International Journal of Advances in Medicine
Senthilnathan K et al. Int J Adv Med. 2023 Mar;10(3):212-216
http://www.ijmedicine.com
pISSN 2349-3925 | eISSN 2349-3933
DOI: https://dx.doi.org/10.18203/2349-3933.ijam20230359

Original Research Article

Study of albuminuria in heart failure patients- an original research article

Kaushik Senthilnathan[1]*, Vrinda Kulkarni[2], Sudhir D. Dhokar[2], Meghna V. Pose[2]

[1]Department of Neurology, Madha Medical College, Chennai, Tamil Nadu, India
[2]Department of Medicine, BYL Nair Hospital, Mumbai, Maharashtra, India

Received: 24 May 2022
Revised: 13 December 2022
Accepted: 02 February 2023

***Correspondence:**
Dr. Kaushik Senthilnathan,
E-mail: kaushik1944@gmail.com

ABSTRACT

Background: Heart failure is associated with albuminuria, frequently microalbuminuria and it has shown to correlate with the severity of heart failure.
Methods: Prospective observational study. Hundred patients were studied, with albuminuria being measured before and after correction of heart failure.
Results: One third of patients with heart failure had microalbuminuria. No correlation of albuminuria with severity of heart failure was found. The decrease in albuminuria following treatment of heart failure was statistically significant.
Conclusions: This study shows association of albuminuria to be statistically associated with heart failure and its reversibility with treatment of heart failure.

Keywords: Albuminuria, Heart failure, Albumin creatine ratio

INTRODUCTION

Albuminuria is a marker of renal injury that can often be detected earlier than any tangible decline in glomerular filtration rate.[1] Initially thought of as only a marker for decline in renal function, albuminuria has been found to be a risk factor for cardiovascular morbidity and mortality as well.[2] Myriad pathophysiological mechanisms may underlie the relationship between renal and cardiovascular disease, including insulin resistance, inflammation, and endothelial dysfunction.[3] Lot of interest has been generated in the association of albuminuria in heart failure patients. The albuminuria is seldom macroalbuminuria, it is frequently microalbuminuria and reversal are found in most of the patients as heart failure resolves.[4] It has been found in some studies that the severity of albuminuria is directly related to the severity of congestive cardiac failure.[5] Killip classification is used to classify heart failure in the present study.

Aims and objectives

Aims and objectives were to study prevalence of albuminuria in heart failure patients, to correlate between the severity of heart failure and albuminuria, and to demonstrate reversibility of albuminuria with treatment of heart failure.

METHODS

Study design

It was a prospective observation study.

Source of data

The present study was carried out in a tertiary care hospital over period of 18 months.

Study place

The study was conducted at the BYL Nair Hospital, Mumbai.

Study period

The study was conducted from June 2017 to December 2018.

Inclusion criteria

Patients aged 18 years and older, diagnosed as heart failure by clinical examination and patients giving consent were included.

Exclusion criteria

Patients with age less than 18 years, and patients not giving consent were excluded.

Hundred heart failure patients admitted in medicine wards, medicine ICU and cardiac ICU were taken up for study. Detailed history and clinical examination of patients was done to classify the severity of congestive cardiac failure according to Killip classification. All routine investigations including CBC, RFT, LFT ECG and lipid profile were recorded. The amount of albuminuria was estimated by albumin to creatinine ratio in two random urine samples. First spot urine test was done on admission before treatment was started, urine albumin and creatinine are measured and then the ratio of the two gives the value of urine albumin creatinine ratio 1 (UACR1). Repeat clinical examination was done to look for resolution of heart failure. The reduction in crepitations on lung auscultation was taken to be suggestive of successful treatment of heart failure. Repeat spot urine test was done after heart failure resolved, again urine albumin and creatinine were measured and their ratio gave the value of urine albumin creatinine ratio 2 (UACR2).

Ethical committee approval obtained in January 2017 from the ethical committee of Topiwala National Medical college.

Statistical analysis

Sample size was calculated using the formula given where N is sample size, Z is Z value for level of confidence, for level of confidence of 95%=Z value is 1.96, P is expected prevalence=30%, and D (error allowed) is taken as 9%.

$$N = \frac{Z^2 \times p(1-p)}{D^2}$$

Using all the above values,

$$N = \frac{1.96 \times 1.96 \times 0.3 \times 0.7}{0.09 \times 0.09}$$

N=101 rounded to 100 for simplicity.

