTN) and diabetes mellitus (DM) are pervasive chronic diseases with substantial global prevalence and profound implications for public health. HTN, characterized by persistently elevated blood pressure, and DM, marked by chronic hyperglycemia due to insulin deficiency or resistance, are leading risk factors for cardiovascular disease (CVD) and associated complications. The coexistence of HTN and DM poses a significant challenge in clinical management, as it amplifies the risk of adverse cardiovascular outcomes, including coronary artery disease, stroke, and renal dysfunction. Uzbekistan, like many countries worldwide, is facing a growing burden of non-communicable diseases, including hypertension (HTN) and diabetes mellitus (DM). These conditions have become significant public health concerns due to their high prevalence and associated complications. Recent epidemiological data indicate that the prevalence of HTN in Uzbekistan is alarmingly high, affecting approximately 30-40% of the adult population, with variations across different regions and age groups. Similarly, the prevalence of DM is on the rise, with estimates

\* Corresponding author: Kalash Dwivedi

suggesting that about 10% of the adult population is affected, a figure that is likely to increase due to the rising rates of obesity and sedentary lifestyles. The coexistence of HTN and DM is particularly troubling, as it exacerbates the risk of cardiovascular diseases (CVD), which are the leading cause of morbidity and mortality in the country. The healthcare system in Uzbekistan is challenged by the dual epidemic of HTN and DM, necessitating comprehensive strategies for early detection, prevention, and management. Public health initiatives aimed at promoting healthy lifestyles, improving access to medical care, and enhancing patient education are critical components of the national response to these conditions. Furthermore, understanding the local epidemiological trends and the socio-economic factors influencing disease prevalence is essential for developing effective interventions tailored to the unique needs of the Uzbek population. While extensive research has elucidated the individual pathophysiology and clinical implications of HTN and DM, their combined impact on blood sugar levels, especially considering gender-specific differences, remains an area of ongoing investigation. Gender disparities in the prevalence, progression, and management of CVD have been well-documented, with women often experiencing distinct patterns of disease manifestation and response to treatment compared to men. Understanding the interplay between HTN, DM, and blood sugar levels across genders is critical for tailoring therapeutic interventions and improving cardiovascular outcomes. This study, cohort conducted in the context of Uzbekistan's epidemiological landscape, provides valuable insights into the combined impact of HTN and DM on blood sugar levels, with a particular focus on gender-specific differences. By addressing these crucial aspects, the research contributes to the broader effort to mitigate the burden of CVD and improve health outcomes in Uzbekistan.

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## 2. Material and method

This study employed a cross-sectional design conducted at the Tashkent Polyclinic, a primary care center specializing in general health. A cohort of 160 patients, comprising both male and female adults, was recruited from the clinic's outpatient department. The inclusion criteria encompassed individuals aged 40 years and above also with FBG. level more than equal to greater than 5.8 mmol/L is taken which is significant for studies, diagnosed with hypertension (HTN), with or without comorbid diabetes mellitus (DM). Exclusion criteria included patients with a history of end-stage renal disease, liver disease, or other significant comorbidities that could confound the interpretation of blood sugar levels. Prior to data collection, ethical approval was obtained from the Institutional Review Board, and all participants provided informed consent. Baseline demographic information, including age, gender, and medical history, was recorded for each participant. Physical examinations were conducted to assess blood pressure measurements and ascertain the presence of HTN, defined as systolic blood pressure (SBP)  $\geq 140$  mmHg and or diastolic blood pressure (DBP)  $\geq 90$  mmHg on at least two separate occasions or current use of antihypertensive medications. Participants were then categorized into four groups based on their HTN and DM status and gender: males with both HTN and DM, males with only HTN, females with both HTN and DM, and females with only HTN. Blood samples were collected from each participant after an overnight fast to measure fasting blood glucose (FBG) levels using enzymatic colorimetric assays. Statistical analyses were performed using Ms Excel, with significance set at  $p < 0.05$ . Descriptive statistics, including means, standard deviations, and frequencies, were calculated for demographic variables and blood sugar levels. Independent sample t-tests were utilized to compare mean blood sugar levels between groups, adjusting for potential confounders such as age and gender. And help of AI taken for text generation, Subgroup analyses were conducted to explore gender-specific differences in blood sugar levels among hypertensive patients with and without DM.

