

“Screening and Isolation of Nasal Colonization Drug Resistance MRSA in Oral Cancer Patients in a Tertiary Care Hospital of Eastern India”

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Abstract:

Introduction: Cancer patients are at risk for developing serious infections. Due to immune compromised status many times these patients may get infected with normal resident flora and ultimately become infected. Methicillin-resistant Staphylococcus aureus (MRSA) is a common cause of healthcare-associated infection worldwide. Immuno compromised patients are more susceptible to develop infection from own colonized MRSA.

Aim and Objective: To Screen and Isolate Nasal Colonisation Drug Resistance MRSA in Oral Cancer Patients in a Tertiary Care Hospital of Eastern India.

Material and Methods: The study was conducted in the Department of Microbiology, RMCH & RC, Mandhana, and Kanpur for a period of 1 year August 2020 to August 2021. The Nasal swabs were collected from patients within 24 hours of admission. The samples were transported to the Laboratory soon after the collection. Anterior nares of 100 participants having oral cancer were screened for colonization of Staphylococcus aureus. Isolates were identified as Staphylococcus aureus as per standard protocol and were further subjected to see the production of MRSA as per CLSI criteria.

Results: Total In our study of 60 patients the Nasal sample were taken of the Cancer patients and there were different isolates found at the very first time survey . The table below shows the number of isolates found in our study. There were 60 patients in our study which was divided into two groups according to treatment plan, first group was given chemotherapy (n=40) and second group was given radiotherapy (n= 20) A total of 30 (50 %) cases were having Staphylococcus aureus in their nasal cavity out of which 23 (38.3%) were MRSA

Conclusion: If patient’s nasal flora is showing MSSA initially, it must be taken seriously and should be treated as there is high chance in MSSA flora for development of MRSA following various treatment strategies. As patient might develop MRSA colonization after chemotherapy and radiotherapy which may further be the reason for resistant infection in immune-compromised cancer patients

Keywords: Staphylococcus, MRSA, Drug resistance

Introduction

Staphylococcus aureus is the leading cause of healthcare-associated infection. Various studies in India reported MRSA colonization in various category of patients around 44-46% from multiple body sites [1,2]. Infections with MRSA, both community and hospital acquired, are well established and the source of infection is often a carrier. There are very few studies showing the magnitude of MRSA nasal colonization among healthy persons from the community Many times with decreasing immunity these commensally can act as pathogen which can cause a subsequent healthcare acquired infection. Several studies have clearly found that about 14-20% of (MRSA) colonization may progress to MRSA infection [3, 4]. Patients infected with MRSA usually show worse

clinical outcomes than those with methicillin-sensitive Staphylococcus aureus (MSSA) infections. These infections are not only difficult to treat but they can also lead to certain life-threatening complications. There is a considerable proportion of cancer patients colonized with MRSA [5]. The treatment of malignant condition with cancer therapy has become increasingly effective, but it is associated with significant side effects, including bone marrow suppression. Patients undergoing radiotherapy and chemotherapy for oral cancer are more susceptible to bacterial infections [6]. In the present study we planned to screen the oral cancer patients for nasal colonization for MRSA.

Material and Methods

This was an observational study which was conducted in the Department of Microbiology and Department of Radiotherapy and Oncology, which was conducted in the Department of Microbiology and Ophthalmology for the period of 6 months i.e, January 2021 to June 2021 at RMCH & RC. A written consent was taken from every patients enrolled for the study and Ethical clearance was taken from the ethical committee.

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Those patients who did not consent for the study and had other immune-compromised condition were excluded from the study. A total of 60 participants having oral cancer were screened for colonization of *S. aureus* in anterior area as per standard protocol. [7] Nasal swab sample was collected when patient was enrolled for the study. Based on treatment regimen these patients were divided in Two groups one the chemo therapy group and the other was Radiotherapy group. Colonies of *Staphylococcus aureus* were identified by colony morphology and were confirmed by Gram stain, catalane test and slide and tube coagulate test. Strains confirmed as *Staphylococcus aureus* were tested for resistance to methicillin by disc diffusion using cefoxit in disc (30 microgram) [7], Himedia Laboratory, India.

