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ESTIMATION OF RENAL FUNCTION TEST AMONG TYPE I DIABETIC PATIENT AT DARWESH DIABETES INSTITUTE AND RESEARCH CENTER PABBI NOWSHERA

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Abstract

Diabetes mellitus is a chronic metabolic disorder associated with several long-term complications, including diabetic nephropathy, which is a major cause of chronic kidney disease and renal failure. The present descriptive cross-sectional study was conducted to estimate renal function tests among Type I diabetic patients visiting Darwesh Diabetes Institute and Research Center, Pabbi Nowshera, from June 1, 2024, to July 1, 2024. A total of 35 insulin-

dependent male Type I diabetic patients of different age groups were included in the study. Patients with known chronic kidney disease and those unwilling to participate were excluded. Blood samples were collected and analyzed for serum urea and creatinine levels using the Micro Lab 300 biochemical analyzer. The results showed that the majority of participants belonged to the age group of 37–48 years (42.9%), followed by 25–36 years (31.4%) and 49–60 years (25.7%). Creatinine analysis revealed that 37.1% of patients had serum creatinine levels of 0.8 mg/dl, while 34.3% showed 1.0 mg/dl levels. Urea estimation demonstrated that most participants (68.6%) had serum urea levels ranging from 26–32 mg/dl. Correlation analysis indicated relatively higher creatinine and urea levels among older age groups, particularly patients aged 49–60 years, suggesting increased risk of renal impairment with advancing age. The study concludes that although most Type I diabetic patients maintained relatively normal renal function parameters, a considerable proportion exhibited elevated urea and creatinine levels indicating possible early renal impairment. Regular monitoring of renal function tests and early preventive strategies are essential to reduce the progression of diabetic nephropathy and improve patient outcomes among Type I diabetic patients.

Introduction

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia due to defects in insulin secretion, insulin action, or both (American Diabetes Association, 2023). Type I diabetes mellitus (T1DM) is an autoimmune disease resulting from destruction of pancreatic β-cells, leading to absolute insulin deficiency and lifelong dependence on insulin therapy (Atkinson et al., 2014). The incidence of Type I diabetes is increasing globally, particularly among children and young adults, making it a significant public health concern (IDF, 2021).

Long-term uncontrolled diabetes is associated with several microvascular and macrovascular complications. Among these complications, diabetic nephropathy is considered one of the leading causes of chronic kidney disease (CKD) and end-stage renal disease (ESRD) worldwide (Gross et al., 2005). Diabetic nephropathy develops gradually due to persistent hyperglycemia, which damages the glomerular capillaries and renal tissues, ultimately impairing kidney function (Caramori & Rossing, 2022).

Renal complications in Type I diabetic patients generally appear after several years of disease duration and may initially present as microalbuminuria, followed by proteinuria, reduced glomerular filtration rate (GFR), elevated serum creatinine, and renal failure in advanced stages (Willacy, 2023). Early detection of renal dysfunction is therefore essential for preventing irreversible kidney damage and improving patient outcomes.

Renal function tests (RFTs) are important laboratory investigations used to assess kidney function and detect early renal impairment. These tests commonly include serum creatinine, blood urea nitrogen (BUN), serum electrolytes, estimated glomerular filtration rate (eGFR), and urinary albumin excretion (Batuman, 2024). Monitoring these parameters among diabetic patients helps clinicians identify nephropathy at an early stage and initiate timely therapeutic interventions.

Several factors contribute to the progression of diabetic nephropathy, including poor glycemic control, hypertension, obesity, dyslipidemia, and prolonged duration of diabetes (Gross et al., 2005). Studies have shown that effective glycemic control and regular monitoring of renal function can significantly reduce the progression of kidney disease in diabetic patients (IDF, 2021). In Pakistan, the prevalence of diabetes is increasing rapidly, creating a substantial burden on the healthcare system. However, limited local studies are available regarding renal function abnormalities among Type I diabetic patients, especially in regional healthcare institutions. Darwesh Diabetes Institute and Research Center, Pabbi Nowshera, provides specialized diabetic care to a large number of patients and offers an important setting for assessing renal complications associated with Type I diabetes mellitus.

Therefore, the present study entitled **"Estimation of Renal Function Test Among Type I Diabetic Patient at Darwesh Diabetes Institute and Research Center Pabbi Nowshera"** aims to evaluate renal function parameters among Type I diabetic patients and determine the frequency of renal impairment in this population. The findings of this study may contribute to early diagnosis and management of diabetic nephropathy, thereby reducing the risk of chronic kidney disease and improving quality of life among diabetic patients.

