

Cardiovascular manifestations in chronic renal failure patients on hemodialysis

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ABSTRACT

Objectives: To study the characteristics of hemodialized patients included in the study and demonstrate patterns of cardiovascular manifestations in patients as well as the impact of duration of dialysis on these manifestations.

Methods: This is a cross-sectional descriptive study carried out on patients undergoing regular hemodialysis in the Dialysis Unit, Al-Thawra General Hospital, Sana'a, Yemen, between September 2000 and December 2000.

Results: This study was carried out on 50 patients who were on regular hemodialysis; the male to female ratio was 1.3:1 with a mean age of 39.8 ± 12.6 years and mean dialysis duration of 61.3 ± 7.57 months. The study revealed the following results: 78% of patients have hypertension with mean systolic blood pressure (BP) of 151 ± 32 mm Hg and

mean diastolic BP of 94 ± 19 mm Hg, valvular dysfunctions were found in 70%, heart failure in 50%, ischemic changes in 34% and finally 26% of patients have pericardial effusion whereas only one patient (2%) has pericardial rub.

Conclusion. We conclude that cardiovascular manifestations in Al-Thawra General Hospital were found higher than what has been found in other centers worldwide. We recommend to re-evaluate the practice in this department particularly the efficiency of dialysis and follow up of the patients. Statistically there was no significant correlation between the duration of dialysis and cardiovascular manifestations.

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Chronic renal failure (CRF) is defined as a long standing irreversible impairment of renal functions that results in a syndrome of complex multi organ derangement.¹ Chronic renal failure is one of the major medical health problems in the world. Regarding this problem in Yemen there were no available studies on the incidence or prevalence of CRF except for some studies, which would not give a complete picture in Yemen. Different organ systems are affected and of these, the cardiovascular system is one of the vital systems that are affected by different pathophysiological disorders, which vary in extent and distribution. Several studies have carried out and described the percentages of the cardiovascular manifestations and threw lights on the different aspects of them and showed that cardiac

abnormalities commonly develop during CRF initiating therapy of CRF and it appear to be getting higher. In addition, it is found that the cardiac disorders are the most common reported causes of death among patients with CRF, which accounted for approximately 48% of causes of death.² Finally, we carried out this research to throw lights upon the cardiovascular manifestations in patients with CRF and provide the related authorities and interesting health workers with information describing this situation.

Methods. The study was carried out in hemodialized patients in the Al-Thawra General Hospital, Sana'a, Yemen. The study is a cross-sectional

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descriptive study that was carried out between September 2000 and December 2000. Fifty patients were included in the study. The criteria used to choose patients are patient who has been diagnosed with CRF on regular hemodialysis and excluded patients with cardiovascular diseases before developing CRF. The total number of patients on regular hemodialysis in this renal unit was 140. The data was collected by direct interview with each patient during dialysis. A complete history was taken and full physical examination was carried out for every patient including fundal examination of the retina under supervision of medical and ophthalmologic specialists. After that electrocardiography, posteroanterior chest x-ray and echocardiography were carried out for all patients included in this study. The findings were read by the medical specialist with cardiac and radiological consultation. The data was collected and concentration was paid on cardiovascular manifestations and it is wise to mention that heart failure was diagnosed according to Framingham criteria and hypertension was diagnosed and classified according to the classification of National Joint Committee. The data was entered on the IBM computer and SPSS program was used for data entry and statistical analysis.

Results. Fifty patients with CRF on hemodialysis were included in the study. The male to female ratio was 1.3:1 and the majority of the patients were within the age group 31-40 years, with a mean age of 39.8 ± 12.6 years (**Table 1**). Approximately 68% of the patients (34) were neither Khat chewer nor smoker. The most common finding was hypertension that was diagnosed in 78% of the patients, whereas 70% had valvular dysfunctions, 50% had heart failure, 34% had ischemic heart diseases, 26% had pericardial effusion, whereas 2% developed pericardial rub (**Table 2**). Hypertension was the most frequent manifestation in which mild hypertension was the most common form (**Table 3**). Among hypertensive patients, grade 3 hypertensive retinopathy was found in 33.3%. The relationship between duration of hemodialysis and hypertension statistically was not significant ($p=0.77$) (**Table 4**). Prominent aortic knuckle was found in 5.1% on chest x-ray examination, strain

