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A Comprehensive Analysis of Risk Factors of Diabetic Nephropathy and Exploring the Treatment Pattern

Aritra Pal [a++*], Asish Bhanja [a++], Joy Williams [a++], Vineesha Geddam [a++], Chandana Bendurthi [a++], Bipin Sah [a++], Bashongdor Marwein [a++], Arka Ghosh [a++], Anurag Rajkonwar [a++], Praveen Sana [b#] and Ratna Kumari [a†]

[a] Aditya Pharmacy College, Surampalem, 533437, Andhra Pradesh, India.
[b] Trust Multispeciality Hospital, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: The study aims to comprehensively analyze diabetic nephropathy's risk factors and treatment patterns, exploring diverse factors for enhanced prevention and personalized management.
Study Design: Prospective study design.
Place and Duration of Study: The study was conducted for 5 months at Trust Multispeciality Hospital, Kakinada.

[++] Interns;
[#] Nephrologist and Renal Transplantologist;
[†] Associate Professor;
**Corresponding author: E-mail: palaritra700@gmail.com;*

Methodology: This retroactive chart analysis of non-critical outpatients folders of Trust Hospital that refers to the mentioned period (11/2022 -04/2023) will use Excel software.
Results: A variety of risk factors promote the development and progression of diabetic nephropathy, including elevated glucose levels, high blood pressure, obesity, the long duration of diabetes, and dyslipidemia. These risk factors are modifiable by hyperglycemic agents, anti-hypertensives, and lipid-lowering agents. Most of the people who are prone to diabetic nephropathy are between 40 and 70 years of age. Males are most affected (80%) compared to females (20%). Oral hypoglycemic agents (97%) and calcium channel blockers (50%) play a major role in reducing the progression of diabetic nephropathy by controlling blood pressure and glucose levels in the subject. Obesity is also a notable risk factor for end-stage renal disease patients.

Keywords: Diabetic nephropathy; end stage renal disease; hyperglycemia; obesity; anti-hypertensive; dyslipidemia.

1. INTRODUCTION

One of the main complications of diabetes mellitus (DM) is diabetic nephropathy (DN), which, left unmanaged, leads to chronic renal failure. End-stage renal failure is 10 times more common in people with diabetes mellitus. About 80% of end-stage kidney failure is caused by diabetes and hypertension either together or individually. A microvascular consequence of both insulin-dependent (IDDM) and non-insulin-dependent (NIDDM) diabetes mellitus known as DN causes diabetics to have higher morbidity and mortality as well as persistent proteinuria. According to studies, diabetic people have a DN prevalence of about 40% The most frequent reason for end-stage renal disease (ESRD) is DN. Choosing, starting, and individualizing medication therapy for individuals with DN can be difficult for physicians.

The main risk factors for the onset of diabetic nephropathy include hyperglycemia, elevated blood pressure, and genetic predisposition. Smoking, elevated blood lipids, and the quantity and source of dietary protein all appear to be risk factors.

Based on the results of urine albumin excretion (UAE), diabetic nephropathy has been didactically divided into the stages of microalbuminuria and macroalbuminuria [1]. When it comes to gender, men are more significantly impacted than women.

The objectives of the study include:-

- Determine a variety of diabetic nephropathy risk factors.
- Examine the techniques and therapy modalities used today.
- Provide information to support improved preventative and individualized management plans.

Scope: Analysing features and approaches of diabetes-related kidney damage to ameliorate preventative and therapeutic principles on a patient-tailored basis.

Justification: Filling up knowledge gaps before making decisions about the optimization of nephropathy in diabetic patients for optimal outcomes.

2. METHODOLOGY

The study consisted of a prospective chart analysis that reviewed 105 outpatient medical records from Trust Multispeciality Hospital between November 2022 and April 2023.

The data analysis was based on patient age, gender, monitoring parameters, and risk factors.

In the study, outpatients of both genders and age groups >35 years were selected as inclusion criteria, whereas pregnant women and newborns were excluded.
The data analysis includes the application of tools like Microsoft Excel for the evaluation of the subject's data.

3. RESULTS AND DISCUSSION

The demographic analysis of subjects with diabetic nephropathy reveals a conspicuous gender imbalance, with 82% of the cohort being male and 18% female. This observation prompts a nuanced exploration of potential gender-specific factors contributing to this divergence,

such as hormonal influences or socio-behavioural variables. Moving to age distribution, the study underscores the diverse impact of diabetic nephropathy across different life stages. Notably, the prevalence peaks in the 66–75 age group, accounting for 37% of the subjects. This age-related susceptibility warrants further investigation into age-specific risk factors and clinical manifestations to inform tailored intervention strategies.

