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COMPARISON OF HBA1C LEVELS IN DIABETIC PATIENTS TAKING ORAL DRUGS AND INSULIN

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Abstract
Effective management of HbA1c is essential for the well-being of patients with diabetes mellitus. Our study aimed to compare the effect of medication and insulin therapy in controlling blood sugar levels, as measured by HbA1c, in patients with diabetes mellitus. Data collected from 200 patients with diabetes mellitus, was divided into two groups based on their treatment method: medication. Statistical analysis was performed using SPSS software to compare the treatment method and HbA1c levels, as well as the correlation between HbA1c levels and blood sugar levels measured randomly. Our study found that both medication and insulin therapy were ineffective in controlling blood sugar levels. However oral drugs significantly lowered the HbA1c levels in comparison to insulin. Also, there was a positive correlation between HbA1c levels and blood sugar levels measured randomly, indicating the importance of regular monitoring of HbA1c levels in patients with diabetes mellitus. Our study provides valuable perceptions about the management of diabetes mellitus and highlights the importance of personalized treatment approaches that adapt to individual patient characteristics and preferences. Further research with larger sample sizes and more comprehensive study designs is needed to validate these findings and improve outcomes for patients with diabetes mellitus.

Introduction
Diabetes mellitus is a disease that occurs when the body fails to control the levels of glucose in the body. It happens when the pancreas fails to produce enough insulin or the cells do not consume the produced insulin as the normal cells do (Suryasa et al., 2021). According to World Health Organization, the disease continues to grow and leads to the death of millions of people every year. 422 million people are suffering from diabetes mellitus worldwide, which includes people of all income statuses. 1.5 million people die every year due to diabetes mellitus (WHO, 2023). International Diabetes Federation (IDF) reports Pakistan as the third highest country in the world after China and India with people living with diabetes mellitus. In 2021, IDF reported a 70% increase in people living in Pakistan affected with diabetes mellitus since 2019 (IDF, 2021). Great efforts are being done worldwide to control the occurrence rate of diabetes mellitus and reduce the death rate associated with it (WHO, 2023).
The disease arises from many factors including the lifestyle of a person, environmental factors, and genetics. However, once affected with the disease hyperglycemic levels need to be controlled (Ballav

and Gough, 2013). If not properly controlled and treated it may lead to other complications in the body such as cardiovascular disease, kidney disorder, infection, and necrosis of lower limbs. Two types of treatment methods are used to control the levels of hyperglycemia, one is insulin and the other is the oral hypoglycemic drug (Zhao et al., 2020). Efforts in changing the lifestyle also help to control the disease, which includes changing dietary patterns, daily exercise routines, monitoring blood glucose levels, etc (Hernández-Ávila et al., 2013).

Once diagnosed with the disease patient has to adopt a particular lifestyle with lifetime treatment to control the levels of blood glucose (Gomes et al., 2019). The normal range of random blood glucose is less than 200mg/dl. Fasting blood glucose which is to be tested after 8-10 hours with no meal or juice intake should be less than 126mg/dl (Petersmann et al., 2019). Another important test that gives a measure of blood glucose levels over three months is HbA1c levels. HbA1c gives the measure of glucose that sticks to hemoglobin in the blood known as glycated Hb. Random blood sugar levels give the estimate of blood glucose present at that particular time when testing. HbA1c gives the value of blood glucose status of three months, the higher the concentration of glucose in the blood the more it sticks to hemoglobin making it glycated Hb (Kazmi et al., 2013). HbA1c is a very important diagnostic test for blood sugar but it also depends on the hemoglobin status of the person. If the person is anemic the hemoglobin levels will be low in blood so it is very important to check the hemoglobin status of the person before monitoring the blood glucose levels with the HbA1c test (Nitin, 2010).

Two treatment therapies are used worldwide to treat diabetes mellitus. Oral drug therapy and insulin control the levels of glucose in the blood (Cramer and Pugh, 2005). Both oral drugs and insulin are available under the label of different multinational companies in Pakistan (Saeed et al., 2022). There are several issues associated with insulin management for patients, which include the fear of injection, timings, and dose injection after the meal (Cramer and Pugh, 2005). Other problems like temperature-controlled storage and transportation are also observed in people with low-income status and underdeveloped countries. Some physicians use combined therapy with insulin and oral drugs to treat patients with diabetes mellitus. Oral drugs together with injected insulin increase the responsiveness of tissues toward the insulin and thus control the levels of blood glucose (Riddle, 2008). However, all these therapies fail to control the HbA1c levels in the normal range in diabetic patients. Efforts are being done to lower the levels to avoid further complications.

