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Comparison of clinical outcomes in diabetic and non-diabetic burns patients in a national burns referral centre in southeast Asia: A 3-year retrospective review

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ABSTRACT

Objective: Diabetic burns patients may be at risk of worse clinical outcomes. This study aims to further investigate the impact of diabetes mellitus on clinical outcomes in burns patients in Singapore.

Methods: A 3-year retrospective review was performed at the Singapore General Hospital Burns Centre (2011–2013). Pure inhalational burns were excluded. Diabetic ($N = 53$) and non-diabetic ($N = 533$) patients were compared, and the impact of diabetes on clinical outcomes, adjusting for confounders, was investigated using multivariate logistic regression.

Results: The diabetic group had a significantly higher incidence of wound infection and severe renal impairment, as well as a longer length of stay, higher number of operations and higher rate of unplanned readmission. ICU admission was significantly associated with hyperglycaemia (OR 5.44 [2.61–11.35], $p < 0.001$) and a higher total body surface area of burn (OR per 1% TBSA 1.07 [1.05–1.09], $p < 0.001$). Unplanned readmission was significantly associated with wound infection (OR 4.29 [1.70–10.83], $p = 0.002$), and mortality associated with a higher TBSA (OR per 1% TBSA 1.1 [1.07–1.14], $p < 0.001$). After adjusting for confounders, diabetes mellitus was not significantly associated with unplanned readmission or mortality.

Conclusions: Diabetic burns patients have an increased risk of worse clinical outcomes, including wound infections, renal impairment and longer length of stay.

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1. Introduction

Diabetes mellitus has consistently been found to be among the top ten leading causes of death in Singapore between the years of 2006 and 2011 [1]. In 2010, the prevalence of diabetes mellitus in the Singapore population was estimated at 11.3% [2], and is expected to continue on an upward trend [3].

Burns patients with diabetes mellitus may be at risk of worse clinical outcomes and increased complications, as a result of the numerous pathological changes and associated disease processes seen in these patients. These include impaired perfusion due to diabetic angiopathy, and increased susceptibility to infection due to diabetic immunopathy [4]. Existing literature on diabetic burns patients offers several significant observations, including an increased frequency of sepsis, community-acquired burn wound cellulitis and urinary tract infections [5], increased burn intensive care unit admissions [6], increased length of hospital stay [6,7], and higher incidence of renal failure [6].

However, there have been no studies to date investigating the relationship between diabetes mellitus and clinical outcomes in burns patients in a Southeast Asian context. The purpose of this study is to further investigate the impact of diabetes mellitus in burns in a tertiary burns referral centre in Southeast Asia.

2. Materials and methods

Patients admitted to the Singapore General Hospital (SGH) Burns Centre over a 3-year period between January 2011 and December 2013 were considered for inclusion in the study. The SGH Burns Centre is a regional tertiary referral centre which functions as the only specialised facility in Singapore to provide acute burns care for adults, and also receives referrals from other centres in the region.

Patients who sustained pure inhalational burns (without surface burns to defined anatomical sites) were excluded from the study. Out of 649 patients, 586 fulfilled the inclusion criteria and were retrospectively analysed (Fig. 1). Patients' electronic medical records were accessed, and the data on epidemiology, clinical outcomes and complications was collected.

Epidemiological data collected include diabetes mellitus status, level of diabetic control, age, gender, ethnicity, total body surface area (TBSA) of burn, depth of burn, site of burn, aetiology of burn and comorbidities. Diabetes mellitus status was based on the patient's past medical history in the electronic medical records. Level of diabetic control was determined using a HbA1c value of 6.5% as a cut-off between well-controlled and poorly controlled diabetes mellitus. This is based on the American College of Endocrinologists guidelines [8].

Primary clinical outcomes studied include admission to the burns intensive care unit, unplanned hospital readmission and mortality. Secondary clinical outcomes studied include length of hospital stay and number of operations. Length of hospital stay was further analysed by determining the length of stay per percentage of TBSA burn. Unplanned readmission

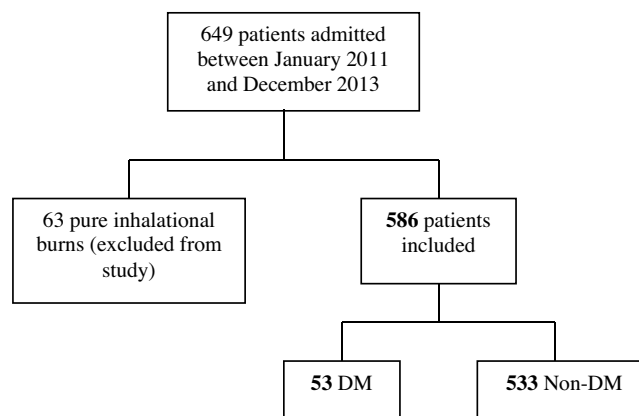


Fig. 1 – Selection of study population.

was defined as any admission to the burns ward within two weeks of the initial date of discharge, with possible reasons including wound infections and difficulties caring for the wound independently at home.

Complications studied include vascular complications (acute myocardial infarction, cerebrovascular accident), infective complications (pneumonia, wound infection, sepsis, urinary tract infection, line sepsis), and end organ-related complications (renal impairment, liver impairment, coagulopathy). Infective complications were diagnosed with microbiological confirmation from positive sputum, wound, blood or urine cultures. Renal function was determined by the creatinine clearance (calculated using the Cockcroft-Gault formula), with renal impairment defined as a creatinine clearance of less than 50 ml/min, and severe renal impairment as a creatinine clearance of less than 30 ml/min [9]. Liver impairment was defined as an elevation of any of the liver enzymes (ALT, AST, ALP, GGT) beyond the upper normal limit. Coagulopathy was defined as a prolonged prothrombin time or prolonged activated partial thromboplastin time.

Patients were stratified based on diabetes mellitus status (i.e. diabetic vs non-diabetic), and descriptive statistics were used to compare between the two groups. Categorical variables were analysed using Fisher's exact test. Continuous variables such as age were analysed using the 2-sample t-test. Continuous variables that did not meet the normality assumption were analysed using the Wilcoxon rank-sum test. Median and interquartile range were calculated for these variables.

Subsequently, a multivariate logistic regression model was developed to identify significant predictors of clinical outcomes, adjusting for confounders. The following three primary clinical outcomes were focused on: admission to burns intensive care unit, unplanned readmission and mortality. The following variables were analysed for their impact on the clinical outcomes being studied: presence of diabetes mellitus, presence of hyperglycaemia, long-term blood glucose control in diabetic patients (HbA1c > 6.5% vs HbA1c < 6.5%), age, gender, ethnicity, TBSA of burn, depth of burn, site of burn, aetiology of burn, comorbidities, and complications (acute myocardial infarction, cerebrovascular accident, pneumonia, wound infection, sepsis, urinary tract

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