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Incidence and Contributing Factors of Methicillin Resistant Staphylococcus Aureus Colonization in School Children

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Abstract

The present study aimed to determine the incidence and contributing factors of Methicillin Resistant Staphylococcus Aureus (MRSA) colonization in school children. The objectives of the study were to determine the incidence and contributing factors of MRSA colonization in school children, find out the association between incidences of MRSA colonization in school children and selected contributing factors and to identify the association between incidence of MRSA colonization and selected demographic variables. A conceptual framework based on Nola J. Pender's Health Promotion Model was developed to guide the study forward. This research study was conducted in 200 school children from selected schools of Malappuram district. A structured questionnaire was used to identify the contributing factors of MRSA colonization. Data from 200 school children and their parents were collected after validating the tool and the data analyzed using descriptive and inferential statistics. The sample was subjected to nasal swab screening and antibiotic sensitivity test. Results revealed that out of the 200 sample, 105(52.5%) were Staphylococcus Aureus positive, out of which 32(30.4%) were MRSA isolates. 73(69.5%) of the 105 sample were Methicillin Sensitive Staphylococcus Aureus (MSSA) positive. The results affirmed that engaging in group play activities (P- value 0.01) and attending camps (P- value 0.04) have significant association with incidence of MRSA colonization n school children at 0.05 significance level. The study reveals that MRSA colonization has no significant association with demographic variables.

Keywords: Incidence; Contributing Factors; Methicillin Resistant Staphylococcus Aureus (MRSA); Colonization; Methicillin Sensitive Staphylococcus Aureus(MSSA).

Introduction

Infections caused by Staphylococcus aureus (S.aureus) have been plaguing mankind for centuries. In 1959, the beta-lactamase resistant penicillin, methicillin was introduced and subsequently became one of the most common drugs of choice for treating S.aureus infections. The identification of the first strains of Methicillin Resistant Staphylococcus Aureus (MRSA) in 1961 paved way for further researches on MRSA.MRSA is actually resistant to an entire class of penicillin- like antibiotics called beta-lactums. If MRSA is acquired in the community it is called Community Acquired MRSA (C MRSA) [1]. From the late 1990s until now a steady increase has been seen in CMRSA infections.Indian Network for Surveillance of Antimicrobial Resistance (INSAR) identified a prevalence of 41% of MRSA in the year 2008; 47% in 2009 [2]. A study from Chicago found a 25 fold increase in the number of school children admitted to the hospital with MRSA infection [3].

Children are most susceptible to MRSA as they come in contact with each other at home, in schools and play ground. Students who live in care centers,

hostels and dormitories have higher chances of being colonized with this infection [4]. MRSA is harmless if it is colonized in the nose and skin folds of children but becomes difficult to treat once it enters the body [5]. For preventing CMRSA, the most susceptible population needs to be identified and measures have to be taken to protect them from life threatening complications [6]. A study conducted in Andhra Pradesh, India, in the year 2008 suggests that healthy school going children under 16 years of age are potential carriers of S.aureus and in particular, MRSA and other multi-drug resistant strains [7].Since there is a paucity of data on this issue in literature from Kerala, India, the present study aims to determine the incidence and contributing factors of MRSA colonization in school children.

Objectives

1. Determine the incidence of MRSA colonization in school children.
2. Find out the association between incidences of MRSA colonization in school children and selected contributing factors.
3. Identify the association between incidence of MRSA colonization in school children and selected demographic variables.