Results

In our study of 60 patients the Nasal sample were taken of the Cancer patients and there were different isolates found at the very first time survey. The table below shows the number of isolates found in our study. There were 60 patients in our study which was divided into two groups according to treatment plan, first group was given chemotherapy (n=40) and second group was given radiotherapy (n= 20)

Table no: 1 Organisms isolated from nasal cavity of oral cancer patients before starting treatment (n=60).

Organisms Isolated	Number of Patients (N=60)	Percentage
MRSA	23	38.3
MSSA	11	18.3
NPO	11	18.3
MSCONS	6	10
MRCONS	5	8.3
<i>Pseudomonas Aeruginosa</i>	4	6.6

A total of 30 (50 %) cases were having *Staphylococcus aureus* in their nasal cavity out of which 23 (38.3%) were MRSA [Table no. 1] followed by MSSA, NPG, MSCONS and MRCONS.

Table no: 2 Organisms isolated from nasal cavity of oral cancer patients before Chemotherapy and radiotherapy treatment (n=40) (n=20).

Organisms Isolated	Patients going for chemotherapy (n=40)	Patients going for radiotherapy (n=20)
MRSA	19 (47.5%)	8 (40%)
MSSA	5 (12.5%)	3 (15%)
NPO	6 (15%)	4 (20%)
MSCONS	5 (12.5%)	2 (10%)
MRCONS	5 (12.5%)	2 (10%)
<i>Pseudomonas aeruginosa</i>	Nil	1 (5%)

Table no. 2 shows Organisms isolated from nasal cavity of oral cancer patients before Chemotherapy and radiotherapy treatment (n=40) (n=20). In this 19 (47.5%) patients were going for chemotherapy had MRSA and with radiotherapy it had 8 with MRSA

Table no: 3 Organisms isolated from nasal cavity of oral cancer patients after Chemotherapy and radiotherapy treatment (n=22) (n=10).

Organisms Isolated from Non-MRSA at second time point survey	No. of Patients after chemotherapy (n=22)	No. of Patients after radiotherapy (n=10)
MRSA	11 (50%)	4 (40%)
MSSA	3 (13.6%)	0 (0%)
NPO	4 (18%)	2 (20%)
MSCONS	2 (9%)	2 (20%)
MRCONS	2 (9%)	1 (10%)
<i>Pseudomonas aeruginosa</i>	0 (0%)	1 (10%)

In table no. 3 there were 11 MRSA isolated from nasal cavity of oral cancer patients after Chemotherapy and with radiotherapy treatment it was 4.

Table no. 4 Percent conversion of various nasal floras to MRSA after chemotherapy and radiotherapy

Type of Micro flora	Patient nasal flora at first time point survey before chemotherapy (n)	After Chemotherapy (n) change in flora to MRSA	Patient nasal flora at first time point survey before radiotherapy (n)	After radiotherapy (n) change in flora to MRSA
NPO	11	1	11	1
MSSA	11	3	11	1
MRCO NS	5	1	-	0

Discussion

Due to immune compromised status many times cancer patients may get infected with normal resident flora and ultimately become infected. In our study of 60 patients the Nasal sample were taken of the Cancer patients and there were different isolates found at the very first time survey. There were 60 patients in our study which was divided into two groups according to treatment plan, first group was given chemotherapy (n=40) and second group was given radiotherapy (n= 20) A total of 30 (50 %) cases were having *Staphylococcus aureus* in their

nasal cavity out of which 23 (38.3%) were MRSA [Table no. 1] followed by MSSA, NPO, MSCONS and MRCONS. this was similar to the study by O'Brien et al. [8] [9]. In our study MRSA is a main colonizer which correlates the other studies done by other author [10] [11]. In our study Organisms isolated from nasal cavity of oral cancer patients before Chemotherapy and radiotherapy treatment (n=40) (n=20). In this 19 (47.5%) patients were going for chemotherapy had MRSA and with radiotherapy it had 8 with MRSA. There were 11 MRSA isolated from nasal cavity of oral cancer patients after Chemotherapy and with radiotherapy treatment it was 4.

