Objective
Neonatal sepsis and the inflammation stress remain major factors that influence the neurological development. Our aim was to evaluate possible correlation of cerebral oxygenation on neonates during a septic episode to the neurodevelopmental outcome at 2 years of age. Cerebral oxygenation was estimated with the evaluation of Total Oxygenation Index (TOI), using Near Infrared Spectroscopy (NIRS).

Methods
A prospective study was conducted in the 2nd NICU of AUTH, Greece, from 6/2012 to 12/2014. Neonates with confirmed sepsis and matched controls underwent 3 NIRS measurements on day 1, 3 and 7 of the episode. After 2 year follow up, the subjects underwent Bayley-III evaluation at 18-24 months of age. The composite scores for Cognitive and Motor skills were estimated for every neonate and scores ≤85 were considered suboptimal.

Results
During the study period 94 neonates (50 cases, 44 controls) were enrolled, with matched neonatal characteristics [median birth weight: 1350 (1082, 2167) vs 1650 (1320, 1995) g, p=0.269, gestational age: 31±3 vs 32±3 weeks, p=0.061]. During the septic episode, neonates with sepsis presented significant decrease on cerebral oxygenation, with significant lower TOI on day 7 (TOI7) compared to controls (62.7±7 vs 71.4±4.4, p<0.001) and significant reduction on TOI between day 1 and 7 (TOIDifference) (-4.8±8 vs 2.6±9.5, p=0.001). Seventy two out of 94 neonates had a Bayley-III Infant Toddler Scale Test performed, on the chronological age of 27±3 months on septic and 28±3 months on controls (p=0.270). No differences were noted regarding Cognitive Composite Score (99.3±15.2 vs 98.4±12.1, p=0.775) and Motor Composite Score (100.7±16.1 vs 102.6±12.4, p=0.594). Cognitive suboptimal scores were recorded in 6 (18%) septic neonates compared to 1 (3%) control (p=0.049) and Motor suboptimal scores on 5 (15%) septic neonates compared to none control (p=0.021). Furthermore, on examining the correlation of TOI and the Bayley scores, neonates with sepsis presented significant linear correlation of TOI7 and Cognitive and Motor Composite scores (p=0.019 and p=0.006, respectively).

Conclusion
Neonates undergoing sepsis are susceptible to episodes of decreased cerebral oxygenation. Furthermore the degree of cerebral oxygenation seems to be correlated to diminished neurodevelopmental outcome, regarding the cognitive and motor skills.