

Frequency of Diabetic Nephropathy in Type II Diabetic Patients

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Author's Contribution

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ABSTRACT

Objective: To determine the frequency of diabetic nephropathy in type II diabetic patients at a tertiary care Hospital.

Methodology: A cross-sectional study was conducted on type II diabetic patients in the Department of Medicine, Indus Medical College & Hospital, Tando Muhammad Khan, from July 2025 to December 2025, on patients aged 18 to 60 years, both genders, who had been previously diagnosed with type II diabetes mellitus for a duration of five years or more and presented with symptoms suggestive of diabetic nephropathy. Diabetic nephropathy was defined as an estimated glomerular filtration rate (eGFR) of less than 60 mL/min/1.73 m². All the findings were documented by the researcher using a structured proforma and statistical analysis was conducted using SPSS software (version 25).

Results: Overall mean age of patients was 51.8 years, with male predominance and most had long disease duration, with 64.9% having diabetes for over 10 years. Diabetic nephropathy was diagnosed among 52.9% patients. It was significantly associated with older age, higher BMI, longer duration of disease, hypertension, cardiovascular disease, use of insulin and poorer glycemic control with higher HbA1c (p=0.001). Additionally, presenting symptoms including swelling, polyuria, foamy urine, and fatigue were also significantly more frequent among patients with nephropathy (P<0.05), along with renal function was markedly decreased in the nephropathy group, with a mean eGFR of 47.9 compared to 79.9 mL/min/1.73m² in those without nephropathy (p=0.001). However, the gender and smoking status did not showed significant association with diabetic nephropathy (P>0.05).

Conclusion: Diabetic nephropathy was observed highly frequent among patients with Type II DM, and closely related to advanced age, elevated BMI, comorbidities, long duration of diabetes mellitus, and poor glycemic control.

Keywords: Diabetes mellitus, diabetic nephropathy, renal insufficiency.

Introduction

Diabetes mellitus (DM) comprises a group of metabolic disorders marked by persistent hyperglycemia as a result of diminished insulin release, impaired insulin response, or both.¹ It represents a growing global health concern, strongly linked to increased rates of morbidity and mortality.² Recently, an estimated 589 million individuals from the world are affected by diabetes, making it one of the most common public health challenges, whereas 853 million adults are predicted to have diabetes by 2050. In year 2024, diabetes was estimated to cause around 3.44 million deaths throughout the world.³ According to global data, type II DM accounts for nearly 96% of all diabetes cases, while type 1 diabetes making only 4% of total diabetic cases.⁴ The Pakistan recorded the greatest age-standardized diabetes prevalence in adults aged 20–79 years in 2024 (31.4%), ranking as first globally, and is projected to overtake the United States (US) in total number of diabetes cases by 2050.^{3,5}

Diabetes mellitus is significantly associated with various microvascular and macrovascular complications,⁶ specifically with poor control. Microvascular complications typically include conditions such as

diabetic neuropathy, nephropathy, and retinopathy, while macrovascular complications include cardiovascular problems such as coronary artery disease and stroke. These complications can negatively affect patient's well-being, quality of life (QOL) and add a significant burden on families as well as healthcare systems.⁶⁻⁸

The diabetic nephropathy (DN) is considered as a major chronic microvascular complication of diabetes and plays a vital role in the development of chronic kidney failure.⁹ The exact cause of diabetic nephropathy remains unclear; however, different factors such as insulin resistance, genetic predisposition, chronic hyperglycemia, and autoimmune mechanisms are the main reasons behind its development.¹⁰ Moreover, diabetes and hypertension either independently or in combination are responsible for approximately 80% of ESRD cases.¹¹

Approximately 20% to 40% of individuals with diabetes mellitus develop diabetic nephropathy,¹² and they are up to ten times higher risk of development of

end-stage renal disease (ESRD). According to the International Diabetes Federation (IDF), up to 40% of individuals with diabetes may progress to ESRD.¹³ According to a Sri Lankan tertiary hospital cohort demonstrated a substantially higher prevalence of around 50.8% and studies from Pakistan report that the prevalence of diabetic nephropathy among patients with type II diabetes ranges from 23.3% to 54.76%.¹⁴ The reported prevalence, however, differs substantially across populations, according to the demographic characteristics, duration of disease, glycemic control, comorbidities, healthcare access, and diagnostic criteria. Additionally the accumulating evidence at local level remains very limited and inconsistent across regions. Therefore this study was planned to determine the frequency of diabetic nephropathy among patients with type-II diabetes mellitus and its association with key demographic and clinical factors.

