

## CHAPTER 1: INTRODUCTION

### 1.1 Background

Diabetic foot ulcer (DFU) is a serious and common complication of patients with diabetes mellitus that significantly increases the cost of treatment. Diabetes is one of the most prevalent chronic diseases: in 2010, one study reported that 285 million adults worldwide had diabetes and this figure is projected to rise to 439 million by the year 2030 (Shaw et al, 2010). This profound demographic shift is likely to result a corresponding increase in the prevalence of chronic diabetes complications, including those in the lower extremity, the diabetic foot (Susan van et al., 2010). Prevalence of risk and DFU is higher in Indonesia. The current study found that the prevalence of risk (neuropathy and angiopathy) in this study was 55.4% (Yusuf et al., 2016). These findings are within global prevalence of risk 40% - 70% (Yusuf et al., 2016). This percentage still remains higher compared to India (Bansal et al., 2014). Meanwhile, current prevalence of DFU is 12%. These findings are higher compared to China which is the most populated Diabetes Mellitus country (Jiang et al., 2015) and in comparison with global prevalence 1.4% - 5.9% (Boulton, 2008). In Dr. Soetomo General Hospital, diabetic foot ulcer is the most common cause of inpatient registration in the Internal Medicine Department and with an average duration of 28 days of hospitalisation amongst those that has been admitted 30% had to undergo amputation, however this data was done from 2003-2007 (Sutjahjo, 2016)

Many studies have reported on the bacteriology of Diabetic Foot Infections (DFIs) over the past 25 years, but the results had varied and often contradicted one another. (Citron et al., 2007). The varied results could be due to differences in causative agents, which had occurred over time, geographical variations, or the type and the severity of the infection, as were reported in the studies (Citron et al., 2007). In Indonesia, based on a study conducted in Jakarta (Radji et al., 2014), has several limitations. This research was done before the implementation of BPJS

which is was implemented in 2014 and more people had access to health care therefore and increase use of antibiotics which may result in resistance. This contributes to the community based infections which are becoming increasingly common. Moreover, this research was done in a navy hospital which can't account for the entire Indonesian population as a navy officer lives a far more different lifestyle than the average Indonesian regardless the sample size is also a matter of limitations with only 35 patients to study from.

Diabetic neuropathy and micro- or macro-ischemia are the two main risk factors that cause DFU (Ismail et al., 2007). Impairment of microvascular circulation limits the access of phagocytic cells to the infected area therefore this causes a reduced concentration of antibiotics at the infected tissue area. Due to the reduced concentrations of phagocytic cells and antibiotic concentrations, diabetic foot wounds are easily infected which then leads to micro-thrombi causing ischemia, necrosis, and then gangrene which requires the need of limb amputation. Therefore, accurate diagnosis of causative organism is essential for the management of these cases especially with the implementation of the new government insurance scheme (BPJS) where only a government approved drug is given to patients with diabetic ulcer under this scheme. Dr. Soetomo General Hospital is the main reference hospital in east Jawa for patients with diabetic ulcer. Patients with diabetes have a 10-fold higher chance of hospitalisation due to soft tissue and bone infection when compared with nondiabetic individuals (Shakil and Khan, 2010). Due to inadequate foot care and local, blood supply to the lower extremities is further compromised.

Diabetic neuropathy leads to repeated non-recognized trauma to the insensate feet and this causes callosities, cracks, fissures, and ulcer formation. Secondary infection of the ulcer with arterial abnormalities further complicates the condition leading to gangrene and limb loss. A compromised immune state in patient with diabetes favours rapid and relentless development of local sepsis and even life-threatening septicaemia. Massive infection is the most common

factor leading to limb amputation (Barman and Jain, 2017). Patients with diabetes are often exposed to many antibiotics and therefore can develop multiple-drug resistant infections (MDRO) and most diabetic foot infections are caused by mixed bacterial infection (polymicrobial). Proper management of infections requires an appropriate antibiotic selection, based on the culture and the antimicrobial susceptibility testing results (Zubair, Malik and Ahmad, 2011).

Medical and research communities are beginning to realize that the diversity of the bacterial populations in chronic wounds may be an important contributor to the chronicity of the wounds, such as diabetic foot ulcers (Shanmugam, 2013). Although there is an abundance of research regarding the type of bacteria found and its antibiotic sensitivity, however there is none regarding its association to the duration of hospitalisation but there are research regarding its risk factors. Moreover, the external data from Western country studies cannot be generalized into Indonesian setting since characteristics of demography, lifestyle and behaviour are different. This fact leads to limitation of preventive strategies to prevent presence of risk and DFU based on Indonesian. (Yusuf et al., 2016). Knowing the duration of therapy will greatly improve the efficiency of treatment, it will also help patients and insurance company to predict the average cost needed for treatment. The use of bacterial antibiotic resistance is to provide the most accurate empirical treatment for patients and to know if there is a new emerging resistance amongst the diabetic ulcer community in which we would have to address. The aim of this research is to determine the association between antibiotic resistance and duration of hospitalisation in patients with infected diabetic ulcer foot in Surabaya.

## **1.2 Problem formulation**

Is there any association between antibiotic resistance and duration of hospitalisation in diabetic foot ulcer patient at Dr. Soetomo General Hospital?

## **1.3 Research Objective**

Based on the above problem formulation, the purpose of this research is to: -

### ○ 1.3.1 General Objective

To analyse the association between antibiotic resistance and duration of hospitalisation in diabetic foot ulcer patient at Dr. Soetomo General Hospital.

### ○ 1.3.2 Specific Objective

1. To describe the profile of inpatients with DFU at Dr. Soetomo General Hospital.
2. To identify the type of bacteria that is most prominent in patients with DFU at Dr. Soetomo General Hospital.
3. To identify the bacterial resistance towards antibiotics found in patients with DFU at Dr. Soetomo General Hospital.
4. To identify the duration of hospitalisation in the average inpatient with DFU in Dr. Soetomo General Hospital.
5. To analyse the resistance of bacteria towards antibiotics and the duration of hospitalisation in patients with DFU in Dr. Soetomo General Hospital with diabetic foot ulcer.

## 1.4 Research Benefits

### ○ 1.4.1 Academic Benefits

1. To further update the knowledge between the association of type of bacteria and its resistance in patients with DFU at Dr. Soetomo General Hospital.
2. To observe the profile of drug resistance within patients with DFU at Dr. Soetomo General Hospital.
3. To observe the current statistics regarding the duration of hospitalisation for the average patients with DFU at Dr. Soetomo General Hospital.

### ○ 1.4.2 Clinical Benefits

1. Medical doctors will be able to use the knowledge on the strains of bacteria found to prescribe a more accurate empirical treatment.
2. Give medical doctors a more general view in the current aetiology of patients with DFU at Dr. Soetomo General Hospital. Medical doctors are able to know if there has been a new resistance amongst the common bacterial thought to be found and treat accordingly.
3. Medical doctors will be able to use the average duration of hospitalisation as an estimate for patient care in terms of patients financial burdens and if the hospital has an overflow of inpatients.