

# Introduction

## 1.1 Background

The establishment of a healthcare system is a basic requirement of every civilized society. Food, medicines, chemicals, equipment and instruments are used while treating out patients as well as patients admitted into hospital, naturally, this leads to the production of a variety of medical and non-medical wastes [1]. An appropriate management and minimization efforts are necessary to reduce the quantity and volume of these types of waste, as well as to reduce handling and disposal expenses [2]. Although significant thermal treatment has been made in healthcare waste, existing healthcare waste management practices still need a great deal of modifications and improvement [2,3]. Throughout the world medicine is one of the sectors that have witnessed significant developments. According to world health organization report, the term medical waste is alternatively known as clinical waste [1]. Generally, medical waste has been classified as clinical waste and legally this definition has not changed [3]. The wastes generated from the treatment of patients suffering from infectious diseases may spread infection either through direct contact or indirectly through the environment [4]. The amount of medical waste produced by hospitals may vary due to a number of factors including hospital type and size; occupancy rate; in- and out-patient ratio; geographic location; state and local waste-handling regulations; and hospital waste-disposal policies [1,4]. The absence of well-defined waste-management policies and guidelines, lack of awareness about the health hazards, insufficient financial and human resources and poor control of waste disposal are the most common problems associated with medical wastes [5]. Many countries such as developing countries do not have an appropriate regulation for medical waste [6]. An essential issue is the clear attribution of responsibility of appropriate handling and disposal of waste [2,4]. Due to increasing private sector involvement in waste-management activities, it is

important to have established laws and regulations on all aspects of waste management (worker safety, adoption of segregation, transportation, treatment, and disposal) [1,4]. Medical waste, if not treated properly, may be hazardous to both people and environment [1]. In many countries, hazardous and medical wastes are still handled and disposed together with domestic wastes, posing a great health risk to municipal workers, the public and the environment. Medical waste must be separated from municipal waste, but in many parts of Africa it tends to be collected along with the rest of the waste stream [5]. Most hazardous and toxic wastes are placed on landfills with few safeguards to protect nearby inhabitants and water sources from contamination. This is usually the case in developing nations [7].

## **1.2 Problem Statement**

Energy is an essential element of life. Our lives are literally surrounded by energy. Rising energy consumption in countries such as Sudan has led to increase interest in the conversion of waste into usable products such as fuels. Of the various processes that can be used to convert medical waste into fuels the pyrolysis process has been identified as having significant potential. The thermal treatment options of pyrolysis, gasification and combined pyrolysis/ gasification systems, are generating increasing interest as viable alternative environmental and economic options for waste processing. These options have a number of advantages over conventional incineration or landfilling of waste.

### **1.3 Objectives**

The objectives of this study are

1. To collect and analyse information on existing handling, treatment, and disposal practices of medical waste generated by hospitals in Khartoum, Sudan.
2. Design and fabricate lab scale burner.
3. To investigate an alternative use for one of the main products generated in thermal treatments of waste.
4. Analyse the syngas component which produced from the thermal treatment.

### **1.4 Scope**

1. From medical waste, the infectious one was chosen.
2. Slow pyrolysis is the treatment applied.

### **1.5 Significance of this study**

Medical waste is a special category of waste, which is highly hazardous due to its infectious or toxic characteristics [7]. Thermal treatments of medical waste can reduce the highly hazardous [8]. Pyrolysis is a thermal method of treatment of waste by heating it in inert atmosphere [7,8]. This process is advantageous over combustion and incineration as there is negligible pollution, low capital cost and storable fuel and chemical feed stock is produced. This study can create public awareness regarding the health risk of the medical waste [9].