In Middle-Aged Women 'Forever Chemicals' Linked to Slightly Lower Muscle Mass

Researchers examined associations between exposure to per- and polyfluoroalkyl substances (PFAS) and muscle mass and function in middle-aged women.

Scientists from MaineHealth Institute for Research, Tufts University School of Medicine, Harvard Medical School, Stanford University, the US Centers for Disease Control and Prevention, and Columbia University Mailman School of Public Health conducted the research.

PFAS are persistent, ubiquitous chemicals that previous studies suggest can increase inflammatory cytokines and reduce testosterone levels. These biological changes are implicated in loss of muscle mass and function and reduced physical performance. Higher PFAS exposure has been associated with greater fat mass and poorer bone health in adults.

But data on muscle health and PFAS in midlife and beyond are sparse. Postmenopausal women are disproportionately impacted by muscle declines, with higher rates of sarcopenia and falls compared to men. According to the authors, previous research had not examined associations between PFAS exposure around menopause and muscle health.



Study

In the present study, researchers investigated associations between plasma PFAS levels and muscle function and mass among women in midlife. Participants were women enrolled in Project Viva, an ongoing prospective cohort that recruited subjects at their prenatal visits in Massachusetts. The present study used data and samples from pregnancy (1999–2002) and midlife (2017–24). PFAS levels in blood samples collected during pregnancy and midlife (2017–2021) were quantified. The primary analyses were cross-sectional, comparing PFAS concentrations and muscle mass assessed in midlife.

The primary outcome was midlife appendicular lean mass index (ALMI), calculated from limb lean mass measured by dual-energy X-ray absorptiometry and adjusted for height to estimate skeletal muscle mass. Secondary outcomes included measures of muscle function: Handgrip strength and the Short Physical Performance Battery (SPPB). The SPPB has a maximum score of 12, and the researchers classified lower scores as less-than-optimal physical performance, rather than necessarily indicating clinical impairment.

The researchers examined the distributions of plasma PFAS levels in pregnancy and midlife, muscle function and mass outcomes, and correlations among these measures. Linear regression models were used to examine associations between plasma levels of individual PFAS and ALMI at midlife. Models were adjusted for age, education, race/ethnicity, household income, months of breastfeeding, lifetime parity, and menopausal status.

The researchers evaluated the combined associations of PFAS with muscle mass using two mixture approaches: PFAS burden scores (estimated using the PFAS Exposure Burden Calculator) and a six-PFAS mixture (determined using quantile g-computation). The researchers also examined whether diet, physical activity, and menopausal status influenced the relationship between PFAS exposure and muscle mass. Finally, secondary analyses assessed associations between midlife PFAS and muscle function, and pregnancy PFAS with ALMI.

Results

The study included 551 women with a mean age of 50.7 years at the midlife visit. Of these, 488 contributed to the muscle mass analysis, 545 to handgrip assessments, and 273 to physical performance testing. Most participants were college graduates (79%), non-Hispanic White (67%), and postmenopausal (59%). On average, they had 2.5 lifetime births and 21.3 months of breastfeeding. Women with higher PFAS burden scores in midlife were more likely to be non-Hispanic White and have higher physical activity and household income.

The geometric mean midlife plasma concentration of perfluorooctanesulfonic acid (PFOS) was the highest at 2.58 ng/mL, followed by perfluorooctanoic acid (PFOA) at 1.44 ng/mL. Perfluorohexanesulfonic acid (PFHxS), PFOA, and PFOS levels were lower in midlife than during pregnancy. On average, the ALMI was 6.93 kg/m^2 and handgrip strength was 28.1 kg-force. Around 26% of participants had an SPPB score below 12. Midlife plasma levels of certain PFAS were associated with lower ALMI.

Women with higher midlife plasma levels of perfluoroundecanoic acid (PFUnDA), perfluorodecanoic acid (PFDA), and perfluorononanoic acid (PFNA) had lower ALMI. The results of the mixture approaches varied. A higher PFAS burden score showed a weak, uncertain association with lower muscle mass, while a separate analysis examining six PFAS together found a clearer association with slightly lower muscle mass at higher combined exposure levels.

In secondary analyses, women with higher PFDA, PFOA, or PFAS burden scores in midlife were less likely to have an SPPB score below 12, indicating slightly better measured physical performance. They found no evidence of an association between PFAS levels and handgrip strength. Most participants achieved the maximum SPPB score, which may have limited the test's ability to detect small differences. Further, higher PFOS levels in pregnancy were associated with a higher ALMI, while pregnancy PFNA levels showed an uncertain inverse association with ALMI.

The team found no consistent evidence that PFAS-ALMI associations differed by physical activity, menopausal status, or diet. Some associations appeared stronger after menopause, but the differences between menopausal groups were not statistically clear. Additional adjustment for prepregnancy body mass index weakened the inverse associations, suggesting that underlying body size may partly explain the findings.

Conclusion

Overall, women with higher plasma levels of select PFAS had slightly lower muscle mass in midlife, without corresponding evidence of poorer muscle function. The main analyses measured exposure and muscle mass at approximately the same time, so they cannot establish whether PFAS contributed to muscle loss. Unmeasured factors, including differences in body composition, may also have influenced the findings.

The PFAS-ALMI association did not consistently differ by midlife diet, physical activity, or menopausal status. All participants had previously given birth, and most were relatively healthy middle-aged women, which may limit the relevance of the results to older or more diverse populations. Further longitudinal studies are needed to determine whether PFAS exposure contributes to muscle loss over time and how these relationships compare with potentially modifiable or established determinants of muscle health.

Source:

https://www.news-medical.net/news/20261111/e28098Forever-chemicalse28099-linked-to-slightly-lower-muscle-mass-in-middle-aged-women.aspx