

Assessment of Hemodialysis Adequacy in patients with Chronic Kidney Disease in the Hemodialysis Unit at Sohag University Hospital

AUTHORS

**Abdallah Hafez Abdel-Naiem, Lotfy Hamed Abo Dahab, Eman Ahmed Sabet ,
Emad Ahmed Mohammed**

ABSTRACT

INTRODUCTION

evaluation of HD adequacy in patients with ESRD who were being maintained on regular HD in a trial to identify the prevalence and causes of inadequate HD among the patients and the impact of HD adequacy on other parameters.

DESIGN AND SETTING: PROSPECTIVE STUDY, AT SOHAG UNIVERSITY HOSPITAL IN EGYPT.

METHODS

All patients in this study were subjected to laboratory investigations including blood urea nitrogen (BUN) (before dialysis and after dialysis), serum albumin, and hemoglobin (Hb) level.

- **URR** = $(1 - [\text{postdialysis BUN} \div \text{predialysis BUN}])$

Kt/V was calculated using the second-generation Daugirdas formula

- Single-pool **Kt/V** = $-\ln(R - 0.008 \times t) + (4 - 3.5 \times R) \times \text{UF}/W$,

R is the ratio of postdialysis to predialysis BUN; *t* is the length of a dialysis session in hours; UF is the ultrafiltration volume in liters; and *W* is the patient's postdialysis weight in kilograms.

RESULTS

The results shown that 69,64% of patients had adequate HD ($\text{KT}\backslash\text{V} > 1,2$), and only 30,36% of patients had inadequate HD ($\text{KT}\backslash\text{V} > 1,2$).

CONCLUSION

A significant percentage (69,64%) of patients in the HD unit of Sohag University hospital had adequate HD. HD adequacy was influenced by several factors such as duration and frequency of the dialysis session.

INTRODUCTION

End-stage renal disease (ESRD) causes irreversible, severe kidney failure for which patients require treatment with dialysis or kidney transplantation to survive [1].

It is a major outcome of chronic kidney disease (CKD), with an important effect on the quality of life (QOL) and health resource utilization [2]. Hemodialysis (HD) is one of the main modalities of renal replacement therapy [3]. HD patients still have higher mortality and hospitalization rates, as well as lower QOL, compared with the general population [4].

the adequacy of the dialysis dose has a profound effect on patient morbidity

and mortality [5].

To ensure that patients are receiving the prescribed urea clearance, the clinician must regularly monitor and measure the dose delivered. Urea clearance should be measured at least every 8 wk. Examples of acceptable techniques for estimating delivered dose are formal single-pool urea kinetics, urea reduction ratio (URR), and Kt/V natural logarithm formulae. [6].

URR stands for urea reduction ratio, meaning the reduction in urea as a result of dialysis. The URR is one measure of how effectively a dialysis treatment removed waste products

from the body and is commonly expressed as a percentage.

Patients and methods

- Patients:

• Inclusion criteria:

- Patients on regular HD for 6 months (at least) by means of an arterio-venous fistula (AVF) in the hemodialysis unit at Sohag University Hospital

• Exclusion criteria:

- Patients who are not on regular HD.
- Patients using central venous catheters or arterio-venous grafts
- Patients with advanced comorbid conditions like advanced liver cirrhosis or heart failure or malignancy

-Method of the study:

All patients in this study were subjected to full history taking, complete physical examination, and laboratory investigations including blood urea nitrogen (BUN) (before

Kt/V is another way of measuring dialysis adequacy.

dialysis and after dialysis), serum albumin, and hemoglobin (Hb) level Urea reduction ratio (URR) was calculated using the following formula

• $URR = (1 - [\text{postdialysis BUN} \div \text{predialysis BUN}])$

Kt/V was calculated using the second-generation Daugirdas formula

• $\text{Single-pool Kt/V} = -\ln (R - 0.008 \times t) + (4 - 3.5 \times R) \times UF/W,$

Where \ln represents the natural logarithm; R is the ratio of postdialysis to predialysis BUN; t is the length of a dialysis session in hours; UF is the ultrafiltration volume in liters; and W is the patient's postdialysis weight in kilograms. Online medical calculators will be used.

HD prescription was revised to detect the following:

- (1) Blood flow rate (BFR).
- (2) Ultrafiltration volume (UF volume)
- (3) Effective surface area of the dialyzer.
- (4) Venous pressure.

The Result of the study

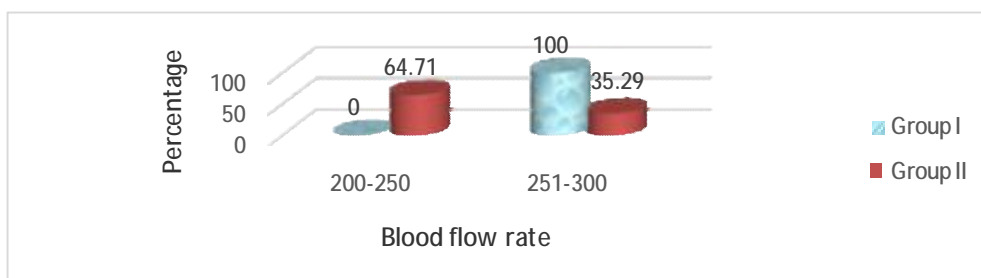
our study included 112 patient classified into 2 groups