pattern was found in 22% on electrocardiography, left ventricular hypertrophy was found in 92.4% on echocardiography examination. Valvular dysfunction was the second most frequent manifestation with the mitral valve regurge the most frequent valvular dysfunction that was found in 40%, and tricuspid regurge was found in 38% of cases (**Table 5**). The most frequent valvular dysfunction was found in those with duration of dialysis of more than 8 years. Heart failure was the third most frequent manifestation, which was diagnosed in 50% in which with dyspnea was the most frequent symptom, which was complained by 80% of patients with heart failure while raised jugular venous pressure was positive in 56%. Cardiomegally was the most frequent sign, which was found in 92% of patients with heart failure, and diastolic dysfunction was found in 68% (**Table 6**). The affected group with regard to the duration of hemodialysis was mostly among the duration group (>2-4) years (**Table 7**). Ischemic heart disease was found in 34% with the male to female ratio of 2:1, the most affected age group was 31-40 years (**Table 8**). There was no significant relationship between duration of hemodialysis and manifestations of ischemic heart disease, (p value = 0.589). Pericardial effusion was found in 26% with male to female ratio of 1.8:1. The affected group according to the duration of dialysis was <1 year and there was no significant relationship between this manifestation and the duration of dialysis, (p -value = 0.386).

DISCUSSION. In our study the male to female ratio was 1.3:1 and this is consistent with other ratios in different countries. The gender with regard to cardiovascular manifestations was variable, for example the hypertension male to female ratio was 1:1.6, while heart failure the male to female ratio was 1:1.1, ischemic heart disease the male to female ratio was 1.8:1 and pericardial effusion the male to female ratio was 1.6:1. Male gender has been shown to be predictive of coronary artery disease in dialysis population.³

In cohort study by Harnett et al,⁴ gender was not predictive of congestive heart failure while in the same group of patients female gender was predictive of left ventricular dilatation. Increasing age has been shown to

Table 1 - Sex distribution according to age group and cardiovascular diseases.

| Sex | Age group | | | | | | Cardiovascular diseases | | | |
|------------|-----------|-------|-------|-------|-------|-----|-------------------------|----|------|----|
| | ≤20 | 21-30 | 31-40 | 41-50 | 51-60 | >60 | PE | HF | IC | HT |
| Male (%) | 10.7 | 10.7 | 39.3 | 25 | 10.7 | 3.6 | 16.5 | 48 | 64.5 | 39 |
| Female (%) | 4.5 | 22.7 | 36.4 | 22.7 | 9.1 | 4.5 | 38.5 | 52 | 35.5 | 61 |

PE - pericardial effusion, HF - heart failure, IC - ischemic changes, HT - hypertension

Table 2 - Distribution of cardiovascular diseases in chronic renal failure patients on hemodialysis.

| Types of CV manifestations | Patients % |
|--|------------|
| Hypertension | 78 |
| Valvular dysfunction | 70 |
| Heart failure | 50 |
| Ischemic changes | 34 |
| Pericardial effusion | 26 |
| Each patient may suffer from >1 type of cardiovascular disease. CV - cardiovascular | |

Table 3 - Severity of hypertension in chronic renal failure patients.

| Severity of hypertension | Systolic blood pressure | | Diastolic blood pressure | |
|--------------------------|-------------------------|--------|--------------------------|--------|
| | n | (%) | n | (%) |
| Mild | 14 | (35.9) | 14 | (35.9) |
| Moderate | 9 | (23.1) | 10 | (25.6) |
| Severe | 9 | (23.1) | 9 | (23.1) |
| Very severe | 7 | (17.9) | 6 | (15.4) |

Table 4 - Distribution of cardiovascular diseases according to duration of dialysis.

| Duration of dialysis | n of cases | HT % | HF % | VD % | IC % | PE % |
|--|------------|-------|-------|-------|-------|-------|
| <1 | 12 | 83.3 | 20 | 58.3 | 33.3 | 41.7 |
| 1-2 | 6 | 66.7 | 16 | 66.7 | 16.7 | 33.3 |
| >2-4 | 14 | 85.7 | 20 | 64.3 | 28.6 | 14.3 |
| >4-8 | 9 | 77.8 | 24 | 77.8 | 55.6 | 11.1 |
| >8 | 9 | 66.7 | 20 | 88.9 | 33.3 | 33.3 |
| Chi square | | 1.764 | 4.351 | 1.452 | 2.846 | 4.147 |
| p-value | | 0.779 | 0.357 | 0.811 | 0.584 | 0.386 |
| HT - hypertension, HF - heart failure, VD - valvular dysfunction, IC - ischemic changes, PE - pericardial effusion | | | | | | |

