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Study of the Neutrophil-Lymphocyte Ratio and Platelet Indices in Patients with Diabetic Nephropathy

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KEYWORDS

Diabetes mellitus , Diabetic nephropathy ,Neutrophil-Lymphocyte Ratio (NLR) and Platelet indices (PLR, MPV, PDW)

ABSTRACT:

Background: Diabetes mellitus (DM) is a serious threat to global health with an increasing prevalence and incidence rates. Diabetes mellitus causes serious complications such as diabetic nephropathy. Diabetic nephropathy is now the most common reason of chronic kidney disease. Inflammation plays a crucial role in development and progression of diabetic nephropathy. Diabetic nephropathy or diabetic kidney disease is a syndrome described by the presence of pathological amounts of proteinuria, diabetic glomerular lesions and decrease of glomerular filtration rate (GFR) in diabetic patients [1]

Methodology: It was an analytical cross-sectional type of study. The source of data included patients attending the medicine outpatient department, admitted to the inpatient department and ICU, diagnosed with type 2 diabetes mellitus after applying the inclusion and exclusion criteria at the National Institute of Medical Sciences & Research & Hospital, Jaipur, Rajasthan.

Written consent was obtained from all participants in this study.

Using the values from the previous study, the sample size was calculated as 107 subjects. A total of 107 patients with type 2 diabetes mellitus were distributed into three groups according to urinary albumin-to-creatinine ratio

Results: The demographic details of the study population are as follows: The total sample consisted of 107 participants. The mean age of the participants was 58.896 ± 9.692 years. In terms of age group distribution, the majority of participants were between 61–70 years (45 participants, 42.0%), followed by those in the 51–60 years age group (31 participants, 29.0%). Participants aged 41–50 years accounted for 16 (15.0%), while 8 participants (7.4%) were aged 71 years or above, and 7 participants (6.6%) fell into the 31–40 years category. In terms of gender distribution, 44 participants (41.5%) were female, while 63 participants (58.5%) were male. The average height of the participants was 168.255 ± 6.257 cm, and the average weight was 74.896 ± 5.402 kg. These characteristics provide a comprehensive overview of the study population

Conclusion: the findings of this study offer a detailed and comprehensive analysis of the clinical and laboratory characteristics of patients suffering from diabetic nephropathy. The data highlight several critical factors contributing to the progression of this disease, including elevated blood pressure, inadequate glycemic control, and the presence of inflammatory markers, such as the neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR), which are significantly associated with the pathophysiology of diabetic nephropathy. These factors point to a multifactorial process where metabolic imbalances and immune system dysregulation interact to accelerate kidney damage in patients with diabetes.

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INTRODUCTION

Diabetes mellitus (DM) is a serious threat to global health with an increasing prevalence and incidence rates. Diabetes mellitus causes serious complications such as diabetic nephropathy. Diabetic nephropathy is now the most common reason of chronic kidney disease. Inflammation plays a crucial role in development and progression of diabetic nephropathy. Diabetic nephropathy or diabetic kidney disease is a syndrome described by the presence of pathological amounts of proteinuria, diabetic glomerular lesions and decrease of glomerular filtration rate (GFR) in diabetic patients [1].The prevalence of diabetes is escalating at an alarming rate worldwide. According to the International Diabetes Federation (IDF), the global number of individuals with diabetes was estimated to be 537 million in 2021 and is projected to rise to 643 million by 2030 and 783 million by 2045. This staggering increase is largely attributed to lifestyle changes, including sedentary behavior, unhealthy diets, and urbanization. Type 2 diabetes mellitus (T2DM) constitutes approximately 90–95% of all diabetes cases, predominantly affecting middle-aged and older individuals, although it is increasingly seen in younger populations [4].

