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A Multicentre Observational Study: Building a Bridge to CKD Prevention in Diabetic Nephropathy Through Antioxidant Strategies

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KEYWORDS

Diabetes, Chronic Kidney Disease, Antioxidants, Glycemic Control, Kidney Health, Diabetic Nephropathy, Type 2 Diabetes.

ABSTRACT:

Introduction:

The objective of this study was to examine the impact of antioxidant therapy on renal and glycaemic indicators in a cohort of 150 patients diagnosed with diabetic nephropathy. The researchers recruited participants who had been diagnosed with both type 1 and type 2 diabetes. This study aimed to explore the potential benefits of antioxidants in the management of renal disease and the control of blood glucose levels. The patients were categorized based on their age, gender, body mass index (BMI), and type of diabetes to examine differences in their treatment response. The noteworthy discoveries encompass substantial decreases in microalbuminuria and HbA1c levels within the cohort subjected to vitamin treatment, suggesting enhanced kidney function and glycaemic regulation. Furthermore, the patients in the vitamin group observed a significant decrease in their serum creatinine levels, indicating the potential for improved kidney function. In addition, the group receiving antioxidants showed noteworthy enhancements in both their fasting and post-prandial blood glucose levels. The study emphasized the importance of early detection and intervention in diabetic kidney disease, especially in persons with type 2 diabetes, to prevent the development of end-stage renal disease. Moreover, the research findings suggest that antioxidant supplementation could play a crucial role in the treatment of kidney problems linked to diabetes.

1. Introduction

The objective of this study was to examine the impact of antioxidant therapy on renal and glycaemic indicators in a cohort of 150 patients diagnosed with diabetic nephropathy. The researchers recruited participants who had been diagnosed with both type 1 and type 2 diabetes. This study aimed to explore the potential benefits of antioxidants in the management of renal disease and the control of blood glucose levels. The patients were categorized based on their age, gender, body mass index (BMI), and type of diabetes to examine differences in their treatment response. The noteworthy discoveries encompass substantial decreases in microalbuminuria and HbA1c levels within the cohort subjected to vitamin treatment, suggesting enhanced kidney function and glycaemic regulation. Furthermore, the patients in the vitamin group observed a significant decrease in their serum creatinine levels, indicating the potential for improved kidney function. In addition, the group receiving antioxidants showed noteworthy enhancements in both their fasting and post-prandial blood glucose levels. The study emphasized the importance of early detection and intervention in diabetic kidney disease, especially in persons with type 2 diabetes, to prevent the development of end-stage renal disease. Moreover, the research findings suggest that antioxidant supplementation could play a crucial role in the treatment of kidney problems linked to diabetes.

2. Material and Methods

A. Antioxidants:

- **Alpha-Tocopherol (Vitamin E):** Alpha-Tocopherol was used in various forms, including supplements, to study its impact on oxidative stress. It was administered to study subjects or cell cultures to assess its effectiveness in reducing oxidative damage.
- **Ascorbic Acid (Vitamin C):** Vitamin C is another powerful antioxidant. It was provided as a supplement or included in the diet of study participants. This helped determine its effects on antioxidant status and oxidative stress markers.
- **N-Acetylcysteine (NAC):** NAC was a compound used to boost cellular glutathione levels, an important endogenous antioxidant. It was administered to study subjects to evaluate its impact on oxidative stress and antioxidant defence mechanisms.
- **Reduced Glutathione:** Reduced glutathione was used as a supplement or incorporated into cell culture

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experiments to assess its role in protecting against oxidative damage.

B. Subjects/Participants: For the study on total antioxidant capacity in plasma, the research included two groups of participants:

a. Type 1 Diabetics: This group consisted of individuals diagnosed with Type 1 diabetes. They were recruited based on specific inclusion criteria related to their diabetic status and health conditions at the time of the study.

b. Normal Subjects: The second group comprised individuals who did not have Type 1 diabetes or any other relevant health conditions. These individuals served as the control group for comparison with the diabetic group.

- Both groups of participants were carefully selected and provided informed consent to participate in the study. The study protocol outlined the procedures they underwent, including blood sample collection and subsequent analysis to measure the total antioxidant capacity in their plasma.
- Data from these participants were collected and analyzed to investigate the differences in total antioxidant capacity between the Type 1 diabetic group and the normal group, providing valuable insights into the role of antioxidants in diabetes-related oxidative stress. [4,5]

C. Statistical Software:

Statistical software, such as SAS, was used for data analysis in the research study.

SAS was selected as the preferred statistical software for its capabilities in handling and analyzing complex data sets, which were crucial for evaluating the impact of antioxidants on oxidative stress markers.

The software was utilized to perform various statistical analyses, including hypothesis testing, regression analysis, and the calculation of p-values.

The results obtained from the data analysis in SAS provided valuable insights into the relationships between antioxidants and oxidative stress markers, contributing to the overall findings of the research study.

Detailed statistical procedures and methodologies were applied using SAS to ensure the accuracy and reliability of the study's statistical conclusions.[6]

3. Methods

A. Introduction:

In the introduction section, the importance of antioxidants in countering the action of free radicals in DNA was explained. A brief overview of the mechanisms by which antioxidants work was provided to set the stage for the research.

