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Study on the Level of Glucose, Hb1ac, Urea, Creatinine, and Complications in Patients with Type 2 Diabetes during Several Periods during the Disease

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ABSTRACT

Background & objective: *Diabetes mellitus (DM) is a growing epidemic with global proportions. It is estimated that in 2019, 463 million adults aged 20-79 years were living with DM. The latest evidence shows that DM continues to be a significant global health challenge and is likely to continue to grow substantially in the next decades, we attempted to shed light on the Compare between patients with diabetes mellitus type 2 in different period of the disease with respect to glucose level, HbA1c and complications correlated with diabetes mellitus and the treatment.* ***Methodology:*** *The study included collecting information on 80 samples from people with type 2 diabetes, which were divided into four groups, group A: 20 samples from patients with diabetes whose duration of infection was less than 5 years, group B: 20 samples from patients with diabetes who had the disease for less than 10 years and more than 5 years, group C: 20 samples from patients with diabetes who had the disease for less than 15 years and more than 10 years, group D: 20 samples from diabetic patients who had the disease for more than 15 years.* ***Results:*** *The study showed for them in terms of the level of glucose, HbA1c, urea, and creatinine, as significant differences were found in the levels of these indicators as the duration of the infection increased. We also monitored the patients in terms of the type of treatment used during these periods and the diseases before and after diabetes. It was found that the longer the period of diabetes, the greater the risk of exposure to chronic diseases associated with diabetes.* ***Conclusions:*** *Through our study, it is clear that diabetes is a disease that develops in those infected with it, and this development of the disease leads to other complications that can affect the rest of the body's organs, such as the eyes, heart, and kidneys.*

Keywords: Diabetes mellitus, Inflammation, HbA1C, Complications.

Article Information

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1. INTRODUCTION

Diabetes mellitus has emerged as a staggering global epidemic, impacting over 150 million lives across the planet. By 2030, projections suggest that this number could soar to a staggering 439 million adults grappling with various forms of this chronic condition, with the vast majority being cases of type 2 diabetes. It's not just a health concern; diabetes mellitus is a leading cause of both illness and death (1).Types of diabetes: Type 1diabetes, once referred to as insulin-dependent or juvenile diabetes, paints a complex picture of the body's struggle with insulin production (2). Type 2 Diabetes: Type 2 diabetes, once known as non-insulin-dependent or adult-onset diabetes, emerges

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from the body's struggle to utilize insulin effectively (3). Inflammation in Type 1 Diabetes (T1D) is more than just a medical term; it's an autoimmune condition marked by the very selective destruction of those vital insulin-producing beta cells in the pancreas (4), while seemingly leaving the other Langerhans cells mostly untouched. It's fascinating—and a bit perplexing—that T1D isn't a one-size-fits-all diagnosis. There's a rich tapestry of variability when it comes to when this disorder strikes, how fierce the autoimmune response can be, and how effective treatments may prove to be for each individual. Research suggests that both the humoral side of immunity and cellular immunity play crucial roles in the unfolding drama of T1D's development. Interestingly (5,6).

Inflammation in Type 2 Diabetes The intricate interplay between beta cell dysfunction and insulin resistance in individuals grappling with type 2 diabetes (T2D) often weaves a complex tapestry of factors. It's fascinating to note that, for many, the shadows of abnormal insulin sensitivity can cast themselves long before the formal diagnosis of diabetes, lingering silently for as much as 15 years (7). This temporal gap has spurred an intriguing blend of mechanistic studies aimed at unraveling the very fabric of insulin resistance, alongside a fresh wave of research that delves into the pathways that ultimately lead to the frailty of beta cells (8).

Type 2 diabetes mellitus (DMT2) isn't just a metabolic condition; it represents a chronic state of inflammation, where the immune system seems to be in overdrive, activating cells and releasing proinflammatory cytokines that contribute to the tangled web of complications arising from the disease. Recent studies have added yet another layer to this narrative, revealing a relationship between new-onset diabetes and the COVID-19 pandemic. This revelation opens up new avenues of exploration in understanding the multifaceted impacts of this viral infection on our metabolic health (9).

2. METHODOLOGY

2.1 Study Design

The study included collecting information on 80 samples from people with type 2 diabetes, which were divided into four groups.

- Group A: 20 samples from patients with diabetes whose duration of infection was less than 5 years
- Group B: 20 samples from patients with diabetes who had the disease for less than 10 years and more than 5 years.
- Group C: 20 samples from patients with diabetes who had the disease for less than 15 years and more than 10 years.
- Group D: 20 samples from diabetic patients who had the disease for more than 15 years.

2.2 Patient selection

In this study, samples were selected at the Diabetes Center at Al-Sadr Teaching Hospital. The ages of the samples ranged from 18 years to 60 years according to a data form that included weight, age, and diseases before and after diabetes.

