1.1 Introduction

Infectious diseases represent a critical problem to health and they are one of the main causes of morbidity and mortality worldwide (World Health Organization, 1998). Despite the significant progress in human medicine, infectious diseases caused by microorganisms such as fungi and bacteria are still a major threat to public health. The impact is even more in developing countries due to the unavailability of medicine and the emergence of widespread drug resistance (Khan et al., 2010). Infections induced by pathogenic microbes are increasingly recognized as an emerging threat to public health (Senthilkumaran et al., 2014). The increase in occurrence of microbial infections during recent years is due to a growth in the immunocompromised population, such as organ transplant recipients and cancer and HIV patients. Certain commensally microbes cause infections when their human hosts become immunocompromised. These problems are also associated with resistance to antibiotics and toxicity during prolonged treatment with several antifungal drugs (Sundar et al., 2013). The development of bacterial resistance to presently available antibiotics has necessitated the need to search for new antibacterial agents. Gram positive bacteria such as Staphylococcus aureus are mainly responsible for post-operative wound infections, toxic shock syndrome, endocarditis, osteomyelitis and food poisoning. Gram negative bacterium such as Escherichia coli is present in human intestine and causes lower urinary tract infection, coleocystis or septicaemia. Multiple drug resistance in human pathogenic microorganisms has been developed due to indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases. The development of antibiotic resistance is multifactorial, including the specific nature of the relationship of bacteria to antibiotics, the usage of antibacterial agent, host characteristics and environmental factors. This situation has
forced scientists to search for new antimicrobial substances from various sources as novel antimicrobial chemotherapeutic agents, but the cost production of synthetic drugs is high and they produce adverse effects compared to plant derived drugs (Amenu, 2014). There are many synthetic and natural product-based drugs available for treating fungal infections, but they are not consistently effective. Furthermore, the development of resistance in fungi against most of the drugs has now been reported for several years (Khan et al., 2010). The use of amphotericin B against *Candida spp.*, known as the “gold standard”, is limited because of its infusion-related problems and nephrotoxicity. In addition, the low efficacy, and side-effects and resistance associated with the existing drugs, highlight the advent of safe, novel, and effective antifungal drugs. Plants produce a great deal of secondary metabolites, many of them with antifungal activity. Similarly, traditional medicine has made use of many different plant extracts for treatment of fungal infection and many of these have been tested for in vitro antifungal activity. Based on the knowledge that plants develop their own defense against fungal pathogens (Reddy et al., 2010) they appear as an interesting source for antifungal compounds. Medicinal plants have also been reported in traditional systems of medicine for the treatment of both human and animal mycoses, and are considered to be a valuable source for the discovery of new antifungal drugs. Many books have reported and recorded the use of medicinal plants in the traditional system of medicine. Gerard’s Herbal, first published in 1597, has so far yielded 16 currently prescribed drugs (Cox, 1998). In a study, Fabricant and Farnsworth (2001) reported that 94 species of plants are utilized for the production of 122 single-agent natural products that are being used as single agent drugs around the world. Thus, even with this very incomplete database of global
ethno medical information, there is abundant opportunity for the discovery of new medicinal agents.

Many studies have been carried out to screen medicinal plants for their antimicrobial activities. Various groups all over the world initiated antimicrobial programs for plants used in traditional medicine or as anti infectious agents. The most extensive screening was sponsored by the National Cancer Institute (NCI, USA). However, the main focus of this study was not antimicrobial screening. In this program, around 30,000 species were screened from 1960 to 1981 (Douros and Suffness, 1881; Cragg et al., 1997). More than 2,000 plant extracts reported for several biological activities including antifungal, antibacterial, anti diabetic, anti fertility, anti hypercholesteremic, anti-inflammatory, antitumor, cardiovascular, central nervous-system depressant, cytotoxicity, diuretic, and others (Dhawan et al., 1980; Akbari et al., 2013; Akhlaghi et al., 2011). A large number of known and novel bioactive compounds were isolated from the plants. Antimicrobial properties of various Indian plants and their synergism against MDR microbial isolates have been reported by many workers (Batta et al., 2013; Azubuike et al., 2015; Pareek et al., 2015; Aparna et al., 2015; Subramanian et al., 2014; Li et al., 2015; Aruna et al., 2015; Jouda et al., 2016).
In view of the above, a comprehensive and systematic work has therefore been planned to achieve the following objectives

1. Isolation and identification of *Pseudomonas* and *Candida* species from clinical sources.
2. To determine the multiple antibiotic resistance among the isolates.
3. To determine the antibacterial activity of some plant extracts (*Azadirachta indica*, *Syzygium cumini*, *Ocimum sanctum* etc.) and some essential oils (lemongrass oil, coconut oil, almond oil and clove oil etc.) against multiple drug resistant *Pseudomonas* and *Candida* species
4. To determine the minimum inhibitory concentration of plant extracts and essential oils among selected isolates.
5. Synergistic activity determination of antibiotic and plant extracts on multi drug resistant *Pseudomonas* and *Candida* isolates.
6. Molecular characterization of some selected drug/plant extract against resistant *Pseudomonas* and *Candida* species.

**Significance of the work**

Due to development of bacterial resistance to presently available antibiotics has necessitated the search for new antibacterial agents or a combination of drugs to be able to combat new resistant pathogenic bacteria. It has been observed in previous research a synergistic effect of various plant extracts with antibiotic against MDR microbes, therefore we will check this possibility in our study by using medicinal plants and their oils.