Antioxidants play a pivotal role in combating the damaging effects of free radicals on DNA. Their significance lay in their ability to neutralize free radicals, which were highly reactive molecules capable of causing oxidative stress and DNA damage. The mechanisms by which antioxidants operated included enzymatic reactions, metal binding, and scavenging of free radicals. These mechanisms collectively acted as a defense system against oxidative stress and its potential consequences.

B. Total Antioxidant Capacity in Type 1 Diabetics:

The research study presented findings that demonstrated the total antioxidant capacity in the plasma of individuals with Type 1 diabetes was 16% lower than that of normal subjects. This significant difference highlighted the potential vulnerability of diabetic individuals to oxidative stress.

The study involved meticulous data collection and analysis, involving both diabetic and normal subjects. The results conclusively indicated that individuals with Type 1 diabetes exhibited reduced total antioxidant capacity in their plasma. This observation underscored the importance of exploring preventive measures to enhance antioxidant defenses in diabetic individuals.

C. Antioxidants as Preventive Measures:

The research delved into the role of antioxidant vitamins C and E as preventive measures for diabetes and cardiovascular diseases. The discussion revolved around the utilization of high doses of these antioxidants to mitigate the risk of these health conditions.

It was noted that antioxidant vitamins C and E held promise as potential preventive interventions. Several studies have revealed their capacity to reduce markers indicative of oxidative stress and lipid peroxidation in diabetic subjects. These antioxidants, when administered in high doses, exhibited the potential to safeguard against the development of diabetes and cardiovascular diseases.

D. Use of Antioxidants in Renal Failure:

The research explained how antioxidants like alpha-tocopherol, ascorbic acid, n-acetylcysteine, and reduced glutathione were utilized to regulate oxidative stress in cases of renal failure.

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In the context of renal failure, these antioxidants played a crucial role in ameliorating oxidative stress, a common complication associated with kidney dysfunction. Alpha-tocopherol (vitamin E), for instance, was administered to renal failure patients to mitigate oxidative damage to kidney tissues. Ascorbic acid (vitamin C) was used to enhance antioxidant defenses and reduce oxidative stress markers. N-acetylcysteine and reduced glutathione were employed to boost endogenous glutathione levels, a vital intracellular antioxidant.

These antioxidants collectively contributed to the management of oxidative stress in renal failure patients, potentially improving their renal function and overall health.

E. Mechanisms of Antioxidant Action:

The research provided detailed insights into the three primary mechanisms through which antioxidants achieved their effects: sequestering free transitional metal particles, catalyzing the breakdown of oxidants, and scavenging free radicals.

First, antioxidants sequestered free transitional metal particles, such as iron and copper, thus preventing their participation in reactions that could generate highly reactive hydroxyl radicals. By doing so, they acted as chelators, limiting the availability of these metals for oxidative reactions.

Second, certain antioxidants catalyzed the breakdown of oxidants within intracellular environments. This enzymatic action ensured the inactivation of harmful molecules like hydrogen peroxide and superoxide, further protecting cells from oxidative damage.

Lastly, antioxidants function as scavengers of free radicals, effectively neutralizing these highly reactive molecules before they can cause cellular harm. This scavenging action rendered the radicals less harmful or inert.

Understanding these mechanisms was essential to grasp how antioxidants acted as potent defenders against oxidative stress and oxidative damage.

F. Statistical Analysis:

The research underscored the importance of statistical analysis in the study, emphasizing its critical role in evaluating treatment effects, minimizing biases, and drawing reliable conclusions based on data.

Statistical methods were the cornerstone of the study's data analysis. They allowed for the systematic examination of results and the assessment of the significance of findings. Through statistical analysis, the study quantified the impact of antioxidants on oxidative stress markers, providing objective insights into their efficacy.

Moreover, statistical methods were instrumental in reducing biases and ensuring that the study's conclusions were based on rigorous and unbiased assessments of the data. The application of statistical techniques bolstered the study's credibility and the reliability of its findings.

G. Statistical Methods in Clinical Trials:

The research provided an overview of the pivotal role statistics played in clinical trials. Statistics were instrumental in ensuring the integrity and validity of clinical trial results. They enabled researchers to make objective assessments and informed decisions throughout the trial process.

Key statistical aspects included hypothesis testing and statistical inference. These methods were essential for drawing meaningful conclusions from clinical trial data.

H. Hypothesis Testing:

The research elucidated the concept of hypothesis testing, a fundamental statistical technique used to assess treatment effects in clinical trials. It introduced the concept of the null hypothesis (H0) and the alternative hypothesis (H1).

In hypothesis testing, the null hypothesis (H0) represented the default assumption, suggesting that there was no significant difference between treatment groups or interventions. The alternative hypothesis (H1), on the other hand, posited that there was a meaningful difference or effect resulting from the treatment.

Additionally, the p-value was defined as a critical measure of statistical significance. It quantified the likelihood of obtaining the observed treatment difference purely by random chance. A small p-value indicated that the observed results were unlikely to have occurred by random variation alone, thereby providing evidence against the null hypothesis.

I. Statistical Inference:

The research delved into the role of statistical inference in clinical trials, particularly in summarizing treatment differences and evaluating the precision of measurements.

Statistical inference allowed researchers to draw inferences about the population based on sample data. It played a crucial role in determining whether treatment effects were statistically significant and provided insights into the clinical relevance of those effects.