Table 5 - Valvular dysfunctions in patients with chronic renal failure.

| Type of valvular dysfunction | Patients % |
|---|------------|
| Mitral valve regurgitation | 66 |
| Mitral valve sclerotic changes | 10 |
| Aortic valve regurgitation | 40 |
| Aortic valve sclerotic changes | 20 |
| Tricuspid valve regurgitation | 38 |
| Tricuspid valve sclerotic changes | 4 |
| Each patient may suffer from >1 type of the valvular dysfunctions | |

Table 6 - Clinical and investigation findings within heart failure patients with chronic renal failure.

| Findings | n | (%)* |
|--|----|------|
| Dyspnea | 20 | (80) |
| Night cough | 13 | (52) |
| Raised jugular venous pressure | 14 | (56) |
| Hepatomegaly | 17 | (68) |
| Basal crepitation | 10 | (40) |
| Lower limb edema | 6 | (24) |
| Third heart sound gallop | 9 | (36) |
| Cardiomegaly | 23 | (92) |
| Pleural effusion | 5 | (20) |
| Pulmonary congestion | 6 | (24) |
| Left ventricular hypertrophy | 2 | (8) |
| Diastolic dysfunction | 17 | (68) |
| Systolic dysfunction | 6 | (24) |
| Ejection fraction <50 | 4 | (16) |
| *Each patient may suffer from >1 type of the clinical or investigation findings. Twenty-five patients suffered heart failure | | |

Table 7 - Distribution of patients according to the duration of dialysis.

| Duration of dialysis in years | Patients % |
|-------------------------------|------------|
| <1 | 24 |
| 1-2 | 14 |
| 2-4 | 28 |
| 4-8 | 18 |
| >8 | 18 |

Table 8 - Distribution of patients with ischemic changes according to the age group.

| Age groups (years) | Patients % |
|--------------------|------------|
| <20 | 17.6 |
| 21-30 | 17.6 |
| 31-40 | 35.4 |
| 41-50 | 17.6 |
| 51-60 | 11.8 |

be a predictor of a number of cardiac conditions among chronic renal failure patients. Among patients starting dialysis in Australia, coronary arterial disease was reported in 21% of patients aged 35-54 years, 47% of patients aged 55-64 years and 55% of patients, 65-74 years.⁵ Similarly in data from the Canadian chronic renal failure registry showed that patients >45 years had much higher prevalence of history of myocardial infarction. Our patient were found to develop cardiovascular manifestations younger than those in other studies and the most frequent affected age in our study was those among age group 31-40 years. Cardiovascular manifestations in which hypertension found to be the most common with 78% concomitant with other studies,^{6,7} but on the other hand, unexpectedly hypertension in our patients was not controlled by hemodialysis, this can be attributed to insufficiency hemodialysis in our patients. Another very important point is that the most common age group in our patients was 31-40 years and this may be due to early death of our patients that may be caused by ineffective hemodialysis that initiates early development of complications. However, it is greater than the percentage in other studies in the world which was 50%.⁹ Mitral regurgitation was the most common abnormality (66%) which is consistent with other studies.¹⁰ Heart failure is present in 50% of patients which is lesser than that occurs in other studies¹¹⁻¹³ and this result can be attributed to unexpected early death in our patients which may be due to insufficient management. Ischemic changes were present in 34% and this result is higher than other studies which was 19.4%.^{14,15} Pericardial effusion was found in 26%. This result is greater than that in another local study which was equal to 14%. However, the result is lesser than that found in other studies in which pericardial effusion was present in over than 62%.¹⁶ This can be attributed to the same reason described previously.¹⁷ Left ventricular hypertrophy was found in 92.4% of our patients which is greater than that in other studies which was equal to 40% (40-60%)¹⁸⁻²⁰ and this can be explained by poor control of hypertension. Finally, it is wise to mention that the relationships between different variables in some aspect of this were not significant and this may be explained by the small size of the sample.

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