Methods

As a preliminary step, the investigator had undergone a week training at Microbiology department of Malabar Institute of Medical Sciences Hospital (presently Aster MIMS Hospital) for nasal swab collection, testing of MRSA/ MSSA swab and coagulase test, susceptibility test of staphylococcus aureus under Dr. Sohalanlal. T, Head of Department, Microbiology. The study was conducted as a non experiemental survey and conducted at Malappuram district, of Kerala among school children of age group 6-12 years from government, aided and unaided schools. A total of 200 children were selected using convenient sampling. Study protocol was approved by the Institutional ethics committee and permission was obtained from school authorities. Informed consent from all the parents and assent from all the children were taken. Explanation about the study and questionnaire was given to participants and doubts were clarified. Incidence of MRSA colonization was determined by culturing the nasal swabs taken from school children in the department of microbiology, Malabar Institute of Medical Science Hospital, Calicut.The data were analyzed using descriptive and inferential statistics. Demographic variables were analyzed using frequency and percentage distribution to find out the incidence and contributing factors of MRSA. Analysis of association between MRSA and demographic variables was calculated by chi-square analysis method.Collected data were analyzed using statistical software SPSS version 16.

Results

Findings showed that 72%of the sample belonged to nuclear family and most of the parents (70.0%) were manual labourers. Majority of the parents (61.0%) had monthly income between Rupees 3000-6000. All the participants of the study were living in the rural areas. It was seen that 51%(105)of sample had isolates of S.aureus and out of this 32 children (30.4%) were MRSA positive and 73 children (69.5%) were MSSA positive.

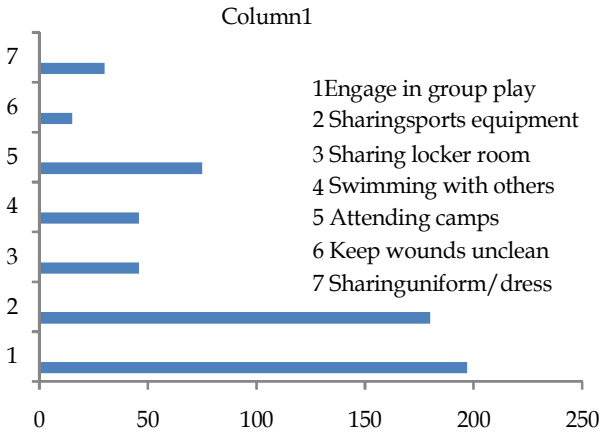

Fig. 1: Frequency distribution of selected contributing factors of MRSA colonization in school children based on checklist for children

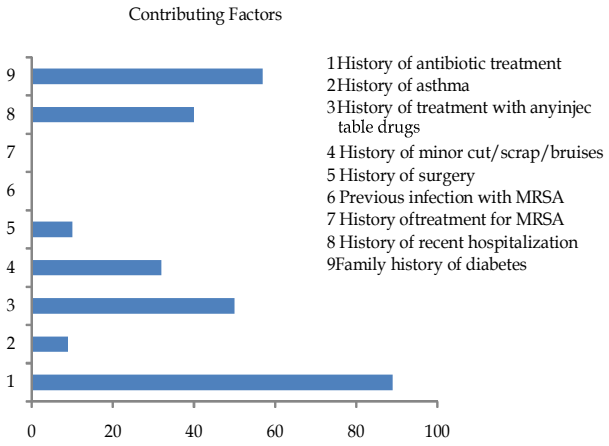

Fig. 2: Frequency distribution of other contributing factors of MRSA colonization in school children based on checklist for parents

Figure 1 show that majority 197 (98.5%) of sample engage in group play activities and majority of them 180 (90%) share their sports equipment with play mates. Only 15 (7.5 %) of sample used to keep their wounds unclean and least of them 30 (15%) share their uniforms or dress with friends or siblings.

Figure 2 also depicts that only 89 (44.5%) of sample had a history of treatment with antibiotics. Past history of MRSA, other infection and injury were considerably low.

Table 1 shows that contributing factors such as engaging in group play activities (P- value 0.01) and attending camps (P- value 0.04) have significant association with MRSA colonization in school childrenat 0.05 significance level.

Table 2 shows that there is no association between demographic variables and incidence of MRSA colonization at 0.05 significance level.