Methodology

A cross-sectional study was conducted on type II diabetic patients in the Department of Medicine, Indus Medical College & Hospital, Tando Muhammad Khan. Study was conducted during 6 months from July 2025 to December 2025 after obtaining ethical approval from Ethical review Committee (ERC) of Indus Medical College and Hospital (IMC/TMK/ERC/July 2025/6). The study participants comprised, all the adult patients aged 18 to 60 years, both genders, who had been previously diagnosed with type II diabetes mellitus for a duration of five years or more and presented with symptoms suggestive of diabetic nephropathy, such as swelling of the feet, ankles, hands, or eyes; frequent urination, foamy urine, nausea, and fatigue, as inclusion criteria. All the patients with diagnosis of type I DM or gestational diabetes, patients with known history of CKD or renal impairment resulting from non-diabetic causes; or end-stage renal disease already on dialysis or renal replacement therapy, individuals with urinary tract infection at the time of screening, cases with incomplete medical records, patients with any other known systemic disorder to independently affect renal function, such as autoimmune disease or malignancy and patients who were not willing to take a part of study were excluded. The sample size of 191 patients was calculated by using the Open Epi online calculator with proportion of (diabetic nephropathy prevalence of 23.3% among type II DM patients) with a confidence level of 95% and a margin of error of 6%. Informed consent was obtained from all the patients who met the eligibility criteria.

Detailed demographic information and clinical examination were done. Weight and height were measured using a calibrated weighing scale and a height measuring device. Body mass index (BMI) was then

measured using the height and weight (kg/m^2). Medical history, including hypertension, cardiovascular disease (CVD), thyroid disorders, and smoking status, was obtained through patient interviews and medical record. Participants were also asked about their presenting complaints, such as swelling of the feet, ankles, hands, or eyes, frequent urination, foamy urine, nausea and fatigue. Additional details regarding the duration and treatment of diabetes mellitus were also collected. Subsequently a venous blood sample was drawn from each participant and sent to the laboratory for analysis of HbA1c levels and serum creatinine. Type II Diabetes Mellitus was diagnosed based on a HbA1c level of $\geq 6.5\%$, or in individuals with a prior diagnosis of diabetes who have been on anti-diabetic medication for at least six months. Glycemic control was assessed on the basis of HbA1c, a form of hemoglobin in blood measured by high pressure (or performance) liquid chromatography (HPLC). It was distributed into good ($\text{HbA1c} < 7\%$), moderate ($\text{HbA1c} 7\text{--}8\%$), and poor ($\text{HbA1c} > 8\%$) glycemic control. Diabetic nephropathy was defined as an estimated glomerular filtration rate (eGFR) of less than $60 \text{ mL/min/1.73 m}^2$, calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation. All findings were documented by the researcher using a structured proforma. Statistical analysis was conducted using SPSS software (version 25). Numerical data were described using means and standard deviations, while categorical data were summarized as frequency and percentages. To examine relationships between categorical variables, the Chi-square test was employed, and statistical significance was set at a p-value of 0.05 or below.

Results

Out of all, 191 patients with Type II diabetes mellitus, males were in majority around 59.2%, and most patients were aged ≥ 50 years, with an average age approximately 52 years. Overweight patients were in majority with over half the patients falling into the BMI range of $25\text{--}29.9 \text{ kg/m}^2$. The hypertension was the most frequent comorbidity, in about 6 in 10 cases, followed by cardiovascular disease around 4 in 10 cases, while just over half the patients had never smoking history. Mostly patients tended to have long-standing diabetes, with nearly two-thirds having lived with the disease for ≥ 10 years, and mostly were on insulin and oral hypoglycemic therapy. The swelling and polyuria were the most frequent symptoms, each affecting around 4 in 10 patients. The glycemic control was moderate among (58.6%) of the cases, with good control seen in about a third and poor control in roughly 1 in 10, reflected in an average HbA1c of 7.25%. The eGFR, average was around 63

mL/min/1.73m², indicating a mild-to-moderate reduction in renal function across the cohort overall, as presented in table I.

