Section A-Research paper

PRO-BNP LEVELS FOR PATIENTS WITH 2nd TYPE OF DM: A PROSPECTIVE, OBSERVATIONAL, NON-INTERVENTIONAL COHORT STUDY

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ABSTRACT

The heart's left ventricle produces pre-proBNP and -mL, respectively. BNPmL, respectively. "Type 2 DM patients are likely to develop heart failure. Pro-BNP levels should be examined in acute heart failure patients". Non-acute BNP and proBNP levels are 35 and 125 pg/mL. The acute cutoffs are 100 pg/mL BNP and 300 proBNP. Studies have found that asymptomatic Type 2 DM patients had their pro-BNP levels evaluated. Hence, in our study, we found that pro-BNP is linked favorably with diastolic dysfunction symptoms and negatively with LVEF. "ProBNP levels in type 2 DM patients may indicate heart failure and its prognosis".

Keywords: Type 2 DM**,** ProBNP levels**,** left ventricle**.**

INTRODUCTION

"The risk of heart failure is increased in type 2 diabetes mellitus patients, according to several studies".[1] Multiple studies have shown that people with diabetes mellitus have worse cardiovascular outcomes than the general population. Although numerous antihyperglycemic medications have been developed to lower blood sugar levels in patients with type 2 diabetes

mellitus, heart failure is still a prevalent complication. Therefore, hyperglycemia may not be the root cause of the increased risk of heart failure in those with diabetes mellitus.[1]

"Studies have proved that BNP has 32 amino acids. Pre-proBNP is a 108-amino-acid pro-hormone synthesized predominantly in the heart's left ventricleBecause it is a powerful vasodilator and natriuretic factor, the hormone regulates salt and water balance. The most frequent type of BNP found in human cardiac tissue is BNP-32. Two peptides that may be present in plasma are Nt-pro BNP and BNP-32. A simple test like this one may be used to assess cardiac health. Stretching the myocardial wall triggers pre-pro BNP, which is transformed into active BNP fragment and NT-pro BNP fragment. Left ventricular diastolic dysfunction and heart failure may be recognized using these data".[2]

"Studies have shown that the BNP test is effective in ruling out heart failure due to its strong negative predictive value. "BNP testing may be useful in monitoring heart failure patients since levels are reduced by treatment with ACE inhibitors, ARBs, spironolactone, and diuretics". After treatment, patients with chronic stable HF may have normal levels. An elevated BNP level may be the result of intrinsic cardiac dysfunction or lung or renal diseases. BNP was a compared to the NYHA classification and other cardiac state measures. Studies have shown that serum pro-BNP level was a strong predictor of risk of death and cardiovascular events in patients with heart failure or cardiac dysfunction".[2,3] pro-BNP levels should be examined, respectively in all patients who develop acute heart failure this may assist to confirm the diagnosis. Non-acute BNP and proBNP levels average 35 and 125 pg/mL, respectively.Short-term diagnostic thresholds are BNP and proBNP levels of 100 and 300 pg/mL, respectively. Monitoring ProBNP levels may prevent heart failure. Patients with heart failure who have proBNP levels above 450 pg/mL and are under 50 years old, 900 between 50 and 75 years old, and over 1500 pg/mL over 75 years old.[4,5,6,7,8] This study assessed pro-BNP levels in asymptomatic type 2 DM.

AIM

The purpose of the study was to evaluate and assess the levels as well as the clinical significance of pro-BNP levels in patients suffering from type 2 DM.

INCLUSION CRITERIA

1. "The study included patients diagnosed with type 2 DM who were asymptomatic for HF ".
2. Both male & female were included in the study with age groups ranging from 18 to 70 years.

EXCLUSION CRITERIA

1. Patients suffering from HF, septic shock, COPD, COF, hyperthyroidism, and nephropathy
2. Patients suffering from CAD, VHD, or both.