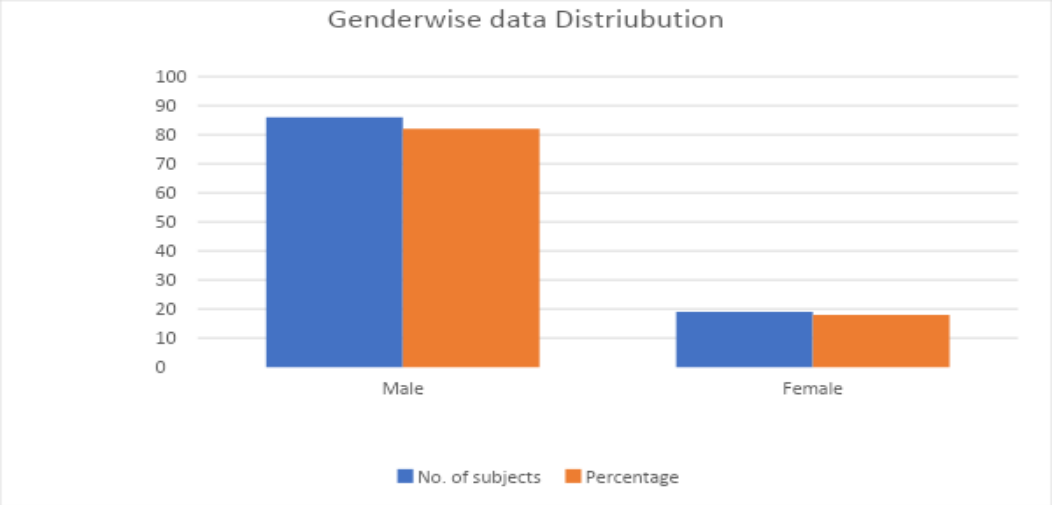

Fig. 1. Gender-wise distribution of subjects with diabetic nephropathy

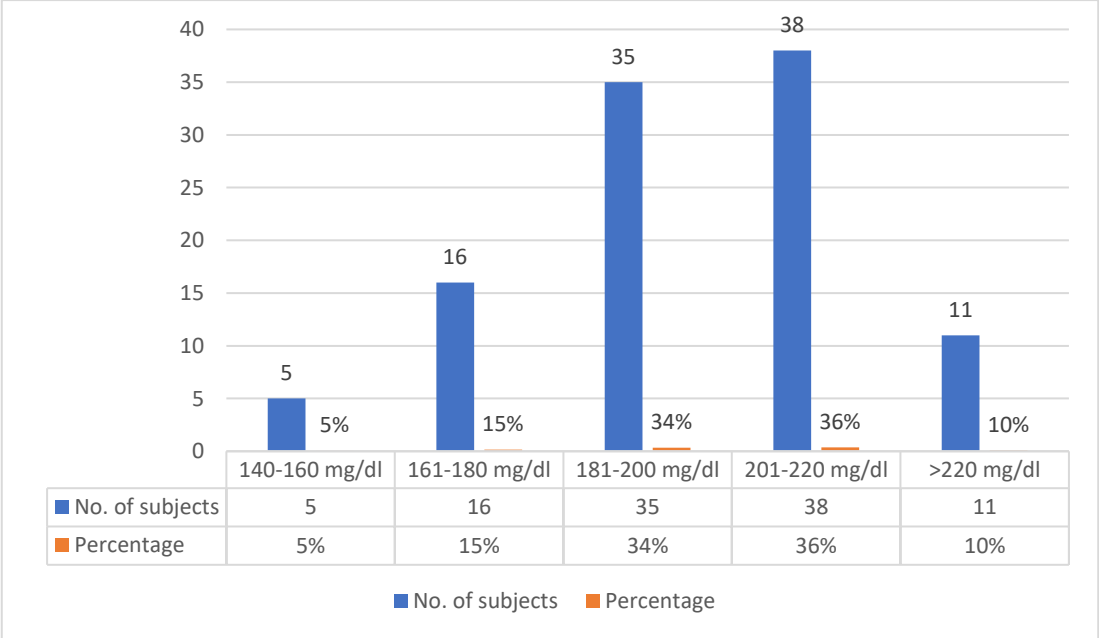

Fig. 2. Distribution of subjects based on blood glucose levels

Table 1. Age-wise distribution of subjects with diabetic nephropathy

SL No.	Age Group	No. Of subjects	Percentage
1	35-45 YEARS	9	10 %
2	46-55 YEARS	12	11%
3	56-65 YEARS	34	32 %
4	66-75 YEARS	39	37 %
5	76-85 YEARS	11	10 %