The health impact of diabetes is profound. It is a leading cause of blindness, cardiovascular disease, stroke, amputations, and kidney failure. In addition to physical and emotional tolls, diabetes imposes an enormous economic burden. The IDF estimated that in 2021, global healthcare expenditures related to diabetes reached $966 billion, a 316% increase over the past 15 years [5].

Diabetes Mellitus in India: A Local Perspective

India has been dubbed the "Diabetes Capital of the World" due to its massive and growing diabetic population. As of 2021, India had approximately 74 million people with diabetes, a number projected to increase to 125 million by 2045. This rise is driven by urbanization, genetic predisposition, and lifestyle factors such as physical inactivity and consumption of calorie-dense diets [6].

The health burden in India is compounded by delayed diagnosis, lack of awareness, and inadequate management of diabetes. The economic impact of diabetes in India is also significant, affecting not only individuals and families but also the national healthcare system. Estimates suggest that India spends more than $10 billion annually on diabetes-related healthcare, a figure expected to rise sharply with increasing prevalence [7].

METHODOLOGY

It was an analytical cross-sectional type of study. The source of data included patients attending the medicine outpatient department, admitted to the inpatient department and ICU, diagnosed with type 2 diabetes mellitus after applying the inclusion and exclusion criteria at the National Institute of Medical Sciences & Research & Hospital, Jaipur, Rajasthan.

Written consent was obtained from all participants in this study.

Using the values from the previous study, the sample size was calculated as 107 subjects. A total of 107 patients with type 2 diabetes mellitus were distributed into three groups according to urinary albumin-to-creatinine ratio:

- Group A: type 2 diabetic patients with normoalbuminuric (urinary albumin-to-creatinine ratio <30);
- Group B: type 2 diabetic patients with microalbuminuria (urinary albumin-to-creatinine ratio 30–300);
- Group C: type 2 diabetic patients with macroalbuminuria (urinary albumin-to-creatinine ratio >300).
- Levels of inflammatory markers, neutrophil-to-lymphocyte ratio, and platelet-to-lymphocyte ratio were recorded and compared among the three groups.
- Frequency was expressed in percentages. A p-value of <0.06 was considered statistically significant.
- Blood samples were collected at the time of admission for the following tests: Complete blood counts with platelet indices, renal function tests, and HbA1c. Neutrophil-to-lymphocyte ratio (NLR) was determined by dividing the absolute neutrophil count by the absolute lymphocyte count.

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INCLUSION CRITERIA:

a) All adult patients of 18 years and above in OPD / IPD / ICU diagnosed with Type 2 diabetes mellitus.
b) Patient who gave consent to participate in study.

EXCLUSION CRITERIA:

Patients with

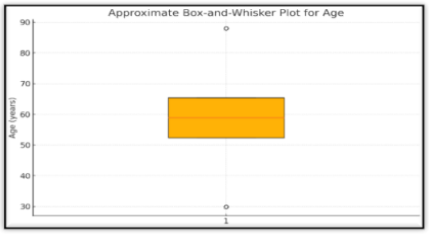
a) Acute infections
b) Bleeding or hematological disorders
c) Severe hypertension
d) Dyslipidemia
e) Chronic liver disease & chronic kidney disease

Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)or steroids.

RESULTS

DEMOGRAPHIC DETAIL

Parameters	Frequency (%)
Total Sample	107
Age Group	
31-40	7 (6.6)
41-50	16 (15.0)
51-60	31 (29.0)
61-70	45 (42.0)
≥71	8 (7.4)
Age (years)	58.896 ± 9.692
Gender	
Female	44 (41.5)
Male	63 (58.5)
Height (cm)	168.255 ± 6.257
Weight (kg)	74.896 ± 5.402