MATERIALS & METHOD

"In this prospective, observational, non-interventional cohort study, patients with type 2 DM who were hospitalized at Krishna Hospital and Medical Research Centre in Karad

participated".The Institutional Ethics Committee scrutinized and sanctioned the research protocols. Prior to the inclusion of any participants in the study, written and informed consent was obtained from them in both their native language and English". "The deceased body underwent a comprehensive examination. The blood pressure of the patient was measured in a supine resting position utilizing a precisely calibrated mercury sphygmomanometer. Two distinct measurements were captured at one-minute intervals, and the mean value was documented. The additional characteristics of the radial artery, including the heart rate, were observed for a complete duration of one minute".

STUDY POPULATION

The present reported to hopsital with total of 42 patients were involved to the wards and intensive care unit".

DUARTION OF STUDY

The research was carried out for a duration of "18 months, starting from October 2018 ending to May 2020".

STUDY SETTING

Individuals who were hospitalized at Krishna Hospital and Medical Research Center in Karad and diagnosed with type 2DM in accordance with ADA criteria were the subjects of the research.

ADA CRITERIA FOR DIAGNOSING DIABETES MELLITUS			
Diagnosis	**Fasting plasma glucose**	**2 hour plasma glucose during OGTT***	**HbA1c**
Normal	<100 mg/dl	<140 mg/dl	≤5.6 %
Impaired	100-125 mg/dl	140-199 mg/dl	5.7-6.4 %
Diabetic	>126 mg/dl	>200 mg/dl	≥6.5 %

TABLE 1: ADA CRITERIA FOR DIAGNOSING DM[9]

INVESTIGATIONS

All patients who were enrolled in the study underwent the following examinations. The FinecareTM pro-BNP Rapid Quantitative Test was employed to assess the pro-BNP level. The Finecare pro-BNP Rapid quantitative test, which utilizes fluorescence immunoassay, has the potential to be administered alongside the Finecare FIA system. The Finecare Pro BNP Rapid Quantitative Test is a diagnostic assay that utilizes fluorescence immunoassay technology. The Finecare Pro BNP Rapid Quantitative Test is an immunodetection assay that employs a "sandwich" methodology. Upon introduction of a blood sample into the detector well of the test, the fluorescence-labeled detector anti-pro BNP antibody selectively adheres

to the pro BNP antigen present in the blood. Upon migration via capillary action on the nitrocellulose matrix of the test strip, the complexes of detector antibody and pro-BNP are sequestered by anti-pro-BNP antibody that has been immobilized on the test strip. "The formation of complexes on the test strip is directly proportional to the amount of proBNP antigen present in the blood samples". This is the resultant effect. The quantity of pro-B-type natriuretic peptide (BNP) amassed is directly correlated to the luminescent indication of the sensor antibody.

	Age < 75 years	**Age > 75 years**
pro BNP (pg/mL)	0- 300 pg/mL	0-400 pg/mL

TABLE 2: REFERENCE RANGE OF PRO BNP FOR FINECARE PRO BNP FIA KIT[10]

OTHER BIOCHEMISTRY INVESTIGATIONS

1. Glycosylated haemoglobin was done by Latex Immunoturbidimetric method. Blood glucose by GOD POD based method.
2. Total cholesterol was done by CHOD PAP based method.
3. Triglycerides were done by GPO method.
4. "HDL by PVS PEGME coupled classic precipitation method".

- ✓ 2D echocardiography was done on VIVID E95 (general electronics).
- ✓ Urine Analysis was done by strip method Siemens company combistick.

STASTICAL ANALYSIS

Data analysis was formulated using IBM SPSS trial version 21. The chi square test involved mean, percentage correlation, standard deviation, age, and multiple correlation calculations. "A number of indicators exhibited a correlation with pro-BNP levels in the study". Researchers utilized Pearson's and Spearman's rank relation coefficients to evaluate these links. The correlation analysis' 'r' value was separated into three groups: strong (0.81), moderate (0.40-0.79), and weak (0.04-0.39). The statistical analysis of the data in this research involved the t-test and the Chi-Square test. A p-value below the statistical threshold of 0.005 was significant.