Table 2. Distribution of subjects according to types of diabetes

Sl No.	Types of Diabetes	No. Of Subjects	Percentage
1	TYPE 1 DIABETES	23	22%
2	TYPE 2 DIABETES	82	78%

Table 3. The percentage (%) of subjects with risk factors for diabetic nephropathy

S. No	Risk Factors	No. of Subjects	Percentage on (N = 105)
1	HYPERTENSION	90	85%
2	SMOKING	23	22%
3	OBESITY	67	63%
4	FAMILY HISTORY	52	49%
5	ELEVATED LIPID LEVELS	39	37%

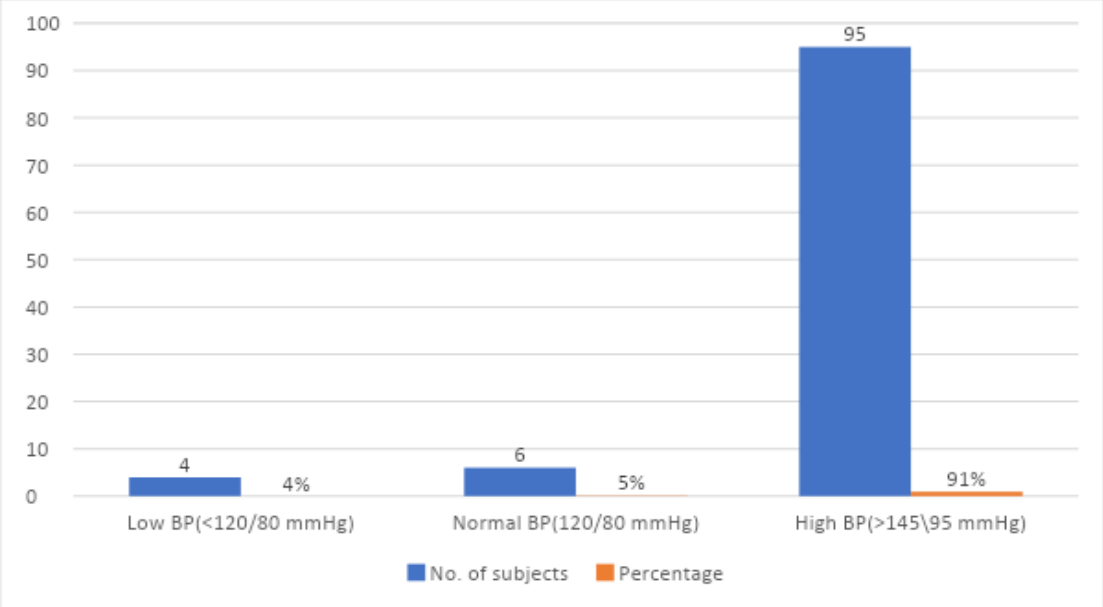

Fig. 3. Distribution of subjects based on blood pressure values

Table 4. Subjects with proteinuria

S.no	Total number of subjects	No. Of subjects with proteinuria	Percentage
1	105	84	80%

Table 5. Distribution of serum creatinine levels in subject

S.no	Serum creatinine levels	No. of subjects	Percentage
1	NORMAL (0.5 – 1.7 mg/dl)	12	11 %
2	SLIGHTLY ELEVATED (1.8–3.5 mg/dl)	24	23%
3	GROSSLY ELEVATED (3.6 – 7.5 mg/dl)	69	66%

Table 6. Stages of CKD in subjects Based on eGFR Values

Sl no	Stages of Chronic Kidney Disease	Egfr Values	No. of Subjects	Percentage
1	STAGE 1	>90	11	10 %
2	STAGE 2	60 - 89	15	14 %
3	STAGE 3a	45 - 59	37	35 %
4	STAGE 3b	30 - 44	24	23 %
5	STAGE 4	15 - 29	12	11 %
6	STAGE 5	<15	6	7 %