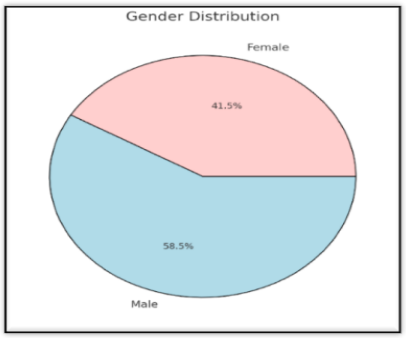


Figure 2. Mean age of the subjects enrolled in the study

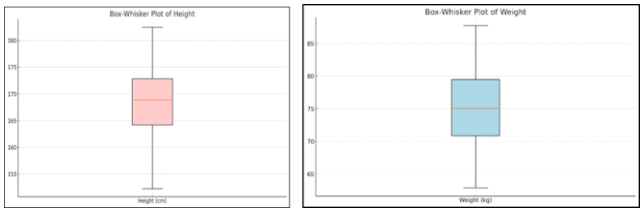


Figure 3. Gender of the subjects enrolled in the study

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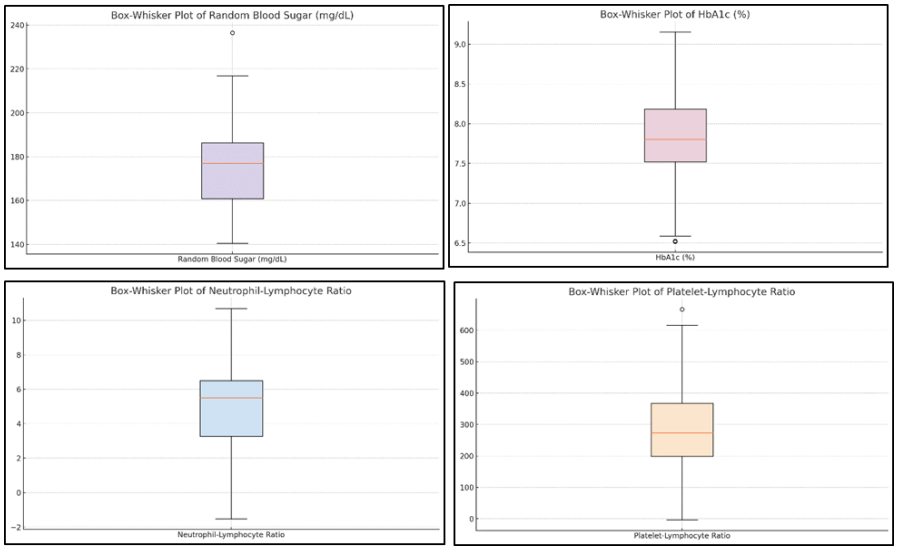

Figure 4. Average height and weight of the subjects enrolled in the study

The demographic details of the study population are as follows: The total sample consisted of 107 participants. The mean age of the participants was 58.896 ± 9.692 years. In terms of age group distribution, the majority of participants were between 61–70 years (45 participants, 42.0%), followed by those in the 51–60 years age group (31 participants, 29.0%). Participants aged 41–50 years accounted for 16 (15.0%), while 8 participants (7.4%) were aged 71 years or above, and 7 participants (6.6%) fell into the 31–40 years category. In terms of gender distribution, 44 participants (41.5%) were female, while 63 participants (58.5%) were male. The average height of the participants was 168.255 ± 6.257 cm, and the average weight was 74.896 ± 5.402 kg. These characteristics provide a comprehensive overview of the study population.

CLINICAL PARAMETERS

Parameters	**Mean ± SD**
Vitals	
Pulse Rate (bpm)	81.264 ± 6.589
Respiratory Rate (RR)	20.009 ± 1.571
Systolic Blood Pressure (SBP, mmHg)	141.368 ± 6.780
Diastolic Blood Pressure (DBP, mmHg)	86.953 ± 4.784

~~***Figure 5. Average Vitals of the subjects enrolled in the study***~~

The clinical parameters of the study participants are as follows: The mean pulse rate was 81.264 ± 6.589 beats per minute (bpm), and the mean respiratory rate was 20.009 ± 1.571 breaths per minute. The average systolic blood pressure (SBP) was 141.368 ± 6.780 mmHg, while the mean diastolic blood pressure (DBP) was 86.953 ± 4.784 mmHg. These clinical parameters provide insight into the general health status of the participants in the study.

