

Original Research Article

A Retrospective Study To Evaluate Pregnancy Outcome In A Positive High Vaginal Swab Culture

¹Gazal, ²Aleeza Pal, ³Nitin Kumar, ⁴Monika Jindal, ⁵Santosh Minhas, ⁶Atul Rana

^{1,6}Junior Resident, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India

²Assistant Professor, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India

³Assistant Professor, Department of Pediatrics, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India

⁴Professor, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India

⁵Professor & Head of Department, Department of Obstetrics & Gynaecology, Maharishi Markandeshwar Medical College & University, Kumarhatti, Solan, Himachal Pradesh, India

Corresponding Author:

Dr. Aleeza Pal (aleezapal16@gmail.com)

ABSTRACT

Background: Upper vaginal tract infection during pregnancy manifesting in the form of Vaginitis, vaginal discharge, has emerged as a major health problem responsible for preterm premature rupture of membranes (PPROM), preterm labour, neonatal and puerperal sepsis. Preterm deliveries come with their own challenges, both for the mother and new-born. High vaginal swab culture positivity during pregnancy for common pathogens, namely Group B Streptococcus, Klebsiella Pneumonia, Escherichia coli, Staphylococcus aureus may predict the predisposition of the mother to PPRM, chorioamnionitis and subsequent neonatal complications.

Methodology: A retrospective study was conducted to analyze fetomaternal outcome of 200 expectant mothers who were admitted for safe confinement after 28 weeks of gestation and were tested for high vaginal swab (HVS) culture & sensitivity, dividing them into two groups, based on the results of their HVS culture i.e., sterile versus nonsterile cases.

Results: 98 patients tested positive for various microorganisms, out of which 60 samples showed mixed flora, 20 Gram positive Cocci, 15 Gram Negative Bacilli, and 3 showed growth of Candida. The most common organisms isolated in high vaginal swabs were Diphtheroids (31%), Coagulase Negative Staphylococcus (8.10%), Escherichia coli (7.10%), Staphylococcus aureus (5.10%) and Candida albicans (3%). The rest 102 samples were sterile. A significant association was found between maternal C-reactive protein (CRP) & increased neonatal morbidity with positive HVS. However, the results of positive HVS culture showed no significant association with other adverse maternal outcomes such as puerperal sepsis and preterm labour.

Conclusion: Ascending intrauterine infections remain an important cause of preterm labour, PPRM, chorioamnionitis, etc. and eventually poor neonatal outcome. Timely treatment with

appropriate antibiotics can go a long way in treating the same. But larger studies are needed to prove the same and to make high vaginal swab a useful screening tool for all antenatal patients to prevent complications and overall improvement of fetomaternal outcome.

Keywords: Fetomaternal outcome, high vaginal swab, infections

INTRODUCTION

Pregnancy remains a state, especially the intrapartum and the postpartum period when the mother and child become susceptible to ascending genital infections, that can lead to adverse maternal outcomes such as endometritis, chorioamnionitis, surgical site infection, postpartum haemorrhage, puerperal pyrexia, puerperal sepsis, subinvolution and adverse neonatal outcomes such as neonatal sepsis, fetal growth restriction (FGR), Respiratory Distress Syndrome (RDS), birth asphyxia may occur at any period of gestation ^[1].

Vaginitis has become a public health concern due to rising incidence in the reproductive age group. Based on the etiology of microbes; infectious vaginitis is classified broadly as vulvovaginal candidiasis (VVC), bacterial vaginosis (BV) and trichomoniasis. Etiology of Preterm delivery, PPRM and other adverse fetomaternal outcomes have been investigated over the past few years. 8-10% of pregnant women at term present with PROM and hence become more prone to intrauterine infection in cases of prolonged first stage of labour ^[2]. A positive association has been established between upper genital tract infections and PROM by a few studies in the past ^[3-5].

In earlier studies it was found that the risk of neonatal infection was increased among mothers colonized with GBS. Prolonged premature rupture of membranes >18 hours, maternal fever during labor and prematurity poses additional risks for neonatal infection ^[3, 7, 8]. Methicillin resistant *Staphylococcus aureus* (MRSA) is also emerging as one of the causes of early onset Neonatal sepsis. Composition of the normal vaginal flora changes in pregnancy; a shift which is dominated by *Lactobacillus*. This change is beneficial as it hampers the growth of pathogens through secretion of bacteriocins such as lactic acid that maintain an acidic pH. Colonization of the urogenital tract with abnormal microbes is associated with maternal and fetal complications ^[9, 10]. Mostly aerobes have been isolated from infected amniotic fluid instead of anaerobes responsible for bacterial vaginosis. Hence a detailed analysis of the change in vaginal microorganisms during pregnancy becomes important to prevent complications that may be associated with it ^[10, 12].