The diabetic nephropathy was diagnosed among 52.9% (n = 101) of the patients with type II diabetes mellitus, as shown in figure 1.

Variables		N	%
Gender	Male	113	59.2%
	Female	78	40.8%
Age (Years)	Mean ± SD	51.83 ± 7.0	
	<50	83	43.5%
	≥50	108	56.5%
BMI	Mean ± SD	27.71 ± 5.65	
	18-24.9	46	24.1%
	25-29.9	107	56.0%
	≥30	38	19.9%
Medical History	HTN	116	60.7%
	CVD	80	41.9%
	Thyroid Disease	27	14.1%
	Current Smoker	53	27.7%
	Ex-Smoker	32	16.8%
Duration of Disease (Years)	Non-Smoker	106	55.5%
	Mean ± SD	12.37 ± 4.88	
	05-10	67	35.1%
Treatment	≥10	124	64.9%
	Insulin	87	45.5%
Present Sign & Symptoms	Oral hypoglycemic agent	104	54.5%
	Swelling	81	42.4%
	Polyuria	77	40.3%
	Foamy Urine	70	36.6%
	Nausea	58	30.4%
HbA1c	Fatigue	66	34.6%
	Mean ± SD	7.25 ± 1.08	
Glycemic Control	Good	58	30.4%
	Moderate	112	58.6%
	Poor	21	11.0%
eGFR	Mean ± SD	62.99 ± 18.81	

DM: Diabetes Mellitus; HTN: Hypertension; CVD: Cardiovascular Disease; HbA1c: Hemoglobin A1C; eGFR: Estimated Glomerular Filtration Rate.

According to the post stratification analysis, advanced aged individuals (mean 53 vs. 50 years, $p=0.009$), raised BMI (mean 29 vs. 26, $p<0.001$), and prolonged duration of diabetes (mean 13 vs. 11.5 years, $p=0.016$) were more common among cases with nephropathy, along with hypertension (74.3% vs. 45.6%), CVD (50.5% vs. 32.2%), insulin use (73.3% vs. 14.4%), and poorer glycemic control with higher HbA1c were also found significantly more frequent in these patients ($p=0.001$). Additionally, the symptoms including swelling, polyuria, foamy urine, nausea, and fatigue, together with markedly reduced kidney function with a lower mean eGFR were significantly associated with nephropathy compared to those without ($p=0.001$).

However the gender, thyroid disease, and smoking status, did not showed significant association with diabetic nephropathy as presented in table II.

Discussion

Type II diabetes is a growing global health problem, with higher rates of morbidity and mortality. It is characterized by long-term metabolic disruptions, which can result in a variety of complications affecting multiple organ systems. The DN is among the most severe and prevalent microvascular complications of type II diabetes, causing significant morbidity and progression to end-stage renal disease (ESRD).¹⁵ In this study was focused on finding the current frequency of diabetic nephropathy among patients presented with type II DM, given its widespread impact and the strain it places on healthcare systems. Early identification of diabetic nephropathy is also critical, as it allows for better management and lowers the risk of severe complications and death. The current study found that 52.9% of patients had diabetic nephropathy, indicating a significant disease burden among those suffering from type II diabetes.

This frequency is in line with earlier findings in comparable populations. Comparable results were reported by Mushtaq et al¹⁶ who observed that the diabetic nephropathy was detected in 54.76% of type II diabetic patients. A consistent trend was observed by Jamil et al¹⁷, who demonstrated a slightly higher frequency of diabetic nephropathy around 57.40%. On the other hand, Khan et al¹⁸ described a considerably higher frequency of diabetic nephropathy approximately 82%, demonstrating the wide variation that continues to characterize this complication across different study populations. Correspondingly, a large cross-sectional international study carried out at the National Hospital of Sri Lanka, involving 3,000 individuals with type-II diabetes, revealed a comparably high prevalence of around 50.8%.¹⁹ The variability in the prevalence across the studies most likely reflects dissimilarities in diagnostic criteria for nephropathy, the age and disease-duration profile of the study populations and the extent of background glycemic and blood pressure control, rather than a true underlying variance in the disease biology. The relatively higher frequency observed in the present study may also reflects by the fact that it included only individuals who presented with symptoms suggestive of diabetic nephropathy, including swelling of the feet, ankles, hands, or eyes; frequent urination; foamy urine and fatigue, rather than an unselected population with diabetes.