RESULT

AGE & GENDER

The study comprised 42 participants. Out of the entire sample, 16.68% of the subjects, comprising 3 males (14.29%) and 4 females (19.05%), were below 40 years of age. Within

the sample population, it was observed that six subjects (14.28%) fell within the age group of 41 to 50. Of these subjects, two (9.52%) were male and four (19.05%) were female. In the age group of 51 to 60 years, there were six male individuals, representing 28.57% of the group, and five female individuals, representing 23.81% of the group. Of the total subjects, 42.85% (n = 18) belonged to the age group of 61 to 70 years. Within this age group, 47.62% (n = 10) were male and 38.10% (n = 8) were female. The statistical significance of the pair was found to be lacking with a 'p' value of 0.77.

Age group (years)	**Males**		**Females**		**Total**	
	n=21	**%**	**n=21**	**%**	**n=42**	**%**
Less than 40	3	14.29	4	19.05	7	16.68
41 to 50	2	9.52	4	19.05	6	14.28
51 to 60	6	28.57	5	23.81	11	26.19
61 to 70	10	47.62	8	38.10	18	42.85
Total	21	100.00	21	100.00	42	100.00
(DF=12; χ^2=1.12;'p'=0.77)						

TABLE 3 : FREQUENCY DISTRIBUTION OF STUDY POPULATION ACCORDING TO AGE AND GENDER

SIGNIFICANCE OF PRO-BNP IN PATIENTS SUFFERING FROM TYPE 2 DM.

A. Pulse Rate & Blood Pressure

Our study included 42 subjects in total. Their vital signs (blood pressure, heart rate, and pulse) were taken as part of a regular medical procedure. Males had a mean pulse rate of 87.76 and 11.35 beats per minute, while females had a mean pulse rate of 90.28 and 15.95 beats per minute. "Male and female patients' pulse rates did not vary statistically significantly (p = 0.576). In comparison to females, males had a mean systolic blood pressure of 108.57 ±16.77 mm Hg". The mean SBP did not vary statistically significantly between males and females (p=0.235). Males had a mean diastolic blood pressure of 72.85± 7.83 mm Hg, while females had a mean diastolic blood pressure of 77.61± 8.30 mm Hg. Males and females had differing means for DBP, and the difference was statistically significant (p = 0.0475).

B. Blood Sugar, Serum Hba1c & Serum Creatinine Level

"Our study assessed serum creatinine, FBS, and HbA1c levels. Males had 187.52 (73.95 mg/dL) and females had 184.90 (56.65) MFBS. The mean statistical FBS between males and females did not vary statistically (p = 0.892)". After eating, males had a mean blood sugar of 203.57 (52.17 mg/dL) and females 203.80 (54.19). The mean postprandial blood sugar levels

did not vary statistically (p = 0.989) between males and females. Males had mean HbA1c levels of 8.47 mg/dL and females had 2.30 mg/dL. "The mean HbA1c levels in males and females did not vary statistically (p = 0.480). Males had MBCL of 0.94 ± 0.17 mg/dL, whereas females had 0.95 ± 0.19. Males and females showed identical MBCL (p = 0.878)".

C. Serum Lipids

"Males had a mean serum TGL concentration of 135.95 (35.36 mg/dL), whereas females had a mean concentration of 120.42 (37.59 mg/dL). With a p-value of 0.261, the study indicated no statistically significant difference in average serum TGL between male and female subjects". Total serum cholesterol levels averaged 153.19 32.34 mg/dL in males and 141 41.31 mg/dL in females. There was no statistically significant difference in the mean serum TC levels of males and females, as evidenced by a p-value of 0.287, according to the study. Males had a mean serum HDL level of 44.33 11.12 mg/dL, whereas females had a mean serum HDL level of 40.95 7.99 mg/dL. A p-value of 0.190 indicates that there is no statistically significant difference between the average serum HDL levels of male and female study participants. Males had a mean serum LDL level of 104.19 (33.55 mg/dL), whereas females had a mean serum LDL level of 91.95 (29.60 mg/dL). A p-value of 0.170 indicates that there was no statistically significant difference in the mean serum LDL levels between males and females. Males had a mean serum VLDL level of 26.57 5.19 mg/dL, whereas females averaged just 25.09 5.96 mg/dL. According to the results of the study, neither males nor females showed significantly different mean serum LDL levels (p = 0.451).

