Indian Journal of Obstetrics and Gynecology Research 2023;10(4):421–425

Content available at: https://www.ipinnovative.com/open-access-journals

Indian Journal of Obstetrics and Gynecology Research

Journal homepage: www.ijogr.org

Original Research Article

Prevalence of methicillin resistant *staphylococcus aureus* (MRSA) colonization in pregnant females visiting at tertiary care hospital in Northern Mumbai

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ARTICLE INFO

Article history:
Received 18-05-2023
Accepted 29-07-2023
Available online 22-11-2023

Keywords:
Obstetrics
Decolonization
MRSA
Prevalence
Screening
Staphylococcus aureus

ABSTRACT

Background: Methicillin resistant s*taphylococcus aureus* (MRSA) screening is a routine practice at many hospitals for high-risk patients. However, its incidence and clinical significance in expectant mothers are poorly understood. Hence, the purpose of the current study was to look at MRSA colonization rates in our obstetric population.

Material and Methods: Prospective study was conducted for three months from December 2019 to February 2020. MRSA screening samples from pregnant women at 32-34th weeks of gestation were collected after informed consent. All screening samples underwent standard microbiological analysis. Women who tested positive for MRSA received a decolonization program and their care was monitored.

Results: Total 78 mothers were included in the study. The rate of MRSA colonisation was 2.5% at 32 – 34th week of gestation. Decolonization protocol was advised for MRSA carriers.

Conclusion: Our obstetric population has a low colonization rate for MRSA. Infections could be decreased with targeted antenatal MRSA screening and decolonization in women at high risk. Continued monitoring of MRSA infections in obstetric population and their infants is required.

1. Introduction

Staphylococcus aureus is a pathogen that caused high morbidity and mortality due to many nosocomial and community related infections.[1] This pathogen is responsible for many different types of human infections, such as impetigo, boils, cellulitis, folliculitis, carbuncles, scalded skin syndrome, abscesses and potentially fatal illnesses.[2] Methicillin-resistant s*taphylococcus aureus* (MRSA) is a kind of s*taphylococcus aureus* that is resistant to methicillin among other antibiotics. It is well-known that MRSA is endemic in India, with regional variations in antimicrobial susceptibility patterns.[3] Due to the limited number of antimicrobial drugs that may be used to treat MRSA, early detection of the illness and its susceptibility pattern become essential for therapy. In India, the combined prevalence of MRSA was estimated to be 37% (95% CI: 32- 41) between 2015 and 2020.[4]

Methicillin resistant *staphylococcus aureus* (MRSA) is a microbial pathogen that is commonly seen in postpartum infections of mothers and outbreaks in neonatal intensive care units (NICUs) are often associated with it.[5,6] MRSA colonization in obstetrics can cause morbidity in mothers and their born children.[7,8] The incidence of maternal MRSA colonization and the resulting morbidity, however,

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https://doi.org/10.18231/j.ijogr.2023.081

are little understood. Hence, present study was conducted at a tertiary care hospital to know the detect the rate of MRSA colonization in pregnant women.

2. Materials and Methods

2.1. Study period and location

A prospective observational study was conducted at 250-bedded NABH accredited tertiary-care hospital located at Northern Mumbai, which caters population, form both urban and rural areas adjacent to Mumbai city. Study was conducted for a period of three consecutive months from December 2019 to February 2020. Hospital has a well-planned infection control committee and robust infection control team. All guidelines and protocols followed in hospital are as per National Accreditation Board for Hospitals & Healthcare Providers standards. The policy made for hospital included MRSA screening only for high-risk patients on admission.

2.2. Study source

The department of Obstetrics and Gynaecology caters 180-200 patients per month and approximately 30-35 deliveries. All pregnant women visiting the department for consultation were included in the study with informed consent. Samples for MRSA screening were collected by the infection control nurse and processed in the Department of Clinical Microbiology for further evaluation.

2.3. Inclusion criteria

The study included all pregnant women who were at least 18 years old and came in for a consultation between the 32nd and 34th week of pregnancy.

2.4. Exclusion criteria

Women who visited the department for reasons other than pregnancy, cases of early pregnancy with a gestational age of less than 30 weeks, and patients lesser than 18 years were disqualified from the study to refrain from obtaining the guardians' consent.

2.5. Microbiological procedure

All clinical samples from Obstetrics and Gynecology department were accepted for processing at Department of Microbiology. Total three swabs namely nasal, axillary and groin (Most common sites of MRSA colonization) were collected after obtaining consent from the participant. Nasal swabs were taken by gently rotating the swab in anterior nasal mucosa and repeat for the other nostril with same swab. Axillary swabs were collected by gently rotating swab in both arm pits. Groin swabs were taken by gently rotating the swab in inguinal area. Swabs collected are send to department of Microbiology for further process. All swabs were inoculated on 5% sheep blood agar (BioSmart Media, Mumbai) and CHROMagar^{TM} MRSA (HiMedia Laboratories LLC). Cefoxitin disk (30microgram) was placed at the centre of streaking lines on blood agar. All inoculated agar plates were kept under incubation at 37°C for 24-48 hrs. Plates screened for any significant observation at 24hrs and 48hrs. The susceptibility of cefoxitin was interpreted as per Clinical and Laboratory Standards Institute (CLSI) guidelines.[9]

