



**PREVALENCE AND ANTIMICROBIAL SUSCEPTIBILITY OF NASAL CARRIAGE OF
STAPHYLOCOCCUS AUREUS IN ANGANWARIES CHILDREN IN UJJAIN (M.P.)**

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ABSTRACT

Staphylococcus aureus plays an important role in spreading of diverse range of infection in human as well as in animals. Many evidences that community acquired *S.aureus* infections are spreading among children. A prospective study was done in children between 1 to 6 years of age attending 100 anganwaries. 10 children were randomly selected from each anganwary. A total 1002 children were included in these studies. The isolated colonies were identified using standard laboratory procedure and tested for susceptibility to various commonly used antibiotics according to CLSI. Out of 1002 children, 351 samples were cultured and found positive for *S.aureus*. The prevalence of *S.aureus* of nasal carriage was 35%. These results showed that sex is not a significant risk factor in *S.aureus* carriage rate. The antibiotic susceptibility patterns of the isolated revealed that vancomycin (96%) are most susceptible. The high rates of nasal carriage of *S.aureus* and presence of resistance to commonly used antibiotics are disturbing. Antibiotic stewardship programs promote judicious use of antibiotics that are urgently needed to prevent spread of *S.aureus* infection.

KEYWORDS: *Staphylococcus aureus*, Nasal carriage, Antimicrobial susceptibility.

INTRODUCTION

S.aureus has been recognized as an important pathogen in human disease (Barber *et al.* 1948). *Staphylococci* adhere to the epithelial cells of anterior nares of healthy person and children. The anterior nares have been shown to be the main reservoir of *S.aureus* in both adult and children (Doebblin 1995). The *S.aureus* transmits to the nares by contaminated hands and surface area where it can survive for months (Peacock *et al.* 2001). The infection caused by *S.aureus* and has a clinical range from minor skin infection to severe life threatening infection (Lowry 1998).

S.aureus is the most common bacteria cause for diverse range of infections, including sepsis, deep abscesses, pneumonia, osteomyelitis and infective endocarditis (Lowry 1998). The anterior nares of the nose are the most frequent carriage site for *S.aureus* (Williams 1963). The hand carriage and nasal carriage of *S.aureus* are strongly correlated (Wertheim *et al.* 2006). Advances in control of infections have not completely eradicated the problem because of development of resistance (Thomas 1981). Antimicrobial resistance can increase complications and costs associated with procedures and treatments. In India, the studies have been done in adults in intensive care units (Anupurba *et al.* 2003; Saxena *et al.* 2003) but studies on prevalence of nasal carriage and antibiotic susceptibility patterns of *S.aureus* in Indian

children are few (Raman *et al.* 2009; Chatterjee *et al.* 2009).

MATERIAL AND METHOD

This was a prospective study conducted during a period of 28 month from February 2008 upto May 2010. The study was conducted among children that attending the anganwaries of Ujjain. The anganwaries are focal point for delivering the services under the Integrated Child Development Scheme (ICDS) run by the ministry of women and child development, government of India. We purposely choose 100 anganwaries to evenly cover the city and 10 children randomly selected for sampling.

The samples were collected from anganwaries' children where the age of children was 1 to 6 years. The samples were collected on sterile cotton swab and sent to the microbiology laboratory at Madhav Science College Ujjain. The temperature of 4-5°C was maintained during transportation of samples. The complete details about specimen, containing names, age, sex and details of family members were mentioned in the documents. These swab sticks were streaked on 5% sheep blood agar and incubated at 35°C for 18 to 24 hrs. The colonies found on this blood agar then the morphology of bacterial colonies were identified by the process of mannitol fermentation, gram staining, catalase and coagulase test (Murray *et al.* 1999). Antibiotic

susceptibility test was performed using Kirby-Bauer's disc diffusion method on Muller Hinton agar according to performance standards of CLSI (CLSI 2010).

The plates were incubated at 30-35°C for 18-24 hrs. In the MHA media, different zones appeared that showed the susceptibility of *S.aureus*. These zones were observed by zone reader instrument. The zones were measured from east to west and north to south. The mean values were calculated. The control samples of *S.aureus* (ATCC 25923) were used for comparative study. The statistical analysis was performed using Stata 10.0 software (Stata Crop. college station Texas, USA). The prevalence of *S.aureus* was estimated at 95% confidence interval.

RESULT

The present study was conducted to find the prevalence of nasal carriage of *S.aureus* and to analyze the antimicrobial susceptibility patterns. In this study, 1002 children were selected from 100 anganwaris in which

51% (n=514) were boys while 49% (n=488) were girls (Table-1). 37% children were of 2 to 4 years age and 58% children belonged to family size from 4 to 10 members (Table-2 & 3). 351 children were positive from *S.aureus* in which 167(48%) were male while 184 (52%) were female. Thus, the prevalence of *S.aureus* was 35% (95% confidence interval CI 32.07 to 37.98) (Table-1).

