Journal of Chemical Health Risks

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JCHR (2025) 15(5), 2571-2580 | ISSN:2251-6727

Association of Serum Adiponectin and Urinary Nephrin for Identification of Nephropathy in Patients with Type 2 Diabetes Mellitus

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(Received: 25 August 2025 Revised: 27 September 2025 Accepted: 14 October 2025)

KEYWORDS

Adiponectin, Type 2 Diabetes Mellitus, Nephropathy and Nephrin

ABSTRACT:

Introduction: Adiponectin is an adipose tissue secreted protein and nephrin is a podocyte secreted protein. Both protein link with the mechanism involved in the pathophysiology of type 2 diabetes mellitus and nephropathy.

Objectives: The present study aimed to evaluate the serum adiponectin and urinary nephrin for early detection of nephropathy in patients with type 2 diabetes mellitus.

Methods: This case control study using serum samples obtained from 160 participants, controls (40), normo albuminuria (40), micro albuminuria (40), macro albuminuria (40). This biochemical, clinical, and experimental parameter were analysed statistical analysis were done by SPSS 20.0 software.

Results: Serum adiponectin and urinary nephrin levels in type 2 diabetes mellitus groups are very high and significant when compared to controls. The urinary nephrin and serum adiponectin levels significant positively corelated with urinary albumin creatinine ratio and significant and negatively corelated with eGFR (P=0.001**). The ROC curve analysis reviled the serum adiponectin and urinary nephrin very high in significant at area under curve with sensitivity (100.00 and 77.50) and specificity (100.00 and 100.00) with P value 0.001**.

Conclusions: Based on the study findings the serum adiponectin determination beneficial for the patients with type 2 diabetes mellitus. The measurement of urinary nephrin served as an early predictable and prognostic marker for nephropathy in patients with type 2 diabetes mellitus.

1. Introduction

Type 2 Diabetes mellitus (T2DM) is a global health issue due to numerous variables, including aging, population growth, sedentary lifestyles, and the adoption of western lifestyles, may be connected to this. Multi-system involvement brought on by reduced insulin sensitivity and ensuing hyperglycemia is a hallmark of T2DM (1-3). Diabetic Nephropathy (DN), cardiomyopathy, retinopathy, neuropathy, and other problems are frequently caused by abnormalities in the vascular architecture that occur in people with T2DM. One of the main micro vascular complications of T2DM is nephropathy. Microalbuminuria is one of the first clinical manifestations of DN. The recent studies were reported that it is not sensitive and specific marker for nephropathy because it has lot of flows include it is elevated in other disease condition, T2DM with normoalbuminuria patients showed advanced renal pathophysiological changes in their biopsy and many of microalbuminuria patients revert back to normoalbuminuria. Since there is a need for marker to predict early onset of nephropathy in patients with T2DM (4).

Adiponectin is an adipocytokine it acts as an insulin sensitizer, anti-diabetic and anti-atherogenic properties. These include the reduction of monocyte adhesion to

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JCHR (2025) 15(5), 2571-2580 | ISSN:2251-6727

endothelial cells, the suppression of macrophage oxidised low density lipoprotein uptake through scavenger receptors, the reduction of macrophage-to-foam cell transformation, and the inhibition of vascular smooth muscle cell migration and proliferation (5-8).

According to recent clinical studies, patients with T2DM have lower plasma adiponectin levels than controls and reported there is no relation between T2DM and nephropathy (9-10). The numerous studies found that patients with DN had higher serum levels of adiponectin, and other studies looked into the possibility of using these levels as an early predictor of microvascular complications in patients with T2DM, particularly in those with diabetic nephropathy. However, previous studies reported there is a connection between insulin resistance (IR) and adipose dysfunction has been established, also there is still controversy regarding the direct relationship between adiponectin levels and kidney problems (11-14).

Nephrin, a 180 KD transmembrane protein, is a crucial part of glomerular podocyte structure. Glomerular podocytes express it and it is a member of the immunoglobulin superfamily of cell adhesion receptors. Numerous studies observed the nephrinuria has been identified as a promising early indicator of glomerular damage (15-16). Urinary nephrin has been extensively researched as a glomerular damage biomarker for the identification of glomerular damage (17). These studies showed that urine nephrin levels correspond with the severity of the disease, that glomerular injury may occur regardless of proteinuria, and that nephrinuria is frequently identified before proteinuria/albuminuria (18-19). Urinary nephrin diagnostic accuracy in identifying glomerular injury in patients with both acute and long-term renal injury has not yet been thoroughly examined and analyzed. This study designed to evaluate the association of serum adiponectin and urinary nephrin for identification of nephropathy in patients with type 2 diabetes mellitus.