2.6. Decolonization protocol

The women were assured that they would only receive a phone call in the event that the MRSA test was positive. In this situation, the infection control staff at the hospital would develop a special decolonization plan for the expectant mother. The infection control nurse monitors all MRSA-positive female patients and in coordination with the patient's obstetrician, is in charge of decolonizing MRSA carriers. On receiving a positive result, it was instructed to decolonize using nasal mupirocin ointment and chlorhexidine bathing for five days.[10] A database of all MRSA cases was kept prospectively by the infection control team.

2.7. Ethics

The institutional ethics committee gave its approval to the project. There were no risks to study participants and the decision to participate was entirely optional.

3. Results

A total of 122 pregnant women participated in OPD during the 3-month study period. Of these, 78 (72%) consented to participate in the study. MRSA was cultured from her 2 females (2.5%). Two MRSA carriers had no known MRSA risk factors and had not undergone routine prenatal MRSA testing. One patient only tested positive in the nasal swab and was MRSA-free after one treatment; the second patient tested positive in both the nasal and axillary swabs. None of them had their infants admitted to the NICU. Both patients' next follow-up screenings were skipped.

4. Discussion

Pregnant women and newborns are now more frequently infected with MRSA than they were ten years ago. There is mounting evidence that maternal MRSA colonization during pregnancy increases the risk of newborn MRSA colonization and, occasionally, infection.[11]Additionally, antibiotic exposure is common among obstetric patients, which is a known risk factor for MRSA infection and other drug-resistant microorganisms.[11] Even in developed nations, postpartum infection is still a typical

occurrence.[12] However, there is insufficient information about the epidemiology of MRSA infections in postpartum women in the literature that has been published, and there is no agreement on how to lessen the prevalence and effects of such infections. Given the urgency of the dual threat of multidrug resistance and stalled antibiotic development, this is concerning.

The results of the current study demonstrated that MRSA is uncommon in maternity units and that its low morbidity burden during pregnancy. The outcome was in line with the Scottish MRSA screening pathfinder program's findings, which showed that only 66% of all MRSA-positive colonisations were discovered through screening.[13] A study from Danish emergency department reported 0.3% MRSA prevalence.[14] Copenhagen et al reported 0.11% prevalence of MRSA colonization. The samples taken from the rectum, nose, and throat that were likely to catch more MRSA carriers may be the cause of the higher rates.[15] Buttner et al[16] reported 1% and 0.3% prevalence in pregnant women for nasal and vaginal specimens respectively. Similarly, Beigi H et al[17] reported 1.3-2.1% colonization in pregnant women. However, Wang B et al[18] reported 0.34% colonization and observed a low prevalence of MRSA among obstetrical patients. Checking only the nose would fail to detect significant portion of colonized persons because S.aureus may also be present in the throat, axilla, rectum, groin or perineum. Hence, in present study screening samples were collected from three sites.

Present study showed that both females had no risk factors. 0.13% prevalence was found in a trial in Holland, but 73.2% of the participants had no known risk factors for MRSA transmission.[19] The absence of risk factors in the majority of MRSA positive cases raises concerns about the efficacy of simply asking patients about risk factors specific to MRSA on hospital admission and not screening them in the absence of risk factors. The two risk factors for MRSA colonization that are most frequently present are multiparity and prior MRSA infection. Even though it was noted that screening only high-risk women would be of little use, a very sizable randomized controlled trial would be required to make a firm determination on the acceptance of the clinical and financial effectiveness of MRSA screening procedures for pregnancy cases.

The possibility of decontamination prior to delivery, the optimization of antibiotic prophylactics during caesarean section, and isolation of mother and child for the duration of the hospital stay are the key benefits of early MRSA screening during pregnancy. Potential health effects on newborns could result from MRSA colonization in pregnant mothers.[17] Knowing whether or not a woman has MRSA colonization may be more important when screening her for extended stays in hospitals or while visiting her newborn in enhanced area units. The rate of MRSA identification in mothers would almost probably increase with the addition of one extra screening swab.

Targeted MRSA screening in high risk areas, such as NICUs, as suggested by Kristinsdottir et al[6] might be taken into consideration to prevent transmission from mother to infant. The incidence of NICU MRSA outbreaks is decreased by screening new patients upon admission. If systematic screenings are implemented, the possibility of earlier detection of potential epidemics is stressed by both Kristinsdottir et al[6] and Bozzella et al.[20] Even so, we did not comprehensively check for MRSA transmission from mother to child in the current study. Chen et al[21] raised concerns about the health of expectant mothers and their unborn children have been raised by MRSA contamination in prenatal vaginal cultures. Fortunov et al[22] concluded that there are no agreed-upon standards regarding the proper assessment and treatment of previously healthy term and late preterm newborns with CAMRSA isolates. Even Lazenby G et al[23] reported that vertical transmission of newborn methicillin-resistant S. aureus colonization is not significantly hampered by maternal MRSA infection. Hence, we can conclude that hospital shall make their own policy for MRSA screening in NICU and maternity units based on the local prevalence rates.