D. Serum Pro BNP & Left Ventricular Ejection Fraction (LVEF)

"In our study, the male participants exhibited a MLVEF of 44.33 ±10.93, while the female participants displayed a mean LVEF of 45.70± 12.85. The study findings indicate that there was no statistically significant variation in the mean LVEF between male and female participants, as evidenced by a p-value of 0.667. The mean serum proBNP level for males was 4545.28±7989.80 pg/mL, whereas for females it was 4388.4±5322.70 pg/mL. The study findings indicate that there was no statistically significant disparity observed in the mean serum proBNP levels between the male and female participants (p=0.45)".

Variables	**Males (Mean ± SD)**	**Females (Mean ± SD)**	**Significance ('p' value)**
Pulse rate (per minute)	87.76 ± 11.35	90.28 ± 15.95	=0.576
SBP (mm Hg)	119.52 ± 18.02	108.57 ± 16.77	=0.235
DBP (mm Hg)	72.85 ± 7.83	77.61 ± 8.30	=0.047
BSL F (mg/dL)	187.52 ± 73.95	184.90 ± 56.65	=0.892

BSL PP (mg/dL)	203.57 ± 52.17	203.80 ± 54.19	=0.989
HbA1C (%)	8.47 ± 2.30	8.07 ± 2.30	=0.480
Serum creatinine (mg/dL)	0.94 ± 0.17	0.95 ±0.19	=0.878
Serum TG (mg/dL)	135.95 ± 35.36	120.42 ± 37.59	=0.261
Serum total cholesterol (mg/dL)	153.19 ± 32.34	141 ± 41.31	=0.287
Serum HDL (mg/dL)	44.33 ± 11.12	40.95 ± 7.99	=0.190
Serum LDL (mg/dL)	104.19 ± 33.55	91.95 ± 29.60	=0.170
Serum VLDL (mg/dL)	26.57 ± 5.19	25.09 ± 5.96	=0.451
LVEF (%)	44.33 ± 10.93	45.70 ± 12.85	=0.667
pro BNP (pg/mL)	4545.28 ± 7989.80	4388.4 ± 5322.70	=0.45

TABLE 4: SIGNIFICANCE OF PRO-BRAIN NATRIURETIC PEPTIDE IN PATIENTS SUFFERING FROM TYPE 2 DIABETES MELLITUS.

LEVEL OF PRO-BNP WITH TYPE 2 DM.

The current investigation established a correlation between the pro-BNP level in the subjects under study and several parameters. The study found that the pro-BNP level exhibited a moderately positive correlation with age (r = 0.33), SBP (r = 0.45), DBP (r = 0.56), duration of T2DM (r = 0.63), HbA1c (r = 0.48) BSL-F (r = 0.50), BSL-PP (r = 0.35), LVDD (r = 0), LDL (r = 0.51), VLDL (r = 0.11), and albuminuria (r = 0.71 and 0.63) Additionally, a weak positive correlation was observed with pulse rate (r = 0.02), sr. triglyceride level (r = 0.010), and sr. total cholesterol level (r = 0.02). Conversely, pro-BNP exhibited a negative correlation with LVEF (r = -0.65) and serum HDL (r = -0.08).

Parameter	**'*r*' value**
Age	0.33
Pulse rate	0.02

SBP	0.45
DBP	0.56
Duration of DM	0.63
HbA1c	0.48
BSL F	0.50
BSL PP	0.35
LVEF	-0.65
LVDD	0.47
Sr. triglycerides	0.10
Sr. total cholesterol	0.02
Sr. HDL	-0.08
Sr. LDL	0.51
Sr. VLDL	0.11
Albuminuria	0.71
Glycosuria	0.63

TABLE 4: LEVEL OF PRO-BNP IN PATIENTS SUFFERING FROM TYPE 2 DM.