2. Objectives

The present study aimed to evaluate the serum adiponectin and urinary nephrin for early detection of nephropathy in patients with type 2 diabetes mellitus.

3. Methods

This case control study conducted in type 2 diabetes mellitus patients with and without nephropathy. The study subjects were recruited after approval of Institutional Ethics Committee (IEC), Department of Biochemistry and Medicine, Raichur Institute of Medical Sciences, Raichur, Karnataka, India. This case control study included 160 subjects, sub divided into controls (n=40), T2DM patients with normo albuminuria (n=40), micro albuminuria (n=40), macro albuminuria (n=40). The subjects were included after obtaining informed consent form. The patients were diagnosed according to American Diabetic Association criteria (20-21) and sub grouped based on micro albumin levels as per kidney diseases improvement global outcomes criteria (22). The controls should not have any illness were included. The subject with known history of liver, thyroid, renal, other types of diabetes, cardio vascular, pregnant and lactating women were excluded.

Biochemical parameters like blood sugars, lipid profile, HbA1c, urinary albumin creatinine were determined by using laboratory standard methods. The urinary nephrin and serum adiponectin was analyse by using enzyme linked immunosorbent assay. The data were statistically expressed as mean ± standard deviation. The statistical analysis was done by using SPSS version 20.0 software.

4. Results

The age, BMI, blood sugars, dyslipidemia glycated Hemoglobin, albumin creatinine ratio significantly very high in patients with T2DM when compared to controls (P=0.001**). Along with that the T2DM patients show drastically decreased levels of eGFR when compared to controls (P=0.001**). Additionally, the urinary nephrin and serum adiponectin levels were significantly very high in patients with T2DM when compared to controls (P=0.001**) (**Table 1**).

The age, BMI, blood sugars, dyslipidemia glycated Hemoglobin, significantly very high in T2DM patients with normo, micro and macro albuminuria when compared to controls (P=0.001**). We also observed, the T2DM patients with micro and macro albuminuria show drastically increased levels of albumin creatinine ratio when compared to T2DM patients with normo albuminuria and controls (P=0.001**). Along with that the T2DM patients with micro and macro albuminuria

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show drastically decreased levels of eGFR when compared to T2DM patients with normo albuminuria and controls (P=0.001**). Additionally, the urinary nephrin and serum adiponectin levels were significantly very high in T2DM patients with normo, micro and macro albuminuria when compared to controls (P=0.001**) (**Table 2**).

The urinary nephrin were significant and positively corelated with BMI, blood sugars, total cholesterol, TGL, VLDL, LDL, urinary albumin creatinine ratio and serum adiponectin (P=0.001**) and also the urinary nephrin negatively corelated with HDL, and eGFR, respectively P value is 0.001**. The serum adiponectin were significant and positively corelated with BMI, blood sugars, total cholesterol, TGL, VLDL, LDL, urinary albumin creatinine ratio and urinary nephrin (P=0.001**) and also the serum adiponectin negatively corelated with HDL, and eGFR, respectively P value is 0.001** (**Table 3**).

A serum adiponectin and urinary nephrin showed very high significant at area under curve (1.000 and 0.893) with specificity (100.00 and 100.00) and sensitivity (100.00 and 77.50), respectively P value is <0.0001. Additionally, we also observed the urinary albumin creatinine ratio and eGFR not shown significant at area under curve (0.708 and 0.537) with specificity (67.50 and 40.00) and sensitivity (70.00 and 85.00), respectively P value is 0.3634 and 0.5802 (**Table 4**).

The eGFR levels significant and drastically decreased in T2DM patients with micro and macro albuminuria when compared to T2DM patients with normo albuminuria and controls (**Figure 2**).

The albumin creatinine ratio levels significant and drastically increased in T2DM patients with micro and macro albuminuria when compared to T2DM patients with normo albuminuria and controls (**Figure 3**).

The urinary nephrin levels significant and drastically increased in T2DM patients with normo, micro and macro albuminuria when compared to controls (**Figure 4**).