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LABORATORY PARAMETERS

Parameters	Mean ± SD
Laboratory Parameters	
Random Blood Sugar (RBS, mg/dL)	175.472 ± 19.230
HbA1c (%)	7.687 ± 0.581
Neutrophil-Lymphocyte Ratio	5.130 ± 2.397
Platelet-Lymphocyte Ratio	283.642 ± 144.845
Urinary Albumin-Creatinine Ratio (UACR)	195.679 ± 170.571

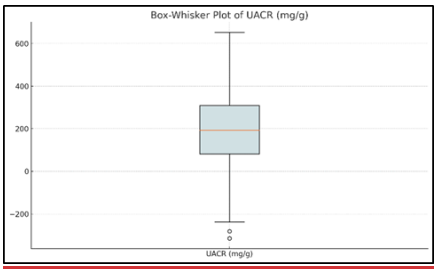
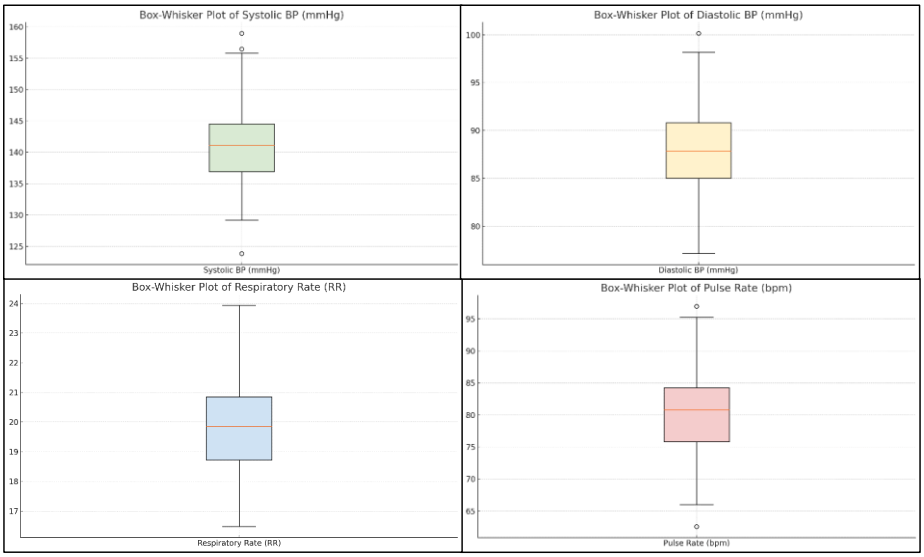