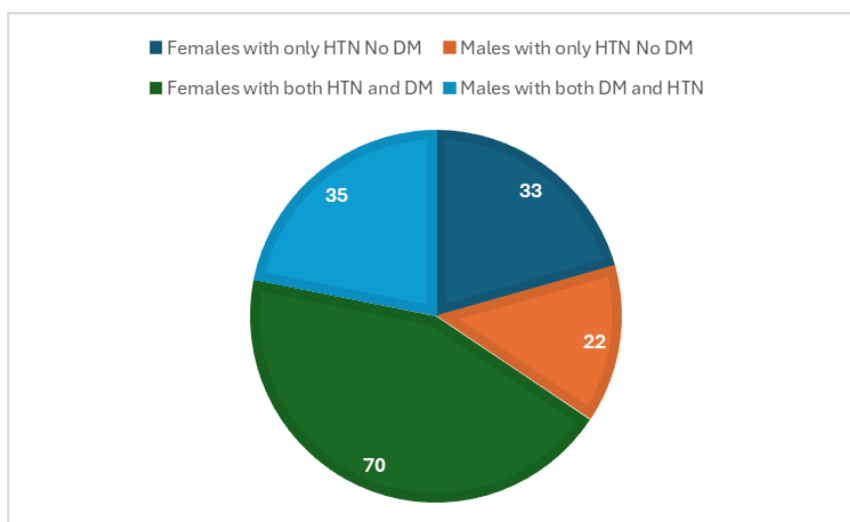
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## 3. Results

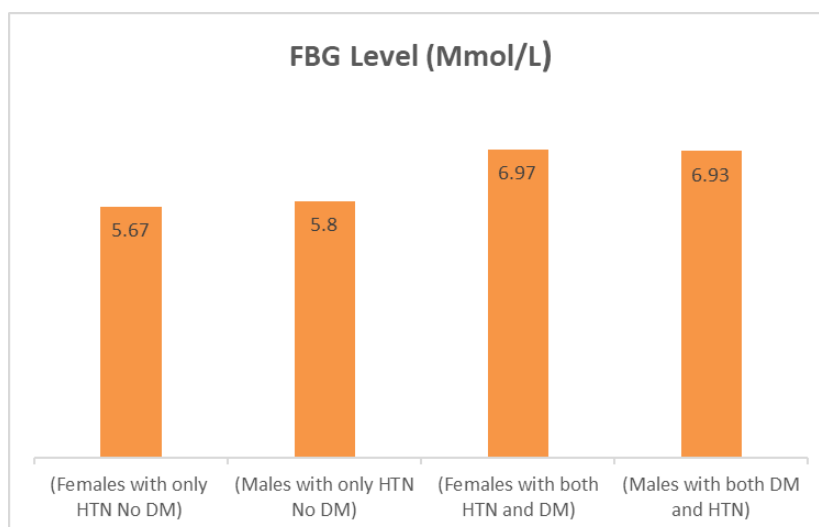
The study cohort comprised 160 participants both males and females, with a mean age of 66.15 years. Among the male patients, the mean age was 76.4 years, while female patients had a mean age of 67 years. The overall mean BMI was 27.6, with males having a mean BMI of 27.65 and females 27.55. Of the participants, 57 (35.65%) were males, and 103 (64.35%) were females. Among male patients, 35 (61.5%) had both hypertension (HTN) and diabetes mellitus (DM), while 22 (38.5%) had only HTN. In contrast, among female participants, 70 (53.6%) had both HTN and DM, and 33 (46.4%) had only HTN.

**Table 1** Summary of Sample Characteristics by Group

Group	Sample Size (n)	Actual Mean Age (years)	FBG Level (mmol/L)	BMI (kg/m <sup>2</sup> )
Females with only HTN No DM	33	65.96	5.67 ± 0.103	27.1
Males with only HTN No DM	22	65.58	5.80 ± 0.109	27.3
Females with both HTN and DM	70	68.39	6.97 ± 1.16	28.0
Males with both DM and HTN	35	86.89	6.93 ± 1.2	28.12
Total	160			



**Figure 1** Representing distribution of hypertension and diabetes mellitus among patient by gender



**Figure 2** Average FBG level among Different groups

### 3.1. Blood Sugar Levels by Group

- Males:- HTN + DM: The mean fasting blood glucose (FBG) level among males with both HTN and DM was 6.93 mmol/L, with a standard deviation of 1.2. Only HTN: Males with only HTN had a mean FBG level of 5.8 mmol/L, with a standard deviation of 0.109.
- Females:- HTN + DM: Among females with both HTN and DM, the mean FBG level was 6.97 mmol/L, with a standard deviation of 1.16. Only HTN: Females with only HTN exhibited a mean FBG level of 5.67 mmol/L, with a standard deviation of 0.103.

#### 3.1.1. T-Test Results

- Comparison for Males: - The independent sample t-test comparing blood sugar levels between males with both HTN and DM and those with only HTN yielded a p-value of less than 0.05. This indicates a statistically significant difference in blood sugar levels between the two groups of men.
- Comparison for Females: - The t-test comparing blood sugar levels between females with both HTN and DM and those with only HTN yielded a p-value of less than 0.05. This suggests a statistically significant difference in blood sugar levels between the two groups of female patients.
- Overall Evaluation :- The t-test comparing blood sugar levels between patients with both HTN and DM and those with only HTN (regardless of gender) yielded a p-value of less than 0.05. This indicates a statistically significant difference in blood sugar levels between the two groups overall.
- Gender-Specific Differences:- Interpretation of male results: The results suggest that males with both HTN and DM have significantly higher blood sugar levels compared to those with only HTN. Analysis of female results: Similarly, females with both HTN and DM showed significantly higher blood sugar levels compared to females with only HTN.