Our study suggests that if a patient is colonized with MSSA then there is a high chance that it will be converted to MRSA colonization after Chemotherapy or Radiotherapy. This study also emphasizes that in patients with chronic diseases like cancer if nasal carriage initially showed MSSA then it must be decolonized to avoid its conversion into MRSA and further life-threatening complications like pneumonia and sepsis.

In our study we also found out that After Chemotherapy (n) change in flora to MRSA was more as compared to the Radiotherapy [12].

Conclusion

Nowadays, MRSA is a serious threat to mankind especially in immune compromised patients with cancer. Therefore, this group of patients should be screened for presence of MRSA in their nasal flora, if patient's nasal flora is showing MSSA initially; it must be taken seriously and should be treated as there is high chance in MSSA flora for development of MRSA following various treatment strategies.

References

1. Indian Network for Surveillance of Antimicrobial Resistance (INSAR) group, India, Joshi S, Ray P, et al. Methicillin resistant Staphylococcus aureus (MRSA) in India: Prevalence & susceptibility pattern. The Indian Journal of Medical Research. 2013;137(2):363-69.
2. Singh AK, Agarwal L, Kumar A, Sengupta C, Singh RP. Prevalence of nasal colonization of methicillin-resistant Staphylococcus aureus among school children of Barabanki district, Uttar Pradesh, India. J Family Med Prim Care. 2018;7:162-66.
3. Balm MN, Lover AA, Salmon S, Tambyah PA, Fisher DA. Progression from new methicillin-resistant Staphylococcus aureus colonization to infection: An observational study in a hospital cohort. BMC Infectious Diseases. 2013;13(1):1
4. Davis KA, Stewart JJ, Crouch HK, Florez CE, Hospenthal DR. Methicillin-resistant Staphylococcus aureus (MRSA) nares colonization at hospital admission and its effect on subsequent MRSA infection. Clinical Infectious Diseases. 2004; 39(6):776-82.
5. Ghanem HM, Abou-Alia AM, Alsirafy SA. Prevalence of methicillin-resistant Staphylococcus aureus colonization and infection in hospitalized palliative care patients with cancer. American Journal of Hospice and Palliative Medicine. 2013; 30(4):377-79.
6. Panghal M, Kaushal V, Kadayam S, Yadav JP. Incidence and risk factors for infection in oral cancer patients undergoing different treatments protocols. BMC Oral Health. 2012; 12(1):1.
7. Clinical and Laboratory Standards Institute. Performance Standards for Antimicrobial Susceptibility Testing; Twenty-Seven Informational Supplement; CLSI Document M02-A12 and M07-A10, CLSI. 2017.
8. O'Brien FG, Pearman JW, Gracey M, Riley TV, Grubb WB. Community strain of Methicillin resistant Staphylococcus aureus involved in a hospital outbreak. J Clin Microbiol. 1999; 37(9):2858-62.
9. Saxena S, Singh K, Talwar V. Methicillin-resistant Staphylococcus aureus prevalence in community in the east Delhi area. Jpn J Infect Dis. 2003; 56(2):54-56.
10. Schmalz O, Strapatsas T, Alefelder C, Grebe SO. Methicillin-resistant Staphylococcus aureus in palliative care: A prospective study of Methicillin-resistant Staphylococcus aureus prevalence in a hospital-based palliative care unit. Palliat Med. 2016;30(7):703-06
11. Ribeiro LLC, Aparecida BD. Prevalence of Staphylococcus aureus colonization in renal transplant patients. Rev. Esc. Enferm. USP [Internet]. 2014 Oct [cited 2018 Sep 28]; 48(5):827-33.
12. Jay S, Cooper et al. Postoperative Concurrent Radiotherapy and Chemotherapy for High-Risk Squamous-Cell Carcinoma of the Head and Neck. N Engl J Med 2004; 350:1937-1944.