2.3 Data Collection

This study was carried out in Al-Sadder Teaching Hospital in Al-Najaf province during the period from October 2023 to February 2024. . The process was carried out by conducting a random survey in the city of Najaf as described above, which included more than 80 samples.The study compares the problems of type 2 diabetes during certain periods of the disease, in addition to indicators of kidney function and other complications that may occur as a result of the long period of infection, as they are linked to diabetes, and analyzes the effect of inflammation on these complications that may occur and develop as a result of the long period of infection for patients with type 2 diabetes.

2.4 Biochemical Tests

a) Serum creatinine determination was done by kit, which is BIOLABO REAGENT products (02160, Maizy, France/REF: 80107).
b) Serum urea was estimated by Talke and Schubert enzymatic reaction method (urea kit is a BIOLABO REAGENT product, 02160, Maizy, France/ REF: 92032).
c) Glucose was estimated by GOD-PAP colorimetric method enzymatically by using kit from BIOLABO REAGENT products (02160, Maizy, France/ REF: 80009).

2.5 Statistical Analysis

The data was analyzed using the Graphpad prism v7 (GraphPad Software
Inc.). (P-value < 0.05)

3. RESULT AND DISCUSSION

3.1 Glucose and Hemoglobin A1c (HbA1c)

Results of (**Table 1**) showed the study a significant increase ($p< 0.05$) in glucose level in diabetic patients (group A) when compared to diabetic patients (group D) , also there is a significant increase ($p< 0.05$) in glucose level in diabetic patients (group B) when compared to diabetic patients (group D). In the other hand there is no significant increase between the other groups.

The findings of this study indicated that there is a significant increase in HbA1c between most groups of diabetic patients, In our study level of HbA1c increases as the duration of diabetes increases, (**Table 1 and Figure1).**

Table 1: View Mean , standard error (M. ±S.E) to Glucose, HbA1C , Serum Urea (S.Urea), and Serum Creatinine (S.Cr.) mg/dl concentration of diabetic groups . *: p< 0.05 or significant differences between percentages.

Groups	Glucose (M ± S.E.)	HbA1C (M ± S.E.)	S.Urea (M ±S.E.)	S.Cr. (M ± S.E.)
Group A	192.4 ± 8.523	7.815± 0.5199 *	32.20±0.8033	0.7325±0.08097
Group B	195.0 ± 9.763	7.940± 0.4048 *	33.35± 1.634	0.8995±0.1924
Group C	228.5 ± 19.19 *	9.825± 0.5058 *	32.70±1.210	1.020±0.1309
Group D	251.2 ± 11.88 *	10.99± 0.4644 *	47.10±5.175	1.360±0.2016
P.value	P< 0.0045	P< 0.0001	P< 0.0005	P< 0.0465

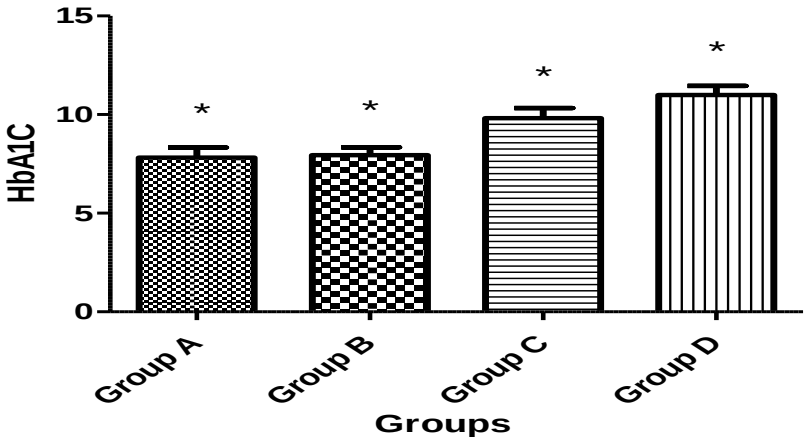

Figure 1: **HbA1c distributions of diabetic patients group.**

3.2 Biochemical Tests

The results of estimation the biochemical parameters show there is a significant increase in serum urea in group D in comparison with the other groups, On the other hand the results of estimation the creatinine values were not appear to be very different except between group A and group B (there is significant increase in creatinine level), There is a significant increase in serum level of urea and creatinine with respect to the duration of the diabetes, (**Table 1, Figure 2 and Figure 3**).

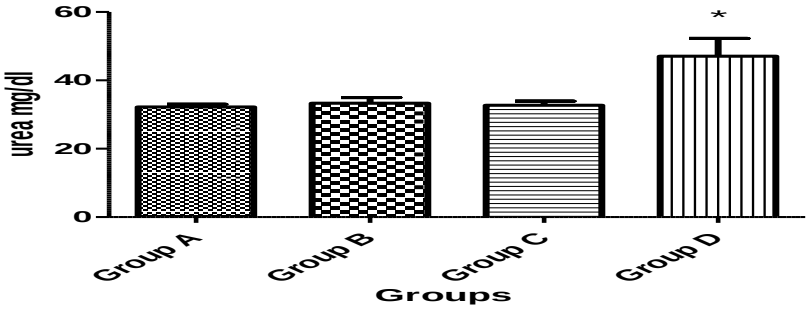

Figure 2: S. urea distribution of diabetic patients group.

