Prenatal and early-life stress exposure impact on rodent microglia, astrocyte, and oligodendrocyte density and morphology: a systematic review and multilevel meta-analysis.

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This meta-analysis sought to investigate the impact of early-life (ELS) and prenatal stress (PNS) on microglia, astrocyte, and oligodendrocyte density and morphology within rodent offspring brain. We compiled data available up to July 19th, 2022 from the databases: Pubmed, Web of Science and Embase. Screening phases were performed blindly, using the Rayyan QCRI software. Studies were excluded if they: (1) were not written in English; (2) were not empirical; (3) did not use mice or rats; (4) did not have a prenatal or early life stress protocol; (5) did not analyze glial cells in the brain; (6) only used transgenic or knockout animals; (7) did not have a baseline control group. All statistical analysis and risk of bias assessment were performed using the software R. Databases provided us 95 studies for analysis. Results indicate that animals exposed to PNS or ELS show significant increase in microglia density (SMD = 1.50; 95% CI 0.69, 2.31. SMD = 0.40; 95% CI 0.01, 0.78, respectively) and soma size (SMD = 0.91; 95% CI 0.19, 1.53), as well as decreased oligodendrocyte density (SMD = -1.19; 95% CI -2.08, -0.31. SMD = -0.35; 95% CI -0.79, -0.01). However, no effect on astrocyte was identified (SMD = 0.40; 95% CI -0.13, 0.93. SMD = -0.12; 95% CI -0.49, 0.24). Meta-regression indicates that stress protocol, sex, age, tissue and molecular analyis technique could influence results. This data reinforces that neuroimmunological alterations and hypomyelination might be associated with dysfunctions induced by exposure to stress during key developmental periods.

Keywords: Chronic stress; glial cells; glial morphology; meta-regression.