Variables		Diabetic Nephropathy		P-Value
		Present (%)	Absent (%)	
Gender	Male	56 (55.4%)	57 (63.3%)	0.268
	Female	45 (44.6%)	33 (36.7%)	
Age (Years)	Mean $\pm$ SD	53.08 $\pm$ 6.69	50.42 $\pm$ 7.11	0.009
	<50	37 (36.6%)	46 (51.1%)	0.044
	$\geq$ 50	64 (63.4%)	44 (48.9%)	
BMI	Mean $\pm$ SD	29.06 $\pm$ 6.64	26.19 $\pm$ 3.79	<0.001
	18-24.9	25 (24.8%)	21 (23.3%)	<0.001
	25-29.9	43 (42.6%)	64 (71.1%)	
	$\geq$ 30	33 (32.7%)	5 (5.6%)	
Medical History	HTN	75 (74.3%)	41 (45.6%)	<0.001
	CVD	51 (50.5%)	29 (32.2%)	0.011
	Thyroid Disease	18 (17.8%)	9 (10.0%)	0.121
	Current Smoker	34 (33.7%)	19 (21.1%)	0.091
	Ex-Smoker	13 (12.9%)	19 (21.1%)	
	Non-Smoker	54 (53.5%)	52 (57.8%)	
Duration of Disease (Years)	Mean $\pm$ SD	13.17 $\pm$ 4.56	11.48 $\pm$ 5.09	0.016
	05-10	27 (26.7%)	40 (44.4%)	0.010
	$\geq$ 10	74 (73.3%)	50 (55.6%)	
Treatment	Insulin	74 (73.3%)	13 (14.4%)	<0.001
	Oral hypoglycemic Agent	27 (26.7%)	77 (85.6%)	
Present Sign & Symptoms	Swelling	62 (61.4%)	19 (21.1%)	<0.001
	Polyuria	50 (49.5%)	27 (30.0%)	0.006
	Foamy Urine	44 (43.6%)	26 (28.9%)	0.036
	Nausea	37 (36.6%)	21 (23.3%)	0.046
	Fatigue	44 (43.6%)	22 (24.4%)	0.006
HbA1c	Mean $\pm$ SD	7.53 $\pm$ 1.04	6.94 $\pm$ 1.05	<0.001
Glycemic Control	Good	17 (16.8%)	41 (45.6%)	<0.001
	Moderate	66 (65.3%)	46 (51.1%)	
	Poor	18 (17.8%)	3 (3.3%)	
eGFR	Mean $\pm$ SD	47.89 $\pm$ 8.27	79.93 $\pm$ 11.37	<0.001

DM: Diabetes Mellitus; HTN: Hypertension; CVD: Cardiovascular Disease; HbA1c: Hemoglobin A1C; eGFR: Estimated Glomerular Filtration Rate.

In this study, advanced age was significantly related with diabetic nephropathy (mean 53.08 vs. 50.42 years, $p=0.009$), with individuals aged 50 years or older carrying significantly higher risk of nephropathy ($p=0.044$). These finding were closely aligns with the Saudi registry study, which reported age more than 45 years as a significant risk factors for DN, with prevalence increasing substantially with each successive age band studied.²¹ Consistently the Sri Lankan study also reported that the increasing age as an independent risk factor for microvascular complications, including nephropathy.¹⁹ Moreover in this study the higher BMI and longer duration of diabetes were strongly associated with DN in this study (mean 29.06 vs. 26.19 kg/m², $p<0.001$), (mean 13.17 vs. 11.48 years, $p=0.016$), respectively with obese patients (BMI $\geq$ 30) markedly overrepresented among those with nephropathy and nearly three-quarters of nephropathy patients having lived with diabetes for 10 years or more. A consisting observation was reported by a recent national case-control study conducted in Peshawar, which specifically evaluated BMI along with central obesity and diabetes duration as risk factors for DN.²⁰ The disease duration is

one of the most consistently replicated findings in the international literature, as the Saudi registry study detected diabetes duration as among the strongest predictors of the nephropathy among diabetic patients, with prevalence increasing sharply among patients with both older age and longer disease duration collectively.²¹ The increasing age is biologically consistent with cumulative glomerular exposure to hyperglycemia and hemodynamic stress over the time, reflecting the age as one of the more universally reproducible determinants of DN across the populations.