Methodology:

A descriptive cross-sectional study was conducted among Type I diabetic male patients visiting Darwesh Diabetes Institute and Research Center, Pabbi Nowshera, from 1st June 2024 to 1st July 2024. A total of 35 insulin-dependent Type I diabetic male patients of all age groups were included in the study. Only those participants who voluntarily agreed and provided written informed consent were enrolled. Patients with known chronic kidney disease and those unwilling to participate were excluded from the study.

Approximately 3 cc of blood sample was collected from each participant using a sterilized syringe and transferred into gel tubes. The samples were centrifuged to separate serum from cellular components following standard operating procedures (SOPs). Serum urea and creatinine levels were analyzed using the Micro Lab 300 biochemical analyzer. The materials used during the procedure included gel tubes, syringes, alcohol pads, tourniquets, cotton swabs, and biochemical reagents. The collected serum samples were mixed with specific reagents according to the manufacturer's instructions, and the biochemical analyzer provided quantitative estimations of urea and creatinine levels.

Results:

In this descriptive cross-sectional study aimed to estimate the Renal function test among insulin dependent type-I diabetic patients visiting at Darwesh diabetes institute and research center pabbi nowshera

Spanning from June to July 2024.

Age wise Distribution:

All type-I diabetic patients that were included in this study were divided into three age groups. The first group includes those participants who were having age between 25 to 36 years. In first group fall 11 participants out of 35 shows maximum frequency after age group second. In second group we included those participants with age between 37 to 48 years fall 15 participants show maximum frequency in this age group. In third group includes participants with age between 49 to 60 years fall 09 participants as shown in table 4.1 and figure 4.1.

Table 1 shows Age wise distribution

		Frequency	Percent	Cumulative Percent
Age	25 to 36 Years	11	31.4%	31.4%
	37 to 48 Years	15	42.9%	74.3%
	49 to 60 Years	9	25.7%	100%
	Total	35	100%	

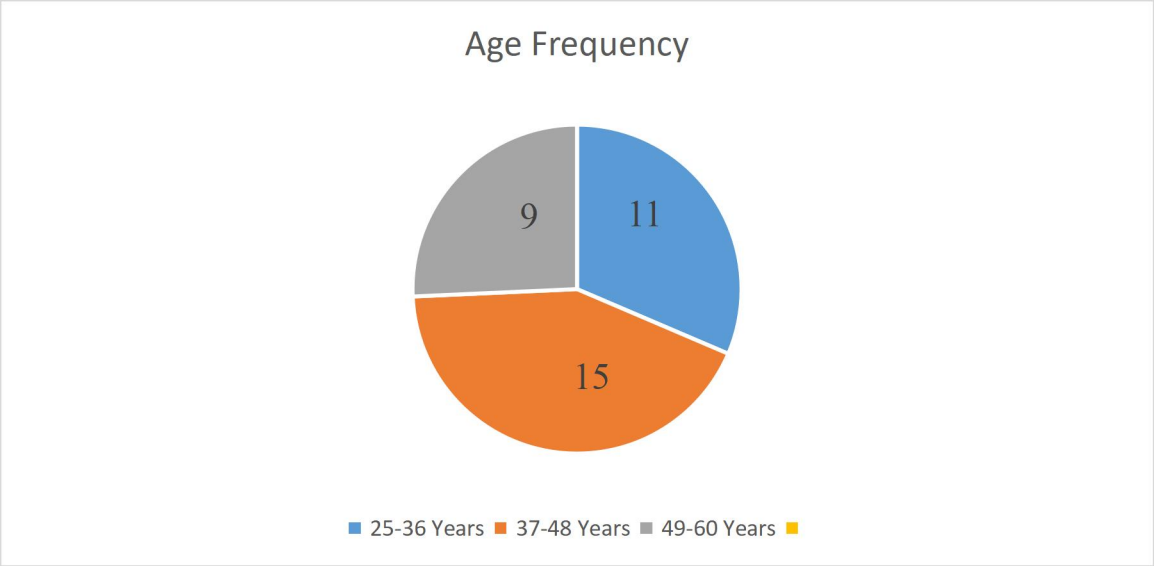

Figure 1 shows Age wise distribution

Creatinine wise Distribution:

All type-I diabetic patients that were included in this study were divided into four groups on the basis of creatinine. The first group includes those participants who were having creatinine level in serum 0.8 mg/dl. In first group fall 13 participants out of 35 shows maximum frequency in this group. In second group we included those participants with creatinine level in serum 0.9 mg/dl, fall 08 participants. In third group includes participants with creatinine level in serum 1.0 mg/dl fall 12 participants. In forth group we included those participants with creatinine level in serum 1.1 mg/dl, fall 02 participants as shown in table 4.2 and figure 4.2.

