

SALT AND WATER BALANCE IN HEMODIALYSIS

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OBJECTIVES

Most unwanted side effects of hemodialysis therapy are caused by shifts of water and sodium. Balance of salt and water in maintenance hemodialysis therapy is influenced by ingestion of salt and water by the patient as well as by dialysis induced ultrafiltration and changes in plasma sodium concentration. Dialysis induced increase of sodium concentration may induce thirst whereas its decrease may induce symptoms of dysequilibrium syndrome.

METHODS

337 patients have been included into the study. Dialysis was performed three times per week for 4-6 hrs, Q_b 280 ml/min. Sodium concentration in dialyzing fluid was always 138 mmol/l using the same proportioning system and dialyzer (A 2008, A 4008, A 5008, Fx60, Fresenius Medical Care).

Patients were treated in one center up to 20 years by the same doctors. Body weight, ultrafiltrate, pre- post plasma sodium concentration were recorded every three months and measured using the same measuring device. There were no injections of sodium chloride during treatment. Sodium balance was calculated using a kinetic model. Mean inter-dialysis increase of body weight is 2,5 kg which is removed by ultrafiltration.

RESULTS

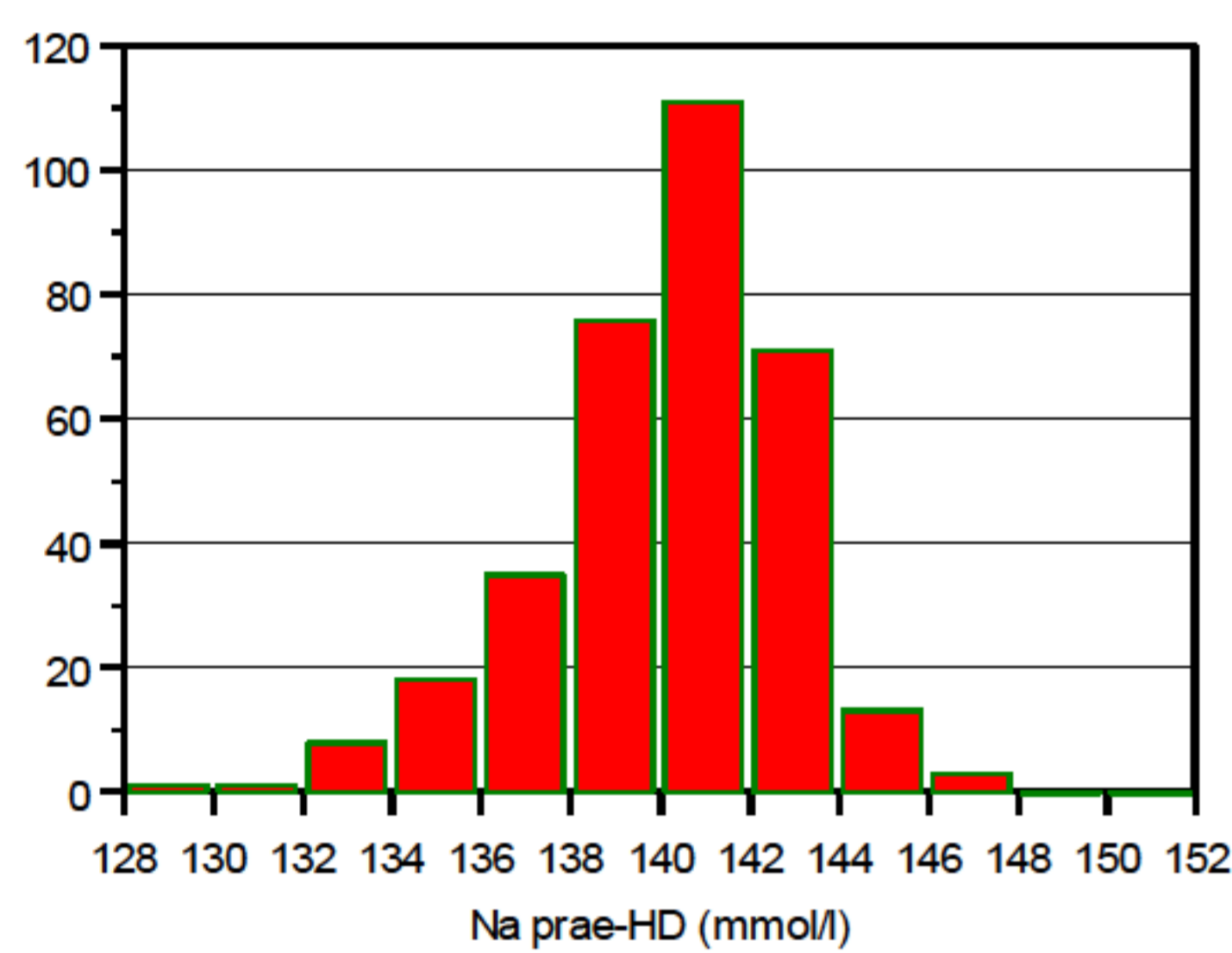


Fig. 1: Distribution of pre-dialysis sodium concentration. Mean 140,18 +/- 2,74 mmol/l. Range 134 - 145 mmol/l. n = 337.

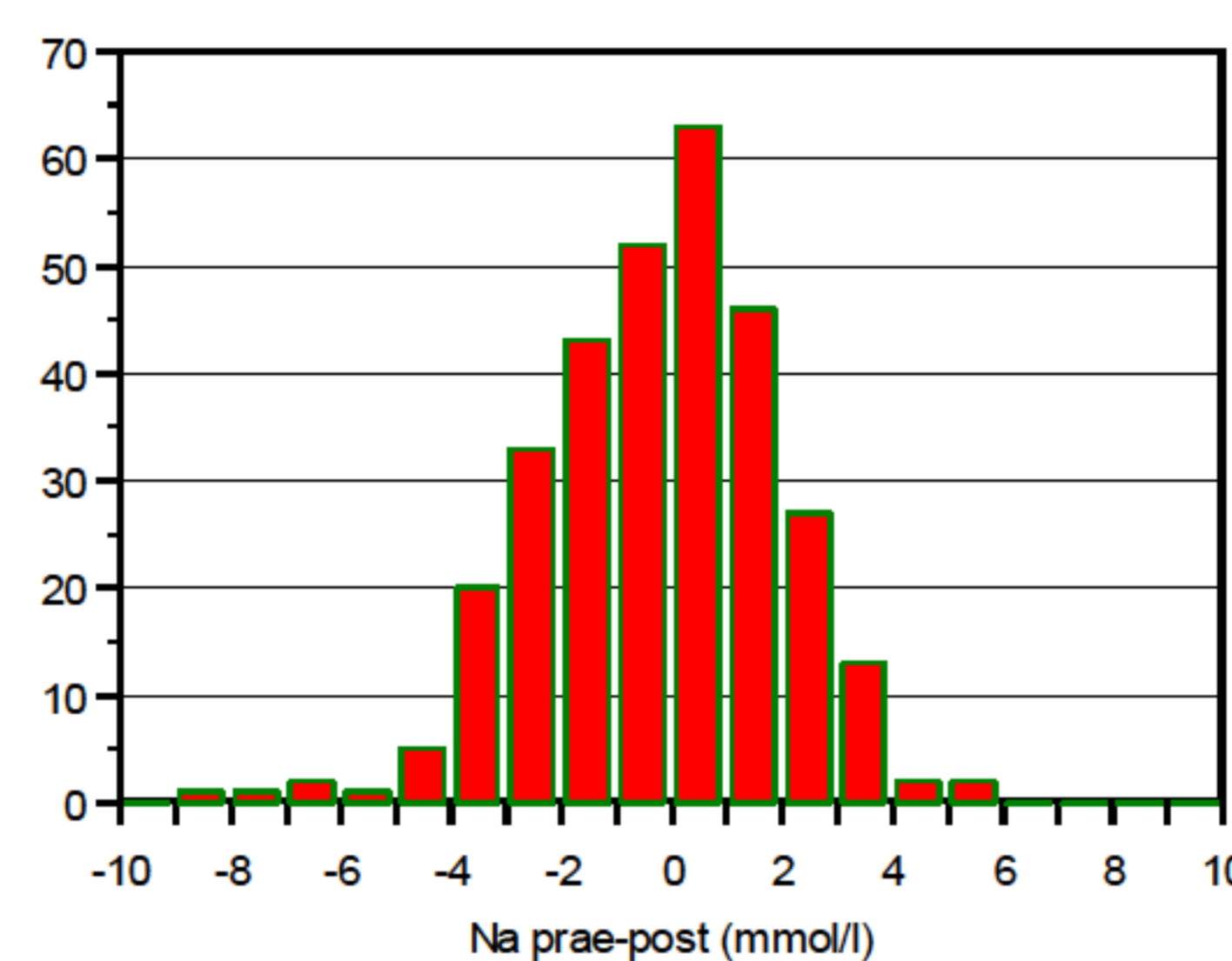


Fig. 2: Distribution of Δ pre-post hemodialysis sodium concentration. Means of each patient during his time on HD-therapy. Mean - 0,22 +/- 2,16 mmol/l. Range: -6 - +8 mmol/l. n = 311.

