"NASAL AND HAND CARRIAGE OF BACTERIA IN DIFFERENT GROUPS OF PERSONS IN A TEACHING HOSPITAL IN INDIA"

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ABSTRACT:

Research Problem: What is the level of bacterial carriage in different groups of hospital staff?

Objective: To study nasal and hand carriage of bacteria in different groups of persons in a teaching hospital.

Study Design: Prospective study.

Setting: Surgical wards of J.N. Medical College Hospital, A.M.U., Aligarh.

Participants: Randomly selected persons from different groups of hospital staff (doctors, nurses, ward and OT assistants), visitors of patients, patients and medical students.

Sample Size: 275 persons.

Study Variables: Nasal and hand carriage of S. aureus and gram negative bacilli.

Outcome Variables: Percentage of hospital staff showing bacterial carriage in their nose or on their hands.

Statistical Analysis: By tests of significance.

Result: Overall bacterial carriage rate in different categories of hospital staff was found to be 54.5%. Doctors and paramedical staff had higher bacterial carriage rate as compared to other groups. Though Staphylococcus aureus was the commonest organism isolated from both nose and skin, carriage of Escherichia coli, Pseudomonas and Klebsiella group of gram-negative bacilli was also observed. Nasal carriage was commoner than dermal carriage.

Conclusion: Doctors and paramedical staff in hospital transmitting pathogenic bacteria from their nose and skin to their patients.

Key Words: Hospital - acquired infection, Bacterial carriage Staphylococcus aureus, Escherichia coli.

INTRODUCTION:

The major impact of bacterial carriage by hospital staff on the problem of hospital acquired infections has been pointed out by many workers throughout the world. Staphylococcus aureus is a normal commensal of the nose in 30 - 40% of healthy individuals; but in hospital personnel an increased carriage rate has been found[7,13,15]. Many workers have associated a high rate of carriage of S. aureus in hospital staff with high rate of wound infection. Carriage of gram-negative rods on the hands of hospital staff is also common[4]. Our hospital has a high rate of post-operative wound infection caused mainly by S.aureus and E.coli, though other gram-negative rods also play a significant role[1]. We, therefore, investigated nasal and hand carriage of pathogenic bacteria in different groups of health care workers who had regular contact with patients.

MATERIAL AND METHOD:

The study was conducted in the surgical wards of Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh, India, over a period of one year - 1st August, 1991 to 31st July, 1992. 275 persons were studied and they included doctors, nurses, ward and operation theatre (O.T.) assistants. Visitors of patients, patients and medical students were also examined. Nasal and hand carriage of S. aureus, and other gram-negative bacilli was investigated. Sterile cotton swabs pre-moistened with broth were used. Nasal swabs were taken by introducing sterile cotton swabs into the anterior nares and gently rolling it over the nasal mucosa on both sides, while hand swabs were collected by rubbing a sterile cotton swab over the back of the wrist. The swabs were immediately transported to the laboratory and inoculated on to Blood Agar, Teepol Lactose Agar, [illegible]. Identification of bacteria was done according to standard techniques.[5,11,14]

OBSERVATIONS:

Out of 275 persons examined, 150 (54.5%) were found to carry either S. aureus or gram-negative bacilli in their nose or on their hands. Doctors were

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found to have the highest rate of bacterial carriage (80.0%). 76.0% paramedical staff (nurses) were carriers, as were 66.0% of ward and O.T. assistants. 52.0% patients were carriers. Carriage rates were lower in visitors of patients (18.0%) and medical students (16.0%). (Table - I).

When carriage of S. aureus was considered separately, (Table - II), it became evident that persons who had close contact with patients i.e. doctors and paramedical staff, had much higher carriage rate, both in nose (42.0 - 58.0%)and on skin (24.0% - 30.0%), than the visitors and students (12.0% - 16.0% in nose and 4.0% - 8.0% on skin). As a whole nasal carriage of S. aureus was more (37.0%) than hand carriage (18.9%).

Table III depicts that amongst the gram-negative bacilli isolated, E.coli headed the list. Pseudomonas and Klebsiella were isolated occasionally. Most of the gram-negative rods were isolated from the hands rather than nose. Apart from a single visitor, from whose nose E.coli was isolated, medical students and visitors of patients were otherwise free of gram-negative bacilli. Doctors and paramedical staff (nurses and attendants) frequently carried gram-negative bacilli.

DISCUSSION:

It is obvious from our results that the overall rate of bacterial carriage by hospital staff was significant. Moreover, the carriage rate was highest in doctors, nurses and Ward and O.T. assistants. This finding is of great concern because these very people handle patients and equipments. Agrawal[1] and Bauer et al[2] reported similar findings. S. aureus was more prevalent in nose of persons who had close contact with patients as compared to occasional visitors. This finding of the present study is in conformity with the observations of Agrawal[1] and Onyemelukwe[8].

In our study, phage-typing or antibiotic sensitivity tests were not performed, so the high rate of bacterial carriage could not be directly correlated with the high rate of nosocomial infection, but there were ample data linking nasal carriage of S. aureus by hospital staff with hospital acquired infections.[2,3,6,10] Reybrouck[9] and Steere and Mallison[12] have described direct contact spread of organisms from the hands of doctors and paramedical workers to the patients, as the commonest mode of transmission of hospital-acquired infections. Similarly, Casewell and Phillips [4] demonstrated the role of hands of hospital personnel in transmission of Klebsiella sp. to the patients.

CONCLUSION:

On the basis of all these studies, it can be very well assumed that doctors and para-medical staff in a hospital, unless they adopt appropriate preventive measures, can themselves serve as a major mode of transmission of pathogenic bacteria to their patients.

