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NASAL AND HAND CARRIAGE RATE OF STAPHYLOCOCCUS AUREUS AMONG FOOD HANDLERS WORKING IN A TERTIARY CARE HOSPITAL IN CENTRAL INDIA.

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KEYWORDS :

INTRODUCTION

Food-borne related illnesses have increased over the years negatively affecting the health and economic well-being of many developing nations[1]. Staphylococcus aureus is responsible for a variety of cutaneous and systemic infections in addition to Staphylococcal food poisoning (SFD). About a third of healthy human populations carry this bacterium in their nose. Strains present in the nose often contaminate the back of hands, fingers and the face.[2]As a result, nasal carriers can easily become skin carriers to act as a major source of cross-contamination in food and drinking establishments. Consequently, food handlers in food establishments are usually regarded as the source of SFD to customers.[3,4]

On the other hand, Staphylococcus aureus have a feature of developing antimicrobial resistance quickly and successfully to antibiotics through various mechanisms that involves the acquisition and transfer of antibiotic resistance plasmids, as well as the possession of intrinsic resistance mechanisms.[5]

Due to rising concerns over food safety and the lack of adequate research to ascertain the extent of Staphylococcus aureus colonization among food handlers, this study was designed to assess its prevalence and antibiotics sensitivity pattern among food handlers working in different food establishments in a tertiary care hospital in Central India.

MATERIALS AND METHODS

Study Area and Period

A hospital based cross sectional study was conducted in dept of Microbiology, Indira Gandhi Government Medical College, Nagpur. Study subjects included food handlers working in canteens, hostels and hospital food suppliers at Indira Gandhi Government Medical College, Nagpur. The study was conducted from April to October in the year 2022. Around 60 food handlers working in food preparation, serving and cleaning of utensils were included in the study.

Socio-demographic Data and Swab Specimen Collection

A structured questionnaire was used to collect data on name age, sex, job category, work place, address, and educational status of each food handler. Nasal specimen was taken using swab moistened with sterile normal saline solution. The tips were inserted 1–2 cm inside the anterior nares of both nostrils and rotating six times. Then, the swabs were immediately inserted into a sterilized screw capped tubes containing 5ml normal saline. Another sterile cotton tip applicator stick was used to collect the hand swab samples from their palm, between finger nails and at finger tips/under nails of both hands and transported to dept of Microbiology, Indira Gandhi Government Medical College, Nagpur for Culture and antimicrobial sensitivity.

S. aureus Isolation and Identification

The nasal and hand swab specimens were inoculated on to Mannitol Salt Agar (Hi Media) and Blood agar (Hi Media). The swabs were immediately placed in a bacterial transport medium. All plates were incubated at 37^0C for 24 hours under aerobic conditions. Presumptively suspected colonies of S. aureus from both media were taken and further confirmed by Gram staining, catalase and slide and tube coagulase , hemolysis on blood agar, DNase tests in addition to culture properties on mannitol salt agar medium following standard procedures.[6]

Antimicrobial Susceptibility Testing of S. aureus:

Susceptibility testing was performed on Muller Hinton agar (Hi Media) using modified Kirby Bauer disc diffusion technique . They were directly inoculated onto blood agar (Hi Media), and were incubated aerobically at 37°C for 18-24 hours.

The following drugs with their respective concentrations were used: Ampicillin (AMP, 10 µg), Amoxicillin-Clavulanic Acid (AMC, 30 µg), Ceftriaxone (CTR, 30 µg), Ciprofloxacin (CIP, 5 µg), Clindamycin, Erythromycin (E, 15µg), Gentamicin(G, 10µg), Cefoxitin (CX, 30µg), Tetracycline(TE, 30µg), and Trimethoprim-Sulphamethoxazole (COT, 1.25/23.75µg), Vancomycin (VA, 30µg) and Penicillin G (P 10 units).

Staphylococcus aureus ATCC 25923 and Escherichia coli ATCC 25922 were used as a quality control strains for the antimicrobial susceptibility test. The resistance and sensitivity results were interpreted according to the Clinical and Laboratory Standards Institute protocol 2022.[7]

Data Analysis Procedures:

SPSS version 20 software was used for statistical analysis.

RESULTS

Table 1: Distribution of Socio-demographic Characteristics of Food Handlers Working in and Food Handlers Working in Canteens, Hostels and Hospital Food Suppliers.