Chi square test and paired t tests used to asses statistical significance. Data tabulated using statistical package for the social sciences (SPSS) software.

Results are calculated using SPSS software.

RESULTS

In the present study 60 percentage of patients were in the age group of 41-60 years, 25 percentage of patients were in the age group of 21-40 years, 13 percentage of patients were in the age group of more than 60 years of age (Figure 1).

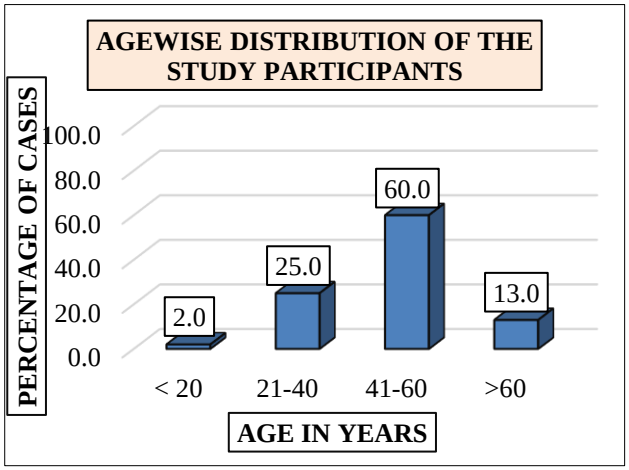

Figure 1: In the present study 60 percentage of patients were in the age group of 41-60 years, 25 percentage of patients were in the age group of 21-40 years, 13 percentage of patients were in the age group of more than 60 years of age.

In the present study 52 percentage of patients were female and 48 percentage were male out of a total of 100 patients (Figure 2).

Further, in the present study 46 percentage of patients were diagnosed as IHD (ischaemic heart disease), 43 percentage of patients were diagnosed with RHD (rheumatic heart disease), another 11 percentage were diagnosed with DCMP (dilated cardiomyopathy) (Figure 3).

Also, in the present study 59 percentage patients belonged to Killip's class 2, 32 percentage of patients belonged to Killip's class 3, 9 percentage belonged to Killip's class 4 (Figure 4).

In the study at the time of diagnosis of heart failure, 33 percentage of patients have microalbuminuria, 13 percentage of patients had albuminuria. Rest 54 percentage of patients had urine albuminuria in the normal range (Figure 5).

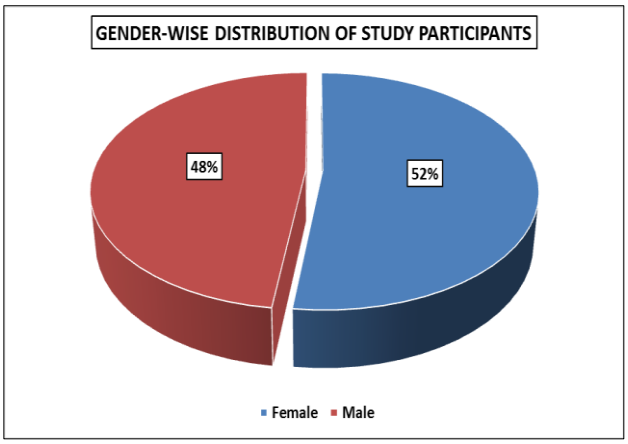

Figure 2: In the present study 52 percentage of patients were female and 48 percentage were male out of a total of 100 patients.

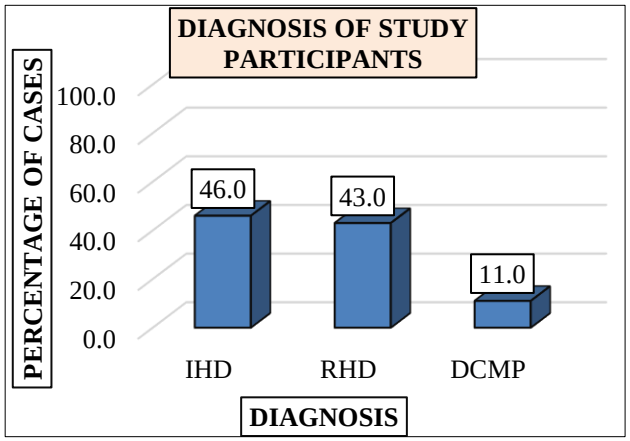

Figure 3: In the present study 46 percentage of patients were diagnosed as IHD, 43 percentage of patients were diagnosed with RHD, another 11 percentage were diagnosed with DCMP.