We conducted our study to compare the efficiency of oral drugs and insulin in controlling the HbA1c levels in diabetes mellitus patients. The purpose of this study is to check which therapy is more effective in lowering HbA1c levels.

Materials and Methods

Research Methodology

A cross-sectional study was designed to compare the levels of HbA1c in Diabetic patients taking oral drugs and insulin as a treatment. A written informed consent was taken from patients before the collection of data. Study was approved by research and ethical committee of Riphah International University. A questionnaire was prepared to collect the information from the patients. Data included age, gender, the dosage of the oral drug in mg/day, the dosage of insulin in units/day, results of HbA1c, and random blood sugar levels. All the data was collected from Farhat Ishtiaq Medical Complex, Sialkot. 200 diabetic patients were included in the study taking oral hypoglycemic drugs and insulin for the treatment of diabetes. Patients were personally approached at the hospital diabetic clinic to fill out the questionnaires.

Data Analysis

SPSS software was used to analyze the data. Data were arranged in an Excel sheet and data of the patients taking drugs were separated from those taking insulin. Frequencies of the males and females present in the study were calculated. Frequencies of the patients taking drugs and insulin were calculated. Pearson's Correlation was used to find the correlation between random blood sugar and HbA1c levels in both oral drugs and insulin-taking patients. HbA1c levels of both groups were compared by applying a t-test. P-value <0.05 was considered significant.

Results

Data for HbA1c and Blood sugar random were collected from 200 patients with diabetes mellitus. Patients were divided into two groups, one taking the drug and the other taking insulin for the treatment of diabetes mellitus. HbA1c levels were compared in both groups to find out which intervention works better to control the levels of HbA1c. SPSS analysis was used to analyze the data obtained from patients.

Table.1 shows the statistical distribution of HbA1c and Blood sugar at random. It shows the minimum and maximum values of HbA1c and Blood sugar at random included in the data with mean±SD. The minimum value of HbA1c included in the data is 6.1 and the maximum value of HbA1c is 12.4% . The minimum value of blood sugar at random is 103 mg/dl and the maximum value of blood sugar at random is 584 mg/dl.

Table.1: Statistical Distribution

	Minimum	**Maximum**	**Mean**	**Standard Deviation**
HbA1c	6.1	12.4	8.573	1.4012
Blood Sugar Random	103	584	313.82	94.441

Table.2 shows the frequency distribution of gender and treatment method. Gender frequency shows that 99 males were included in the study and 101 females were included in the study. As already discussed that the patients with diabetes were divided into two groups depending on their method of treatment. The frequency table shows that 100 patients were taking drugs for the treatment and 100 number of patients were taking insulin as the treatment.

Table.2: Frequency Distribution

Gender		**Treatment**	
Male	**Female**	**Insulin**	**Oral Drug**
99	**101**	100	100

Figure.1 shows the levels of HbA1c in patients with diabetes taking insulin and drugs as the treatment method. An Independent t-test with a significant p-value > 0.05 was applied to find the significant difference in HbA1c levels among both groups.

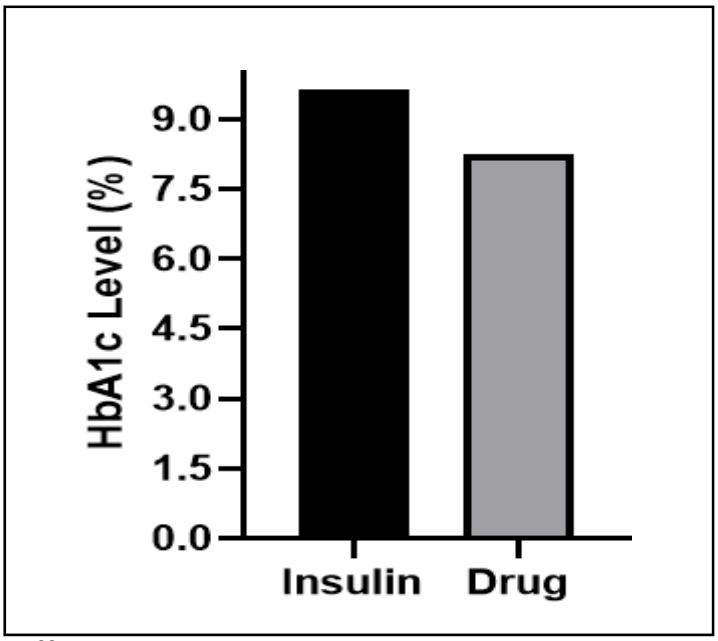

Fig.1: Mean difference in HbA1c levels in patients taking insulin and oral drugs.