J. Data Analysis Steps:

The research outlined the four main steps in data analysis:

i. Presenting Results in Tables and Graphs: Data were presented in a clear and organized manner, often using tables

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and graphs. These visual representations facilitated data interpretation and communication.

ii. Assessing Relationships: The analysis involved assessing relationships between variables to identify patterns or correlations within the data. This step helped uncover important associations that could inform clinical decisions.

iii. Calculating Confidence Intervals: Confidence intervals were calculated to estimate the range within which population parameters, such as treatment effects, were likely to fall. They provided a measure of the precision of the estimated values.

iv. Evaluating Evidence Using p-Values: The p-values obtained from hypothesis testing were used to evaluate the strength of evidence against the null hypothesis. Smaller p-values indicated stronger evidence against the null hypothesis and greater support for the alternative hypothesis.

K. Student's t-Test:

The research explained the use of the student's t-test, a widely employed statistical method for comparing means between two populations or groups. This method was instrumental in assessing whether observed differences in sample means were statistically significant or simply due to random variability.

The research distinguished between two types of t-tests: paired and unpaired. Paired t-tests were utilized when the same subjects or items were measured under two different conditions or at two different time points. Unpaired t-tests, on the other hand, were employed when comparing means between two independent and unrelated groups. Each type of t-test had its appropriate application, depending on the research design and data structure.

L. ANOVA (Analysis of Variance):

The research mentioned the use of ANOVA (Analysis of Variance) as a powerful statistical tool for comparing means across multiple groups. ANOVA was particularly valuable when dealing with more than two treatment groups or conditions. It allowed for the simultaneous assessment of whether there were statistically significant differences among these groups.

It was emphasized that post-hoc analysis was often necessary following ANOVA to determine which specific groups had contributed to the observed differences. This step helped identify where statistically significant differences existed among the multiple treatment groups.

M. Correlation:

The research discussed the concept of correlation and its pivotal role in analyzing relationships between variables. Correlation was employed to assess the degree and direction of association between two variables. A correlation coefficient quantified the strength and direction of this relationship.

Various correlation coefficients, such as the Pearson correlation coefficient, were introduced, and their interpretation was explained. A correlation coefficient value close to +1 indicated a strong positive relationship, while a value close to -1 indicated a strong negative relationship. A value near 0 suggested little or no linear correlation between the variables.

N. Descriptive Statistics:

The research defined essential descriptive statistics, including mean, median, mode, range, and standard deviation. These statistics provided valuable insights into the characteristics of data distributions.

- The mean represented the average value of a dataset.
- The median was the middle value when data were sorted.
- The mode was the most frequently occurring value.
- The range captured the spread of data from the minimum to the maximum.
- The standard deviation quantified the degree of data dispersion around the mean.

O. Data Presentation:

The research emphasized the importance of presenting data in both tabular and graphical formats for clarity and effective communication. Tables and graphs were valuable tools for organizing and visualizing data, making it easier for researchers and readers to comprehend and interpret research findings. Proper data presentation enhanced the accessibility and impact of research results. [7-15]

Results and Discussion

A study was conducted to investigate the impact of remotely controlled cell reinforcement on the renal boundary and glycaemic boundaries in patients having diabetic nephropathy. The study was conducted on 150 (n) patients with type-1 and type-2 diabetes (122 gentlemen and 28 women) between ages gathering of 40-80 years. For quite a long time, patients with hindered renal capacity experienced microalbuminuria. (Urinary egg whites excretion> 30 mg/dL).

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Table No 1: overall distribution of patients with DN baseline characteristics

Sr no.	Baseline characteristics of patients		Total no. of subjects	IDDM	NIDDM	Control group	Vitamin group
1	Age	40-50 Yrs.	37	21	16	15	22
		51-60 Yrs.	73	26	47	39	34
		61-70 Yrs.	32	13	19	16	16
		71-80 Yrs.	08	04	04	05	03
2	Sex	Male	122	49	73	62	60
		Female	28	15	13	13	15
3	BMI	Below 18.5	02	01	01	01	01
		18.5 - 24.9	91	38	53	53	38
		25 - 29.9	25	08	17	07	18
		30.0 & Above	04	02	02	01	03

The above information shows that the appropriation of patients in two gatherings relies on age, sex, weight, stature, and BMI. This would be more obvious if it could be in a graphical portrayal.

There are two types of DM NIDDM and IDDM. In this examination, we have chosen two types of DM subjects. Furthermore, on that premise here we have indicated the number of patients grouped on the premise of those types; so, it will be again simpler to recognize etiological factors just as a class more delicate to cause few movements.

Table 2: Type-wise classified subjects

Insulin Dependent Diabetes Mellitus (IDDM)	Non-Insulin Dependent Diabetes Mellitus (NIDDM)
64	**86**

In the above table, we distinguished types of DM that those subjects we enrolled in our study of diabetic nephropathy and antioxidants we entered 150 no. of patients where 86 no. of subjects had type 2 DM and 64 no. of subjects had type 1 DM which means more patients are suffering from NIDDM.