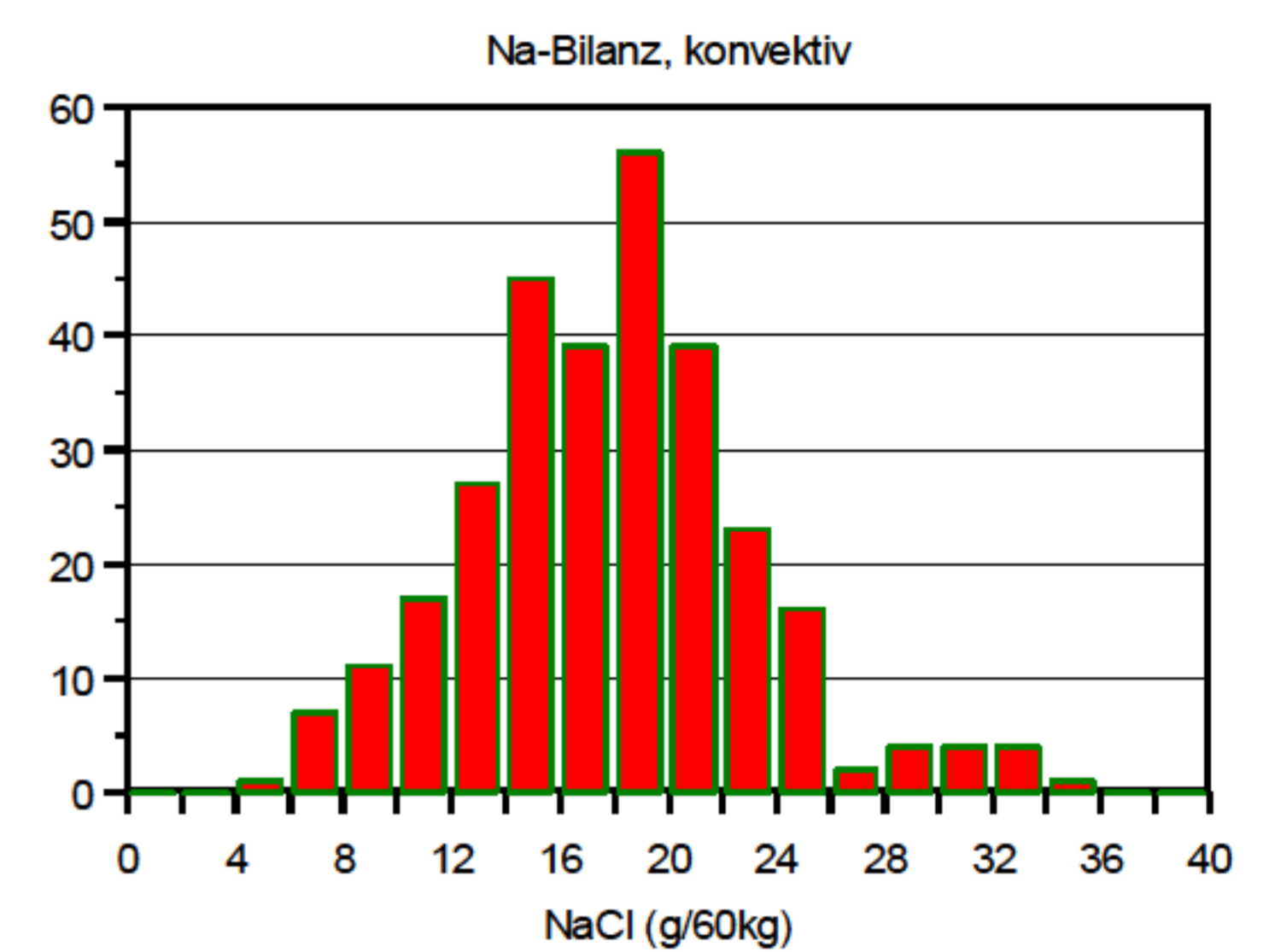


Fig. 3: Distribution of convective sodium balance normalized to 60 kg body weight. Mean - 17,8 +/- 5,2 g NaCl/ 60 kg body weight, Range: 4 - 34 g NaCl/60 kg. n = 296. Calculated daily salt ingestion 9,7 g.