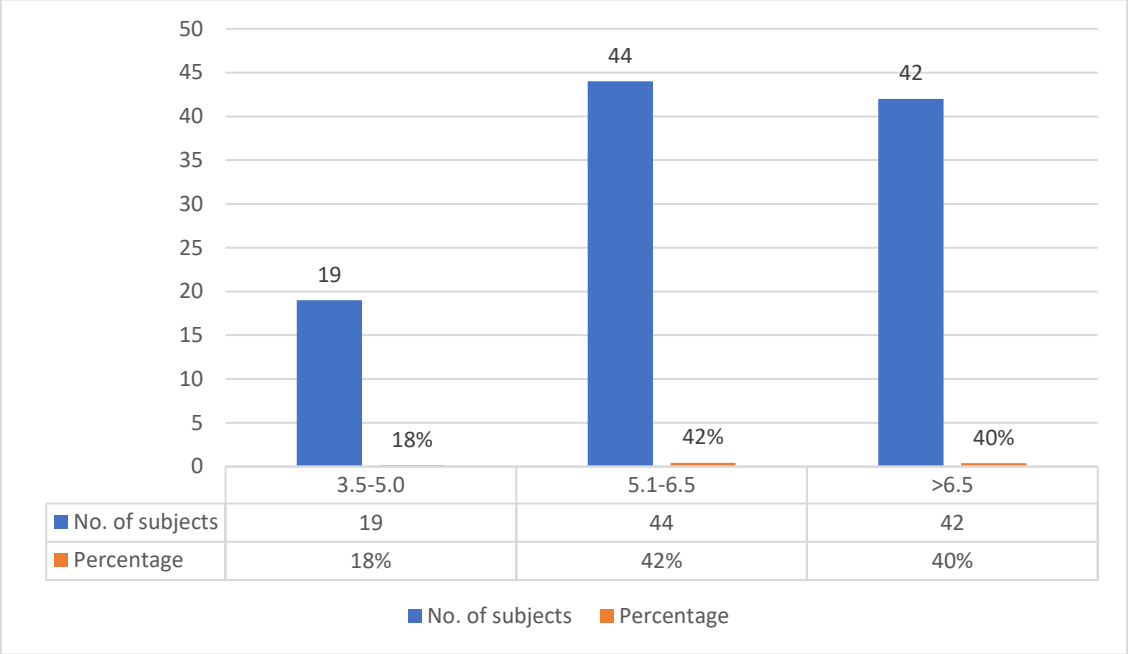

Fig. 4. Distribution of serum potassium levels in subjects

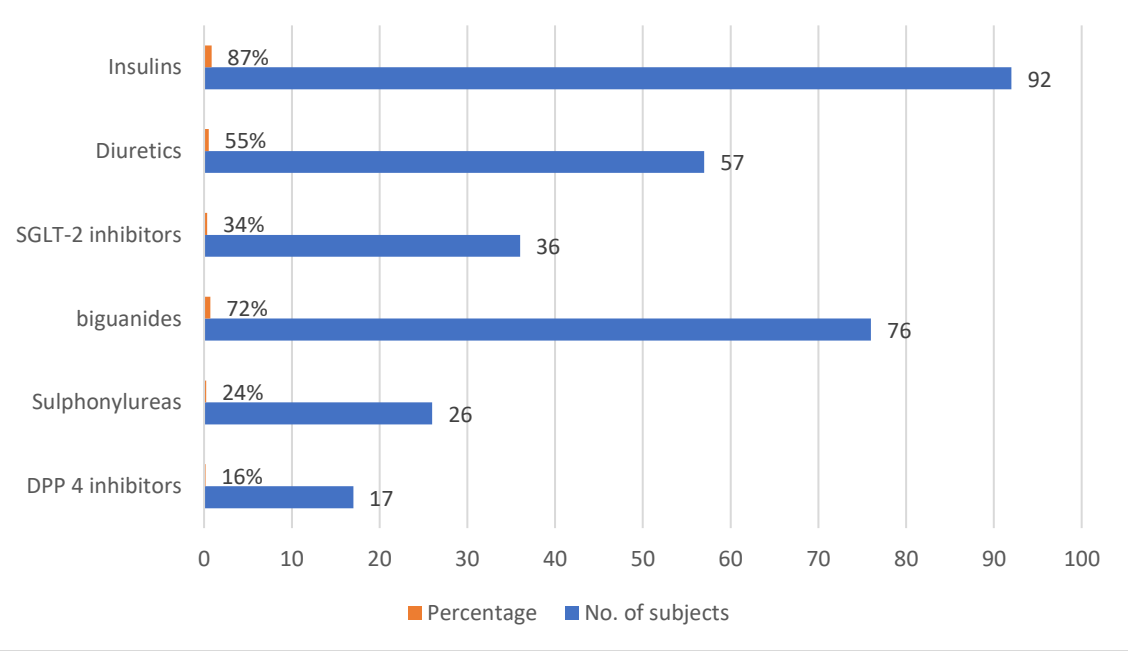

Fig. 5. Medication prescribed for the treatment of diabetes

Table 7. Medication prescribed to treat diabetic nephropathy complications

S.no	Medication	No.of subjects	Percentage
1	CALCIUM CHANNEL BLOCKERS	76	72 %
2	DIRECT RENIN INHIBITORS	34	32%
3	ANGIOTENSIN-CONVERTING ENZYMES	32	30 %
4	MINERALO CORTICOID RECEPTOR ANTAGONISTS	36	34%

In examining diabetes types, the predominance of type 2 diabetes (78%) aligns with established epidemiological patterns. However, a deeper exploration of the distinct phenotypic attributes of Type 1 and Type 2 diabetic nephropathy is warranted to comprehensively understand their respective pathological trajectories. The study affirms the well-established association between hypertension and diabetic nephropathy, with 85% of subjects presenting with concurrent hypertension. Additionally, the coexistence of smoking (22%), obesity (63%), family history (49%), and elevated lipid levels (37%), emphasizes the intricate interplay of systemic factors contributing to the complex etiology of diabetic nephropathy [2]. Stratification of subjects based on blood glucose levels provides insights into the importance of glycaemic control. Elevated readings in significant proportions underscore the need for optimizing glucose management strategies to mitigate renal complications effectively.

Elevated blood pressure levels are prevalent in 91% of the subjects, reinforcing the intrinsic relationship between hypertension and diabetic nephropathy (Al-Rubeaan et al., 2014). Rigorous blood pressure management emerges as a paramount consideration in the comprehensive care paradigm for afflicted individuals. Proteinuria (80%) and elevated serum creatinine levels corroborate the severity of nephropathic manifestations. These clinical markers underscore the imperative for vigilant monitoring and therapeutic interventions aimed at ameliorating renal function. Various stages of chronic kidney disease reveal a dynamic trajectory of renal compromise, with pronounced representation in stages 3a and 3b. The distribution across CKD stages accentuates the evolving clinical course of nephropathy, necessitating tailored therapeutic modalities corresponding to the progressive nature of the condition [3-5].