The serum adiponectin levels significant and drastically increased in T2DM patients with normo, micro and macro albuminuria when compared to controls (**Figure 5**).

5. Discussion

In the current investigation, type 2 diabetes mellitus patients with micro-albuminuria had significantly higher serum adiponectin concentrations. The adiponectin levels also showed a slight and statistically significant connection with FBS, HDL and HbA1c (23-24). The correlation analysis revealed that micro-albuminuria was a separate predictor of adiponectin levels, and that there was a substantial positive correlation between adiponectin levels and the urinary albumin creatinine ratio. The other studies suggested that elevated adiponectin levels could predict death and the development of chronic kidney disease to dialysis. The higher synthesis of and elevated adiponectin levels indicate the renal insufficiency (25-26). Adenosine monophosphate activated protein kinase in the renal glomerulus is activated by adiponectin, according to multiple studies. In diabetic nephropathy, a rise in adiponectin may be a preventive mechanism meant to enhance endothelial function, lower oxidative stress, and decrease inflammation.

Another recent study discovered that in individuals with type 2 diabetes mellitus shown significant increased adiponectin levels were positively correlated albumin excretion rate (AER) (27). Additionally, adiponectin elevation in diabetic patients may be physiological to prevent tubular injury and inflammatory cell infiltration into the tubulo-interstitial area. The plasma adiponectin levels were inversely correlated with eGFR and were much greater in individuals T2DM with renal diseases. Additionally, another recent study discovered a significant correlation between elevated adiponectin levels and micro and macroalbuminuria observed in T2DM patients when compare to T2DM with normoalbuminuria and healthy controls.

According to this analysis, urine nephrin has a very high diagnostic accuracy in individuals with both acute and chronic renal injury, suggesting that it may be a possible predictor of early glomerular impairment. The urinary nephrin has, in fact, shown promise as a marker for early glomerular injury in a number of studies (28-29). It may also be a helpful routine diagnostic marker that can be used either by itself or in conjunction with other novel markers, such as cell cycle arrest markers and neutrophil gelatinase-associated lipocalin, to predict early kidney injury.

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The present study measured urinary nephrin found that patients with higher urine albumin levels had considerably higher levels of the protein. Similarly, additional research has demonstrated that urinary nephrin rose linearly as the illness worsened, indicating that measuring nephrin may be a helpful indicator of the development of glomerular damage (30). According to current standards, albuminuria is a sign of glomerular nephropathy. However, as glomerular structural damage occurs before microalbuminuria, this has limits in terms of timing for early nephropathy identification. While albuminuria has been independently and significantly linked to the development of ESKD, ACR is generally recognized for the classification of glomerular damage and chronic kidney disease in terms of specificity (31).

The included studies demonstrated a positive correlation between nephrinuria and elevated albumin and hyperglycemia levels in the urine. But a significant percentage of diabetic patients with normoalbuminuria also had nephrinuria. Considering that hyperglycemia is anticipated to worsen renal vasculature and the glomerular filtration barrier over time, nephrinuria may serve as an early warning sign of renal impairment (32). Even while not all diabetes individuals who have nephrinuria go on to develop kidney disease, nephrinuria can serve as a warning sign for the need for interventional measures in this susceptible group as well as an early indicator of glomerular damage before it develops into fulminant renal disease or injury. The results of this meta-analysis indicated that urinary nephrin may be a promising biomarker of glomerular injury.

6. Conclusion

Based on the study findings the serum adiponectin determination beneficial for the patients with type 2 diabetes mellitus. The measurement of urinary nephrin served as an early predictable and prognostic marker for nephropathy in patients with type 2 diabetes mellitus.