DISCUSSION

“There has been a rise in the incidence of diabetes mellitus in developing nations such as India. Type 2 DM patients are more susceptible to mortality due to heart failure. "By conducting a comparative analysis with previous research studies, this study aimed to assess the predictive ability of pro-BNP for heart failure in patients with type 2 DM."

AGE

"In our study, we enrolled 42 participants, the majority of whom were aged 61 to 70 years (42.86%), followed by 51 to 60 years (26.19%), and under 40 years of age (16.67%). The study participants' mean ages were 55.40 and 11.42 years. Age was observed to have a weak but positive correlation with pro-BNP levels in the study participants. (Significance level =

0.031; p value. Hui Gong et al. reported a positive correlation (p 0.05) between the pro-BNP level and the population age. The mean age of study participants was 64 years old. " Kumiko Hamano et al. reported that the mean age of the study population was 64.12 years and that there was a positive correlation between age and pro-BNP level (p = 0.001).[11] "P. Gaede et al. reported a significant positive correlation (p 0.001) between the mean age of the study population (58.6 years) and pro-BNP levels".[12] "Results showed a weak positive correlation between age and pro-BNP levels (p = 0.061)," reported Carsten Taschope et al. The mean age of the study population was 49 years plus 13 years.[13] "Rosiak M et al. found a similar positive correlation between age and pro-BNP level for their study population, who reported a mean age of 64.4 +/- 8.2 years".[14] Alain Bertoni et al. demonstrate a significant positive correlation between age and pro-BNP level (p = 0.05) in a study population with a mean age of 59.56.8 years.[15]

GENDER

42 subjects, comprising 21 (50%) males and 21 (50%) females, were enrolled in the present study. There was no statistically significant difference in reported mean proBNP levels between males (4545.28±7989.80 pg/mL) and females (4296.09±5322.70 pg/mL) (p = 0.45). However, studies have reported that females exhibited higher levels of pro-BNP than males. Yet , these studies cannot be directly compared with our present study due to the predominance of females in the population.

PULSE RATE

Our study's current population exhibited an average pulse rate of 89.02±13.55 beats per minute. Additionally, a mild positive correlation was observed between the pro-BNP level and pulse rate, with a 'p' value of 0.854. As per the past researches, the average pulse rate was recorded to be 72.8±10.4 beats per minute. Conversely, Masugata et al. observed a mean pulse rate of 685 beats per minute and established that it exhibited only a moderate correlation with proBNP levels (p = 0.024).[16] Further ,studies have concluded a positive correlation (p = 0.41) between pro-BNP and pulse rate. The aforementioned highlights the importance of the current pulse rate among individuals with diabetes, as evidenced by prior research, and aligns with the findings of the current investigation.

SBP &DBP

"In our study, males had an average SBP of 119.52±18.02 mm Hg and females 108.57±16.77 mm Hg. In the study, there was no statistically significant difference between males and females (p = 0.23), although there was a strong positive correlation between SBP and pro-BNP levels (p = 0.002)".

"The mean DBP for males was 72.855.73 mm Hg, whereas the mean for females was 77.618.30 mm Hg. DBP demonstrated a weak positive correlation with pro-BNP levels (p = 0.72) and showed statistical significance in both males and females. " Anuva Mishra et al. found that the mean diastolic blood pressure (SBP) among his study participants was 128.29 mm Hg and had a weak positive correlation with the pro-BNP levels (P = 0.46), while the mean diastolic blood pressure (DBP) was 827.8 mm Hg".[17] "In a study, Sasaki N et al.