In this study the comorbidities were significantly associated with diabetic nephropathy and serve as important risk factors, as hypertension (74.3%) and cardiovascular disease (50.5%) were common among diabetic nephropathy patients, with statistically significant associations $p=0.011$. The findings were consistent to the studies by Mushtaq et al¹⁶ where 76.0% of diabetic nephropathy patients were hypertensive and Jabbar et al²² reported hypertension in 82.86 and cardiovascular disease in 22.9% of patients with diabetic nephropathy. The substantial

correlation between hypertension and DN is well explained physiologically; meanwhile raised systemic BP directly increases intra-glomerular pressure, accelerating nephron injury already underway from chronic hyperglycemia.

Moreover the increasing duration of disease and poor glycemic control are the important risk factors associated with DN, as mean duration of disease was significantly higher among patients with diabetic nephropathy (13.17 versus 11.48) $p=0.016$, with most of these patients (73.3%,) having the condition for ≥ 10 years, and mean HbA1c was significantly higher in patients with diabetic nephropathy (7.53 versus 6.94) $p=0.001$, with most patients presenting with moderate glycemic control (65.3%) or poor glycemic control (17.8%). The findings were supported Mushtaq et al¹⁶ and Jabbar et al²³. Collectively findings revealed that the diabetic nephropathy remains a common and largely predictable complication of diabetes mellitus specifically with prolonged disease duration, poorly controlled diabetes, advanced age, obesity and hypertension,

suggesting regular kidney screening, better glycemic and blood pressure control, and healthy weight management remain the most effective strategies for the early prevention and delaying the progression of this complication.

Conclusion

Diabetic nephropathy was observed highly prevalent, affecting around 52.9% of patients with Type II diabetes mellitus, and closely related to advanced age, elevated BMI, comorbidities, long duration of diabetes mellitus, and poor glycemic control. Overall findings underscore that diabetic nephropathy remains a common and significant complication in this population, emphasizing the importance of early screening, strict blood pressure and glycemic pressure control, and proactive management of modifiable risk factors to prevent the renal decline and improve long-term outcomes among patients with diabetes.