The distribution of serum potassium levels elucidates potential electrolyte imbalances inherent in diabetic nephropathy. The notable proportion of patients with potassium levels exceeding 6.5 necessitates judicious management to avert complications associated with hyperkalemia [6,7]. In the realm of medication patterns, the pharmacotherapeutic panorama for diabetes management encompasses a diverse array of agents, highlighting the intricate challenge of glycemic control. Similarly, the pharmacological armamentarium for diabetic nephropathy underscores the concerted effort towards blood pressure modulation with the substantial employment of calcium channel blockers [8,9].

4. CONCLUSION

In conclusion, this comprehensive analysis of subjects with diabetic nephropathy illuminates several key facets essential for understanding and managing this complex condition. The pronounced gender disparity, with 82% males and 18% females, prompts further exploration into gender-specific factors influencing disease manifestation. Age distribution highlights a peak prevalence in the 66–75 age group, underscoring the need for age-tailored interventions. The predominance of Type 2 diabetes (78%) aligns with established trends, urging a nuanced examination of the distinctive characteristics of Type 1 and Type 2 diabetic nephropathy. Hypertension emerges as a pervasive risk factor (85%), necessitating meticulous blood pressure management and glycemic control.

Elevated proteinuria (80%) and serum creatinine levels substantiate the severity of nephropathy, emphasizing the importance of vigilant monitoring. Chronic kidney disease staging reveals a dynamic trajectory, emphasizing the progressive nature of the condition and the need for stage-specific therapeutic approaches. Electrolyte imbalances, particularly potassium levels exceeding 6.5, demand judicious management to mitigate associated complications. The pharmacotherapeutic landscape underscores the intricate challenge of glycemic control, while the substantial use of calcium channel blockers in diabetic nephropathy treatment underscores the integrated focus on blood pressure modulation.

In essence, these findings provide a nuanced understanding of the multifactorial nature of diabetic nephropathy, guiding the development of personalized and integrative strategies for effective clinical management. Future research avenues may delve into gender-specific influences, age-tailored interventions, and the dynamic interplay between diabetes types and nephropathic manifestations.

CONSENT

As per international standards or university standards, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standards or university standards written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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