In present study, screening for MRSA done between 32-34^{th} week of gestation. There is a chance of contracting MRSA between the MRSA screening and delivery when done between the 13th and 20th week of pregnancy, however in a country with low MRSA prevalence, we think the risk is very low. It was noted that it was challenging to guarantee that women were tested even for elective sections, and that preoperative screening was obviously impossible for emergency sections. Prophylactic antibiotics were not given for all antenatal patients before delivery as per hospital's antimicrobial usage policy. However, it is advised that antibiotic prophylaxis for caesarean sections be given before to skin incision rather than following cord clamping, as antibiotic prophylaxis targeting MRSA may provide a higher benefit.[24]

Skin and soft tissue infections are closely correlated with the CAMRSA genotype, and crowded environments, damaged skin, polluted surfaces, close contact, and a lack of cleanliness are frequently linked to outbreaks. CAMRSA is emerging in pregnant women.[25] Predominantly skin and soft tissue infections characterize the clinical presentation of CAMRSA in pregnancy, which is comparable to that of other patients. The extremities, buttocks, breasts, vulva or groin, abdomen, incision, and urine are among the areas that can become infected. Following birth, post-partum infections can manifest as mastitis that develops into a breast abscess, furunculosis, cellulitis, and wound infection. Numerous dangerous and occasionally fatal infectious disorders have been linked to CAMRSA. Study conducted by Butt et al [27] noted 14.6% MRSA in post op infection

and puerperal sepsis. Despite the fact that these syndromes induced by MRSA have not yet been particularly recorded in pregnant women, practitioners should be aware of them and begin the proper testing and treatment.

Recurring courses of antimicrobials and attempts at staphylococcal decontamination are frequently ineffective in treating recurrent CAMRSA skin and soft tissue infections, which is a widespread condition. Being unable to prevent contact between mothers and newborns is neither practical nor desired, making the implementation of proper infection control measures in a large hospitalized population a significant problem.

When a patient is admitted to our tertiary care hospital, MRSA screening is often only done if risk factors for MRSA colonisation are present. However, assessment for persistent colonization by repeating nasal swabs should be done. Decolonization should be attempted only after consultation. In case of recurrent infections, mupirocin susceptibility should be checked.[26]

Clinicians should be aware of their local resistance rates given the rising incidence of MRSA, the wide regional variation in colonization and infection rates, and the presence of rising resistance to treatments now available. Maintaining a monitoring program to determine local colonization rates, their link to clinical illnesses, and patterns of antibiotic resistance is one way to acquire this knowledge. The findings will help create a baseline for predicting future increases in MRSA colonization rates in this population.

MRSA frequency was reported to be around 37% in India by Patil S et al.[4] In India, the epidemiology of MRSA in humans is gradually changing, and the prevalence has grown over time as a result of inadequate awareness, excessive use of antimicrobial medications for human health, an increase in infections brought on by poor hygiene, and a lack of strict laws and regulations governing the use of antibiotics. Despite the expensive cost of antibiotics, their use has increased due to incorrect prescribing, indiscriminate use, and sales of over-the-counter medications. To control the spread of resistance, there is a need to implement strict laws in society and to cultivate the practice of rational usage of antibiotics.

The current study contains a number of drawbacks. It was an observational study of typical clinical practice with a small number of MRSA infections, hence there was no systematic evaluation of outcomes like the rate of transfer from mother to child. Secondly, many pregnant women did not participate. The reason might be lack of awareness regarding MRSA and its consequences. However, no data were available to explain why they did not participate. Hence, it is not known whether they were at higher risk of MRSA colonisation than the participating women. It is possible that the actual rate could be different from the predicted one. However, this study has provided some important information on the incidence of MRSA in cases of maternity and highlighted that every patient does not require to be screened at our hospital. It may be possible to lower the infectious illness related to MRSA among pregnant women who are going through surgical deliveries by screening them for MRSA, however, the best way to do screening in terms of cost and clinical results is yet to be established.

5. Conclusion

MRSA screening recommendations are currently debatable and not widely accepted. Infections could be decreased with targeted antenatal MRSA screening and decolonization in women at high risk. Data on the persistence of MRSA are insufficient to determine the ideal gestational age for screening. The best time frame for MRSA screening is one that enables carriers to get decontamination therapy ahead to their anticipated due dates. In our setting, the prevalence of MRSA is low among pregnant women, so we do not recommend that all pregnant women undergo regular nasal screening tests.

6. Source of Funding

None.

7. Conflict of Interest

None.

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Cite this article: Patel K, Thiyagarajan KS, Patil YP, Choudhari VS, Carval TN. Prevalence of methicillin resistant *staphylococcus aureus* (MRSA) colonization in pregnant females visiting at tertiary care hospital in Northern Mumbai. *Indian J Obstet Gynecol Res* 2023;10(4):421-425.