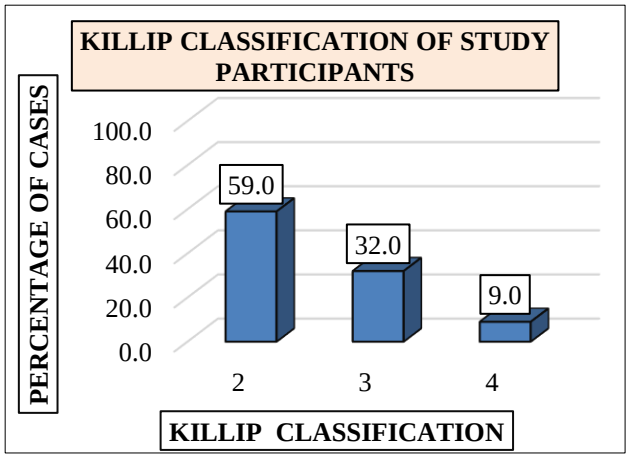

Figure 4: In the present study 59 percentage patients belonged to Killip's class 2, 32 percentage of patients belonged to Killip's class 3, 9 percentage belonged to Killip's class 4.

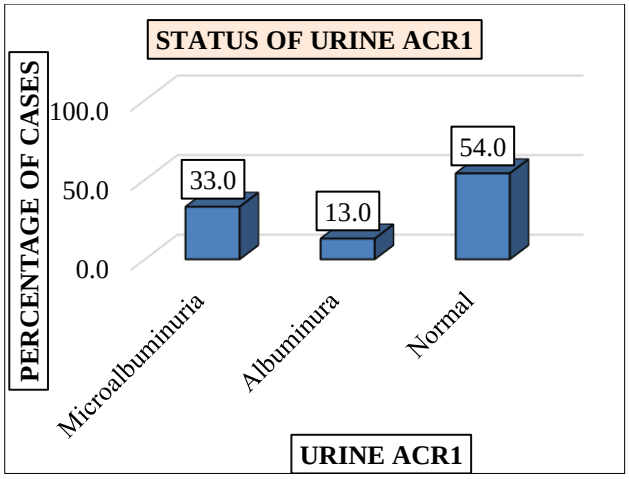

Figure 5: In the study at the time of diagnosis of heart failure, 33 percentage of patients have microalbuminuria, 13 percentage of patients had albuminuria. Rest 54 percentage of patients had urine albuminuria in the normal range.

After resolution of heart failure, the percentage of patients having microalbuminuria decreased to 25. Patients having albuminuria reduced to 10 percentage (Figure 6).

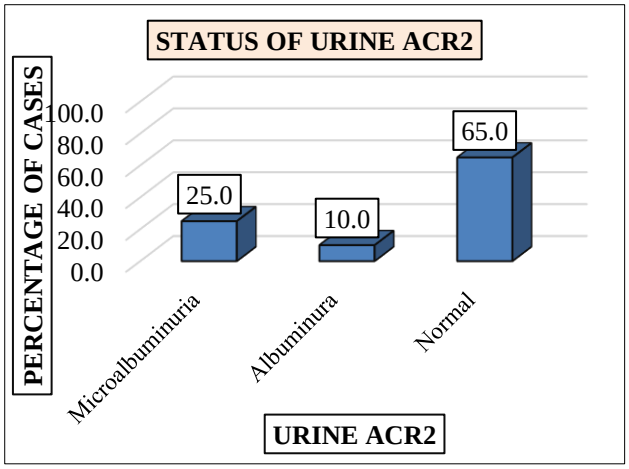

Figure 6: After resolution of heart failure, the percentage of patients having microalbuminuria decreased to 25. Patients having albuminuria reduced to 10 percentage.

The graph in Figure 7 shows the relationship between patients having albuminuria and Killip class.

In the present study the correlation between albuminuria and severity of heart failure is not statistically significant, as the p value is more than 0.05 (0.2002).