Table 2 shows creatinine wise distribution.

		Frequency	Percent	Cumulative Percent
Creatinine	0.8 mg/dl	13	37.1	37.1

0.9 mg/dl	8	22.9	60.0
1.0 mg/dl	12	34.3	94.3
1.1 mg/dl	2	5.7	100.0
Total	35	100.0	

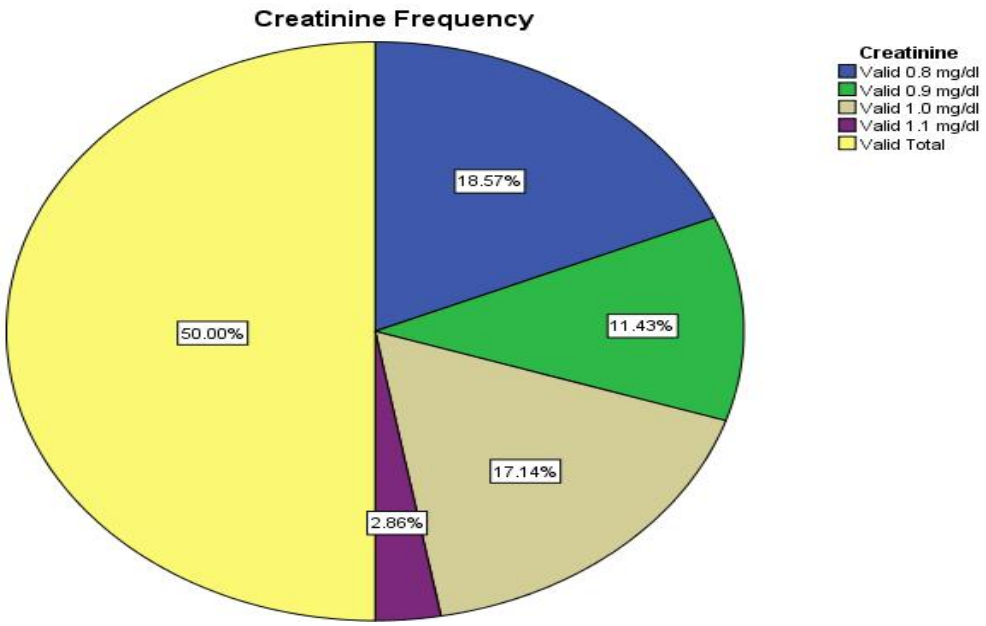

Figure 2 shows creatinine wise distribution.

Urea wise Distribution:

All type-I diabetic patients that were included in this study were divided into four groups on the basis of urea level in serum. The first group includes those participants who were having urea level in serum from 26-32 MG/DL. In first group fall 24 participants out of 35 shows maximum frequency in this group. In second group we included those participants with urea level in serum from 33-40 MG/DL, fall 10 participants. In third group includes participants with urea level in serum from 48-54 MG/DL fall only 01 participants as shown in table 4.3 and figure 4.3.