observed a substantial positive correlation between SBP and proBNP (p 0.001) but only a weak positive correlation between DBP and proBNP (p=0.28).The mean systolic blood pressure was 128.29 mm Hg (p 0.001), and the mean diastolic blood pressure was 827.8 mm Hg (p 0.001). There was a strong positive correlation between the pro-BNP level and both of these tests.[18] A study by Masugata et al. found that "the mean systolic blood pressure (SBP) was 13013 mm Hg, and the mean diastolic blood pressure (DBP) was 696 mm Hg. (p = 0.59 and p = 0.45, respectively) SBP and DBP levels demonstrated a weak positive correlation with pro-BNP levels.[16]. " Another study found a weak positive correlation between pro-BNP and DBP (p = 0.45) and a substantial positive correlation between pro-BNP and SBP (p = 0.027). The study also found a substantial positive correlation between SBP and proBNP (p = 0.002) but only a weak positive correlation between DBP and proBNP (p = 0.39)". Rosiak M et al. reported a weak positive blood pressure correlation (p = 0.5 and p = 0.33) between pro-BNP levels and both systolic and diastolic blood pressure.[14] A weak positive correlation (p = 0.3) between DBP and pro-BNP was observed by Alain G. Bertoni et al.[19] Therefore, the present study's findings are in agreement with the aforementioned studies.

Diabetes Mellitus

"The current investigation recruited a total of 42 participants. Among the evaluated subjects, 23 individuals (54.77%) had a diabetes mellitus diagnosis for a duration of less than five years. The mean duration of diabetes mellitus for the remaining 19 subjects (45.23%) was 4.6±4.32 years. Individuals with a mean duration of diabetes mellitus of less than five years exhibited an average pro-BNP level of 1235.08± 1217.54 pg/mL, whereas those with a mean duration of diabetes mellitus exceeding five years demonstrated an average pro-BNP level of 8276.94 ±8483.48 pg/mL". "A significant statistical correlation (p0.01) was observed between individuals who had been diagnosed with DM for less than 5 years and those who had been diagnosed with DM for more than 5 years. An observed correlation of moderate strength (r = 0.63) was found between the duration of DM and proBNP levels".

"In a study similar to the current one, Kumiko Hamno et al. reported a mean diabetes mellitus duration of 95 years and a present positive correlation with proBNP (p = 0.029). "Kursat Dal et al. reported a substantial decrease in pro-BNP levels in the study group (p 0.001)" after improved glycemic management".[20] "According to studies, the average age of people with diabetes in the study group was 7.5–3.5 years. In studies, a strong correlation (p = 0.05) has been reported between the duration of diabetes mellitus and the level of proBNP. Consequently, the present study was similar to previous studies".

FBSL & PPBSL

The current investigation investigates the levels of BS during periods of fasting and after meals. The mean FBGC following a period of fasting was found to be 186.21 (65.08 mg/dl), whereas the mean postprandial BG concentration was observed to be 203.69 (52.54 mg/dl). A stastistically significant positive correlation (p 0.001) was observed between fasting blood sugar and proBNP, while a similar correlation (p = 0.002) was found between PPBSL and proBNP. Consequently, the research aforementioned and the current study were indistinguishable.

Serum Hba1c Level

The current study has identified a robust positive correlation (p 0.001) between the levels of HbA1C and proBNP. The arithmetic average of the HbA1C level among the participants in the study group was 8.26% (2.14%).The concentration of pro-BNP was found to be 927.85 3662.094 pg/mL in individuals with a HbA1c level of 7%, whereas it was observed to be 5486.6 7635.7671 pg/mL in individuals with a HbA1c level greater than 7%. The correlation between the two variables was found to be positively significant (p 0.01). The current study is supported by many past studies which revealed that the average HbA1c level was 11.0 +/- 2.5%. Hence, The current study's results align with those of previous research.

Lipid Profile Parameters

The current investigation reports the average serum triglyceride level to be 128.19± 36.89 mg/dL, the average total cholesterol level to be 147.09 ±37.16 mg/dL, the average HDL level to be 42.64 ± 9.71 mg/dL, the average LDL level to be 98.07 ±31.35 mg/dL, and the average VLDL level to be 25.83 ± 5.57 mg/dL. The study revealed a correlation between elevated pro-BNP levels and specific components of the LID profile. The pro- BNP exhibited a weak positive correlation with TC (p = 0.887), TGL (p = 0.502), and VLDP (p = 0.483), while showing a negative correlation with HDL (p = 0.604) and LDL (p = 0.52).