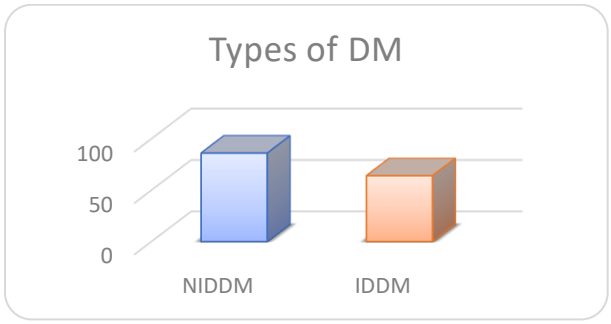

Figure 1: Type wise distribution of patients

Before beginning the fundamental piece of study, all investigation subjects are recognized in to male and female classes experiencing kinds of DM with all control just as nutrient gathering. So, we have sorted enlisted subjects dependent on sexual orientation; so, it will be another discovery to discover more delicate sex for causing related infections.

Table 3: Categorized according to gender.

Gender	Total	IDDM	NIDDM	Control Group	Vitamin Group
Male	122	49	73	62	60
Female	28	15	13	13	15

Because of this order, we have seen that a more prominent number of patients experiencing diabetic nephropathy are male nearly female. You can likewise clear thought from the graphical portrayal underneath:

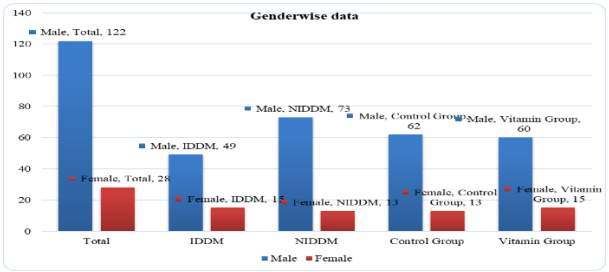

Figure 2: Genderwise distribution

Afterward, subjects or patients can be appropriately recognized in more exact order for which we have recognized them into various classes by isolating them according to age bunches as appeared in beneath table just in a graphical way.

Table 3: Age-wise distribution among groups

Age Range	Total Patients	IDDM	NIDDM	Control Group	Vitamin Group
40-50 yrs.	37	21	16	15	22
51-60 yrs.	73	26	47	39	34
61-70 yrs.	32	13	19	16	16
71-80 yrs.	8	4	4	5	3

The above shows dissemination of patients/subjects with DN is ordered or potentially appropriately characterized to effortlessly perceive what age gathering of subjects is bound to have affectability of etiological components.

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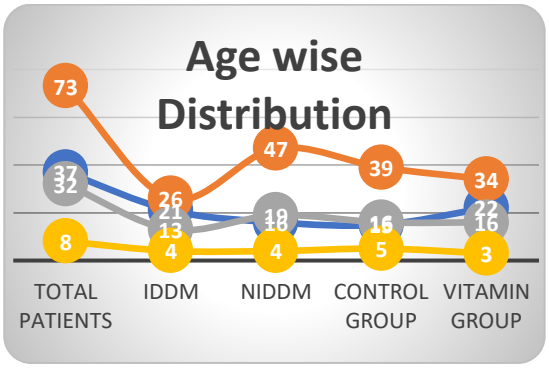


Figure 3: Age range-wise distribution of patients

Also, the next appropriation that appeared in the table depends on the weight list which relies upon weight in Kg. what's more, Hight in Meter. With goal is that it will give us close-by thought to get the affectability of BMI range for getting influenced by related etiological variables answerable for moving subject in peril zone.

Table 4: BMI-based Classification of subjects with DN

BMI Range	Total Patients	IDDM	NIDDM	Control Group	Vitamin Group
Below 18.5	2	1	1	1	1
18.6-24.9	91	38	53	53	38
25-29.9	25	8	17	7	18
30 & above	4	2	2	1	3

The table just as graphical portrayal is verification of demonstrating impact of expanding BMI and its expanding affectability towards seriousness and movement towards related infections. As more no. of subjects are at the fringe of corpulence which is unsafe for each diabetic individual.

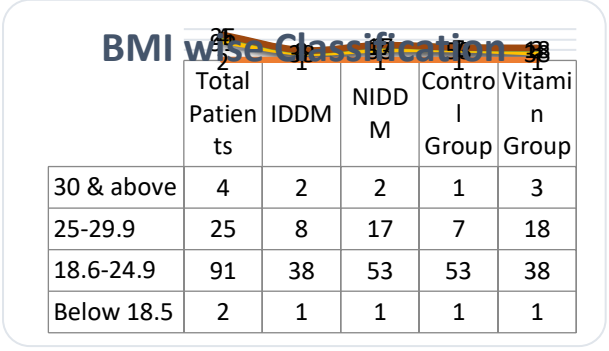


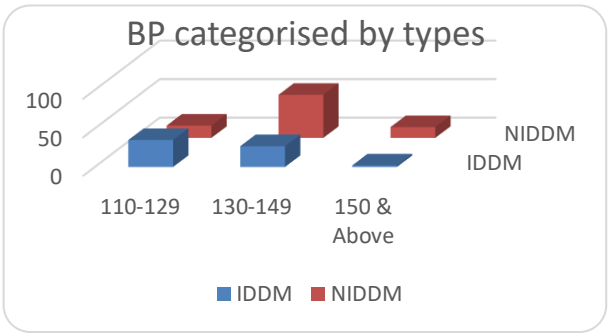
Figure 4: Represents BMI category

We likewise arranged pulse range on the premise of sorts of DM so that will get thought of more danger of hypertension in kind of diabetes mellitus. So we plan to outline it just as a diagram for it.