Comparing urine ACR 1 and urine ACR 2 values it is inferred that the difference of patients with microalbuminuria before and after heart failure is statistically significant (Figure 8).

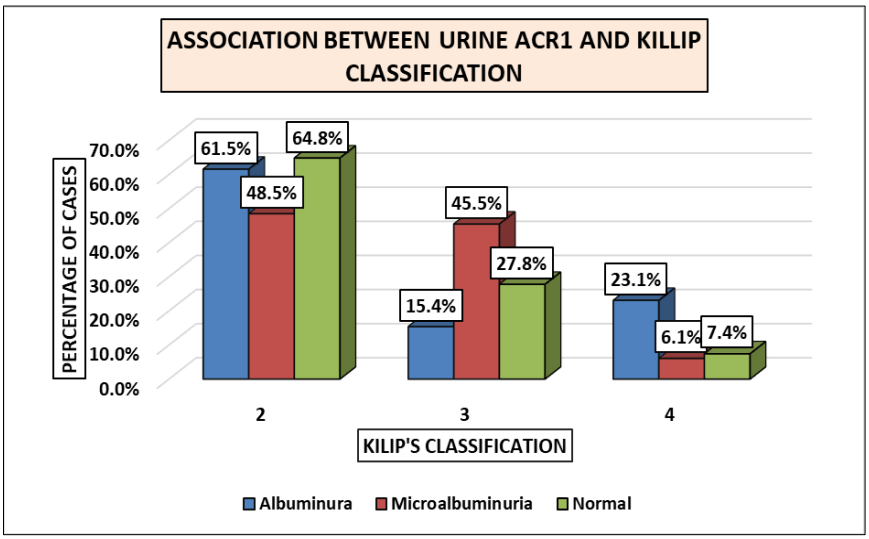

Figure 7: The graph shows the relationship between patients having albuminuria and Killip class. In the present study the correlation between albuminuria and severity of heart failure is not statistically significant, as the p value is more than 0.05 (0.2002).

Table 1: Urine ACR1 with Kilip classification.

Urine ACR1	Kilip classification			Total
	2	3	4	
> 0.03				
Count	24	17	5	46
% within urine ACR 1	52.2	37.0	10.9	100.0
Normal				
Count	35	15	4	54
% within urine ACR 1	64.8	27.8	7.4	100.0
Total				
Count	59	32	9	100
% within urine ACR1	59.0	32.0	9.0	100.0
P value	0.2002	0.3267	0.405	

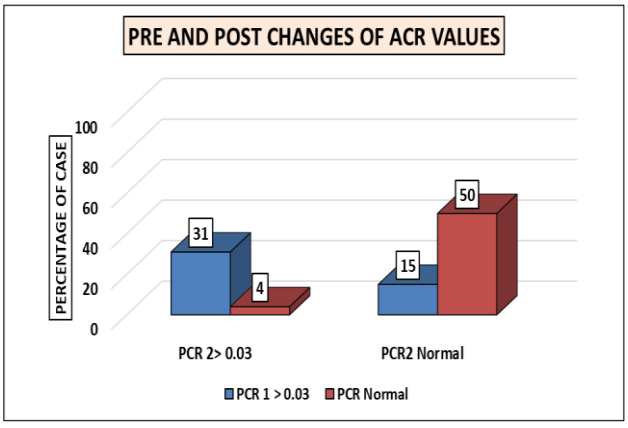

Figure 8: Comparing urine ACR 1 and urine ACR 2 values it is inferred that the difference of patients with microalbuminuria before and after heart failure is statistically significant.

Table 2: Comparison of difference between urine ACR1 and ACR2.