7. References

1. Yalçın T, Oğuz SH, Bayraktar M, Rakıcıoğlu N. Anthropometric measurements and serum TNF-α, IL-6 and adiponectin in type 2 diabetes. Diabetol Int. 2021 Oct 29;13(2):396-406.
2. Veluri, G., Murugan, M., Palem, S. P., Gangannagari, V. K. (2022). Serum Adiponectin as a Diagnostic Marker of Nephropathy among Patients with Type 2 Diabetes Mellitus: A Cross-sectional Study. Journal of Clinical & Diagnostic Research, 16(11).
3. Ganesh V, M M, Palem SP. Adiponectin Can Be an Early Predictable Marker for Type 2 Diabetes Mellitus and Nephropathy. Cureus. 2022 Jul 26;14(7):e27308.
4. Huang K, Liang Y, Ma Y, Wu J, Luo H, Yi B. The Variation and Correlation of Serum Adiponectin, Nesfatin-1, IL-6, and TNF-α Levels in Prediabetes. Front Endocrinol (Lausanne). 2022 Mar 3;13:774272.
5. Diwan AG, Kuvalekar AA, Dharamsi S, Vora AM, Nikam VA, Ghadge AA. Correlation of Serum Adiponectin and Leptin levels in Obesity and Type 2 Diabetes Mellitus. Indian J Endocrinol Metab. 2018 Jan-Feb;22(1):93-99.
6. Tuppad S, Medala K, Umesh M, Gaur A, Ganji V, Sakthivadivel V, Kumar P. Serum Adiponectin and Nitric Oxide Levels in Type II Diabetes and Its Correlation With Lipid Profile. Cureus. 2022 Apr 30;14(4):e24613.
7. Mohammed Saeed W, Nasser Binjawhar D. Association of Serum Leptin and Adiponectin Concentrations with Type 2 Diabetes Biomarkers and Complications Among Saudi Women. Diabetes Metab Syndr Obes. 2023 Jul 13;16:2129-2140.
8. Yildiz Y, Ozaksit G, Serdar Unlu B, Ozgu E, Energin H, Kaba M, Ugur M. Serum adiponectin level and clinical, metabolic, and hormonal markers in patients with polycystic ovary syndrome. Int J Fertil Steril. 2014 Jan;7(4):331-6.
9. Baig M, Gazzaz ZJ, Bakarman MA, Alzahrani SH. Correlation of Serum Vaspin, Omentin-1, and adiponectin with metabolic phenotypes in Type-2 diabetes mellitus patients. Pak J Med Sci. 2021 Nov-Dec;37(7):1762-1767.
10. Kalyani RS, Raghunath V. Assessment of serum and salivary adiponectin levels in newly diagnosed Type II diabetes mellitus patients. J Oral Maxillofac Pathol. 2020 May-Aug;24(2):245-250.

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11. Yan M, Su B, Peng W, Li L, Li H, Zhuang J, Lu Y, Jian W, Wei Y, Li W, Qu S, Xu Y. Association of serum vaspin and adiponectin levels with renal function in patients with or without type 2 diabetes mellitus. J Diabetes Res. 2014;2014:868732.

12. Liu W, Zhou X, Li Y, Zhang S, Cai X, Zhang R, Gong S, Han X, Ji L. Serum leptin, resistin, and adiponectin levels in obese and non-obese patients with newly diagnosed type 2 diabetes mellitus: A population-based study. Medicine (Baltimore). 2020 Feb;99(6):e19052.

13. Tang YH, Wang YH, Chen CC, Chan CJ, Tsai FJ, Chen SY. Genetic and Functional Effects of Adiponectin in Type 2 Diabetes Mellitus Development. Int J Mol Sci. 2022 Nov 4;23(21):13544.

14. Mihai M, Vladut S, Sonia-Teodora L, Laura Mihaela S, Victoria N, Irina Elena M, Claudiu M. Correlation between Overweight, Obesity, Gestational Diabetes Mellitus, Adipokines (Adipolin and Adiponectin), and Adverse Pregnancy Outcomes: A Pilot Study. Medicina (Kaunas). 2024 Sep 20;60(9):1544.

15. Mir MM, Mir R, Alghamdi MAA, Wani JI, Sabah ZU, Jeelani M, Marakala V, Sohail SK, O'haj M, Alharthi MH, Alamri MMS. Differential Association of Selected Adipocytokines, Adiponectin, Leptin, Resistin, Visfatin and Chemerin, with the Pathogenesis and Progression of Type 2 Diabetes Mellitus (T2DM) in the Asir Region of Saudi Arabia: A Case Control Study. J Pers Med. 2022 May 1;12(5):735.

16. Chen T, Tu M, Huang L, Zheng Y. Association of Serum Adiponectin with Intima Media Thickness of Dorsalis Pedis Artery and Macroangiopathy in Type 2 Diabetes. J Diabetes Res. 2020 Jan 3;2020:4739271.

17. Alfaqih MA, Al-Mughales F, Al-Shboul O, Al Qudah M, Khader YS, Al-Jarrah M. Association of Adiponectin and rs1501299 of the ADIPOQ Gene with Prediabetes in Jordan. Biomolecules. 2018 Oct 22;8(4):117.