Table 5: Range of systolic blood pressure and types of DM

Systolic Range(mmHg)	*IDDM*	*NIDDM*
110-129	35	16
130-149	27	56
150 & above	2	14

Figure 5: Type of DM affected more by hypertension

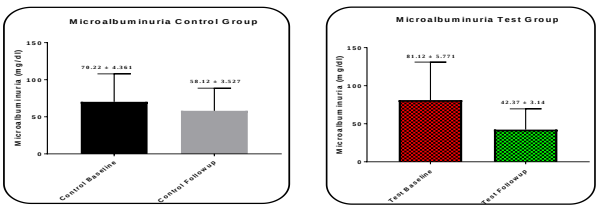


Diabetic nephropathy

Table 6: Effect of antioxidants on the biochemical parameter of Diabetic nephropathy patients by applying t-Test

Parameters	Control Group		Vitamin Group	
	Baseline	Final	Baseline	Final
Microalbuminuria	70.22 ± 4.361	58.12 ± 3.52	81.12 ± 5.77	42.37±3.14***
Serum creatinine	1.89 ± 0.058	1.90 ± 0.059	1.96 ± 0.053	1.58±0.055***
HbA1c%	7.42 ± 0.10	7.53 ± 0.09	7.93 ± 0.14	7.06 ± 0.10***
Fasting	164.9 ± 6.14	169.6 ± 3.15	163.0 ± 6.75	146.2 ± 2.47*
PP1	210.5 ± 5.99	216.4 ± 3.68	217.5 ±7.72	192.5 ± 4.22*
Systolic	130.8 ± 1.5	134.3 ± 0.90*	130.8 ± 1.30	131.4 ± 1.34

Following portrayal subtleties on results of biochemical tests in both examinations alongside measurable correlations of the hugeness of association by applying t-test investigation



(A) **(B)**

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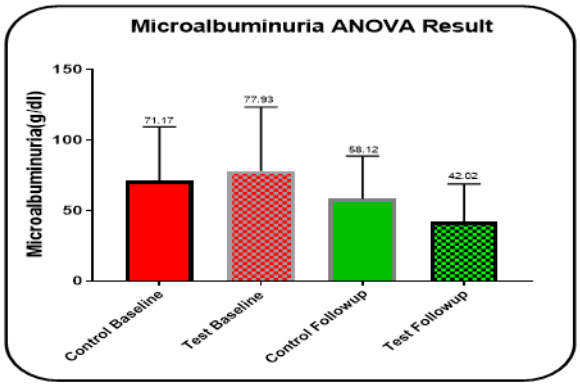
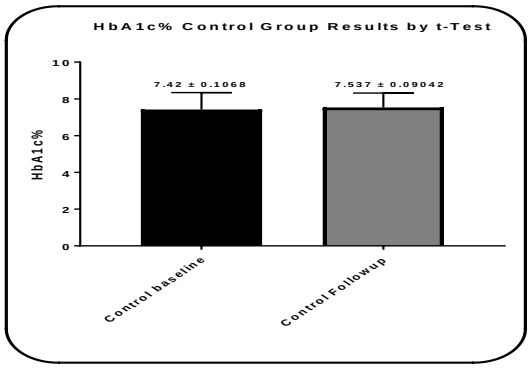


(C)

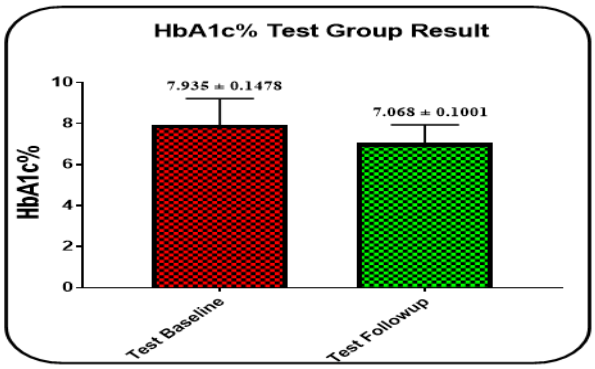
Figure 5 (a): Effect on Control group with regular treatment **(b):** Effect of Antioxidants on Microalbuminuria in patients with Diabetic Nephropathy **(c):** Observation of microalbuminuria result by ANOVA Statistical psychoanalysis using paired t-test is performed and principles are there in Mean ± SD $p<0.0327^*$ which is <0.05 is established to be important.

HbA1c:

HbA1c levels in the control group remained relatively stable, with a minor change from 7.42 ± 0.10 to 7.53 ± 0.09, indicating no significant decrease. In contrast, the vitamin-treated group exhibited a substantial reduction in HbA1c levels, decreasing significantly from 7.93 ± 0.14 to 7.06 ± 0.10 after one month of treatment ($p<0.0001$). This statistical comparison highlights a notable improvement in HbA1c levels in the vitamin group compared to the control group, as demonstrated in the charts.



