IMPACT OF RAMADAN FASTING ON BLOOD GLUCOSE LEVELS: A CASE CONTROL PILOT STUDY.

Abstract

Background

Fasting in the month of Ramadaninduces metabolic changes that may influence glucose metabolism and cardiovascular parameters in both diabetic and non-diabetic persons. This study was designed to examine the effects of Ramadan fasting on blood glucose, blood pressure, and body mass index (BMI) in diabetic patients and healthy controls.

Methods

This study was conducted at the Department of Physiology, University of Karachi from 17 February to 18 March 2026. 40 participants(20 diabetic patients and 20 healthy controls, aged 20–40 years) were included after informed consent. Demographic and lifestyle factors data were collected using a questionnaire. Fasting blood glucose, blood pressure, and BMI were measured. Fasting blood glucose was assessed after 6–7 hours of fasting using a glucometer (On Call EZ II). Data was analysed using MS Excel, and t-tests were applied with $p < 0.05$ considered significant.

Result

In healthy controls, no significant changes were noticed in fasting blood glucose (91.5 ± 9.76 to 89.45 ± 9.85 mg/dL, $p = 0.507$), blood pressure, or BMI. In diabetic patients, fasting blood glucose significantly dropped from 169.2 ± 35.67 to 139.8 ± 33.81 mg/dL ($p = 0.008$), while changes in blood pressure and BMI were not significant.

Conclusion

Fasting in Ramadan significantly improvesglycemic control in diabetic patients without notable adverse effects on blood pressure or BMI, suggesting potential metabolic benefits under fasting conditions.

Introduction

Ramadan, the ninth month of Islamic lunar Hijri calendar, is observed by Muslims through fasting, known as As-Saum, which is one of the five pillars of Islam. During this time, Muslims refrain from eating, drinking, and intimate relations from dawn until sunset. Ramadan is not only a period of fasting but also a time for spiritual reflection, self-discipline, and developing empathy for those less fortunate. Ramadan fasting in is a religious obligation for Muslims, who make up about 24% of the world's 1.8 billion population (1).

Globally, around 463 million adults are living with diabetes, 90% of them having type 2 diabetes (2). Pakistan has one of the highest rates of diabetes, ranking third in the world after China and India(IDF Diabetes Atlas, 10th Edition, 2021)(3) The prevalence of diabetes in Pakistan has been steadily increasing, from 11.77% in 2016 to 17.1% in 2019. In next five years, the International Diabetes Federation estimated that 26.7% of adults in Pakistan would have diabetes, expanding to approximately 33 million cases (2).

Diabetes is influenced by both hereditary and lifestyle factors that include high blood pressure, high triglycerides, low HDL, cardiac diseases, diet rich in fats and carbohydrates, high alcohol intake,sedentary lifestyle, obesity, polycystic ovarian syndrome (PCOS), and older age(4). Family history also plays a seriousrole in the onset of diabetes.

Diabetes occurs when pancreas doesn't produce enough insulin or the body can't effectively use the insulin it produces, leading to higher blood sugar levels. There are two main types of diabetes. Type 1 diabetes (T1D), also known as insulin-dependent or juvenile diabetes, is an

autoimmune condition where T-cells destroy pancreatic β cells, resulting in inadequate insulin production (5). Type 1 diabetes is not common, accounting for less than 10% of all diabetes cases, but its frequency has been growing globally since the 1950s, with an annual surge of 3-4% over the last 30 years (6). Most people with type 1 diabetes develop it before age 30, though it can occur later. Type 2 diabetes, often referred to as non-insulin-dependent or adult-onset diabetes. It'sone of the leading causes of illness and death worldwide (7). Type 2 diabetes doesn't result from deficiency of insulin, but rather from cells becoming less responsive to it due to the downregulation of insulin receptors(8).

Diabetes complications can be classified into two classes: chronic complications, which develop over time, and acute complications, which can occur suddenly. A 1999-2004 data indicated prevalence of chronic microvascular complications: kidney disease, foot problems, eye damagemore than macrovascular complications: heart attacks and strokes (9). Dental problems, poor immunity, pregnancy issues are other complications.

Fasting has been shown to potentially reduce the risk of hypoglycaemia in type 1 diabetes, lower glycemic variability, and improve fat metabolism in both type 1 and type 2 diabetes(10). Fasting also increases the sensitivity of the body towards insulin and lowers production of glucose in the body and improves body's metabolism. Fasting, therefore, is a good approach to manage diabetes when safely accomplished under medical supervision (Herz et al., 2023). This study aimed to investigate the effect of Ramadan fasting on blood glucose levels of diabetic individuals and non-diabetic individuals.

Material and Methods

The study was carried out at the Department of Physiology, University of Karachi between17 February to 18 March2026. This study was approved from the local ethical committee of the Department. Informed consent was obtained from allparticipants, and they werechosen to participate in this study voluntarily.This study included 40 participants, 20 diabetic patients, 20 non-diabetic controls, aged between 20-40 years. Demographic and lifestyle were recorded through a questionnaire.