18. Kostovska I, Tosheska-Trajkovska K, Topuzovska S, Cekovska S, Spasovski G, Kostovski O, Labudovic D. Urinary nephrin is earlier, more sensitive and specific marker of diabetic nephropathy than microalbuminuria. J Med Biochem. 2020 Jan 10;39(1):83-90.

19. Mogos M, Milas O, Socaciu C, Socaciu AI, Vlad A, Gadalean F, Bob F, Cretu OM, Suteanu-Simulescu A, Glavan M, Balint L, Ienciu S, Iancu IL, Jianu DC, Ursoniu S, Petrica L. Urinary and Serum Amino Acids May Be Associated with Podocyte, Proximal Tubule, and Renal Endothelial Injury in Early Diabetic Kidney Disease in Type 2 Diabetes Mellitus Patients. Biomedicines. 2025 Mar 10;13(3):675.

20. Tian Y, Chen XM, Liang XM, Wu XB, Yao CM. SGLT2 inhibitors attenuate nephrin loss and enhance TGF-β1 secretion in type 2 diabetes patients with albuminuria: a randomized clinical trial. Sci Rep. 2022 Sep 20;12(1):15695.

21. Ma R, Liu L, Jiang W, Yu Y, Song H. FK506 ameliorates podocyte injury in type 2 diabetic nephropathy by down-regulating TRPC6 and NFAT expression. Int J Clin Exp Pathol. 2015 Nov 1;8(11):14063-74. PMID: 26823720; PMCID: PMC4713506.

22. Kandasamy Y, Smith R, Lumbers E R, Rudd D. Nephrin: A biomarker of early glomerular injury. Biomarker Research. 2014;2(1):21.

23. Weil J E, Lemley K V, Mason C C, Yee B, Jones L I, Blouch K, Lovato T, Richardson M, Myers B D, Nelson R G. Podocyte detachment and reduced glomerular capillary endothelial fenestration promote kidney disease in type 2 diabetic nephropathy. Kidney Int. 2012;82(9):1010.

24. Patari A, Forsblom C, Havana M, Taipale H, Groop P H, Holthofer H. Nephrinuria in Diabetic Nephropathy of Type 1 Diabetes. Diabetes. 2003;52(12):2969.

25. Nakamura T, Ushiyama C, Suzuki S, Hara M, Shimada N, Ebihara I, Koide H. Urinary excretion of podocytes in patients with diabetic nephropathy. Nephrol Dial Transplant. 2000;15(9):1379.

26. Mogensen C E. Microalbuminuria as a predictor of clinical diabetic nephropathy. Kidney Int. 1987;31(2):673.

27. Jim B, Ghanta M, Qipo A, Fan Y, Chuang P Y, Cohen H W, Abadi M, Thomas D B, He J C. Dysregulated Nephrin in Diabetic Nephropathy of Type 2 Diabetes: A Cross Sectional Study. PLoS One. 2012;7(5):e36041.

28. Fiseha T. Urinary biomarkers for early diabetic nephropathy in type 2 diabetic patients. Biomarker Research. 2015;3(1):16.

29. Al-Rubeaan K, Siddiqui K, Al-Ghonaim M A, Youssef A M, Al-Sharqawi A H, Alnaqeb D. Assessment of the diagnostic value of different biomarkers in relation to various stages of diabetic nephropathy in type 2 diabetic patients. Scientific Reports. 2017;7(1)

30. Veluri G, Mannangatti M. Urinary Nephrin is a Sensitive Marker to Predict Early Onset of Nephropathy in Type 2 Diabetes Mellitus. J Lab Physicians. 2022 Oct 26;14(4):497-504.

31. Ng D P K, Tai B, Tan E, Leong H, Nurbaya S, Lim X, Chia K, Wong C, Lim W, Holthöfer H. Nephrinuria associates with multiple renal traits in type 2 diabetes. Nephrol Dial Transplant. 2011;26(8):2508.

32. Ganesh V, Murugan M, Goud VG, Gangannagari V K. Correlation of urinary nephrin with albuminuria to predict early onset of nephropathy in patients with type 2 diabetes mellitus. International Journal of Health Sciences 2022;6(S3): 4621-4630.