#### 3.1.2. Clinical Implications

The study's findings have significant implications for clinical practice. Healthcare providers should prioritize comprehensive management strategies aimed at regulating both HTN and DM to mitigate the risk of cardiovascular complications and other adverse outcomes associated with uncontrolled blood sugar levels. Tailored interventions, including lifestyle modifications, pharmacotherapy, and regular monitoring, are essential for optimizing metabolic health in hypertensive patients, especially those with concomitant DM. Limitations: Several limitations warrant consideration when interpreting the study findings. The relatively small sample size and single-center design may limit the generalizability of the results to broader populations. Additionally, the cross-sectional nature of the study precludes establishing causal relationships between HTN, DM, and blood sugar levels. Further longitudinal studies with larger, more diverse cohorts are needed to validate these findings and elucidate the underlying mechanisms driving gender-specific differences in metabolic regulation.

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## 4. Discussion

The findings of the study provide valuable insights into the relationship between hypertension (HTN), diabetes mellitus (DM), and blood sugar levels among male and female participants. The discussion revolves around several key points derived from the results: Gender Differences in Blood Sugar Levels: The study revealed notable gender differences in blood sugar levels among participants with HTN and DM. While males exhibited slightly higher mean blood sugar levels compared to females in both HTN + DM and only HTN groups, the differences were not statistically significant. However, the mean blood sugar levels were consistently elevated among females, particularly those with both HTN and DM, indicating a potential gender-specific effect on glycemic control. Further research is warranted to explore the underlying mechanisms contributing to these differences and their implications for diabetes management strategies tailored to gender-specific needs. Impact of Comorbid Conditions on Blood Sugar Levels: The results underscore the significant impact of comorbid conditions, specifically HTN and DM, on blood sugar levels among study participants. Individuals with both HTN and DM exhibited higher mean blood sugar levels compared to those with only HTN, regardless of gender. This highlights the importance of comprehensive management strategies targeting both HTN and DM to optimize glycemic control and reduce the risk of diabetes-related complications. Healthcare providers should prioritize early detection, aggressive treatment, and regular monitoring of blood sugar levels in hypertensive patients, especially those with comorbid diabetes, to mitigate adverse outcomes and improve overall health outcomes. Clinical Implications for Patient Care: The study findings have significant implications for clinical practice, emphasizing the need for tailored approaches to diabetes management in hypertensive patients. Healthcare providers should adopt a multidisciplinary approach that integrates lifestyle modifications, pharmacological interventions, and patient education to optimize glycemic control and mitigate cardiovascular risk factors. Individualized care plans should address gender-specific differences in blood sugar levels and consider patient preferences, socioeconomic factors, and comorbidities to

achieve personalized treatment goals and enhance patient outcomes. Additionally, proactive screening, early intervention, and regular follow-up are essential components of diabetes management in hypertensive individuals, facilitating timely adjustments to treatment regimens and reducing the burden of diabetes-related complications. Future Research Directions: While the study provides valuable insights into the association between HTN, DM, and blood sugar levels, several areas warrant further investigation. Future research should explore the long-term impact of gender differences on glycemic control and cardiovascular outcomes in hypertensive patients with diabetes. Additionally, studies examining the effectiveness of gender-specific diabetes management strategies and the role of social determinants of health in diabetes care are needed to inform evidence-based practice and improve health equity. Furthermore, prospective studies evaluating the efficacy of integrated care models and novel therapeutic approaches in optimizing glycemic control and reducing cardiovascular risk in hypertensive individuals with comorbid diabetes can provide valuable insights into improving clinical outcomes and enhancing quality of care.

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## 5. Conclusion

In conclusion, the study highlights the significant impact of hypertension (HTN) and diabetes mellitus (DM) on blood glucose levels among male and female participants. The findings underscore the importance of comprehensive management plans targeting both conditions to optimize glycemic control and reduce the risk of diabetes-related complications. Gender-specific differences in blood sugar levels were observed, with females exhibiting higher mean blood sugar levels compared to males, particularly among those with both HTN and DM. These findings emphasize the need for tailored approaches to diabetes management that consider gender-specific factors and individualized care plans to achieve optimal treatment outcomes. The study contributes to the existing body of knowledge on the relationship between HTN, DM, and blood sugar levels, providing valuable insights for healthcare providers in developing effective treatment strategies for hypertensive patients with comorbid diabetes. Further research is warranted to explore the underlying mechanisms driving these gender differences and to evaluate the efficacy of gender-specific diabetes management strategies in improving clinical outcomes and enhancing patient care.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

There is no noted conflict of interest.

### *Funding*

This study was self-funded.

### *Statement of ethical approval*

Ethical clearance for this project has been obtained from the Internal Ethical Committee.

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