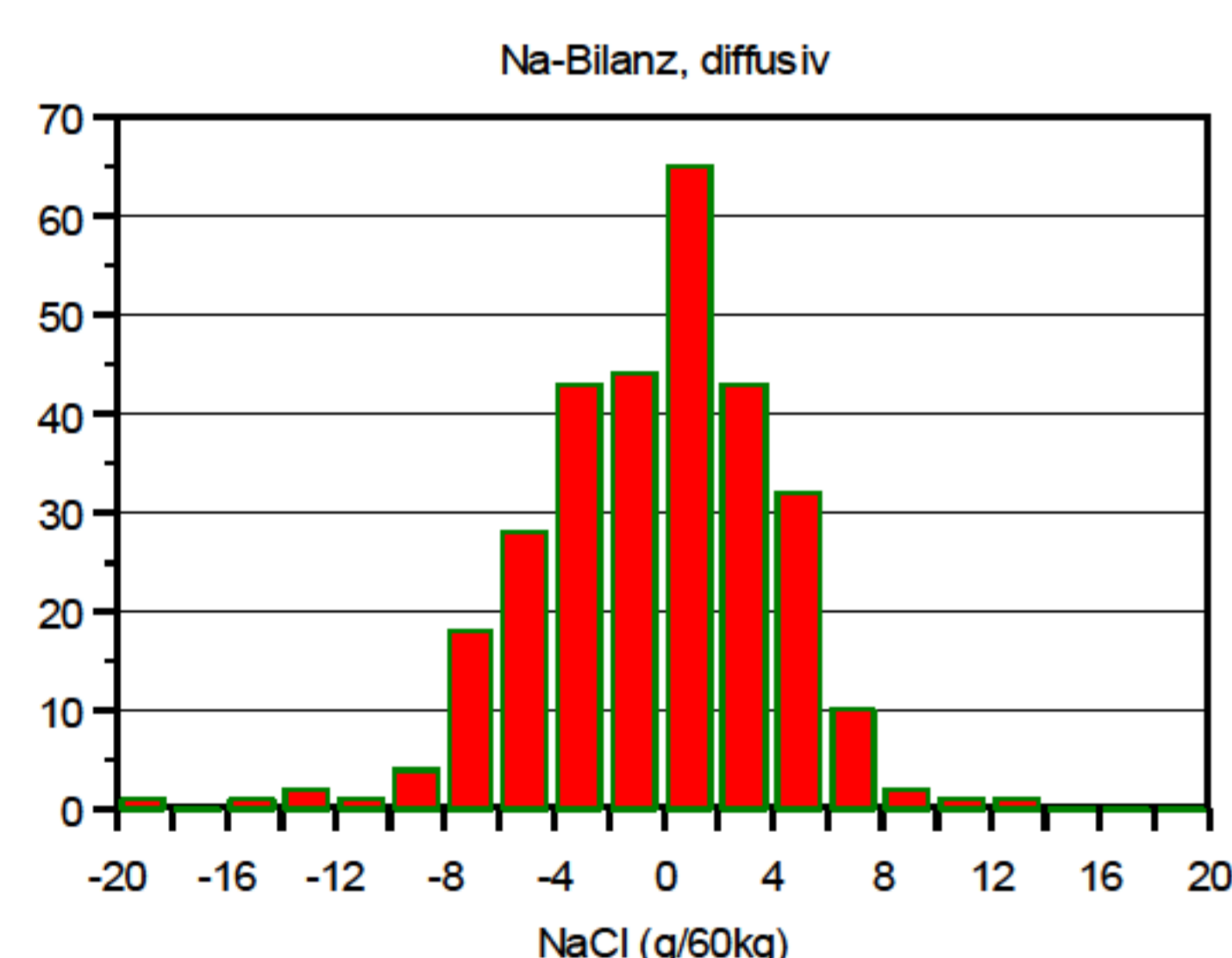


Fig. 4: Distribution of diffusive sodium balance normalized to 60 kg body weight. Mean - 0,3 +/- 4,4 g NaCl/60 kg body weight. Range +/-12 g NaCl/60 kg. High convective removal may be compensated by high diffusive ingestion of salt.

