

Effect of hemodialysis treatment on cognitive and psychomotor function in end stage renal disease patients

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OBJECTIVES

Uremia is associated with impairment of different cognitive and psychomotor functions in patients with end stage renal disease (ESRD). However the pathogenesis of this cognitive and psychomotor dysfunction is still unknown. In this study, Symbol Digit Modalities Test (SDMT) and Complex Reactimeter Drenovac (CRD series), a battery of computer generated psychological tests were used to assess changes in cognitive and psychomotor function due to hemodialysis treatment.

METHODS

In this cross-sectional study, we measured cognitive and psychomotor function in 41 ESRD patients maintained on hemodialysis, one hour before and one hour after they underwent hemodialysis. To evaluate whether removal of uremic toxins during HD session is associated with change in cognitive and psychomotor functions selected population of 41 (13 females, 28 males) adult patients on maintenance (4.07 ± 2.98 years) HD (aged 60.83 ± 11.14 years) were investigated. Assessment of cognitive and psychomotor functions was performed by CRD series tests to measure simple visual discrimination of signal location (CRD-311), short-term memory (CRD-324), simple convergent visual orientation (CRD-21) and convergent thinking (CRD-11). Results of cognitive motor tests were given as total time of test solving (TT) and minimum time of test item solving (MT). Higher CRD-series tests scores (TT and MT measured in seconds) indicate poorer cognitive and motor performance (tests took longer to complete). Also, SDMT was used to measure oculomotor abilities and hand-eye coordination. Higher SDMT score indicated better cognitive and psychomotor performance.

Table 1 Differences in cognitive - psychomotor performance one hour before and one hour after hemodialysis session (Student's t-test for dependent data, one-tailed significance)

Test	Tests results	Pre_HD	Post_HD	P
		X±SD	X±SD	
Test of simple visual discrimination of signal location (CRD-311)	TT	45.38± 9.25	46.21± 9.30	0.153
	MT	0.53± 0.12	0.54± 0.12	0.167
Test of short-term memory actualization (CRD-324)	TT	72.70± 21.45	74.49± 26.76	0.116
	MT	0.65± 0.19	0.64± 0.24	0.249
Test of simple convergent visual orientation (CRD-21)	TT	80.15± 36.22	77.93± 34.94	0.162
	MT	1.40± 0.44	1.26± 0.41	0.004
Test of convergent thinking (CRD-11)	TT	222.05± 77.27	210.33± 68.10	0.034
	MT	108.19± 671.02	1.26± 0.41	0.157
Trail Making Test, form A	TT	52.88± 25.61	50.39± 23.62	0.099
Symbol Digit Modalities Test score		29.59± 11.24	32.07± 13.07	0.002

Legend: p significance; *p < 0.05; X ±SD, arithmetic mean ± standard deviation; Pre_HD, pre hemodialysis; Post_HD, post hemodialysis; TT, total test solving time (in seconds); MT, minimum time of item solving (in seconds)

RESULTS

This results demonstrated a significantly better cognitive and psychomotor performance in MT of solving simple convergent visual orientation test (1.40 ± 0.44 vs. 1.26 ± 0.41, p = 0.004), TT of solving convergent thinking test (222.05 ± 77.27 vs. 210.33 ± 68.10, p = 0.034) and SDMT test score (29.59 ± 11.24 vs. 32.07 ± 13.07, p = 0.002) after HD treatment.

CONCLUSIONS

Removal of uremic toxins by hemodialysis leads to an improvement in cognitive and psychomotor processing. Future research, with larger number of participants in a prospective research model, should continue to examine which cognitive domains are particularly related to uremia in ESRD population.

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