Table 3 shows urea wise distribution

		Frequency	Percent	Cumulative Percent
Urea	26-32 MG/DL	24	68.6%	68.6%

33-40 MG/DL	10	28.6%	97.1%
48-54 MG/DL	1	2.9%	100%
Total	35	100%	

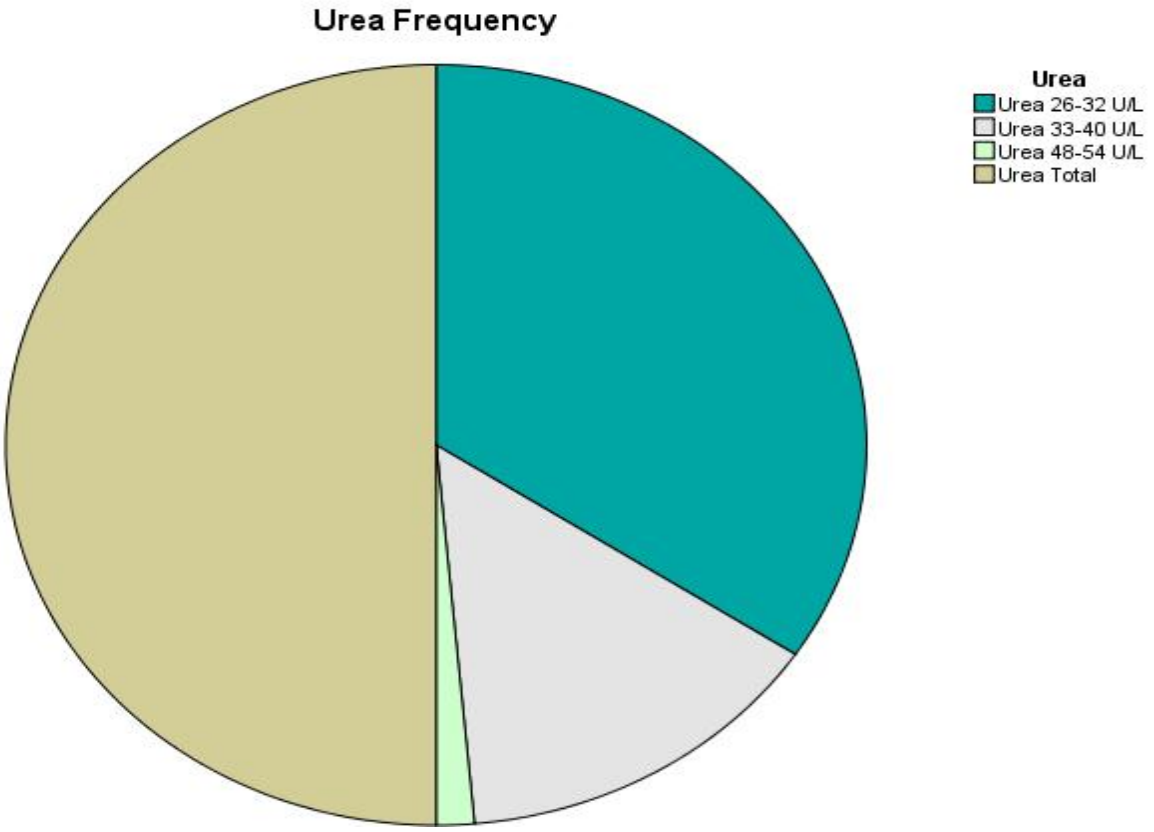

Figure 3 shows urea wise distribution

Correlation of age with creatinine:

All type-I diabetic patients that were included in this study were divided into three age groups. The first group includes those participants who were having age between 25 to 36 years. In first group fall 11 participants out 35, among those 04 were having 0.8 mg/dl creatinine level in serum, 04 were having 0.9 mg/dl creatinine level in serum and 03 were having 1.0 mg/dl creatinine level in serum. In second group we included those participants with age between 37 to 48 years fall 15 participants, among those 06 were having 0.8 mg/dl creatinine level in serum, 02 were having 0.9 mg/dl creatinine level in serum and 07 were having 1.0 mg/dl creatinine level in serum. In third group includes

participants with age between 49 to 60 years fall 09 participants, among those 03 were having 0.8 mg/dl creatinine level in serum, 02 were having 0.9 mg/dl creatinine level in serum, 02 were having 1.0 mg/dl creatinine level in serum and 02 were having 1.1 mg/dl creatinine level in serum as shown in table 4.4 and figure 4.4.

Table 4 shows correlation of age with creatinine

		Creatinine				
		0.8 mg/dl	0.9 mg/dl	1.0 mg/dl	1.1 mg/dl	Total
Age	25 to 36 Years	4	4	3	0	11
	37 to 48 Years	6	2	7	0	15
	49 to 60 Years	3	2	2	2	9
Total		13	8	12	2	35