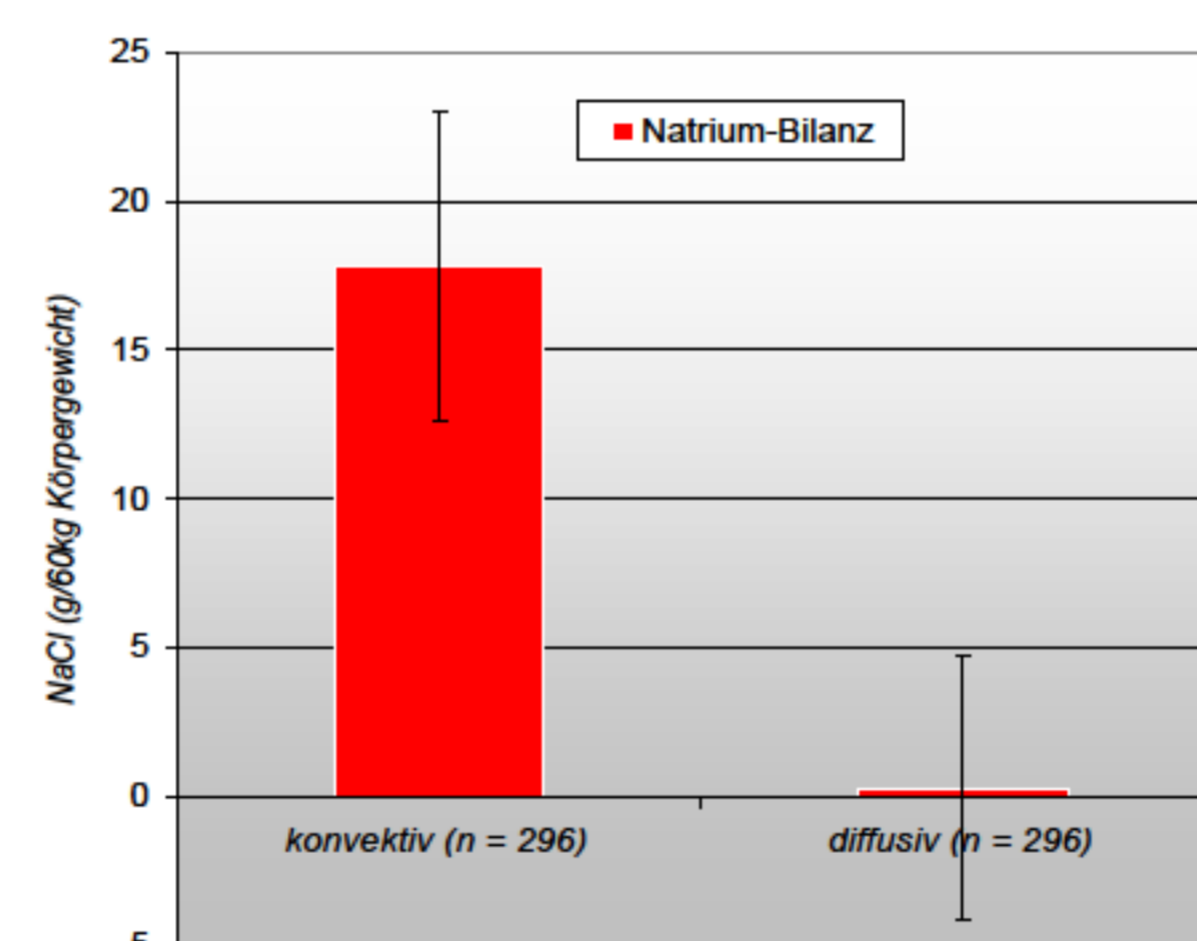


Fig. 5: Comparison of mean convective and diffusive sodium balance normalized to 60 kg body weight. Low diffusive balance indicates that patients ingest salt and water mostly in isotonic manner.

