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## Review

# Systematic review and meta-analysis of complications and outcomes of obese patients with burns



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## ABSTRACT

Obesity has been described as a factor that contributes to poorer outcomes and more severe complications in burned patients. We thus aimed to meta-analyse the literature present regarding the extent to which obesity contributes to the prevalence of various complications in burns. We searched MEDLINE, Science Direct and Web of Science for 363 articles. Eventually, we selected only 7 articles for our analysis based on our selection criteria. Data was analysed via Review Manager 5.3, using Mantel–Haenszel statistics and random effect models. Length of stay and mortality rates were significantly different for obese patients compared to non-obese patients at a Mean Difference (MD) of 2.16 (95% CI = 0.42–3.87;  $I^2 = 0$ ;  $p = 0.01$ ) and Odds Ratio (OR) = 1.97 (95% CI = 1.07–3.46;  $I^2 = 65\%$ ;  $p = 0.03$ ) respectively. Number of wound infections, number of burn operations and length of ICU stay were not found to be statistically different. We postulate that our significant findings are due to the proinflammatory state and poorer glycemic control in obese patients. As our review was limited by the few articles currently available in the literature, it is suggested that more studies of high quality be performed to better understand the implications of obesity in burns.

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## 1. Introduction

Obesity is a global epidemic and has been recognised as a major contributor of chronic diseases and disability internationally [1]. Dependent on gender and geographical location, the prevalence of obesity in Europe ranges from 4.0% to 36.5% [2]. Amongst US adults, the prevalence of obesity is 31% in men and 33% in women [3]. 30% of individuals below the age of 18 years are overweight, with 16% estimated to be obese [4]. Obesity was officially declared by the World Health Organisation (WHO) as a global issue in 1997 after the morbidity associated with obesity was accepted [5]. Currently, it is the most important risk factor contributing to health burden internationally [6,7]. Its comorbidities include non-insulin-dependent diabetes mellitus (NIDDM), hypertension, dyslipidemia, stroke, coronary heart disease, and certain types of cancers. The calculated impact of disease disability as a result of obesity was 10 times greater than the number of life years lost due to premature deaths for individuals who die below 75 years of age [8]. For patients being admitted into hospitals, weight has been examined as an essential predictor of morbidity and mortality [9–11]. Susceptibility towards obesity is a result of various factors, including early foetal and postnatal malnutrition [12] and epigenetic factors [13]. Risk factors for obesity comprise of genetic [14], behavioural [15] and environmental factors [16,17]. The pathogenesis of obesity revolves around the absence of appropriate energy hemostasis as a result of disrupted physiological pathways which are largely driven by hormones such as insulin and leptin.

Obesity has been described in the literature as a factor that has contributed to poorer outcomes and more severe complications in burns patients [18] alongside other risk factors such as extremes of age (very young and very old [19]) and diabetes mellitus [20]. In fact, obesity has been strongly established as a vital risk factor in critically ill patients especially after major injury [21–24]. Various studies have studied the relationship of obesity with different burns complications. The excessive stress placed upon the burns patient requires intact physiological systems to appropriately react to consequent hypermetabolism and hypercatabolism. The alterations to physiological processes and responses of the body to injury and inflammation due to the rise in adiposity has resulted in numerous challenges for healthcare teams [25]. A large predilection towards deficient recovery systems would have the potential to cause severe harm to obese patients when rapid, undisturbed recovery is vital for survival in the setting of burns. Studies have proposed that such patients are potentially prone to a variety of complications such as wound infections, increased length of hospital stay, increased length of ICU stay and increased number of burn related operations [28–31]. However, articles currently in the literature are based on

data obtained from various study populations, with differing demographic groups, inclusion criteria and management protocols. To date, there have been no reviews to synthesise the data present within the literature. As such, it remains challenging to generalise the data available appropriately from the various individual articles to heterogeneous populations internationally. As the prevalence of obesity continues to rise rapidly, it is necessary to appreciate the full picture of obesity on the eventual outcomes of burns patients. General conclusions obtained from a combined analysis of the various study populations currently presented in the literature would provide teams all around the world a better understanding of complications obese patients with burns are at higher risk of. With this information, it is hoped that medical teams are empowered to improve their care for obese patients who sustain burns. In this systematic review and meta-analysis, we thus aim to synthesise the information present in the current studies which investigate the impact of burns on obese patients and identify the complications which such patients are more prone to as a result of burns.

## 2. Methodology

### 2.1. Protocol

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Checklist was used as a guide for this review. Further details regarding the checklist can be found at the following website: <http://www.prisma-statement.org/documents/PRISMA%202009%20checklist.doc>. As this is the first review regarding complications sustained amongst obese patients who sustained burns, no other pre-existing review protocol was present as a reference for this study.

### 2.2. Search technique

Only articles published in the English language were considered for this review. We searched MEDLINE, Science Direct and Web of Science (1956 to March 2015) for publications in any language that described associations between obesity and the prevalence of complications in burns patients. Our search terms were as follows: “(obesity[MeSHTerms]) AND burns [MeSH Terms]” for MEDLINE, “TITLE-ABSTR-KEY (burns) and TITLE-ABSTR-KEY (obesity)” for Science Direct and “TOPIC (obesity) AND TOPIC (burns)” for Web of Science.

### 2.3. Study selection

Out of 363 articles identified from these three databases, we selected articles which were relevant to complications in obese patients sustaining burns. Only papers involving human

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