Obesity Research & Clinical Practice (2015) 9, 1—11

REVIEW

Age-dependent decline of association between obesity and mortality: A systematic review and meta-analysis

Zhiqiang Wang*

School of Medicine, University of Queensland, Brisbane, Queensland, Australia

Received 7 November 2013; received in revised form 22 January 2014; accepted 25 January 2014

KEYWORDS
Obesity;
Mortality;
Confounding;
Age dependent

Summary
Objective: It is debatable if the strength of obesity—mortality association depends on age. The objective of this study was to investigate the influence of age on the obesity—mortality association in men and women, and to assess if adjusting for major confounding factors altered the age-dependent trend of the obesity—mortality association.
Design and methods: Articles were identified by searches of PubMed through 15 August 2013. Twenty studies which reported two or more age-specific effect estimates were identified. A random-effect approach was applied to estimate pooled effect sizes for different age groups.
Results: There was a significant heterogeneity among studies within each age group in the effect estimates for the association between obesity and mortality. The pooled hazard ratio estimates decreased with increasing age from 1.59 (95% confidence interval, 1.46—1.72) for men and 1.60 (1.49—1.72) for women under 35 years to 1.11 (1.08—1.15) for men and 1.11 (1.09—1.14) for women 75 years or older. On average, the effect estimate was decreased by about 10% with every 10 years increase in age.
Conclusions: Adjusting for known confounding factors of smoking, pre-existing illness, hypertension and diabetes has little impact on the age-dependent decline trend of the obesity—mortality association. Therefore, the strength of the association between obesity and mortality weakens with increasing age.

* Corresponding author at: School of Medicine, University of Queensland, 817 Health Sciences Building, Royal Brisbane & Women's Hospital, Herston, QLD 4029, Australia. Tel.: +61 7 33464811; fax: +61 7 33465178.
E-mail address: z.wang@uq.edu.au

1871-403X/$ — see front matter
http://dx.doi.org/10.1016/j.orcp.2014.01.006

Contents

Introduction

It is well accepted that obesity is associated with significantly higher risk of all-cause mortality [1,2]. It is still debatable if the strength of obesity—mortality association depends on age. Increasing evidence suggests that the association between obesity and mortality declines with advancing age [3—5]. A diminishing association with age has also been reported between obesity and cardiovascular disease [6,7]. However, in a recent study, Masters et al. argued that the weakening obesity and mortality association with age was derived from biased estimates of the relationship because the models of those studies failed to account for confounding influences [8]. They suggested that the estimates of the obesity—mortality relationship became stronger with increasing age, which contradicted the findings from previous reports.

Understanding whether the obesity—mortality association is modified by age is important for defining optimal weight and for guiding weight control efforts among people of different ages. Individual reports about age effects on the obesity—mortality association have often attracted criticisms mainly about biases due to uncontrolled confounding [9—13]. Although there are a number of review articles examining the association between obesity and mortality [1,2,14], the literature reporting the effect of age on the obesity—mortality association has not been systematically reviewed. Studies on this topic require large samples to generate and compare age-specific effect estimates. Confounding has been considered as one of the major threats to the validity of those observational studies. Generally, different sets of potential confounding factors were controlled for in different studies even though smoking and pre-existing illness have generally been considered as confounding factors. On the other hand, adjusting for some intermediate variables in the causal pathway may diminish the estimates of the true association between obesity and mortality (over-adjusting) [15].

The objective of this study was to review evidence about the influence of age on the obesity—mortality association in men and women. To achieve this objective, we compiled and summarised the published age specific hazard (or risk) ratios of all-cause mortality for obesity in cohort studies that had provided age specific risk ratios for two or more age groups. Since confounding is the focus of the debate, we also compiled confounding factors adjusted for in those studies and assessed whether adjusting for smoking and pre-existing illness provided different age trends of the obesity—mortality association.

Methods

Study search and selection

Articles were identified by searches of PubMed through 15 August 2013. Searching the following combinations of key words in titles: ''Weight or BMI or Body mass index or Obesity) and (Mortality), not (patient*, adolescen*, child*, neonat*, infant*, pregnant*, cancer*), we retrieved 564 articles as shown in Fig. 1. Reading through the titles and abstracts of those articles, we excluded 394 papers focusing on special groups of patients and animals. The remaining170 manuscripts were reviewed to identify those articles which used BMI categories to define obesity in prospective cohort studies and assessed the association between obesity and all-cause mortality in either men or women or both. We identified twenty research articles which reported age specific hazard (or risk) ratios for two or more age groups in the same study for the final analysis of this review [4,5,8,16—32].