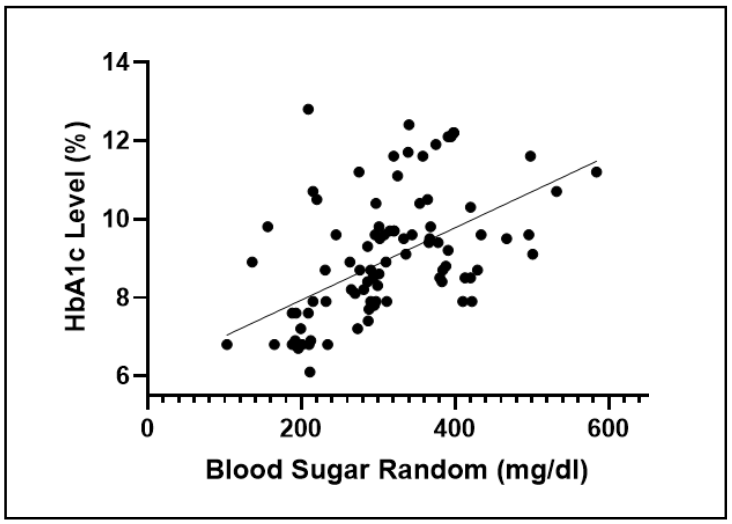

Fig.2 Correlation of HbA1c levels with blood sugar at random in patients.
Both HbA1c and blood sugar at random are measured to estimate the levels of glucose in the blood.

Figure.2 shows a positive correlation between HbA1c levels and blood sugar at random levels in the same patients. A straight line of a scatter graph shows that the values of HbA1c are directly proportional to blood sugar random values. It means that if HbA1c levels are high in a patient its blood sugar random tests also show a high value. Pearson correlation using SPSS software was applied that showed a strong positive correlation between HbA1c and blood sugar random with a significant p-value = 0.000

Discussion:

Managing diabetes effectively is vital for maintaining overall health and reducing the risk of complications associated with the condition. With advancements in medical science, there are various treatment options available, including medication and insulin therapy (Giugliano et al., 2011). Our study aimed to compare the effectiveness of two interventions insulin and oral drugs in controlling blood sugar levels, as measured by HbA1c, in patients with type II diabetes mellitus. The study involved collecting data from 200 patients and conducting statistical analysis using SPSS software.

Our study provide valuable perceptions into the management of diabetes. Both oral medication and insulin therapy failed in controlling blood sugar levels at normal. On average oral drugs were better in glycemic control than insulin. There are several previous research studies that has demonstrated the efficacy of both treatment methods. (Cheng et al., 2020) found insulin treatment more effective for diabetes mellitus type II. (Harahap and Nasution, 2018) found that peope with diabetes mellitus type II taking insulin has a better quality of life as compared to people taking oral drugs. (Lingvay et al., 2009) also concluded insulin to be a better and safe treatment option for diabetic patients. Another group of researchers reported that oral drugs are equally as good as insulin in lowering the HbA1c levels. They described that on average oral drugs were better in glycemic control as compared to insulin (Vaughan et al., 2017).

Our results showed a positive correlation between HbA1c levels and blood sugar levels measured randomly. This suggests that higher HbA1c levels are associated with elevated blood sugar levels, which highlights the importance of regular monitoring of HbA1c levels in patients with diabetes mellitus. HbA1c is a valuable marker for assessing long-term blood sugar control, as it reflects average blood sugar levels over the past two to three months (Nitin, 2010). By monitoring HbA1c levels, healthcare workers can evaluate the effectiveness of treatment and make adjustments as needed to achieve optimal blood sugar control (Nasir Hussain Shah et al., 2013).

While the findings of the study have valuable visions, it is essential to recognize the limitations of the research. One limitation is the relatively small sample size of 200 patients, which may limit the induction of the findings to broader populations of patients with diabetes mellitus. Also, the study design did not clarify potential variables, such as diet, exercise, and comorbidities, which could

influence HbA1c levels and blood sugar control. Future research with larger sample sizes and more comprehensive study designs could help to address these limitations and provide further insights into the management of diabetes mellitus.

Another problem that can relate to our results is unawareness among people for administering insulin properly. There are several requirements for handling insulin properly which includes maintaining it at optimal temperature and injecting insulin subcutaneously properly (Bahendeka et al., 2019). A proper education should be given to people about insulin storage and use.

In conclusion, our study comparing medication and insulin therapy in patients with diabetes mellitus provides valuable insights into the management of the condition. The findings highlight the importance of regular monitoring of HbA1c levels and underscore the need to adapt treatment approaches made to individual patient characteristics and preferences. While the study has limitations, it lays the groundwork for future research aimed at improving outcomes for patients with diabetes mellitus. By continuing to explore treatment approaches, healthcare providers can attempt to optimize blood sugar control and enhance the quality of life for individuals living with diabetes mellitus.

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