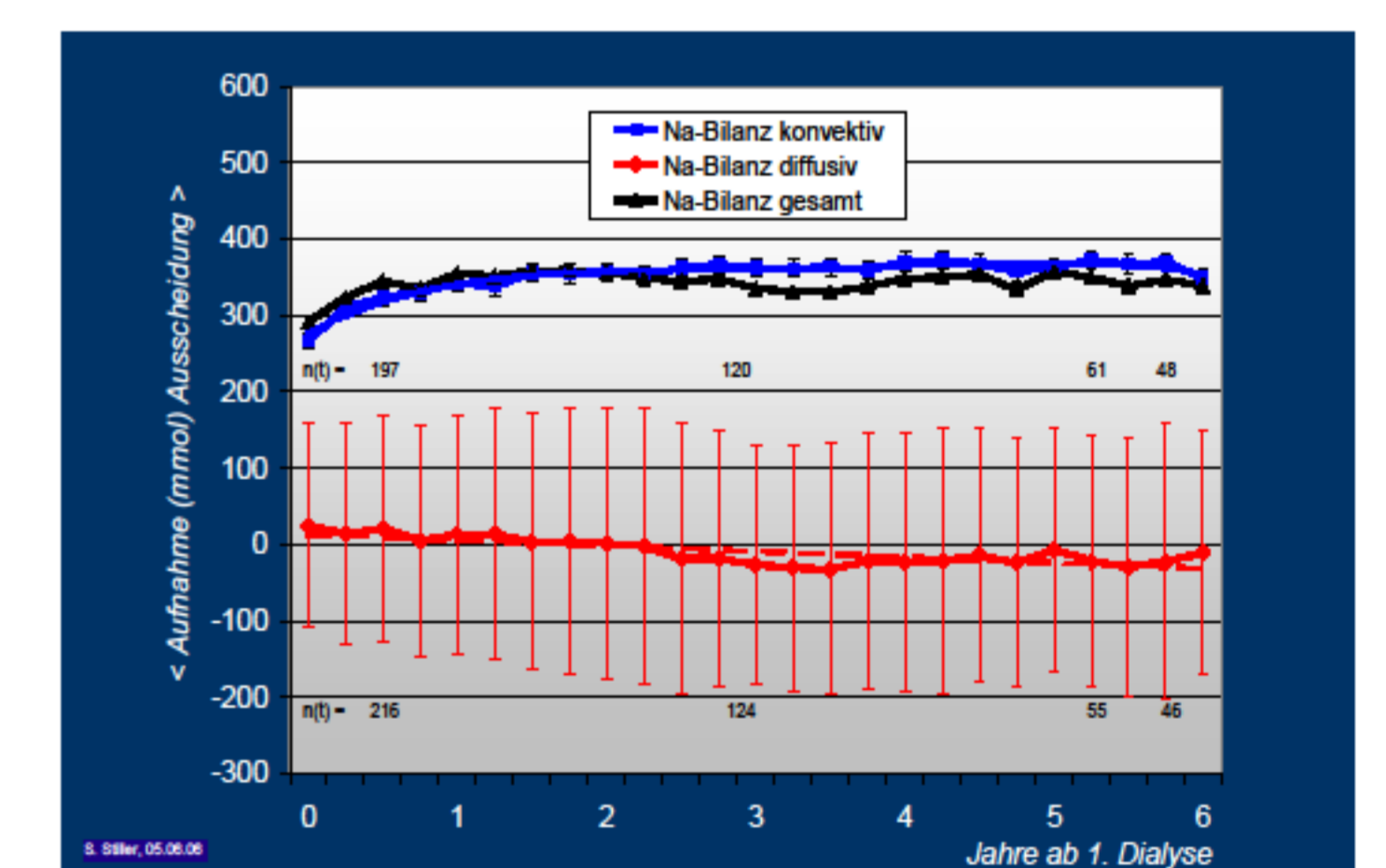


Fig. 6: Progression of mean sodium balance. Blue curve: convective balance. Red curve: diffusive balance. Black curve: Combined balance. After 2 years on hemodialysis diffusive balance is slightly positive by about 15 mmol corresponding to 1,5 g NaCl.

CONCLUSIONS

Most patients exhibit dialysis induced changes in sodium concentration less than 3 mmol/l. Patients having high amounts of ultrafiltrate exhibit high convective sodium removal which is compensated by positive diffusive sodium balance. High diffusive ingestion or removal of salt may induce unwanted side effects like thirst or dysequilibrium syndrome. By drinking and eating salt and water most patients accommodate to the sodium concentration of the dialyzing fluid to make dialysis more comfortable and less affected with unwanted side effects.

REFERENCES:

1. Mann H, Stiller S: Sodium modeling. *Kidney Int Suppl* 76, S79-88 (2000)
2. Stiller, S. Mann, H: Significance of sodium measurement in regular dialysis treatment. *Life Support Systems* 4, 169-171 (1986)
3. Lee SW: Sodium balance in maintenance hemodialysis. *Electrolyte Blood Press* 10(1), 1-6 (2012)