The antibiotic susceptibility pattern with *S.aureus* showed in figure 1. Vancomycin, cotrimoxazole, gentamicin, doxycycline, tetracycline, levofloxacin, ofloxacin, ciprofloxacin, ceftriaxone and ampicillin were used for the determination of sensitivity against *S.aureus*. The vancomycin sensitivity was respectively 96%, ofloxacin 90%, levofloxacin 89%, ciprofloxacin 83%, ceftriaxone 83%, cotrimoxazole 71%, gentamicin 68%, ampicillin 68%, doxycycline 61% and tetracycline 57%. In all antibiotics, vancomycin was highly sensitive in comparison to other antibiotics used in the antibiotic susceptibility test against *S.aureus*.

Table 1: Showing relation between sex of children and nasal carriage of *S.aureus*.

Sex	n (%) ^a	<i>S. aureus</i> nasal carriage		Crude OR	Std. Err.	95% CI	P value
		Negative (%) ^a	Positive (%) ^a				
Male	514 (51)	347 (53)	167 (48)	Ref	-	-	-
Female	488 (49)	304 (47)	184 (52)	1.25	0.16	0.96-1.63	0.084

a- column percentage, ref-reference category, OR- odds ratio, CI-confidence interval

Table 2: Showing relation between the age groups of children and nasal carriage of *S.aureus*.

Age group	n (%) ^a	<i>S. aureus</i> nasal carriage		Crude OR	Std. Err.	95% CI	P value
		Negative (%) ^a	Positive (%) ^a				
1 to 2 years	348 (35)	206 (32)	142 (41)	Ref	-	-	-
>2 to 4 years	374 (37)	251 (38)	123 (35)	0.71	0.11	0.52-0.96	0.028
>4 to 6 years	280 (28)	194 (30)	86 (24)	0.64	0.10	0.46-0.89	0.009

a- column percentage, ref-reference category, OR- odds ratio, CI-confidence interval

Table 3: Showing relation between the number of members in the family and nasal carriage of *S.aureus*.

Number of family members	n (%) ^a	<i>S. aureus</i> nasal carriage		Crude OR	Std. Err.	95% CI	P value
		Negative 651(%) ^a	Positive 351(%) ^a				
Up-to 4	347 (35)	238 (37)	109 (31)	Ref	-	-	-
>4 to 10	585 (58)	381 (58)	204 (58)	1.16	0.16	0.88-1.55	0.028
>10	70 (7)	32 (5)	38 (11)	2.59	0.69	1.53-4.37	<0.000

a- column percentage, ref-reference category, OR- odds ratio, CI-confidence interval

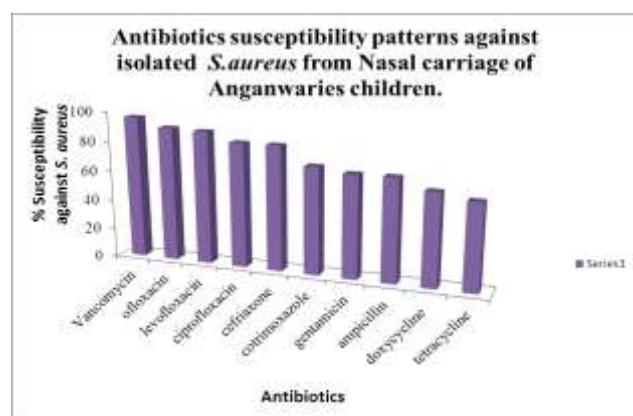


Figure 1: Antibiotics Susceptibility Patterns Against Isolated *S.aureus* from Nasal Carriage of Anganwaris Children.

DISCUSSION

In this study, 1002 anganwaris' children were enrolled between the age of 1 to 6 years. Different antibiotics were used against *S.aureus* that was isolated from nasal part of children and found that vancomycin was highly effective against *S.aureus*. The study also showed that *S.aureus* nasal carriage rate was 35%. The age character was very significant because it showed that the nasal carriage decreases as the age of the child increases. The prevalence of colonization of *S.aureus* has previously been shown to be age dependent (2-18). A study was done in the same geographical location among 1562 healthy children from 1 to 59 months of age 6% of the children were tested positive for nasal carriage of *S.aureus* (Pathak et al. 2011).

Raman KV *et al.* reported a prevalence of 16% for *S.aureus*, 19% of which were MRSA among school going children (5 to 15 years) in Andhra Pradesh India (Raman *et al.* 2009). The prevalence result varied across different age group in our study with lower prevalence in the age group below 1 year, these differences were not statistically significant. In another study done in north Indian children living in slums, the carriage rate was 52% and MRSA was 4% respectively (Chatterjee *et al.* 2009).