TABLE - I

OVERALL CARRIAGE OF BACTERIA IN DIFFERENT GROUPS OF PERSONS

Group of study persons	No.of persons studied	No.of Persons +ve for bacterial carriage	%
Doctors	50	40	80.0
Nurses	50	38	76.0
Ward and O.T. Assitants	50	33	66.0
Visitors of patients	50	9	18.0
Patients	50	26	52.0
Medical students	25	4	16.0
TOTAL:	**275**	**150**	**54.5**

** Includes Staph.aureus, E.coli and other gram - negative bacilli.*
Z test = 3.3, p < 0.01 (Doctors and nurses vs patients)
Z test = 8.0, p <.0.001 (Visitors and medical students vs patients)

TABLE - II

CARRIAGE OF STAPHYLOCOCCUS AUREUS IN DIFFERENT GROUPS OF PERSONS

Group of study persons	No.of persons	Positive in nose	Positive in skin
Doctors	50	29(58.0)	12(24.0)
Nurses	50	27(54.0)	14(28.0)
Ward and O.T. Assistants	50	21(42.0)	15(30.0)
Visitors of patients	50	6(12.0)	4(8.0)
Patients	50	15(30.0)	6(12.0)
Medical students	25	4(16.0)	1(4.0)
TOTAL:	**275**	**102(37.0)**	**52(18.0)**

(Figures in parenthesis indicate percentage). 2 doctors and 2 nurses had colonisation in more than one site.
X^2 for nasal carriage = 35.46 (p<0.001)
X^2 for dermal carriage = 18.03 (p<0.001)

TABLE - III

CARRIAGE OF GRAM - NEGATIVE BACILLI IN DIFFERENT GROUPS OF PERSONS

Group of study persons	Carriage site	No.of persons studied	Number of persons positive for bacterial carriage		
			E.coli	Pseudomonas Sp.	Klebsiella Sp.
Doctors	Nose	50	0	0	1(2.0)
	Skin	50	3(6.0)	1(2.0)	1(2.0)
Nurses	Nose	50	0	0	0
	Skin	50	6(12.0)	2(4.0)	2(4.0)
Ward and O.T. Assistants	Nose	50	0	0	0
	Skin	50	5(10.0)	1(2.0)	2(4.0)
Visitors of patients	Nose	50	1(2.0)	0	0
	Skin	50	0	0	0
Patients	Nose	50	2(4.0)	0	1(2.0)
	Skin	50	3(6.0)	2(4.0)	2(4.0)
Medical students	Nose	25	0	0	0
	Skin	25	0	0	0

(Figures in parenthesis indicate percentage)

REFERENCES:

1. Agarwal, P., A study of post-operative wound infections in surgical wards of J.N. Medical College Hospital, Aligarh, Thesis for M.D. (Microbiology), Aligarh Muslim University, Aligarh, 1981.
2. Bauer, T.M. et. al, An epidemiological study assessing the relative importance of airborne and direct contact transmission of microorganisms in a medical intensive care unit. J. Hosp. Infact 1990, 15: 301 - 309.
3. Casewell, H.T. et. al, Bacteriological and clinical experiences and the methods of control of hospital infections due to antibiotic resistant staphylococci, Surg.Gynae. and Obst. 1958, 106: 1 - 10.
4. Casewell, M., Phillips, I., Hands as route of transmission of Klebsiella species, Brit. Med. J. 1977, 2: 1315 - 1317.
5. Duguid, J.P. Mackie and Mc Cartney Practical Medical Microbiology, eds. Collee JG, Duguid, J.P., Faser, A.G., Marmion, E.P. 13th Ed. Churchill Livingstone, 1989: 305 - 308.
6. Grogen, J.B., Artz, C.P., Bennett, J.C., Welch, L.J., A study of nose and throat carriers of staphylococci in a general community J. Mississippi M A 1961, 2:137.
7. Hardas, U., Shukla, R.N., Srivastava, R.B., Carriage of staphylococci among hospital staff, J. Ind. Med. Ass. 1964, 43: 163-164.
8. Onyemelukwe, N. et. al, Nasal carriage of staphylococcus aureus in hospital staff and its antibiotic sensitivity in Enugu, Nigeria, J. Com. Dis. 1992, 24 (1): 46 - 48.
9. Reybrouck, G., Role of hands in the spread of nosocomial infections, J. Hosp. Infect 1983,, 4: 103 - 110.
10. Shooter, R.A., Griffiths, J.D., Cook, J., Williams, R.E.O, Out break of staphylococcal infection in a surgical ward, Brit. Med. J., 1957, 1: 133:436.
11. Sleigh, J.D., Duguid, J.P., Mackie and Mc Cartney Practical Medical Microbiology, eds. Collee, J.G., Duguid , JP, Fraser, A.G., Marmion, E.P. 13th Ed. Churchill Livingstone, 1989: 436 - 437.
12. Steere, A.C., Mallison, G.F., Handwashing practices for prevention of nosocomial infection, Annal. Int. Med. 1975, 83: 683 - 690.
13. Verma, B.S., Shah, K.C., Dalal, KS, Studies on colonization by staphylococcus aureus, Ind. J. Dermat. Venerol. 1965, 31: 139 - 142.
14. W.H.O., Hospital acquired infection: Guidelines to laboratory method, Reg. Publc. Europ Series 1978, No. 4.
15. Williams, R.E.O., Healthy carriage of staphylococcus aureus- its prevalence and importance, Bact. Review, 1963, 27: 36 - 71.