Group I: Kt/V of at least 1.2 (adequate dialysis dose) (78)

Group II: Kt/V less than 1.2 (inadequate dialysis dose) (34)

Comparison between Kt/V values as regard blood flow rate

Astrong association between higher clearance rate and BFR(>250 ml/min) (p=.0001)

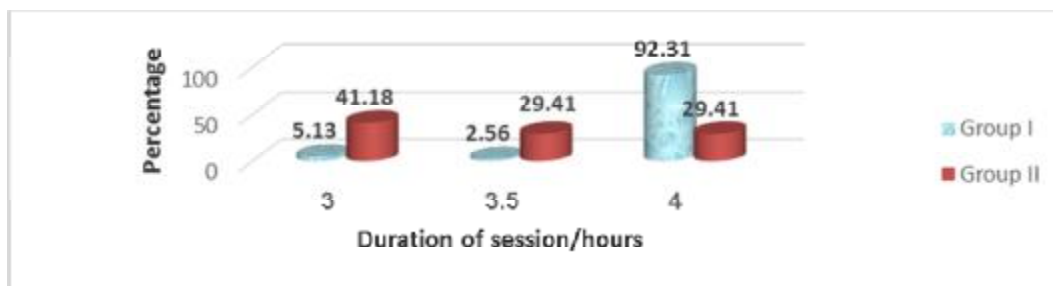


Comparison between Kt/V values as regard UF volume:

Decrease in clearance rate was noted in patients with UF volume greater than 3 l as only 12.82% of them showed Kt/V values of at least 1.2. Differences in the clearance rates were statistically insignificant ($P = 0.80$)

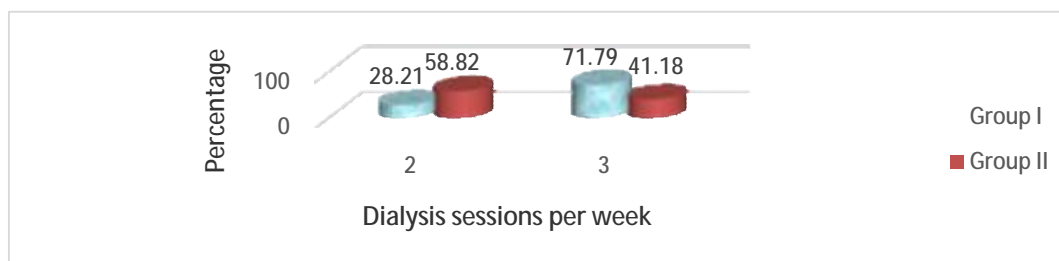


Comparison between Kt/V values as regard duration of session: A strong association between higher clearance rates and increased dialysis duration of each session



Comparison between Kt/V values as regard dialysis sessions per week:

A strong association between higher clearance rates and frequency of dialysis per week



Discussion

It was noted that dialysis adequacy differs among the different dialysis centers.

It was reported to be high as in the USA, as, according to the 2007 annual report, over 90% of patients had a Kt/V greater than 1.2 [5].

Other dialysis centers in other countries such as Brazil, Nigeria, Nepal, Pakistan, and Iran reported lower values of adequacy (only 35–

45% of patients had a Kt/V greater than 1.2) [6a].

An Egyptian Study performed in Tanta in 2015 had shown that 40% of patients had a Kt/V greater than 1.2 [6b].

As regards the relationship between Kt/V and URR, the results of the present study revealed that all patients with spKt/V at least 1.2 had URR of at least 65% (statistically significant

positive correlation between Kt/V and URR; $P < 0.0001$). These results were in agreement with the study by Afshar *et al.* [7], who found a statistically strong correlation between URR and eKt/V ($P < 0.001$).

our results were in disagreement with the study by Oreo and Hamburger [8], who reported a poor correlation between URR and Kt/V in 942 patients when both values were measured simultaneously

As regards the BFR, analysis of the results of the present study revealed that increased BFRs were associated with increased rate of clearance. This is clear from the findings of Kt/V values of at least 1.2 (200–250 ml/min, 0%; 251–300 ml/min, 100%). Difference in clearance rates among the various groups of BFRs was statistically significant ($P = 0.0001$). These results were in agreement with the study by Kim *et al.* [9], Borzou *et al.* [10], Ward [11], and Port *et al.* [12].

our results were in disagreement with those of Ghali and Malik [13]; there was no significant effect of increasing BFR on HD adequacy. They attributed their results to the effect of other factors affecting dialysis adequacy, such as malnutrition, anemia, short time of dialysis session, premature cessation of sessions of HD, infection, inadequate blood flow from vascular access, hypotension episodes, technical reasons, and the design of the study and the sample size.

As regards the duration of HD sessions, analysis of the results of the present study revealed that clearance was strongly associated with increased duration of the dialysis process. Difference in clearance rates among the various duration periods was statistically significant ($P = 0.0001$). These results were in agreement with the study by Stewart *et al.* [14], who showed that time still had a profound

effect on dialysis adequacy, indicating the importance of ensuring that patients remain on dialysis for the full time prescribed [5].

As regards dialysis frequency, analysis of the results of the present study revealed improvement in clearance rates with increased dialysis frequency per week.

Conclusion

A significant percentage (69,64%) of patients in the HD unit of Sohag University hospital had adequate HD. HD adequacy was influenced by several factors such as duration and frequency of the dialysis session.

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