Consistent with the current investigation, ,many researches have documented a modestly favorable association between pro-BNP and overall serum cholesterol (p = 0.59), pro-BNP and TGL (p = 0.75), pro-BNP and HDL (r = -0.082), pro-BNP and serum LDL (p = 0.27), and pro-BNP and VLDL (p = 0.45). The results indicate that HDL exhibited a negative correlation (r = -0.012) with pro-BNP, while TC and serum TGL displayed weak positive correlations (p = 0.269 and p = 0.43, respectively).The results obtained from the current investigation are consistent with the outcomes of prior research studies.

Left Ventricular Diastolic Dysfunction

"Our study revealed that among the 42 subjects, 15 (35.72%) exhibited grade I LVDD, 13 (30.95%) exhibited grade II LV diastolic dysfunction, 12 (28.56%) exhibited normal LV diastolic function, and a mere 2 (4.76%) exhibited grade III LV diastolic dysfunction. The presence of LVDD has been linked to increased levels of pro-BNP.The study revealed a significant positive correlation (p<0.001) between the level of pro-B-type natriuretic peptide (BNP) and left ventricular (LV) diastolic dysfunction. The mean proBNP levels for subjects with normal diastolic dysfunction were 536.15 ± 5586.66 pg/mL, whereas those with impaired LVDF had mean proBNP levels of 5231.48 ± 7090.97 pg/mL. There was a statistically significant difference (p = 0.01) observed between subjects with normal diastolic function and those without".

Urine Albumin

The current investigation revealed a lack of statistical significance in the disparity of urine albumin levels between genders ($p = 0.46$). The study found a statistically significant positive correlation ($p < 0.001$) between levels of urine albumin and proBNP, suggesting a relationship between the two variables. The average pro-BNP concentration among individuals who exhibited negative results in their urine tests was 827,528,081 picograms per milliliter. A significant association was observed by many studies between the levels of pro-BNP and urine albumin (p 0.05). The present study is closely linked to the previous research findings.

Urine Sugar

The current investigation revealed that out of the total sample size of 33 subjects, 18 individuals (42.86%) exhibited a measurable concentration of sugar in their urine, while the remaining 15 subjects (35.71%) demonstrated a standard urine analysis. Out of the total participants, only one individual (2.38%) exhibited urine sugar levels of 2 or more, while eight subjects (19.05%) demonstrated levels of 1 or more. The study found that individuals with glycosuria had a mean proBNP level of 7196±7314 pg/mL, while those without glycosuria had a mean level of 1367.4±5553.478 pg/mL. Statistical significance was observed when comparing proBNP levels among subjects with and without glycosuria. Although there was no statistical significance observed between genders, a positive correlation was noted between levels of urine albumin and pro-BNP ($p< 0.001$). Further investigation is necessary to draw definitive inferences concerning this yet-to-be detected range.

Correlation Between Pro BNP Levels With Diabetic Retinopathy.

The current investigation examined the average proBNP levels among individuals with and without DR. The study found that the average pro-BNP level among individuals with retinopathy was 8007.55±8764.56 pg/mL, while those without retinopathy had an average pro-BNP level of 3299.81±2345.20 pg/mL. The statistical significance of the proBNP level was observed in both subjects with and without retinopathy ($p = 0.023$). Studies have revealed that patients diagnosed with diabetic retinopathy exhibited elevated levels of pro-BNP ($p<0.001$).The current investigation is therefore connected to the previously mentioned studies.

CONCLUSION

Studies have proved in past that HF can be closely related to Type 2 DM. Hence,type 2 DM has become a global concern as the number of patients with the disease increases in India. In our present study we conducted type 2 DM patients blood proBNP levels relations. Henceforth , we come to conclusion that pro-BNP showed a absolute link with DDS and a false relation with LVEF. Thus,Pro-BNP levels in type 2 DM patients may suggest for HF and its prognosis.

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