In our study, the children attending anganwaris were shown to have significant higher prevalence of carriage. The fact that large family size with 10 or more members had higher carriage prevalence as compared to family with less than or equal to 4 members. This might be due to poor hygiene, overcrowding and grater sharing of nasal flora with in a large family. The studies have demonstrated the importance of close contacts with in households and with parents in spread of *S.aureus* carriage among children residing in the same household. In relation to nasal carriage of *S.aureus* and sex of the child are not consistent.

In this research the susceptibility test showed that vancomycin, ofloxacin, levofloxacin, ciprofloxacin, ceftriaxone, cotrimoxazole, gentamicin, ampicillin, doxycycline and tetracycline have highest susceptibility against *S.aureus* organism.

CONCLUSION

The aim of this study to prevent community spread of *S.aureus* and to determine the occurrence of positive *S.aureus* in nares and it's sensitivity patterns to commonly used antibiotics. The prevalence of *S.aureus* nasal carriage was 35%. Antibiotic stewardship programs that promote judicious use of antibiotic are urgently needed. Simple hygiene measures like hand washing are effective in preventing spread of resistant organism in community. In this study, different antibiotics were used against *S.aureus* organism that was isolated from anganwaris childrens' nasal sample and was found that vancomycin is highly effective medicine in comparison to other *S.aureus*.

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REFERENCES

1. Barber, M. and M. Rozwadowska-Dowzenko. Infection by penicillin-resistant *Staphylococci*. *Lancet.*, 1948; 641-644.
2. Doebbling, B.N. The epidemiology of methicillin – resistant *Staphylococcus aureus* colonization and infection. *J. Chemotherapeutics*, 1995; 7: 99-103.
3. Peacock SJ, de Silva I, Lowy FD. What determines nasal carriage of *Staphylococcus aureus*? *Trends microbial*, 2001; 9: 605-610.
4. Lowy, F.D. *Staphylococcus aureus* infections. *New England J.Medicine*, 1998, 339: 520-532.
5. Anupurba, S., Sen, M.R., Nath, G., Sharma, B.M., Gulati, A.K., Mohapatra, T.M., Prevalence of Methicillin- resistant *Staphylococcus aureus* in a tertiary referral hospital in Eastern Uttar Pradesh, 2003; 21: 49-51.
6. Saxena S, Sing K, Talwar V: Methicillin-resistant *Staphylococcus aureus* prevalence in community in the east Delhi area. *Jpn J Infect Dis.*, 2003; 56(2): 54-56.
7. Raman KV, Mohanty SK, Wilson CG: *Staphylococcus aureus* colonization of anterior nares of school going children. *Indian J Pediatr*, 2009; 76(8): 813-816.
8. Chatterjee SS, Ray P, Aggarwal A, Das A, Sharma M: A Community-based study on nasal carriage of *Staphylococcus aureus*. *Indian J Med Res.*, 2009; 130(6): 742-748.
9. Williams RE: Healthy carriage of *Staphylococcus aureus*: its prevalence and importance. *Bacteriol Rev*, 1963; 27: 56-71.
10. Wertheim HF, Van Kleef M, Vos MC Ott A, verbrugh HA, Fokkens W: Nose picking and nasal carriage of *Staphylococcus aureus*. *Infect control Hosp Epidemiol*, 2006; 27(8): 863-867.
11. Thomas KH. Surgical wound infection, an overview. *American Journal of Medicine*, 1981; 70: 712-718, [Pubmed].
12. Bauer A.W., Kirby W.M., Sherris J.C., Turck M. Antibiotic susceptibility testing by a standardized single disk method. *Am. J. Clin. Pathol*, 1966; 45(4): 493-496.
13. Murray PR, Baron EJ, Pfaller MA, Tenover FC, Tenover RH: *Manual of clinical Microbiology*. 7th edition. Washington DC: ASM Press, 1999.
14. CLSI: Performance standards for antimicrobial susceptibility testing M100-S20-U: 20th informational supplement. PA: wayne: institute CaLs, 2010.
15. Pathak A, Mahadik K, Dhaneria SP, Sharma A, Eriksson B, Lundborg CS: Antibiotic prescribing in outpatients: Hospital and seasonal variations in Ujjain, India. *Scand J Infect Dis.*, 2011; 43(6-7): 479-488.
16. Gossens H, Ferech M, Vander Stichele R, Elseviers M: Outpatient antibiotic use in Europe and association with resistance: a cross –national database study. *Lancet*, 2005; 365(9459): 579-587.