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Biometric, clinical and stress effects of alternate day fasting and time-restricted feeding in obese middle-aged female rats

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Intermittent fasting (IF) diets have the potential to reduce the prevalence of obesity and associated chronic diseases.[1,2] This would be particularly important for middle-aged females, as the association of aging, hormonal changes, and the increase in adiposity contribute to obesity-associated comorbidities.[2] However, many contradictory results remain about the efficacy of IF dietary strategies in promoting health benefits, such as lower body weight and lipid profile.[3,4] The aim of this study was to investigate the metabolic effects of two popular IF protocols, the alternate-day fasting (ADF) and the time-restricted feeding (TRF) on biometric and haematological parameters, as well as hepatic energy stores and stress responses in middle-aged obese female rats subjected to high-fat diet (HFD). Wistar rats ($n = 18$, 15 months of age) were fed for 8 weeks with HFD and separated into the following groups for more 8 weeks: Obese, with free access to HFD; Obese + ADF, and Obese + TRF. Control lean animals ($n = 6$, 15 months of age) had free access to standard chow for the same period. During the study, biometric and haematological parameters were analysed, such as body weight, food and energy consumption, and glucose tolerance tests. After euthanasia, blood and tissue samples were collected for lipid profile, oxidative markers and HSP70 determination. Data were analysed using one-way ANOVA followed by Tukey posthoc-test, with a minimum significance of $p < 0.05$. After 8 weeks of IF, ADF reduced body weight by 8.4%, while TRF reduced body weight by 0.93% when compared to the obese group ($p < 0.05$). ADF (0.706 ± 0.057 g/cm^2) and TRF (0.720 ± 0.006) animals presented lower ($p < 0.05$) BMI, when compared to the obese group (0.838 ± 0.107). However, no changes were observed in adiposity, fasting glucose, and glucose tolerance tests. In addition, when compared to the controls, we found an increase ($p < 0.05$) in the level of total leukocytes (750 cells/mm^3 ± 100 v. 2125 ± 225), lymphocytes (698.8 cells/mm^3 ± 87.25 v. 1742 ± 193.25), and monocytes (25.2 cells/mm^3 ± 9.87 v. 111 ± 8.5) in the TRF group, and an increased ($p < 0.05$) number of platelets (231 cells/mm^3 ± 35 v. 302.6 ±30.53) in the ADF group. Blood lipid profiles, including triglycerides and HDL, as well as liver stress responses, such as HSP70 and MDA, were not significantly affected by ADF and TRF dietary protocols. Although ADF and TRF strategies were able to reduce body weight and BMI, these dietary interventions were not able to promote health benefits, such as reducing blood lipid profile, adiposity, and insulin resistance. In addition, ADF and TRF increased inflammatory biomarkers, which potentially may increase the risk of obesity-associated comorbidities.

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