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Abdominal Obesity Phenotypes and Incidence of Type 2 DM, Cardiovascular Outcomes and All-Cause Mortality—A Systematic Review and Meta-Analysis

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ABSTRACT

Background and Aims: The global rise in obesity, a major driver of metabolic diseases, has prompted scrutiny of distinct obesity phenotypes. While overall obesity is concerning, abdominal obesity demonstrates a stronger association with metabolic dysfunction, type 2 diabetes (DM2), and cardiovascular disease (CVD). This review examines the risk of DM2, CVD, and mortality in adults with a metabolically healthy abdominal obese phenotype.

Methods: A systematic search of PubMed/MEDLINE, Web of Science, Cochrane Library, and ProQuest was conducted on April 7, 2025, to identify prospective cohort studies in adults. Eligible studies compared MHAO individuals to metabolically healthy, non-abdominally obese (MHNAO) controls, focusing on outcomes including incident T2DM, fatal and non-fatal CVD events, and all-cause mortality. Pooled estimates were calculated using random-effects meta-analysis, and heterogeneity was assessed using the I^2 statistic.

Results: Six prospective cohort studies ($n = 98,329$) were included. Metabolically unhealthy individuals, regardless of abdominal obesity status, had significantly increased risks of T2DM (RR 9.00, 95% CI 7.51–10.50 for MUHAO; RR 5.03, 95% CI 4.11–5.94 for MUHNAO), CVD, and all-cause mortality (HR 1.67, 95% CI 1.42–1.93 for MUHAO; HR 1.58, 95% CI 1.36–1.79 for MUHNAO). In contrast, MHAO individuals did not show significantly elevated risks of T2DM (RR 2.44, 95% CI 0.95–3.94), CVD, or all-cause mortality (HR 1.07, 95% CI 0.88–1.27) compared to MHNAO controls. Substantial heterogeneity ($I^2 > 50\%$) was observed, partly explained by differences in outcome definitions and metabolic classifications.

Conclusion: While metabolically unhealthy phenotypes are strongly associated with adverse health outcomes, individuals with MHAO appear to have risk profiles comparable to their metabolically healthy, non-abdominally obese counterparts. Nevertheless, abdominal adiposity and metabolic status remain critical determinants of long-term health, and the MHAO phenotype may not be entirely benign.

Trial Registration: PROSPERO (CRD42019111056)

Soraya Doustmohamadian and Azam Doustmohamadian have contributed equally to this work and share first authorship.

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