Figure 5. Average Vitals of the subjects enrolled in the study



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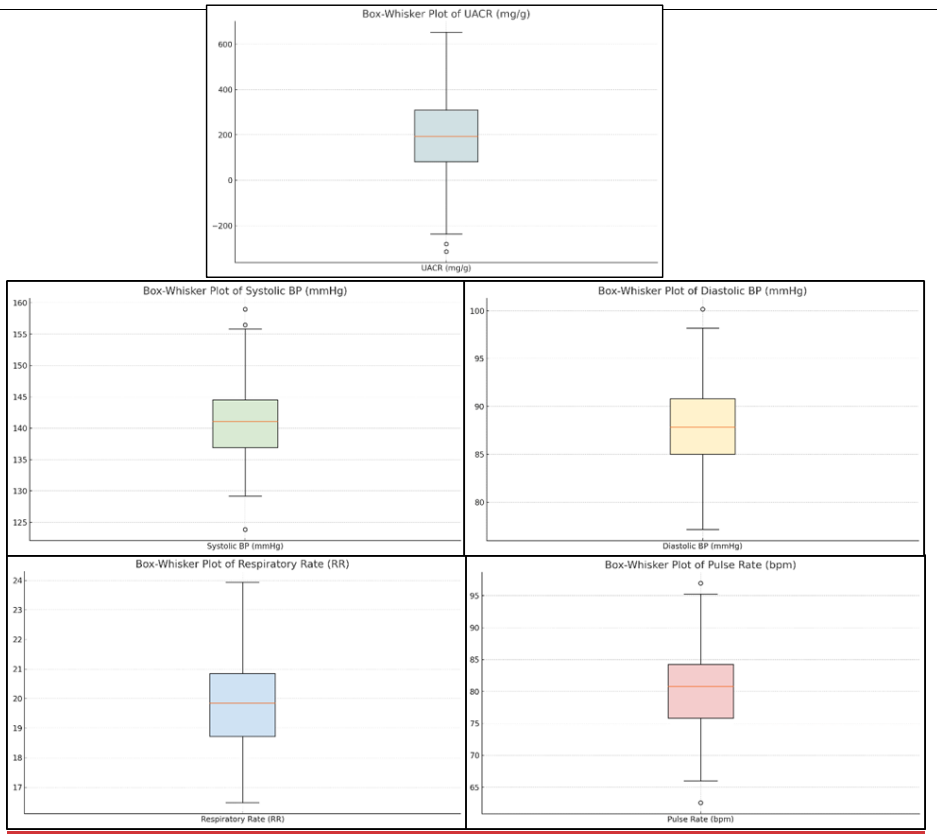

Figure 6. Average Laboratory parameters of the subjects enrolled in the study

The laboratory parameters of the study participants are as follows: The mean random blood sugar (RBS) was 175.472 ± 19.230 mg/dL, and the mean HbA1c was 7.687 ± 0.581%. The mean neutrophil-lymphocyte ratio (NLR) was 5.130 ± 2.397, while the platelet-lymphocyte ratio (PLR) had a mean of 283.642 ± 144.845. The average urinary albumin-creatinine ratio (UACR) was 195.679 ± 170.571. These laboratory parameters provide valuable insight into the clinical profile of the study population, particularly in relation to diabetic nephropathy.

CONCLUSION

In conclusion, the findings of this study offer a detailed and comprehensive analysis of the clinical and laboratory characteristics of patients suffering from diabetic nephropathy. The data highlight several critical factors contributing to the progression of this disease, including elevated blood pressure, inadequate glycemic control, and the presence of inflammatory markers, such as the neutrophil-lymphocyte ratio (NLR) and platelet-lymphocyte ratio (PLR), which are significantly associated with the pathophysiology of diabetic

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nephropathy. These factors point to a multifactorial process where metabolic imbalances and immune system dysregulation interact to accelerate kidney damage in patients with diabetes.

The presence of albuminuria in many of the participants further indicates early kidney involvement. Albuminuria is one of the earliest signs of diabetic nephropathy and is strongly predictive of future renal decline. This reinforces the importance of early detection and intervention. Regular monitoring of urinary albumin levels is critical for identifying patients at risk of progressing to more advanced stages of kidney disease, such as end-stage renal failure, which may require dialysis or kidney transplantation.

In summary, the results of this study strongly support the need for a comprehensive, multifaceted approach to managing diabetic nephropathy. This should include strict blood pressure control, optimal glycemic management, and targeted interventions to reduce inflammation. Such strategies are essential to reduce the burden of diabetic nephropathy, improve patient outcomes, and prevent the development of life-threatening complications. Early diagnosis, continuous monitoring, and personalized treatment regimens are key to improving the long-term health and quality of life of patients with diabetic nephropathy. The findings highlight the critical need for ongoing research to better understand the mechanisms driving kidney damage in diabetes and to explore new therapeutic targets for slowing or reversing the progression of diabetic nephropathy.

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