(A)



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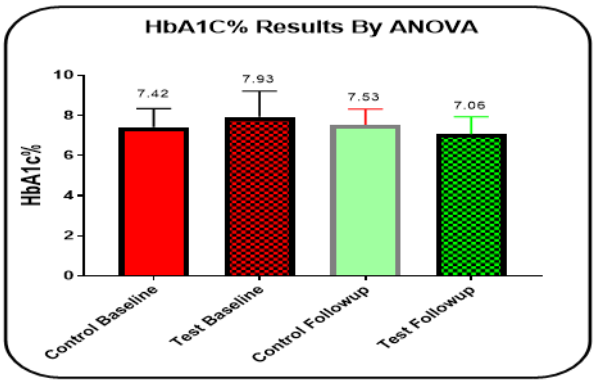

(C)

Figure 6 (a): Effect on HbA1c in patients with Diabetic Nephropathy in control group **(b):** Effect of Antioxidant vitamin on HbA1c in patients with Diabetic Nephropathy in test group **(c):** Observation of HbA1c% result by ANOVA

The p value is 0.4032 which shows that the results are (ns) which is non-significant

P value is <0.0001*** which Shows that results are (s) that is significant

The graphical representation strongly supports the positive impact of antioxidants in diabetic patients, as confirmed by two separate statistical tests, including ANOVA, which found a significant difference ($p<0.0001$). Thus, supplementing diabetic patients with antioxidant vitamins may be crucial in preventing the progression of CKD.

SERUM CREATININE

The change in serum creatinine values from baseline (1.89 ± 0.058) to end measurements (1.90 ± 0.059) in the control group was minimal and not statistically significant.

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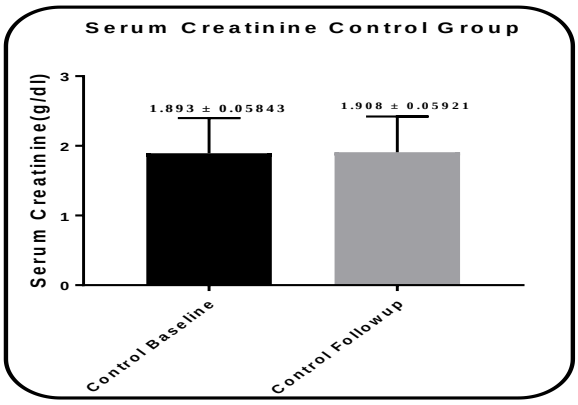
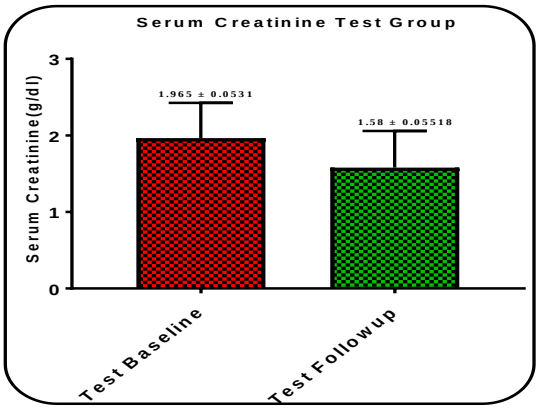


(a)



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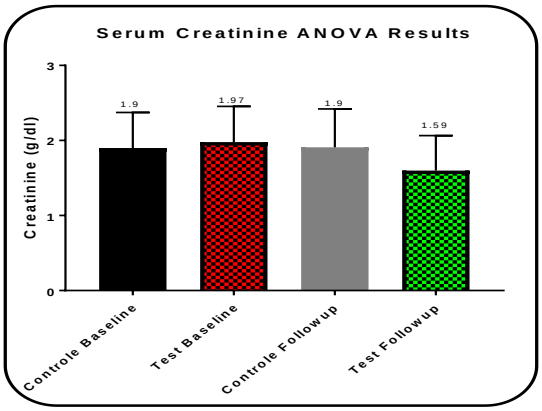

(c)

Figure 7 (a): Effect on control group of patients with diabetic nephropathy **(b): -** Effect of Antioxidants on serum creatinine in patients with Diabetic Nephropathy**(c):** Serum Creatinine data analysis by ANOVA

P value is <0.8603 which Shows that the results are (ns) which is significant

P value is <0.0001*** Which Shows that results are (s) that is significant

Indeed, these results strongly support the potential benefits of antioxidant treatment for diabetic patients in preventing related diseases. In the vitamin group, there was a notable and statistically significant reduction in creatinine levels, dropping from 1.96 ± 0.053 to 1.58 ± 0.055, which significantly outperformed the control group. This underscores the valuable role of antioxidant supplementation in lowering creatinine levels and potentially improving overall health outcomes for individuals with diabetes.

BLOOD SUGAR LEVEL

There was no statistically significant difference in fasting glucose levels within the control group over the three months, with a mean difference of 164.9 ± 6.14 to 169.6 ± 3.15 (p=0.4992).

