1. Introduction

Infectious diseases are the second leading cause of death worldwide (WHO, 1999). Due to the continual emergence (diseases not been previously identified) and re-emergence (diseases which have appeared in a more virulent form) of the diseases, there is a global impact on infectious diseases which will always be on the rise and a concern for a major health issue world-wide.

According to a report, today almost 18.6 % of all the cancers is directly or indirectly associated with the infections ranging from various pathogens including bacteria, viruses and parasites. Most of the peptic ulcer diseases and gastric carcinoma (37 %) are due to the *Helicobacter pylori* infection. Other cancers like, cervical cancer, anal and vulvar carcinoma (27.90 %) are because of the infection by human papilloma virus. Hepatitis B and C virus infection may cause hepatocellular cancer (24.80 %). Burkitt’s lymphoma and nasopharyngeal cancer are a result from the infection due to the Epstein-Barr virus (10.30 %) (Hausen, 2009).

*H. pylori* (gram negative) is one of the most common bacterial pathogen which is microaerophillic, colonizes in the human stomach (Graham, 1997) and is responsible for the chronic gastritis, gastric and peptic ulcer, gastric cancer, gastric adenocarcinoma and mucosa associated lymphoid tissue (MALT) (Marshall and Windsor, 2005). Each year atleast 7 million cases of gastric and duodenal ulcers, adenocarcinoma and MALT lymphoma are reported worldwide resulting in thousands of death. Colonisation of *H. pylori* is usually lifelong and may lead to chronic gastritis (low level inflammation of the stomach lining), duodenal, gastric ulcer and finally gastric cancer (Covacci et al., 1999).

*H. pylori* is recognized as a class I carcinogen and approximately 70-90 % of the population of the developing countries are infected by this pathogen (De et al., 2009). The current treatment strategy to combat this deadly pathogen usually involves a triple therapy including a proton pump inhibitor and two antibiotics, clarithromycin and metronidazole (Calvet et al., 2000). However, eradication of this bacterium is not always successful mainly due to the acquisition of multi-drug resistance which is a cause of major concern leading to inefficient treatment (De et al., 2009). The drug resistance pattern in the *H. pylori* strains seems to vary among strains from different regions of India. The variation in the drug sensitivity among
strains is attributed towards their unique regional genetic features (Datta et al., 2005).

Resistance to the antibiotic metronidazole is most common among \textit{H. pylori} strains (Gerrits et al., 2004; 2006). In the developed countries it is usually between 29-52\% (Jones et al., 2008) and in some of the developing countries it is upto 100\% (Njume et al., 2009; Tanih et al., 2010). The other commonly used antibiotic in the treatment of \textit{H. pylori} is clarithromycin (Megraud and Lehours, 2007). It is the most efficient drug \textit{in-vitro} and is less affected by the pH. The prevalence of clarithromycin resistance shows highest regional variation. The clarithromycin resistance in \textit{H. pylori} has declined the eradication success rate by 40-50\% (Njume et al., 2009). The present treatment therapy (usage of antibiotics) is found to be ineffective against the cure of this deadly organism mainly due to the excessive usage of drugs which eventually makes the pathogen acquire resistance. Besides the resistance development, the multiple side effects of the antibiotics and very high cost of the treatment often leads to avoidance of using the treatment.

Since, the current treatment strategies prove to be ineffective, there has been a considerable interest in various plants and their products for the generation of new drugs to combat this pathogen (Broutet et al., 2003; Wong et al., 2003; Myllyluoma et al., 2005). The high complexity of the bioactive compounds from plants coupled with their broad antimicrobial activity may make it difficult for the pathogenic organisms, including \textit{H. pylori} to acquire resistance during treatment (Cowan, 1999). There has been a growing interest in the phytochemical and antioxidant approach for the eradication of this pathogenic bacterium, primarily due to the decline in the efficacy of the currently available drugs.

Plants have certain metabolites which serve as plant defense mechanism (Cowan, 1999) and other innumerable functions including antimicrobial, antioxidant and free radical scavenging activity. These are secondary metabolites like phenols, flavonoids, tannins, terpenes, alkaloids, coumarins, essential oil etc. (Abdallah, 2011).

When \textit{H. pylori} infection triggers inflammatory response, it causes neutrophilic infiltration. The neutrophils generate oxygen free-radicals that are capable of causing
DNA damage in the nearby cells. The DNA damage induced by the free radicals could lead to gene alterations which are potentially carcinogenic (Hahm et al., 1999).

Antioxidants have known to play an important role in controlling the gastro-duodenal mucosal inflammation, peptic ulcer disease and gastric cancer (Nair et al., 2000). Synthetic antioxidants like, butylated hydroxyl toluene (BHT) and butylated hydroxyanisole (BHA) are also indicated to be potential cause of cancer and hormonal perturbation. Therefore, researchers are working on potential antioxidant activity of natural substances (Mogana et al., 2011). Studies have shown that antioxidants have provided support in the treatment against *H. pylori* infection by the potential to neutralize the DNA-damaging free radicals and also lower the risk of gastric cancer (Akyon, 2002).

The present study was aimed to identify traditional medicinal plants and the subsequent isolation of bioactive fraction/s taking in account the antibacterial and the antioxidant activity to create a combinatorial effect against the target human pathogen, *H. pylori*. The study was also targetted specifically against the Indian *H. pylori* strains as they are known to be geographically different from the Western and the East Asian strains. Besides anti-*H. pylori* activity, antimicrobial activity was also checked against the human pathogenic strains like *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Bacillus subtilis* and *Bacillus cereus*. In addition to the antimicrobial activity the anti-oxidant properties of the plant extracts have been assayed. The overall objectives of the present study are mentioned below.

1.1 Objectives:

1. Screening of plants for antimicrobial activity against *H. pylori*.
2. Effect of anti-*H. pylori* plant extracts on other bacterial human pathogens.
3. Isolation and purification of anti-*H. pylori* components from the crude extract.
4. Estimation of phytochemicals and antioxidant activity.
5. Characterization of the bioactive fraction.