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Associated Factors and Prevalence of Elevated Random Blood Sugar in old generation

Dr. Arpitkumar Kanjibhai Chaudhari[1], Dr. Dhirajkumar Mahendrabhai Fulwani[2]
Dr. Yashkumar Indravadanbhai Chaudhari[3]
(Semey Medical University , Kazakhstan)

Abstract:
Background*: Hyperglycemia, including undiagnosed diabetes and pre diabetes, presents a significant global health challenge, leading to severe long-term complications. While traditional screening often relies on fasting blood glucose (FBG) or HbA1c, random blood sugar (RBS) measurements offer a practical and immediate screening tool, particularly in community settings. This study aimed to determine the prevalence of elevated random blood sugar and identify associated demographic and lifestyle factors among men aged 50 years and above in Semey, Kazakhstan.*
Materials and Methods*: A cross-sectional study was conducted on a sample of 50 men aged 50 years and above residing in Semey, Kazakhstan. Participants were recruited from local community centers or public places. After obtaining implied consent, random blood glucose (RBG) levels were measured using a calibrated point-of-care glucometer (AT care), irrespective of the time since the last meal. Elevated random blood sugar was defined as RBS ≥ 200 mg/ dL, or self-reported diagnosed diabetes. A structured questionnaire collected demographic information (age, ethnicity), anthropometric data (height, weight for BMI calculation), and lifestyle factors (dietary habits, physical activity, smoking, alcohol consumption) and medical history (family history of diabetes, hypertension). Statistical analysis included descriptive statistics, chi-square tests for categorical variables, and independent t-tests for continuous variables. Logistic regression was used to identify independent predictors of elevated random blood sugar.*
Results*: The mean age of the 50 male participants was 61.5±7.8 years. The mean RBG level was 160.2±55.8 mg/dL. The prevalence of elevated RBS ≥ 200 mg/dL or self-reported diabetes was found to be 28%. Of those identified with elevated RBS or diabetes, 45% were newly identified through this screening. Factors significantly associated with elevated random blood sugar in univariate analysis included higher Body Mass Index (BMI) p = 0.04 and a positive family history of diabetes p = 0.08. In multivariate logistic regression analysis, higher BMI (OR = 1.19, 95% CI: 1.05-1.35, p = 0.007) emerged as an independent predictor of elevated random blood sugar.*
Conclusion: *This study indicates a considerable prevalence of elevated random blood sugar among men aged 50 years and above in Semey, Kazakhstan, revealing a significant proportion of*
potentially undiagnosed cases. The utility of RBS as a quick screening tool in community settings is highlighted. Modifiable risk factors such as high BMI are significantly associated with hyperglycemia. These findings underscore the critical need for routine opportunistic screening using RBS, followed by definitive diagnostic testing, and targeted public health interventions focusing on weight management and lifestyle modification to combat the rising burden of diabetes in this vulnerable population in Semey.
Key Word*: Hyperglycemia, RBS, BMI, Family history of DM, H/O Smoking, Alcohol consumption, Physical activity,*

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I. Introduction

Diabetes mellitus (DM) is a major non- communicable disease, characterized by chronic hyperglycemia, resulting from deficiencies in insulin production, insulin action, or both [1]. Untreated or poorly managed diabetes leads to severe long-term complications affecting multiple organ systems, including cardiovascular disease, nephropathy, retinopathy, and neuropathy, significantly increasing morbidity, mortality, and healthcare expenditures [2]. The global prevalence of diabetes is escalating rapidly, with projections indicating a continued increase in the coming decades, particularly in older populations [3].

Timely identification of individuals with elevated blood glucose is crucial for early intervention, initiation of treatment, and prevention or delay of complications. While fasting blood glucose (FBG) and glycated hemoglobin (HbA1c) are the gold standards for diagnosing diabetes and pre diabetes, their application in broad community screening programs can be logistically challenging, requiring overnight fasting or specialized

laboratory equipment [1, 4]. Random blood sugar (RBS) measurement, defined as a blood glucose test performed at any time of the day irrespective of the last meal, offers a practical, convenient, and immediate screening tool, especially in settings where fasting is not feasible or for opportunistic screening [5]. An RBS of ≥ 200 mg/dL in an individual with classic symptoms of hyperglycemia like polyuria, polydipsia, unexplained weight loss are diagnostic of diabetes, and in asymptomatic individuals, it warrants further confirmatory testing [1].

Men aged 50 years and above represent a demographic particularly vulnerable to diabetes due to age-related physiological changes, accumulation of risk factors over time, and potentially different health-seeking behaviors compared to younger individuals or women [6]. Kazakhstan, like many countries in Central Asia, faces a growing burden of non-communicable diseases, including diabetes [7]. However, specific data on the prevalence of elevated RBS and associated risk factors in older men within regional contexts such as Semey are scarce.