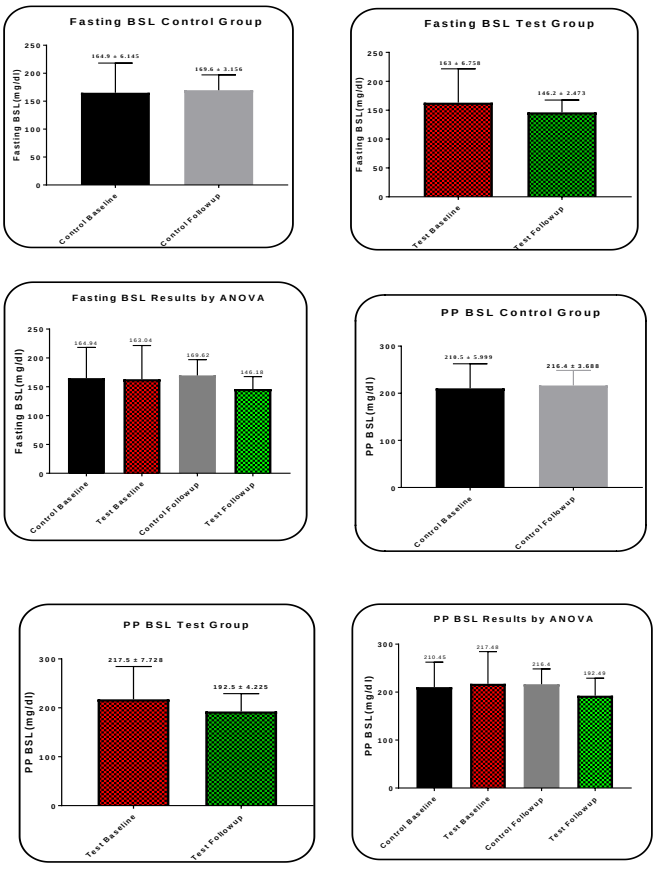

Figure 8 (a): Observation of control group with follow-up **(b):** Effect of Antioxidants on fasting blood sugar level in patients

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with Diabetic Nephropathy**(c):** Analysis of Fasting BSL data by ANOVA **(d):** Observation of PP BSL in the control group **(e)**: Effect of Antioxidants on post-prandial blood sugar level in patients with Diabetic Nephropathy **(f):** PP BSL observation by ANOVA.

The p-value is 0.4992 which shows that the results are (ns) which is non-significant.
P value is <0.0205* which Shows that results are (s) that are significant
The p-value is 0.3998 which shows that the results are (ns) which is significant.
P value is 0.0052** So, P is <0.05 which Shows that results are (s) that are significant

In the vitamin group, there was a significant improvement in fasting glucose levels, with a mean difference of 163.0 ± 6.75 to 146.2 ± 2.47 (p<0.0205*), indicating the benefits of antioxidant supplementation in partially mitigating the effects of diabetes. Similarly, post-prandial glucose levels also showed significant improvement in the vitamin group, with a mean difference of 217.5 ± 7.72 to 192.5 ± 4.22 (p=0.0052**), while no significant changes were observed in the control group, suggesting the potential positive impact of antioxidant vitamins on glucose control [^1^].

Systolic Blood Pressure

In the control group, there was a slight increase in Systolic Blood Pressure, with a mean difference from baseline to follow-up of 130.8 ± 1.5 to 134.3 ± 0.90*.

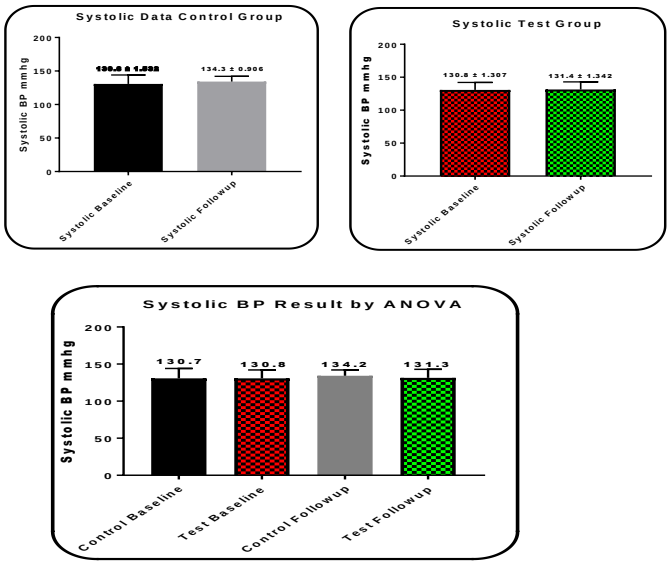

Figure 9 (a): Observation of systolic blood pressure data for the control group **(b):** Effect of Antioxidants on systolic blood pressure in patients with Diabetic Nephropathy **(c):** Systolic BP analysis by ANOVA

P value is 0.0498* So, P is <0.05 shows that results are (s) that are significant
P value is 0.7763, so P is not <0.05 Which Shows that the results are (ns) that is non-significant
A similar perception was accomplished for the test bunch where we got changes in the record in which mean contrast is 130.8 ± 1.30 to 131.4 ± 1.34 in pattern just as follow up separately where p esteem is 0.7763 which isn't <0.05 so result won't state as huge.
Systolic blood pressure is a significant factor in diabetic nephropathy, but this study did not find any significant decrease in systolic blood pressure in either the control or the test group.

Movement OF DN TOWARDS CKD:

The study highlights the importance of early detection of diabetic kidney disease in type 2 diabetes to reduce the risk of progression to end-stage renal disease (ESRD). Hypertension was identified as a significant risk factor in the development of CKD in diabetic patients, emphasizing the need for blood pressure management. Additionally, the presence of microalbuminuria can serve as an early marker to predict CKD progression and prompt timely intervention. Overall, the study underscores the significance of early detection and treatment of diabetic kidney disease to prevent or delay the progression to ESRD, based on analysis of OPD data and patient records [^1^].