BMI, Blood Pressure and Blood Glucose levels were recorded at three points,start of Ramadan, mid-Ramadan, and after Ramadan. Fasting blood glucose levels were measured at 6 to 7-hour fasting period using a glucometer(On Call EZ II). Statistical analysis was conducted using MS Excel to compare groups through T Testing and P value <0.05 was considered significant.

Results

This study examined the effects of fasting during Ramadan on multiple parameters,especially on blood glucose levels among control and diabetic patients and before and after the period of fasting. In healthy controls, fasting blood glucose level showed a minor decrease from 91.5 ± 9.76 mg/dL to 89.45 ± 9.85 mg/dL, and this change was not statistically significant ($p < 0.507$). Similarly, there were minimal changes in systolic and diastolic blood pressure, with 118.55 ± 11.04 to 119.4 ± 16.12 mmHg ($p < 0.827$) and 78.4 ± 12.99 to 75.9 ± 5.46 mmHg ($p < 0.422$), respectively. BMI remained stable, with no significant differences observed ($p < 0.907$).

In contrast, diabetic patients experienced a notable improvement in fasting blood glucose levels, which decreased significantly from 169.2 ± 35.67 mg/dL to 139.8 ± 33.81 mg/dL ($p < 0.008$). Changes in blood pressure were less pronounced, with systolic pressure slightly reducing from 131.5 ± 15.74 to 126.1 ± 6.94 mmHg ($p = 0.314$) and diastolic pressure

showing a marginal change from 82.7 ± 10.29 to 81.3 ± 4.81 mmHg ($p < 0.756$). BMI showed minor, non-significant changes ($p < 0.343$). The results are represented in Table 1.

Table 1: Comparison of Blood Glucose, Blood Pressure and BMI before and after Fasting in Diabetic and Non-Diabetic Persons

Parameters	Groups	Start of Ramadan	End of Ramadan	P- Value
Fasting Blood Glucose	Non-Diabetic	91.15±9.76	89.45±9.85	0.507
	Diabetic	169.2±35.67	139.8±33.81	0.008
Blood pressure				
Systolic	Non-Diabetic	118.55±11.04	119.4±16.12	0.827
Diastolic		78.4±12.99	75.9±5.46	0.422
Systolic	Diabetic	131.5±15.74	126.1±6.94	0.314
Diastolic		82.7±10.29	81.3±4.81	0.756
BMI (kg/m2)	Non-Diabetic	20.58±4.53	20.575±4.47	0.907
	Diabetic	26.35±2.97	26.31±5.72	0.343

Discussion

Ramadan fasting, in which individuals abstain from food, drink, and few other activities from dawn until sunset, has unique effects on those living with diabetes. While fasting holds spiritual significance and potential health benefits, fasting can also pose challenges for people with diabetes. The impact of fasting on blood sugar levels and general health status depends on numerous factors, such as the type of diabetes a person has, the medications they take, their overall health, and how well they manage their condition during the month of Ramadan or fasting period. The changes in routine experienced by people with diabetesdue to fasting may have potential effects on how food, insulin and other medications are processed in the body. Hence, suchmetabolic fluctuations may result in altered blood sugar levels that might be difficult to control without proper scheduling and monitoring. In this study, diabetic

patients significantly showed lower levels of blood sugar after the period of fasting when compared with their initial levels. In non-diabetics, fasting blood glucose levels were only slightly reduced and Systolic and diastolic readings did not change much. Fasting also did not affect BMI, meaning that well monitored fasting may not change body composition. These findings were correlatable with the study that did not find significant alterations in body weight and composition after Ramadan fasting (11). Comparably, fasting in diabetic subjects showed lower fasting blood glucose thereby suggesting glycemic control as fasting glucose was reported to decrease considerably during Ramadan (10,12). Although blood pressure showed slight reductions, these changes were not statistically significant. Weight and BMI changes were also negligible, indicating limited impact on body composition. Similar trends were noted in the study, which concluded that Ramadan fasting does not negatively affect glycemic parameters in type 2 diabetes patients and can even enhance glycemic control in some cases (13,14).

Ramadan fasting offers notable glycemic benefits for diabetic individuals, particularly with appropriate medication adjustments. For non-diabetics, fasting is well-tolerated and does not disrupt metabolic constancy. However, the contrasting dietary and lifestyle patterns between these groups highlight the need for individualized and customized fasting routines and health management strategies. Furthermore, the body's ability to adapt to altered energy metabolism during Ramadan, such as increased fat oxidation,demonstrates its resilience in maintaining metabolic balance despite dietary changes (15,16).

Conclusion

This study explored the positive effects of Ramadan fasting on fasting blood glucose levels among healthy and especiallydiabetic individuals. As the Holy Prophet Muhammad (SAW) said: “Keep the fast, keep your health”.Ramadan fasting may be advantageous for individuals

with diabetes, particularly when shared with appropriate medication and careful diet management, hydration, and physical activity. Diabetic individuals may experience improved blood glucose control, though the risk of blood sugar variations and dehydration remains. Characteristically,non-diabetics,showed minimal changes in studied parameters. Furthermore, healthcare experts should focus on personalized care plans for fasting during Ramadan, including steady monitoring of blood glucose. More research is required to clearly understand the long-term impacts of fasting on diabetes management and to develop muchfocused guidelines for both diabetic and non-diabetic persons.

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