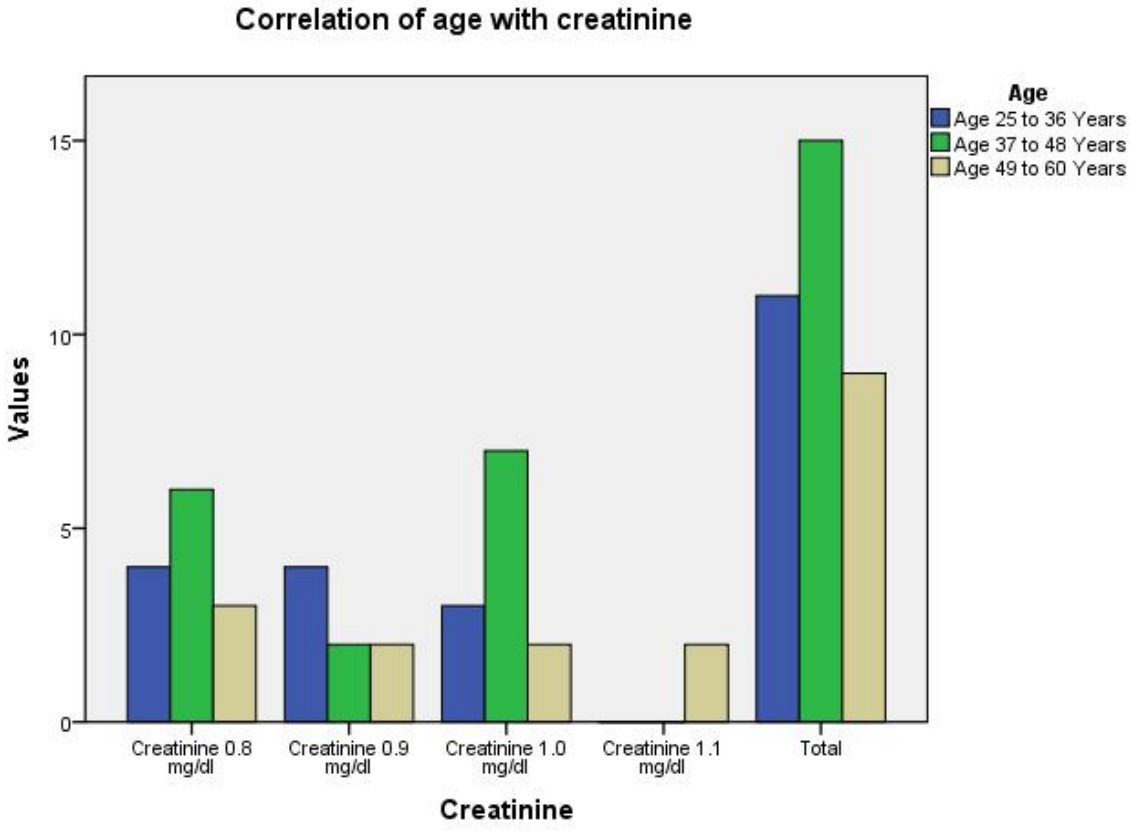

Figure 4 shows correlation of age with creatinine

Correlation of age with urea:

All type-I diabetic patients that were included in this study were divided into three age groups. The first group includes those participants who were having age between 25 to 36 years. In first group fall 11 participants out 35, among those 08 were having 26-32 MG/DL urea level in serum and 03 were having 33-40 MG/DL urea level in serum. In second group we included those participants with age between 37 to 48 years fall 15 participants among those 13 were having 26-32 MG/DL urea level in serum and 02 were having 33-40 MG/DL urea level in serum. In third group includes participants with age between 49 to 60 years fall 09 participants, among those 03 were having 26-32 MG/DL urea level in serum, 05 were having 33-40 MG/DL urea level in serum and only 01 were having 48-54 MG/DL urea level in serum as shown in table 4.5 and figure 4.5.

Table 5 shows correlation of age with urea.

		Urea			
		26-32 MG/DL	**33-40 MG/DL**	**48-54 MG/DL**	Total
Age	25 to 36 Years	8	3	0	11
	37 to 48 Years	13	2	0	15
	49 to 60 Years	3	5	1	9
Total		24	10	1	35

