-Introduction
1 Introduction

*Staphylococcus aureus* (SA) is an important agent causing variety of infections in human beings ranging from mild localized and invasive infections such as carbuncles, cellulitis, lymph node abscess and wound infections to the severe ones like necrotizing pneumonia and necrotizing fasciitis. It is transmitted from one patient to other through close contacts and fomites. It is a ubiquitous organism that colonizes 30-50% of adults and more than 50% of children with underlying skin disorders.

In the past decade the incidence of both community-acquired and hospital-acquired SA infections have increased.\(^1\,^2\) Antibiotic treatments of such cases are increasingly hampered by the spread of drug resistant strains of SA which are resistant to multiple antibiotics including methicillin and, more recently, vancomycin.\(^3\) Methicillin resistant *Staphylococcus aureus* (MRSA) has got special importance because they are resistant to all types of betalactam antibiotics. Since there are many carriers of SA in the population, the infection can be acquired from the community as well. The nose (i.e. the anterior nares) has been shown to be the primary ecological reservoir of SA in humans and their nasal carriage is a major risk factor for SA infections in various clinical settings.\(^4\) Screening of patients admitted to hospitals has been found to be effective in minimizing the spread of MRSA at the Veterans Affairs hospital in Pittsburgh and in hospitals in Denmark, Finland, and the Netherlands.\(^5\) Even though there are not enough reports available on the prevalence of MRSA nasal colonization in children from India, there are data available from other countries like Taiwan, Turkey etc. which shows an increase in the rate of nasal colonization during the past few years.\(^6\,^8\)
Emergence of community associated MRSA (CA-MRSA) strains susceptible to non-betalactam antibiotics was a reckonable observation when noticed in the last decade of the 20th century. The importance of such strains was underscored by the 1999 report detailing the deaths of 4 US children with invasive MRSA infection while, none of them had identifiable MRSA risk factors.9 Pulsed field typing of the isolates confirmed that these community strains were distinct from nosocomial strains isolated from patients in local hospitals.

About 75 percent of CA-MRSA infections are localized to skin and soft tissue and can usually be treated effectively; however CA-MRSA strains display enhanced virulence, spreading more rapidly and causing illness much more severe than traditional HA-MRSA infections, and they can affect vital organs and lead to widespread infection like, toxic shock syndrome and necrotizing pneumonia. This is thought to be due to toxins carried by CA-MRSA strains, such as Panton Valentine leucocidine (PVL). It is a bicomponent exotoxin released from some strains of SA. It destroys white blood cells and it is an important virulence factor. Strains of PVL producing SA produces a new pattern of disease which has emerged in United Kingdom as well as worldwide.10 Like other SA, PVL producing SA predominately causes skin and soft tissue infections, but can also cause severe invasive infections like necrotizing hemorrhagic pneumonia, necrotizing fasciitis etc. leading to high rates of morbidity and mortality.11 The role of PVL in necrotizing pneumonia has been proved by a murine model of acute primary pneumonia.12 Epidemiologic and clinical data provide evidence of having high virulence if CA-MRSA possesses pvl genes.13
Absence of traditional risk factors for MRSA infections has been noticed in children with community associated infections. Many studies that describe risk factors in MRSA infected patients do so by retrospective review of the medical records. Even though there are some studies which describe the risk factors for MRSA infections, there is no adequate information on the risk factors for MRSA nasal carriage among the school going children.

Age, sex, fasting glucose level and smoking were recently demonstrated to be independent determinants of SA nasal carriage. Other factors which are known to increase the risk for colonization include the presence of underlying skin disorders and history of frequent needle use which occur in the setting of diabetes, or hemodialysis. The risk factors for children also include their family size, parent’s education and occupation.

Epidemiological data have always been effectively used to monitor the changes in disease trends among children and for planning healthcare programmes. Unfortunately, most of the published information on the epidemiology of infectious diseases is based on data collected from special diseased groups or medical records in specialized centers which does not necessarily reflect the actual prevalence of nasal carriage in healthy children.

The primary objective in this study has been framed to determine the prevalence of MRSA nasal carriage among healthy school going children in Udupi taluk of Karnataka, INDIA with the associated risk factors. Characterization of the MRSA strains by antibiogram, SCC mec typing, PVL assay and PFGE typing was also an integral part of the objective.
-Scope of the study
2 Scope of the study

There is lacuna in the literature regarding the epidemiological aspects of MRSA infections in India especially with respect to the colonization rates of MRSA. Identification of the source of infection and route of transmission is an essential step in the outbreak investigation of any infectious disease. It will help to plan activities to break the chain of infection.\textsuperscript{15} It seems nasal colonization of MRSA is the most important source for MRSA infections.\textsuperscript{4, 16} MRSA colonization by children plays a vital role in spreading infections in the communities.\textsuperscript{6} Hence decolonization of carriers assumes lot of prominence in containing the infections. The data obtained through this study would help the public health department and other medical practitioners to plan strategies in the prevention of MRSA infections in this region.

Epidemiological typing of the infectious agent can be considered as another important weapon in the armamentarium of the infection control specialists as this pin points the epidemiological clone of MRSA prevalent in the community. In addition to the methods such as SCC mec typing and PVL assay, the highly discriminating PFGE technique was also employed to ascertain the chances of the Indian variant strain of EMRSA-15 making its presence in the region under study.
- Aim & Objectives
3 The aim of the project:

This project aims to investigate the prevalence of nasal colonization of MRSA among school going children of Udupi taluk as well as to determine the epidemiological type of MRSA involved using conventional and molecular methods.

4 Objectives:

1. Estimate the prevalence of nasal carriage of MRSA among the school going children of Udupi Taluk.
2. Characterize the MRSA colonizing anterior nares by antibiotic susceptibility testing, urease production, panton valentine leucocidine assay, SCC mec typing and PFGE.
3. Determine the risk factors for nasal carriage of MRSA in school going children.
4. Compare the MRSA colonizing the anterior nares of school children from Udupi taluk with the MRSA strains isolated from clinical specimens.