This study aims to fill this knowledge gap by assessing the prevalence of elevated random blood sugar and identifying associated demographic, anthropometric, and lifestyle risk factors among a cohort of 50 men aged 50 years and above in Semey, Kazakhstan. The findings will highlight the utility of RBS as a screening tool and inform public health strategies for early detection and prevention of diabetes in this at-risk population.

II. Material And Methods

2.1. Study Design and Population

This was a cross-sectional study conducted in Semey, Kazakhstan, during 20/04/2022 to 20/06/2022. The study population comprised 50 men aged 50 years and above. Participants were recruited through convenience sampling from local community centers, senior citizen groups, or by approaching individuals in public places such as markets and parks, ensuring ethical considerations and avoiding selection bias as much as possible for a convenience sample. Inclusion criteria were: male gender, age 50 years or older, and willingness to provide implied consent.Exclusion criteria included: individuals unable to provide consent or not showing any interest.

The study protocol was reviewed and approved by the Ethics Committee of Semey Medical University. All participants were informed about the screening test and implied consent was taken prior to participation.The study ensured the confidentiality and anonymity of all collected data.

2.2. Data Collection

Data were collected by medical students using a standardized protocol and a structured questionnaire.

Random Blood Glucose (RBG) Measurement: Random blood glucose levels were measured for all participants irrespective of their last meal. Capillary blood samples were obtained by finger prick and analyzed immediately using a calibrated point-of-care glucometer (AT Care). Two consecutive readings were taken, and the average was recorded. Participants who reported a prior diagnosis of diabetes and were on medication for diabetes were categorized as having diabetes, regardless of their RBG on the day of the study.

Definitions of Elevated Blood Sugar Categories:

• Normal RBG: RBG < 200 mg/dL and no prior diagnosis of diabetes.

• Elevated Random Blood Sugar/ Presumptive Hyperglycemia: RBG ≥200 mg/dL or self-reported diagnosis of diabetes or on anti- diabetic medication [1]. (Note: For asymptomatic individuals, an RBG ≥ 200 mg/dL requires confirmation with FBG or HbA1c for a definitive diagnosis of diabetes).

Anthropometric Measurements: Height was measured to the nearest 0.1 cm using a stadiometer. Weight was measured to the nearest 0.1 kg using a digital scale, with participants in light clothing and no shoes. Body Mass Index (BMI) was calculated as weight (kg) divided by the square of height (m2). BMI categories were defined as: normal weight (18.5-24.9 kg/msquare), overweight (25.0-29.9 kg/ msquare), and obese (≥ 30.0 kg/msquare).

Questionnaire Data: A structured questionnaire was administered to collect the following information:

• Demographics: Age, ethnicity, educational level, marital status.

• Lifestyle Factors:

◦ Dietary Habits: Self-reported frequency of consumption

of sugary drinks, fast food, fruits, and vegetables (qualitative assessment of healthy vs. unhealthy patterns).

◦ Physical Activity: Self-reported frequency and duration of moderate-to-vigorous physical activity per week.Categorized as "active" (meeting WHO recommendations of ≥ 150 minutes of moderate-intensity aerobic activity per week) or "inactive."

◦ Smoking Status: Current smoker, ex- smoker, or never smoker.

◦ Alcohol Consumption: Frequency and quantity of alcohol intake.

• Medical History: Self-reported personal history of hypertension, cardiovascular disease, or other chronic conditions. Family history of diabetes .

• Awareness: Participants identified with elevated RBS were asked if they were aware of their high blood sugar condition.

2.3. Statistical Analysis

Data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS statistical software .Descriptive statistics were used to summarize participant characteristics, including mean ±standard deviation (SD) for continuous variables and frequencies with percentages for categorical variables.

The prevalence of elevated random blood sugar was calculated as a percentage. Differences in mean RBS levels between groups were assessed using independent samples t-tests. Chi-square tests were used to examine associations between categorical variables (e.g., BMI category, physical activity, smoking status, family history) and the presence of elevated random blood sugar.

Logistic regression analysis was performed to identify independent predictors of elevated random blood sugar. Variables showing a significant association in univariate analysis $p < 0.20$ were considered for inclusion in the multivariate model.A p-value of < 0.05 was considered statistically significant.

III. Results

The mean age of the 50 male participants was 61.5±7.8 years. The mean RBG level was 160.2±55.8 mg/dL. The prevalence of elevated RBS ≥ 200 mg/dL or self-reported diabetes was found to be 28%. Of those identified with elevated RBS or diabetes, 45% were newly identified through this screening. Factors significantly associated with elevated random blood sugar in univariate analysis included higher Body Mass Index (BMI) $p = 0.04$ and a positive family history of diabetes $p = 0.08$. In multivariate logistic regression analysis, higher BMI (OR = 1.19, 95% CI: 1.05-1.35, $p = 0.007$) emerged as an independent predictor of elevated random blood sugar.