Table 1: Association between incidence of MRSA colonization in school children and selected contributing factors (n=200)

Contributing factors	Chi-square	Table value	df	P value
Engage in group play activities	5.81	3.84	1	0.01*
Sharing sports equipment with play mates	1.33	3.84	1	0.24
Sharing locker room in school	0.38	3.84	1	0.53
Swimming with others	0.38	3.84	1	0.53
Attending camps	3.96	3.84	1	0.04*
Keeping wounds unclean	0.08	3.84	1	0.77
Sharing uniform/dress with friends/ siblings	0.01	3.84	1	0.91
History of treatment with antibiotic	0.23	3.84	1	0.63
History of asthma	1.79	3.84	1	0.18
History of treatment with anyinjectable drugs	0.19	3.84	1	0.65
History of minor cuts/scraps/bruises/insect bites	0.00	3.84	1	0.95
History of surgery	0.12	3.84	1	0.72
History of recent hospitalization	0.08	3.84	1	0.77
Family history of diabetes	0.22	3.84	1	0.63
Frequency of hand washing	1.37	5.99	2	0.50
Methods of hand washing	0.17	3.84	1	0.67
Frequency of bathing	0.43	5.99	2	0.80
Frequency of cutting nails	0.28	7.82	3	0.96

(Significant at 0.05 levels)*

Table 2: Association between incidence of MRSA colonization in school children and selected demographic variables (n=200)

Demographic variables	Chi -square	Table value	DF	P value
Age	1.79	5.99	2	0.40
Gender	0.32	3.84	1	0.56
Birth order	2.75	7.82	3	0.43
Type of family	0.00	3.84	1	0.98
Occupation of parents	2.78	7.82	3	0.42
Family income	4.56	9.49	4	0.33

(Significant at 0.05 levels)*

Discussion

The present study reveals that 105 children out of 200 (52.5%) had isolates of S. aureus. Out of this, 32 (30.4%) among isolates were MRSA positive and 73 (69.5%) were MSSA positive.A study to investigate the nasal carriage of CA MRSA in primary and high school students in Turkey revealed that none of the students had nasal MRSA carriage, but (14.7%) had MRSA colonization. Nasal carriage of MSSA was higher in primary school children (17.8%). The findings supports the findings of the present study.

The present study affirms that engaging in group play activities (P- value 0.01) and attending camps (P- value 0.04) have significant association with incidence of MRSA colonization in school children at 0.05 significance level. No other known risk factors were associated with the incidence of MRSA colonization.In contradiction to this, a retrospective study was conducted to identify CA MRSA infection in North Carolina children. Risk factors identified were parental employment in a school or day care.

The present study depicts that none of the demographic variables were associated with incidence of MRSA colonization at 0.05 significance level. This is inconsistent with a cross sectional study conducted in Iran to determine the prevalence, antibiotic resistance pattern and risk factors for nasal

carriage of MRSA among healthy children aged 1 month to 14 years. The risk factors identified were antibiotic usage during last 3 months, family size of more than 4 members and parental smoking.

However the findings have significance in the medical and nursing practice. When children are getting admitted the health care professionals need to be vigilant in preventing infections with MRSA as most of the children had MRSA colonization in the nasal passages. It may be getting transferred to any areas too. This is particularly important while children are posted for surgical interventions. The preporative preparation need to be done children need to be treated for MRSA to have an uneventful surgical experience and to prevent further complications.

Conclusions

The conclusions drawn from the study are as follows:

1. Sixteen percentage of the selected sample were positive for MRSA colonization.
2. Incidence of MRSA colonization in school children has significant associationwith the risk factors such as engaging in group play activities and attending camps.
3. None of the selected demographic variables were associated with incidence of MRSA colonization.

The study concludes that though there is a considerable increase in incidence of MRSA among school children, an extensive study is needed to state that other known risk factors of MRSA are relevant for the selected population. Since more than 50% of children in the present study had MRSA colonization, the study need to be repeated in a large sample to make adequate evidence for creating protocol for preoperative preparation for decolonization of children before surgical interventions.

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