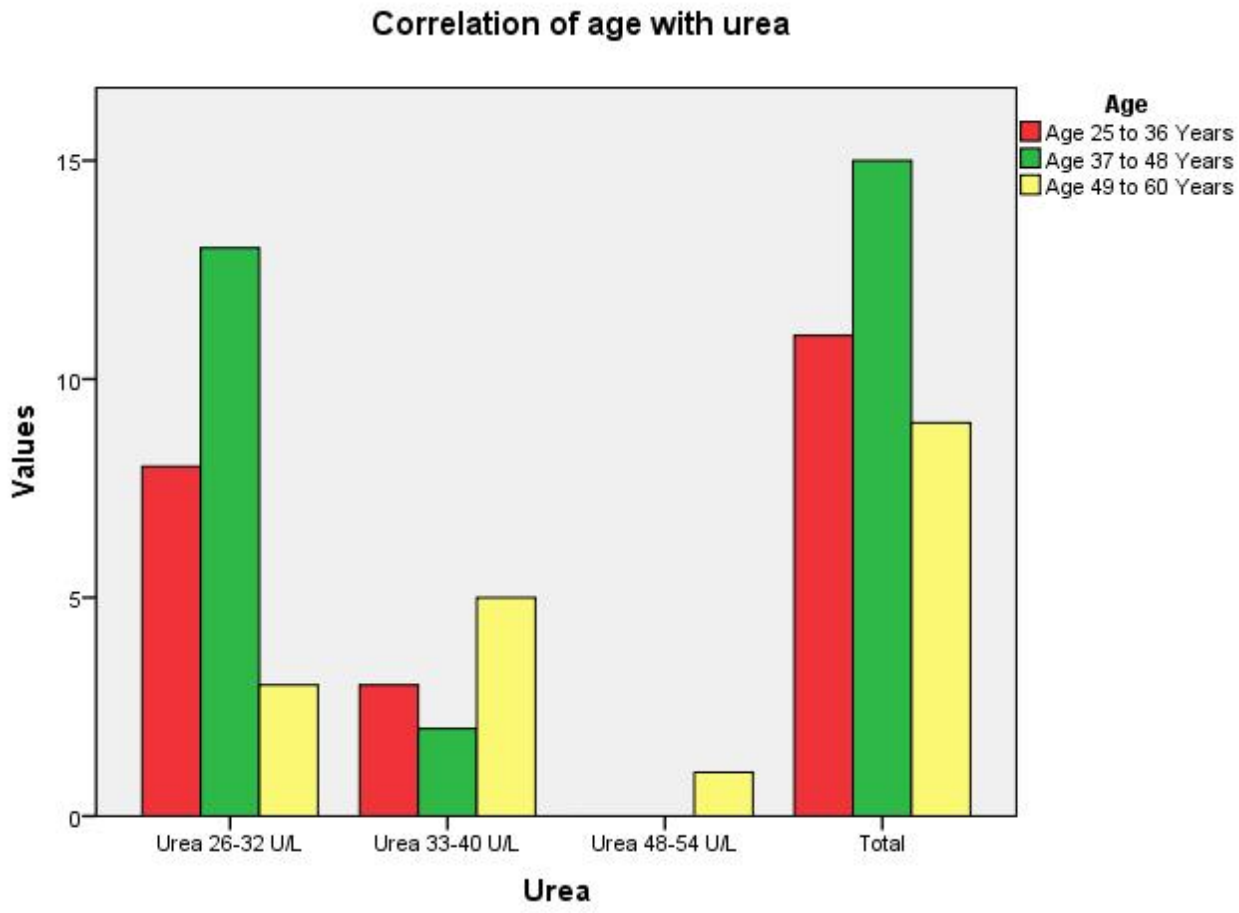

Figure 5 shows correlation of age with urea

Discussion

This descriptive cross-sectional study was conducted among male 1 diabetic patients of all age groups visiting Darwesh diabetes institute and research center pabbi nowshera from June 1, 2024, to July 1, 2024. Thirty-five participants who voluntarily agreed to provide samples were included, while females and those with known chronic kidney disease were excluded. Participants were categorized by age, creatinine, and urea levels. The age distribution revealed that 15 patients were aged 37-48 years, 11 were aged 25-36 years, and 9 were aged 49-60 years. Creatinine levels were distributed as follows: 13 patients had 0.8 mg/dl, 8 had 0.9 mg/dl, 12 had 1.0 mg/dl, and 2 had 1.1 mg/dl. Urea levels showed 24 patients with 26-32 MG/DL, 10 with 33-40 MG/DL, and 1 with 48-54 MG/DL. Correlations indicated that among patients aged 25-36 years, creatinine levels

were 0.8 mg/dl (4 patients), 0.9 mg/dl (4), and 1.0 mg/dl (3), while urea levels were 26-32 MG/DL (8) and 33-40 MG/DL (3). For ages 37-48 years, creatinine levels were 0.8 mg/dl (6), 0.9 mg/dl (2), and 1.0 mg/dl (7), with urea levels at 26-32 MG/DL (13) and 33-40 MG/DL (2). Among those aged 49-60 years, creatinine levels were 0.8 mg/dl (3), 0.9 mg/dl (2), 1.0 mg/dl (2), and 1.1 mg/dl (2), while urea levels were 26-32 MG/DL (3), 33-40 MG/DL (5), and 48-54 MG/DL(1).