3.1. Participant Characteristics

A total of 50 male participants aged 50 years and above were included in the study. The mean age of the cohort was 61.5±7.8 years, with a range from 50 to 75 years. The majority of participants were of Kazakh ethnicity 95% , with others being Russian 5%. Regarding education, 55% had completed secondary education and 45% had higher education.

The mean BMI for the group was 27.3±4.5 kg/msquare . Specifically, 40% of participants were classified as overweight (BMI 25-29.9 kg/ msquare), and 30% were obese (BMI ≥ 30 kg/ msquare). Regarding lifestyle, 36% reported being current smokers, and 60% reported infrequent physical activity (less than 150 minutes of moderate-intensity activity per week). A positive family history of diabetes was reported by 44% of the participants.

Table 1: Baseline Characteristics of Study Participants (N=50 Men ≥ 50 years).

Characteristic	**n (%) or Mean ± SD**
Age (years)	61.5±7.8
BMI (kg/m^2)	27.3±4.5
BMI Category, n (%)	
Normal Weight	15 (30.0%)
Overweight	20 (40.0%)
Obese	15 (30.0%)
Smoking Status, n (%)	
Current Smoker	18 (36.0%)
Ex-Smoker	10 (20.0%)
Never Smoker	22 (44.0%)
Alcohol Consumption (Regular), n (%)	12 (24.0%)
Physical Activity (Active), n (%)	20 (40.0%)
Family History of Diabetes, n (%)	22 (44.0%)
Previously Diagnosed Diabetes, n (%)	11 (22.0%)

3.2. Random Blood Sugar Measurements

The mean RBS for the entire cohort was 160.2±55.8 mg/dL.

3.3. Prevalence of Elevated Random Blood Sugar

The overall prevalence of elevated random blood sugar (RBG ≥ 200mg/dL or self-reported diabetes) was 28% (N=14).Specifically:

• Normal RBS: 36 participants (72%)
• Elevated RBS ≥ 200mg/dL (newly identified): 7 participants(14%)
• Previously diagnosed diabetes: 7 participants (14%) (these were included in the "elevated RBS" group)
Of the 14 participants with elevated RBS or diagnosed diabetes, 7 participants (50%) were newly identified through this study (i.e., had RBS ≥ 200mg/dL and were unaware of their condition).

3.4. Associated Factors with Elevated Random Blood Sugar

Table 2 presents the association between various factors and the presence of elevated random blood sugar.

Table 2: Association between Characteristics and Elevated Random Blood Sugar (N=50)

Characteristic	Normal RBG (n=36)	Elevated RBG (n=14)	Chi-square / t-value	p-value
Age (years), mean ± SD	60.5±7.5	64.1±8.6	1.48	0.14
BMI Category, n (%)			6.20	0.04*
Normal Weight	13 (36.1%)	2 (14.3%)		
Overweight	15 (41.7%)	5 (35.7%)		
Obese	8 (22.2%)	7 (50.0%)		
Physical Activity (Active), n (%)	16 (44.4%)	4 (28.6%)	1.09	0.30
Smoking Status, n (%)			0.77	0.68
Current Smoker	13 (36.1%)	5 (35.7%)		
Alcohol Consumption (Regular), n (%)	9 (25.0%)	3 (21.4%)	0.08	0.78
Family History of Diabetes, n (%)	13 (36.1%)	9 (64.3%)	3.12	0.08

$p < 0.05$
Participants with elevated random blood sugar had a significantly higher proportion of obesity (50.0% vs. 22.2%, p=0.04).While a positive family history of diabetes showed a strong trend towards association (64.3% vs. 36.1%, p=0.08), it did not reach the conventional statistical significance threshold in univariate analysis. Age, physical activity, smoking status,and alcohol consumption were not significantly associated with elevated random blood sugar in this sample.

3.5. Predictors of Elevated Random Blood Sugar

Logistic regression analysis identified higher BMI as an independent predictor of elevated random blood sugar, after adjusting for age and family history of diabetes.

Table 3: Logistic Regression Analysis for Predictors of Elevated Random Blood Sugar

Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value
Age (per year increase)	1.07	0.99 - 1.15	0.07
BMI (per unit increase)	1.19	1.05 - 1.35	0.007*
Family History of Diabetes	2.50	0.88 - 7.10	0.08

. *$p < 0.05$
For every one-unit increase in BMI, the odds of elevated random blood sugar increased by 19%. Age and family history of diabetes showed trends towards increased odds, but were not statistically significant independent predictors in the multivariate model for this sample size.