Urine ACR1	Urine ACR2
>0.03	
Count	31
% within urine PCR 1	67.4
% within urine PCR 2	88.6
Normal	
Count	4
% within urine PCR 1	7.4
% within urine PCR 2	11.4
Total	
Count	35
% within urine PCR 1	35.0
% within urine PCR 2	100.0
P value	0.019

DISCUSSION

Heart failure is one of the leading causes of death in the world.[6] The present study's aim was to look for the association between albuminuria and heart failure. Reversibility of albuminuria with heart failure was also studied. Figure 1 shows the age wise distribution of patients in the current study, with 60% of patients being in the 41-60 years age group. Figure 2 shows the gender wise distribution of patients with females accounting for 52% and males for 48%. Figure 3 shows the etiology wise distribution of the heart failure patients with IHD being the most common with 46% cases, RHD accounting for 43% cases and DCMP accounting for 13%. This is consistent with a previous review done on epidemiology of heart failure in India.[7]

Figure 4 shows distribution of patients based on Killip's class, 59 patients belonged to Killip class 2, 32 patients belonged to Killip class 3, 9 belonged to Killip class 4. Majority of patients in the study belonged to Killip class 2. Table 5 shows distribution of cases based on ACR value at the time of heart failure, 33 percentage of patients have microalbuminuria, 13 patients had albuminuria. Rest 54 patients had urine albuminuria in the normal range.

This is consistent with the previous study by Van der Wal et al in 2005, prevalence of micro albuminuria was found to be 30 percentage.[4]

In the present study Killip classification was used to grade the severity of heart failure. Figure 6 shows distribution of patients based on urine ACR1 value and Killip class. The percentage of patients with no albuminuria having Killip class 2, 3 and 4 are 64, 27 and 7 percentage respectively. While patients with micro albuminuria and albuminuria the percentage of patients with Killip class 2, 3 and 4 are 52, 37 and 11 percentage respectively. The correlation between albuminuria and Killip class was not statistically significant (p=0.2).

After the resolution of heart failure, as shown in Figure 6, the prevalence patients with micro albuminuria reduced to 25 and albuminuria to 10 patients. Similar findings were noted in the study by Albright et al in 1983 that demonstrated that modest albuminuria is a frequent feature of CHF and that this albuminuria reverses promptly with successful CHF therapy.[8]

In the present study the differences in albuminuria before and after treatment was found to be statistically significant (p=0.019).

Limitations

Limitations of the study include: small sample size, other confounding factors influencing proteinuria could not be ruled out, and lack of follow up of patients with persistent proteinuria.

CONCLUSION

The present study concludes that patients with heart failure may develop micro albuminuria or albuminuria, which reverses on treatment. The prevalence of albuminuria is 13% and microalbuminuria is 33% among patients with heart failure in the current study. The study also concludes that the correlation between albuminuria and severity of heart failure was not statistically significant. The change in albuminuria on correction of heart failure was statistically significant.

Among patients whose albuminuria did not reverse with treatment, further monitoring is required to look for causes of renal failure. Whether albuminuria is a risk factor for heart failure, can be ascertained only after further prospective trials in the future.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Cravedi P, Remuzzi G. Pathophysiology of proteinuria and its value as an outcome measure in chronic kidney disease. Br J Clin Pharmacol. 2013;76(4):516-23.
2. Currie G, Delles C. Proteinuria and its relation to cardiovascular disease. Int J Nephrol Renovasc Dis. 2013;7:13-24.
3. Vallianou NG, Mitesh S, Gkogkou A, Geladari E. Chronic Kidney Disease and Cardiovascular Disease: Is there Any Relationship? Curr Cardiol Rev. 2019;15(1):55-63.
4. Jackson CE, Solomon SD, Gerstein HC, Zetterstrand S, Olofsson B, Michelson EL, et al. Albuminuria in chronic heart failure: prevalence and prognostic importance. Lancet. 2009;374(9689):543-50.
5. Bandyopadhyay SK, Ghosh S, Bandyopadhyay R, Ghosh S, Sarkar N. Micro-albuminuria: a predictor of 7-day mortality in acute myocardial infarction. J Indian Med Assoc. 2010;108(12):826-8.
6. Schocken DD, Arrieta MI, Leaverton PE, Ross EA. Prevalence and mortality rate of congestive heart failure in the United States. J Am Coll Cardiol. 1992;20(2):301-6.
7. Huffman MD, Prabhakaran D. Heart failure: Epidemiology and prevention in India. Natl Med J India. 2010;23(5):283-8.
8. Albright R, Brensilver J, Cortell S. Proteinuria in congestive heart failure. Am J Nephrol. 1983;3(5):272-5.

Cite this article as: Senthilnathan K, Kulkarni V, Dhokar SD, Pose MV. Study of albuminuria in heart failure patients- an original research article. Int J Adv Med 2023;10:212-6.