References

- Antar SA, Ashour NA, Sharaky M, Khattab M, Ashour NA, Zaid RT, Roh EJ, Elkamhawy A, Al-Karmalawy AA. Diabetes mellitus: Classification, mediators, and complications: A gate to identify potential targets for the development of new effective treatments. *Biomed Pharmacother*. 2023;168:115734. <https://doi.org/10.1016/j.biopha.2023.115734>
- Kotwas A, Karakiewicz B, Zabielska P, Wieder-Husla S, Jurczak A. Epidemiological factors for type 2 diabetes mellitus: Evidence from the Global Burden of Disease. *Arch Public Health*. 2021;79(1):110. <https://doi.org/10.1186/s13690-021-00632-1>
- Magliano DJ, Boyko EJ, editors. The global picture of diabetes. In: *IDF Diabetes Atlas* [Internet]. 11th ed. Brussels (Belgium): International Diabetes Federation; 2025. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK618744/>
- Ong KL, Stafford LK, McLaughlin SA, Boyko EJ, Vollset SE, Smith AE, Dalton BE, Duprey J, Cruz JA, Hagins H, et al. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: A systematic analysis for the Global Burden of Disease Study 2021. *Lancet*. 2023;402(10397):203-234.
- International Diabetes Federation. *IDF MENA members: Pakistan*. Brussels (Belgium): International Diabetes Federation; 2025.
- Nellaiappan K, Preeti K, Khatri DK, Singh SB. Diabetic complications: An update on pathobiology and therapeutic strategies. *Curr Diabetes Rev*. 2022;18(1):e030821192146. <https://doi.org/10.2174/1573399817666210309104203>
- American Diabetes Association Professional Practice Committee. 11. Chronic kidney disease and risk management: Standards of medical care in diabetes—2022. *Diabetes Care*. 2022;45(Suppl 1):S175-S184. <https://doi.org/10.2337/dc22-S011>
- American Diabetes Association Professional Practice Committee. 12. Retinopathy, neuropathy, and foot care: Standards of medical care in diabetes—2022. *Diabetes Care*. 2022;45(Suppl 1):S185-S194. <https://doi.org/10.2337/dc22-S012>
- Sagoo MK, Gnudi L. Diabetic nephropathy: An overview. *Methods Mol Biol*. 2020;2067:3-7.
- Varghese RT, Jialal I. Diabetic nephropathy. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.
- Koye DN, Magliano DJ, Nelson RG, Pavkov ME. The global epidemiology of diabetes and kidney disease. *Adv Chronic Kidney Dis*. 2018;25(2):121-132. <https://doi.org/10.1053/j.ackd.2017.10.011>
- Allan M, McCafferty K, Sheaff M, Yaqoob MM. Identification and management of diabetic nephropathy. *Medicine (Abingdon)*. 2023;51(4):262-268. <https://doi.org/10.1016/j.mpmed.2023.01.005>
- Natesan V, Kim SJ. Diabetic nephropathy: A review of risk factors, progression, mechanism, and dietary management. *Biomol Ther (Seoul)*. 2021;29(4):365-372. <https://doi.org/10.4062/biomolther.2020.204>
- Shahid A, Sarfraz S, Mustafa A, Siddiqui UN, Ejaz M, Khan A, et al. Frequency of diabetic nephropathy, through renal resistive index, among type 2 diabetic patients with normal albuminuria. *Pak J Med Health Sci*. 2023;17(2):96-99. <https://doi.org/10.53350/pjmhs202317296>
- Qasim H, Ktaifan M, Awawdeh A, Khattab K, Leoni ML, Varrassi G, et al. Hypertensive nephrosclerosis: Pathological changes and overlap with diabetic nephropathy. *Cureus*. 2025;17(9):e92949. <https://doi.org/10.7759/cureus.92949>
- Mushtaq R, Ansar A, Bibi A, Ramzan M. Diabetic nephropathy: Duration and glycemic control affect the outcome. *J Islamic Int Med Coll*. 2022;17(1):41-45.
- Jamil MI, Hussain Y, Khan MS, Shahzad A, Iqbal A, Ahmed A, et al. Frequency of diabetic nephropathy among patients of type 2 diabetes mellitus: Diabetic nephropathy among type 2 diabetes mellitus. *Pak J Health Sci*. 2025;6(5):18-23. <https://doi.org/10.54393/pjhs.v6i5.2896>
- Khan NZ, Ursani TJ, Khokhar JA, Malik S, Khilji MJ, Kaka S, et al. Prevalence of diabetic nephropathy amongst type 2 diabetic patients attending tertiary hospital of Hyderabad, Sindh, Pakistan. *Pak J Biotechnol*. 2024;21(2):332-338. <https://doi.org/10.34016/pjbt.2024.21.02.869>

19. Arambewela MH, Somasundaram NP, Jayasekara HBPR, Kumbukage MP, Jayasena PMS, Chandrasekara CMPH, et al. Prevalence of chronic complications, their risk factors, and the cardiovascular risk factors among patients with type 2 diabetes attending the diabetic clinic at a tertiary care hospital in Sri Lanka. *J Diabetes Res.* 2018;2018:4504287. <https://doi.org/10.1155/2018/4504287>
20. Ubaid S, Osama M, Ullah U, Din ZU, Hassan MZU, Hamza M. Evaluating abdominal obesity and BMI as risk factors for diabetic nephropathy in patients with type 2 diabetes mellitus: A case-control study. *Cureus.* 2025;17(9):e92085. <https://doi.org/10.7759/cureus.92085>
21. Al-Rubeaan K, Youssef AM, Subhani SN, Ahmad NA, Al-Sharqawi AH, Al-Mutlaq HM, et al. Diabetic nephropathy and its risk factors in a society with a type 2 diabetes epidemic: A Saudi National Diabetes Registry-based study. *PLoS One.* 2014;9(2):e88956. <https://doi.org/10.1371/journal.pone.0088956>
22. Jabbar A, Ur Rahman A, Khan AW, Hashimuddin, Khan MY, Butt. Identifying risk factors associated with diabetic kidney disease in type 2 diabetics: A single-center study. *J Popul Ther Clin Pharmacol.* 2024;31(6):445-451.