Quantitative electroencephalographic changes in attention deficit hyperactivity disorder children

Ann A Abdel Kader, Nagwa A Mohamed, Omnia R Amin, Basma B El Sayed, Islam F Halawa


Background
The electroencephalogram (EEG) has long been used to pick up and analyze the electrical activity of the outermost layer of the brain. Attention deficit hyperactivity disorder (ADHD) patients revealed increased power in the lower frequency bands (\( \delta \) and \( \theta \) power) and a raised \( \theta/\beta \) ratio.

Objective
The aim of this study was to detect the quantitative EEG changes in children with ADHD compared with normal children.

Patients and methods
The sampled group consisted of 45 children suffering from ADHD and represented the patient group, and 45 normal children represented the control group. EEG was recorded under resting conditions for all participants. Data from frontal areas were digitally processed and analyzed to calculate the four frequency bands' power (\( \beta \), \( \alpha \), \( \theta \), and \( \delta \)) and then \( \theta/\beta \) ratio was computed. For the patient group, the Wechsler Intelligence Scale for Children was applied and parents of these patients filled out the Arabic version of Conners' Parent Rating Scale-revised-long version.

Results
The patient group showed significantly higher \( \theta/\beta \) ratio in frontal areas compared with the control group (\( P < 0.05 \)). There was a significant negative relation between age and \( \theta/\beta \) ratios and a significant negative relation between age and Conners' hyperactivity subscale (\( P < 0.05 \)). There was a significant positive relation between Conners' hyperactivity subscale and mean \( \theta/\beta \) ratio (\( P < 0.05 \)).

Conclusion
Quantitative EEG markers - namely, the \( \theta/\beta \) ratio - could play a role in the understanding and identification of ADHD.