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Table 1: Comparison of routine biochemical, clinical and experimental variables between controls and T2DM cases

Parameter	Control			T2DM Cases			P-Value
	Mean ± SD			Mean ± SD			
Age (years)	45.03	±	6.17	49.83	±	7.18	0.001**
BMI (kg/m2)	21.54	±	1.33	31.69	±	6.59	0.001**
FBS (mg/dL)	79.55	±	7.12	167.67	±	29.29	0.001**
eGFR (ml/min)	92.51	±	9.03	43.84	±	36.10	0.001**
Total cholesterol (mg/dL)	164.13	±	13.31	255.93	±	63.74	0.001**
TGL (mg/dL)	121.45	±	17.43	191.63	±	51.46	0.001**
HDL (mg/dL)	46.33	±	6.45	33.17	±	7.67	0.001**
VLDL (mg/dL)	21.77	±	4.38	39.53	±	10.53	0.001**
LDL (mg/dL)	87.71	±	10.72	182.89	±	61.96	0.001**
HbA1c (%)	4.39	±	0.77	8.85	±	2.51	0.001**
Albumin Creatinine Ratio (mg/g creatinine)	15.42	±	4.75	341.39	±	328.32	0.001**
Urinary Nephrin (ng/mL)	0.89	±	0.35	4.98	±	2.22	0.001**
Serum adiponectin (mg/L)	8.69	±	1.18	95.62	±	46.60	0.001**

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Table 2: Comparison of routine biochemical, clinical and experimental variables between controls and T2DM cases

Parameter	Control			T2DM with Normo Albuminuria			T2DM with Micro Albuminuria			T2DM with Macro Albuminuria			P - value
	Mean ± SD			Mean ± SD			Mean ± SD			Mean ± SD			
Age (years)	45.03	±	6.17	42.73	±	4.16	50.83	±	4.20	55.95	±	5.59	0.001**
BMI (kg/m2)	21.54	±	1.33	23.60	±	1.23	34.69	±	3.71	36.78	±	3.75	0.001**
FBS (mg/dL)	79.55	±	7.12	141.93	±	11.23	162.03	±	14.88	199.05	±	23.41	0.001**
eGFR (ml/min)	92.51	±	9.03	92.59	±	9.74	26.92	±	10.07	12.02	±	3.15	0.001**
Total cholesterol (mg/dL)	164.13	±	13.31	175.03	±	14.17	281.03	±	14.29	311.73	±	37.94	0.001**
TGL (mg/dL)	121.45	±	17.43	131.28	±	21.16	201.00	±	22.44	242.60	±	25.25	0.001**
HDL (mg/dL)	46.33	±	6.45	39.28	±	7.19	32.12	±	5.42	28.13	±	5.76	0.001**
VLDL (mg/dL)	21.77	±	4.38	27.45	±	2.93	41.05	±	5.49	49.78	±	6.39	0.001**
LDL (mg/dL)	87.71	±	10.72	104.33	±	13.44	207.20	±	17.10	237.15	±	35.84	0.001**
HbA1c (%)	4.39	±	0.77	6.89	±	0.40	7.89	±	1.05	11.76	±	2.10	0.001**
Albumin Creatinine Ratio (mg/g creatinine)	15.42	±	4.75	19.13	±	4.32	237.06	±	35.59	767.99	±	152.63	0.001**
Urinary Nephrin (ng/mL)	0.89	±	0.35	3.10	±	1.52	4.66	±	1.41	7.20	±	1.39	0.001**
Serum adiponectin (mg/L)	8.69	±	1.18	41.70	±	5.03	97.07	±	12.46	148.09	±	25.24	0.001**

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Table 3: correlation of Urinary Nephrin, serum Adiponectin, and other study variables

Parameter	Urinary Nephrin		Serum Adiponectin	
	r	P-Value	r	P-Value
BMI (kg/m2)	0.85	0.001**	0.72	0.001**
FBS (mg/dL)	0.88	0.001**	0.82	0.001**
eGFR (ml/min)	-0.90	0.001**	-0.86	0.001**
Total cholesterol (mg/dL)	0.92	0.001**	0.84	0.001**
TGL (mg/dL)	0.87	0.001**	0.92	0.001**
HDL (mg/dL)	-0.72	0.001**	-0.74	0.001**
VLDL (mg/dL)	0.88	0.001**	0.80	0.001**
LDL (mg/dL)	0.90	0.001**	0.88	0.001**
HbA1c (%)	0.84	0.001**	0.76	0.001**
Albumin Creatinine Ratio (mg/g creatinine)	0.86	0.001**	0.94	0.001**
Urinary Nephrin (ng/mL)	1	0.001**	0.83	0.001**
Serum adiponectin (mg/L)	0.83	0.001**	1	0.001**

