Title

Daily steps and all-cause mortality: An umbrella review and meta-analysis

Abstract

Objective: This study aimed to describe the variability in estimates of the association of daily steps and all-cause mortality in systematic reviews with meta-analyses, to identify the factors potentially responsible for it, and to provide an updated estimate. Methods: Five databases were systematically searched up to May 2024 to identify systematic reviews with meta-analyses and prospective cohort studies. A qualitative synthesis of previous reviews and an updated meta-analysis of cohort studies were performed. Pooled hazard ratios (HRs) with their 95% confidence intervals (CIs) were calculated using a random-effects model. Results: Eleven systematic reviews with meta-analyses and 14 cohort studies were included, revealing considerable variability in result presentation. Our updated meta-analysis showed a nonlinear association, indicating a lower risk of all-cause mortality with increased daily steps, with a protective threshold at 3143 steps/day, and a pooled HR of 0.91 (95% CI: 0.87, 0.95) per 1000 steps/day increment. Physical activity categories consistently indicated progressively reduced mortality risk, with the highly active category (>12,500 steps/day) exhibiting the lowest risk (0.35 (95% CI: 0.29, 0.42)). Conclusion: Systematic reviews and meta-analyses showed considerable variability in effect estimates due to different methods of quantifying exposure. Despite it, our study underscores the importance of increased daily steps in reducing all-cause mortality, with a minimum protective dose of 3000 steps/day, although the optimal dose differed according to age and sex. It is recommended that future studies categorise daily steps by physical activity category, perform dose-response analyses, and use increments of 1000 steps/day.

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