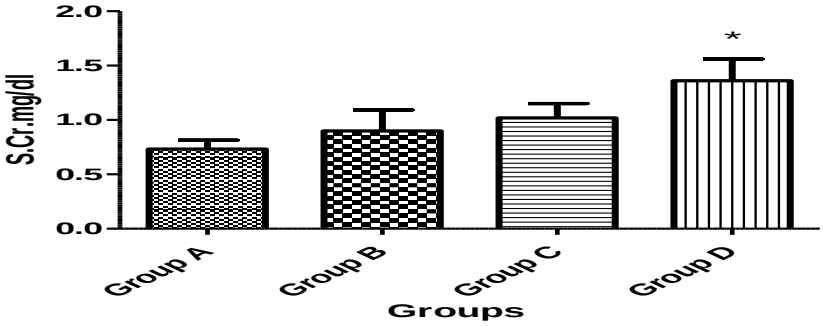

Figure 3: S. creatinine distribution of diabetic patients group.

3.3 Complications

Complications after diabetes. It's clear from the data that the longer the period of diabetes, the lesser the threat of exposure to possible complications, similar as visual impairment, high blood pressure, and habitual order complaint**.** view diabetic patients , results values were expressed as number of patients (results also represented as a percentage (%), *: p< 0.05 or significant differences between percentages. (**Table 2 and Figure 5**).

Table 2: View the percentages of chronic disease complications after diabetes between most groups of diabetic patients.

groups	chronic disease %	No complication %
Group A *	20%	80%
Group B *	45%	55%
Group C	60%	40%
Group D *	100%	0%

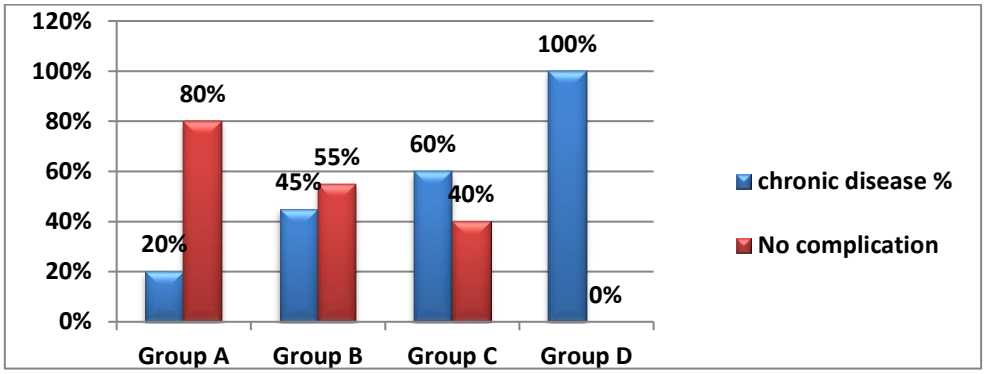

Figure 5:The percentages of distribution of patients according to complications.

4. DISCUSSION

There are several pathways by which hyperglycemia complicate its poisonous effect on cells, apkins and organ systems. Hyperglycemia can induce oxidative stress, upsurge polyol pathway, spark protein kinase C(PKC), enhance hexosamine biosynthetic pathway(HBP), promote the conformation of advanced glycation end- products(periods) and eventually alters gene expressions. Dragged hyperglycemic condition leads to severe diabetic condition by damaging the pancreatic β- cell and converting insulin resistance (10). When insulin resistance in supplemental apkins occurs, the pancreas produces further insulin for prostrating similar conditions. When the β- cells fail to compensate this stress, apoptotic cell death do leading to a disfigurement in insulin product and stashing. This consequence elevates the position of blood glucose gradationally and develops hyperglycemia. (11).

Several former studies showed that long- term glycemic variability may prognosticate microvascular complications, diabetic order complaint, cardiovascular autonomic neuropathy, macrovascular complications and each- beget mortality in diabetic cases (12, 13, and 14). In recent times, studies have set up that HbA1C variability(expressed as intrapersonal SD or measure of friction) is an independent threat factor for diabetic complications in type 2 cases and might indeed be a further dependable measure of glycemic control than the mean HbA1C in type 2 DM(14). Differences between percentages. Diabetes is a condition in which there's too important glucose (a type of sugar) in the blood. Over time, high blood glucose situations can damage the body's organs. Possible long-term goods include damage to large (macrovascular) and small (microvascular) blood vessels, which can lead to heart attack, stroke, and problems with the eyes (15).

5. CONCLUSION

Through our study, it is clear that diabetes is a disease that develops in those infected with it, and this development of the disease leads to other complications that can affect the rest of the body's organs, such as the eyes, heart, and kidneys.

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7. Funding Sources

This study was self-funded from the authors.

8. Conflicts of interest

There are no conflicts of interest.

9. Abbreviations: (DM)-Diabetes mellitus; (T1D)-Type 1 Diabetes; (T2D)- type 2 diabetes (T2D); (HbA1c)-Hemoglobin A1C.

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