Table 4: ROC curve analysis for prediction of Nephropathy in T2DM patients with Normo Albuminuria and Controls

Parameter	AUC	95% CI For	Cut of Values	Sensitivity	Specificity	P-Value
eGFR (ml/min)	0.537	0.422 to 0.649	0.2500	85.00	40.00	0.5802
Serum adiponectin (mg/L)	1.000	0.955 to 1.000	1.0000	100.00	100.00	<0.0001
Albumin Creatinine Ratio (mg/g creatinine)	0.708	0.596 to 0.805	0.3750	70.00	67.50	0.3634
Urinary Nephrin (ng/mL)	0.893	0.804 to 0.951	0.7750	77.50	100.00	<0.0001

Figure 1: Participants of the study

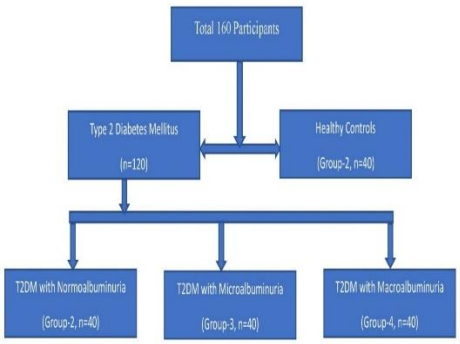

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Figure 2: The eGFR levels in controls and T2DM with normo, micro and macro albuminuria

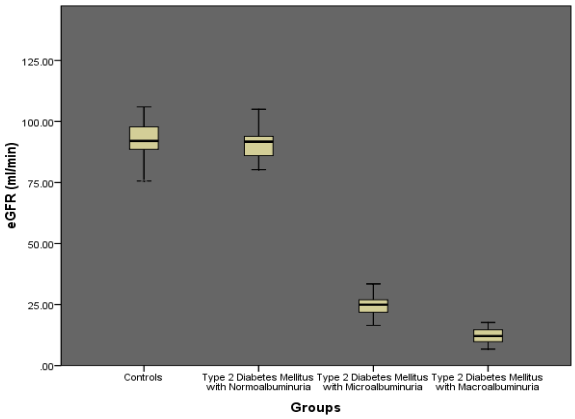

Figure 3: The albumin creatinine ratio levels in controls and T2DM with normo, micro and macro albuminuria

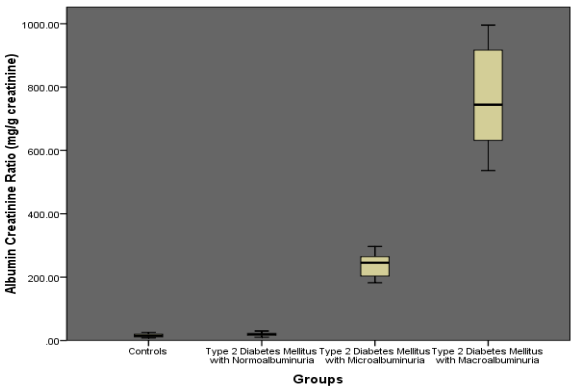

Figure 4: The urinary nephrin levels in controls and T2DM with normo, micro and macro albuminuria

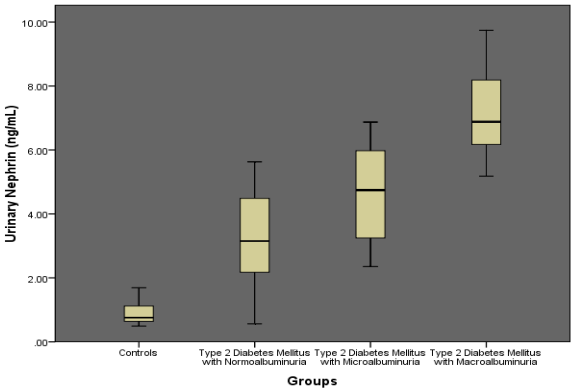

Figure 5: The serum adiponectin levels in controls and T2DM with normo, micro and macro albuminuria