Gender-wise classification:

Table 7: Gender-wise classification

Gender	Total No. of Patients
Male	169
Female	41

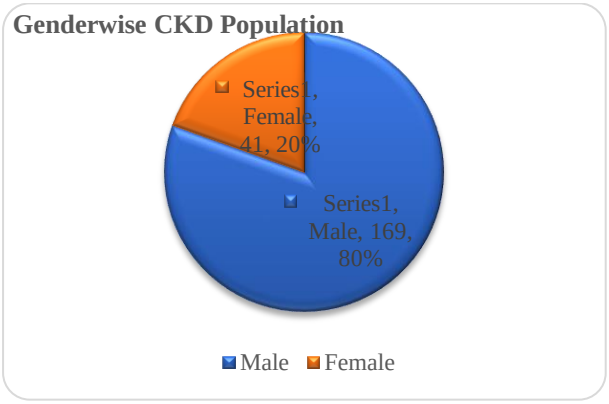

Figure 10: Gender-wise CKD Population

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In the figure, we are getting clear that 80% of the populace in the information we have gathered is male populace and just 20% is female populace. It implies we may consider that more no. of the populace experiencing CKD is male than female.

Classification as per type of diabetes:

Table 6.9: Classification as per type of diabetes

Gender	Total no. patients	IDDM	NIDDM	Non-diabetic
Male	169	6	39	124
Female	41	0	1	40

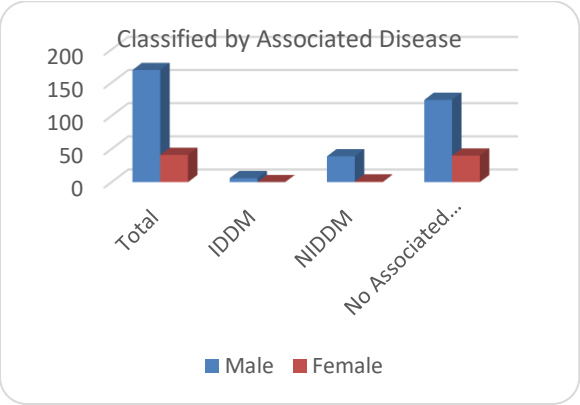

Figure 11: Classification as per types of DM

The study observed a higher number of patients with type 2 diabetes (NIDDM) compared to type 1 diabetes (IDDM), suggesting that NIDDM cases may be more susceptible to progressing to CKD.

ETIOLOGICAL FACTORS

Patients with diabetes face various challenges, including complications like hypertension, nephropathy, and retinopathy that can lead to Chronic Kidney Disease (CKD). Long-term use of medications, especially NSAIDs, can worsen kidney issues. Thus, careful management and monitoring of diabetic individuals are crucial for their overall well-being [^1^].

Table 8: Haemoglobin Status in CKD

Hb% range (gm/dl)	*10 & above*	*9.9 - 7.1*	*7 or below*
No. of patient	24	107	79

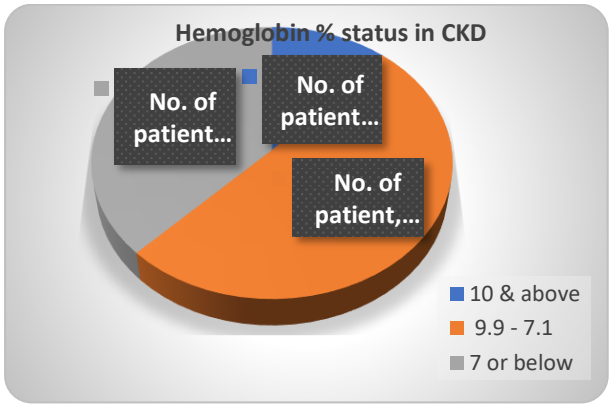

Figure 12: Hb% Status in CKD patients in this study

Apart from patients undergoing renal replacement therapy, sodium bicarbonate (soda bicarb) treatment can have a positive impact. Abnormal kidney size or structure is a significant factor in chronic kidney disease (CKD) and kidney failure. Normal kidneys measure around 10-12 cm, but issues like small-sized kidneys (kidney atrophy) can arise from birth defects or post-birth factors like poor blood supply during development, leading to nephron loss and hindered growth. Chronic infections, renal artery issues, kidney stones, and septicemia from untreated UTIs can all contribute to kidney problems, emphasizing the importance of kidney health [^1^].

Conclusion: The study's findings underscore the potential benefits of antioxidant treatment in patients with diabetic nephropathy. Antioxidant supplementation was associated with improvements in kidney function, glycaemic control, and blood sugar levels. These results highlight the importance of early detection and intervention in diabetic kidney disease, especially in type 2 diabetes cases. While there was a slight increase in systolic blood pressure in both the control and vitamin groups, it was not statistically significant. The study also revealed a higher prevalence of chronic kidney disease among male patients and those with type 2 diabetes. Overall, this research suggests that antioxidants may be a valuable addition to the management of diabetic nephropathy, with the potential to mitigate the risk of progression to end-stage renal disease. Further studies and clinical trials are warranted to validate these findings and refine treatment protocols.

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