Characteristics		Frequency (n=60)	Percentage %
Sex	Male	42	70%
	Female	18	30%
Age	< 20 year	6	10%
	20-29 year	25	41.66%
	30-39year	14	23.33%
	>=40 year	15	25%
Job category	Cook	27	45%
	Dish cleaner	22	36.66%
	Waiter	11	18.33%
Work experience	<2years	27	45%
	2-4years	28	46.66%
	>=4years	5	83.33%
Educational status	Graduate	14	23.33%
	College 12th pass	23	38.33%
	High school	14	23.33%
	Primary school	6	10%
	Can't read and write	3	5%

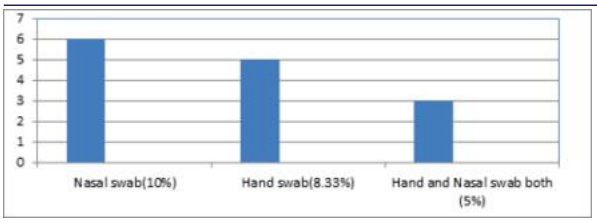

Figure 1: S. aureus Carriage Rate Among the Food Handlers n=14

Table 2: Association of Socio-demographic Characteristics with Carriage of S. aureus Among Food Handlers

Characteristics (n)		S.aureus n=14	
		Positive	Negative
Sex	Male(42)	8(19.04%)	34(80.95%)
	Female(18)	6(33.33)	12(66.66%)
Age in yrs	<20(6)	4(66.66)	2(33.33%)
	20-29(25)	3(12)	13(0.52%)
	30-39(14)	5(35.71)	9(64.28%)
	>40(15)	2(13.33)	13(86.66%)
Work experience in years	<2years(27)	4(14.81)	23(85.18%)
	2-4years(28)	7(25)	21(77.77%)
	>=4years(5)	3(60)	2(40%)
Job category	Cook(27)	2(7)	25(92.59%)
	Dish cleaner(22)	7(31.81)	15(68.18%)
	Waiter(11)	5(45.45)	6(54.54%)
Educational status	Graduate(14)	4(28.57)	10(71.42%)
	College 12th pass(23)	5(21.73)	18(78.26%)
	High school(14)	3(21.42)	11(78.57%)
	Primary school(6)	2(33.33)	4(66.66%)
	Can't read and write(3)	0(00)	3(100%)

DISCUSSION

Studies from different countries have indicated that food handlers have been one of the major sources of food contamination (12,13).[8,9] In this study, the overall prevalence of nasal carriage of Staphylococcus aureus among food handlers was 10%.

The studies done in US (23%)[10], UK (25%)[11], Turkey (23.1%)[12], have different findings[13]. However, it is lower than study findings reported from Ekpoma Edo-Nigeria (60%) and Egypt (31%).[14,15] This difference could be attributed to various factors such as personal cleanliness habits of the workers, level of education, the hygiene of utensils/equipment and the environment where the food handlers are working and regulations employed in each (60%) and Egypt (31%).[14,15] This difference could be attributed to various factors such as personal cleanliness habits of the workers.

The isolation rate of S. aureus from nose and hand were 10% and 8.33%, respectively, which is different than the study findings reported by David and his colleagues (2016)[16]. El- Shenawy and his co-workers in Egypt conducted across sectional study of S. aureus skin carriage (hands and face swabs) and found that 75(38 %) of the 200 persons were positive for the presence of the bacterium[15]. Udo and his co-workers identified 32(18 %) S. aureus out of 174 isolates from the hands of healthy food handlers[17]. In this study, no strains of S. aureus were resistant to methicillin which is lower than the findings from Gondar where the prevalence of MRSA (Methicillin Resistant Staphylococcus aureus) was 9.8%.[5]

The emergence of high MDR isolates could be due to empirical use of broad-spectrum antibacterial drugs, lack of culture and antimicrobial susceptibility tests for selecting most efficacious drugs and non-adherence to hospital antimicrobial policy. It is important to note that the emergence and dissemination of MRSA is an increasing global health problem that complicates the therapeutic management of infections due to S. aureus.

CONCLUSIONS

In conclusion, these findings raise again the imperative need for protective measures including increased public awareness programs, regular monitoring of food handlers for food borne pathogens and intensive training on primary health care and hygiene. The use of nose masks by food handlers and restaurant workers and periodical medical examination could help to prevent the spread of resistant strains of Staphylococcus aureus. Finally, the current finding clearly highlights the significance of implementation of efficient quality control systems in areas of direct contact with hotel and restaurant food products as regulation to protect the public.

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