This study basis on analysis of the Diabetes Control and Complications conducted at US, reveals significant insights into the progression of renal complications in patients with type 1 diabetes mellitus (T1DM) following persistent microalbuminuria, with a median follow-up of 13 years. The study found that over a decade, 28% of patients progressed to microalbuminuria, 15% experienced impaired glomerular filtration rate, and 4% developed end-stage renal disease, while 40% reverted to normoalbuminuric. Notably, more favorable albuminuria outcomes were associated with factors such as intensive diabetes management, lower glycated hemoglobin levels, absence of retinopathy, female sex, lower blood pressure, and reduced concentrations of low-density lipoprotein cholesterol and triglycerides. These findings underscore the critical role of stringent glycemic control and comprehensive cardiovascular risk management in improving long-term renal outcomes for diabetic patients. (De Boer *et al.,* 2011)

This study Kidney function and glomerulopathy over 8 years in young patients with Type I (insulin-dependent) diabetes mellitus and microalbuminuria conducted at Ullevål University Hospital, Norway, provides critical insights into the progression of renal changes in type 1 diabetes mellitus over an eight-year period. The study observed a decline in glomerular filtration rate (GFR) by 2.3 ml/min·1.73 m^2 per year, accompanied by increases in glomerular volume, matrix volume fraction, mesangium volume fraction, and basement membrane thickness. The significant findings include that the mean HbA1c over eight years, baseline matrix volume fraction, and basement membrane thickness collectively explained 70% of the variation in albumin excretion rate (AER). Similarly, baseline mesangial volume fraction, glomerular filtration fraction, and mean 8-year HbA1c accounted for 73% of the changes in GFR. Additionally, smoking was strongly linked to baseline GFR ($r = 0.65$) and was the only significant factor influencing changes in GFR when baseline GFR was excluded from the analysis. These results

underscore the crucial role of long-term glycemic control and smoking cessation in managing renal function deterioration in diabetic patients, highlighting the need for comprehensive strategies to address both metabolic and lifestyle factors to slow renal progression. (Bangstad *et al.,* 2002)

This study Evaluation of Cognitive Deficits in Adults with Type 1 Diabetes Stratified by the Age of Diabetes conducted at India, reveals significant differences between individuals with type 1 diabetes mellitus (T1DM) and healthy controls, particularly in age and glycemic control. The T1DM patients, with a mean age of 24.0 years, were notably younger than the control group, who had a mean age of 27.6 years. This age difference underscores the early onset of T1DM and its long-term management challenges. The study found that the mean HbA1c level in T1DM patients was 9.0%, indicating suboptimal glycemic control. Furthermore, microvascular complications were present in 21.9% of T1DM patients, along with hypothyroidism in 17.8% and coeliac disease in 8.2%, none of which were observed in the control group. These findings highlight the significant burden of associated conditions in T1DM patients and emphasize the need for rigorous monitoring and management strategies to address both glycemic control and related health issues (Senthil *et al.,* 2019).

Conclusions

The findings of this study indicate a varied distribution of creatinine and urea levels across different age groups, highlighting potential age-related differences in renal function among these patients. Most participants had creatinine levels of 0.8 mg/dl and urea levels of 26-32 MG/DL, suggesting that the majority maintained relatively stable renal function. However, a subset of patients exhibited elevated creatinine and urea levels, pointing to possible renal impairment. The correlation analysis between age and Renal function test suggests that middle-aged patients (37-48 years) had the highest frequency of elevated creatinine and urea levels, indicating a greater risk of renal complications in this age group.

Recommendations

1. **Regular Monitoring**: Implement regular monitoring of renal function tests (Renal function test) for insulin-dependent type 1 diabetic patients to identify early signs of renal impairment.

2. **Patient Education**: Enhance patient education programs focusing on the importance of renal function test, early symptoms of renal impairment, and preventive measures.

Limitations

1. **Small Sample Size**: The study's small sample size of 35 participants limits the generalizability of the findings
2. **Single-Center Study**: Conducted at a single hospital, the findings may not be representative of broader populations.

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