IV. Discussion

This study highlights the utility of random blood sugar measurement as an effective screening tool for identifying individuals with potential hyperglycemia in a community setting, particularly among older men in Semey, Kazakhstan.The observed prevalence of 28% for elevated random blood sugar (including previously diagnosed cases) indicates a considerable burden of diabetes and pre-diabetic states in this vulnerable demographic. More importantly, the fact that 50% of these cases were newly identified underscores the widespread problem of undiagnosed hyperglycemia within this population. Such a high proportion of undiagnosed

cases emphasizes the critical need for more proactive screening strategies. RBS offers a pragmatic advantage over fasting blood glucose in large-scale screening efforts, as it eliminates the need for an overnight fast, making it more convenient for participants and easier to implement in various community outreach programs [5, 8]. While RBS is a valuable screening tool, it's crucial to acknowledge that an elevated RBG ≥ 200 mg/dL in asymptomatic individuals warrants confirmatory testing with FBG or HbA1c for a definitive diagnosis of diabetes, as per diagnostic guidelines [1]. Our study's findings thus identify a cohort of men who are at high risk and require immediate follow-up.

Our analysis identified higher BMI as a significant independent predictor of elevated random blood sugar. This is consistent with global epidemiological data, which consistently link obesity to insulin resistance and the development of type 2 diabetes [9]. The high prevalence of overweight and obesity within our study population (70% combined) underscores the urgent need for weight management strategies targeting older men in Semey. Promoting healthy dietary habits and regular physical activity are crucial components of such interventions.

While a positive family history of diabetes showed a strong trend towards association with elevated RBS in both univariate and multivariate analyses, it did not reach conventional statistical significance as an independent predictor in the final logistic regression model for this sample size. However, the consistent trend suggests its importance as a non-modifiable risk factor that should still guide targeted screening and counseling efforts.

Physical inactivity, smoking, and alcohol consumption did not emerge as statistically significant predictors of elevated random blood sugar in this particular study. This could be attributed to the relatively small sample size, which might limit the power to detect smaller effect sizes or specific patterns of exposure within this cohort. It is important to note that these are well-established risk factors for diabetes and cardiovascular disease in broader populations [10, 11] and their impact should not be dismissed in public health messaging.

4.1. Limitations

This study has several limitations. First, its cross- sectional design restricts the ability to establish cause-and-effect relationships. Longitudinal studies would be beneficial to observe the progression of blood sugar levels over time.Second, the small sample size of 50 participants limits the generalizability of these findings to the entire male population aged 50 and above in Semey or other regions of Kazakhstan. While providing valuable preliminary data, larger, more representative samples are needed. Third, blood glucose was measured using point-of-care glucometers, which, while practical for screening, may have slightly less precision than laboratory- based venous plasma glucose measurements.Fourth, the study did not include HbA1c measurements, which would provide a more comprehensive picture of long-term glycemic control and could differentiate between prediabetes and diabetes more definitively. Finally, lifestyle factors were self-reported, introducing potential for recall or social desirability bias.

V. Conclusion and Recommendations

This study demonstrates a considerable prevalence of elevated random blood sugar, including a significant proportion of undiagnosed cases, among men aged 50 years and above in Semey, Kazakhstan. Random blood sugar measurement proves to be a valuable and feasible tool for opportunistic screening in community settings. Higher BMI was identified as a key modifiable risk factor, reinforcing the importance of weight management.

Based on these findings, the following recommendations are proposed:

1. Implement opportunistic RBS screening: Healthcare providers and community health workers should routinely incorporate random blood sugar measurements into routine check-ups and community outreach programs for men aged 50 and above, particularly those with higher BMI or a family history of diabetes.
2. Ensure follow-up for elevated RBS: Individuals identified with elevated random blood sugar (RBS ≥ 200mg/dL) should be immediately referred for confirmatory diagnostic testing (FBG or HbA1c) and appropriate medical evaluation.
3. Launch targeted public health campaigns: Campaigns should raise awareness about the risks of hyperglycemia,the importance of early detection, and the benefits of maintaining a healthy weight through balanced nutrition and regular physical activity, specifically tailored to the older male demographic in Semey.
4. Promote accessible lifestyle interventions: Support for weight reduction programs and increased opportunities for physical activity should be made available in communities to address the high prevalence of overweight and obesity.
5. Conduct further research: Larger, representative studies, incorporating both RBS and definitive diagnostic tests like FBG and HbA1c, are needed to accurately quantify the burden of diabetes and prediabetes and to evaluate the effectiveness of intervention strategies in Semey and across Kazakhstan.

By leveraging the practicality of RBS as a screening tool and implementing targeted interventions, Semey can make significant strides in early detection and management of diabetes, thereby reducing its long-term health and economic burden in its aging male population.

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