Diagnosis and treatment of vaginal infections during the antenatal period in developing countries like India is usually based on clinical symptomatology rather than confirmatory tests like Vaginal swab culture and sensitivity. Hence our retrospective study was an attempt to analyze the importance of sending High vaginal swabs as a routine screening test for all antenatal patients to elicit the relation of positive vaginal swab with fetomaternal outcome.

Material & Methods

This retrospective study was conducted in the department of Obstetrics & Gynaecology at Maharishi Markandeshwar Medical College and Hospital, Solan to evaluate and compare pregnancy outcome in patients with a positive high vaginal swab culture and those with a sterile culture, over a 1-year period from 1st April 2021 till 31st March 2022.

a. Inclusion criteria

Patients of reproductive age group (18-40 years) admitted in labor room after 28 weeks of gestation for delivery irrespective of their parity status.

b. Exclusion criteria

1. Patients admitted directly in second stage of labor/meconium-stained liquor.
2. Patients with duration of leakage >6 hours
3. Gestational age < 28 weeks.
4. Multiple pregnancy.
5. Patients with features suggestive of Chorioamnionitis, which include fever, uterine tenderness, foul smelling liquor.
6. Congenital anomalies, IUD.
7. Chronic medical and surgical conditions complicating pregnancy

The case records of the selected patients were examined for the results of the positive vaginal swab culture sensitivity, the predominant microorganisms and the fetomaternal outcomes in the respective patients. Any postpartum complication including Puerperal Sepsis, Chorioamnionitis, Postpartum hemorrhage, Subinvolution were noted. Neonatal complications in such patients such as, RDS, Sepsis, Prematurity, etc. were also noted. The women with a nonsterile high vaginal swab were taken as cases (n=98), and those with sterile cultures were taken as controls (n=102).

Statistical analysis

The data was tabulated, expressed as mean \pm SD for continuous variables, frequency and percentage for categorical variables and analyzed using Student's t-test and Chi-square test to determine the association between two groups respectively. Statistical analysis was performed using SPSS version 20 (IBM Corp., Armonk, NY), and a p-value \leq 0.05 was considered statistically significant.

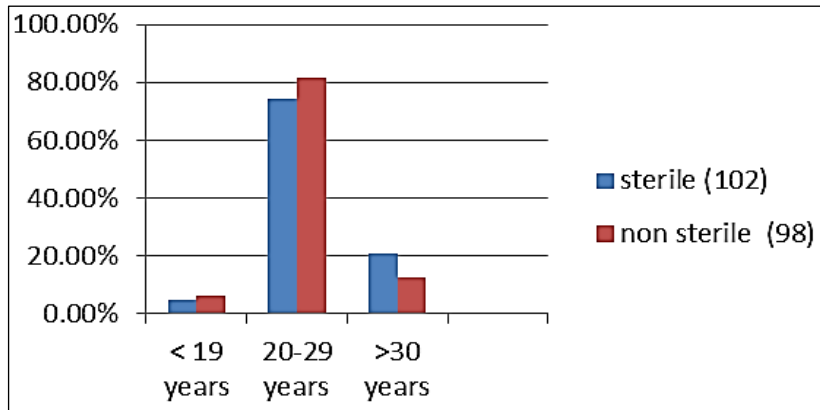
Results

A total of 200 subjects who underwent high vaginal swab testing were included in the study. Out of which, 98 high vaginal swab samples tested positive for various microorganisms and 102 samples showed no growth. Most of the antenatal females in the non-sterile group were in the age group of 20-29 years, 80(81.6%), followed by more than 30 years 12(12.3%) and very few were in the age group less than 19 years 6(6.1%) as shown in Table 1. Whereas, in the sterile group, 5(5.0%), 76(74.5%) and 21(20.5%) were in the age group of <19 years, 20-29 years and > 30 years respectively. However, the results were not significant statistically (Chi square = 3.296, p = 0.192)

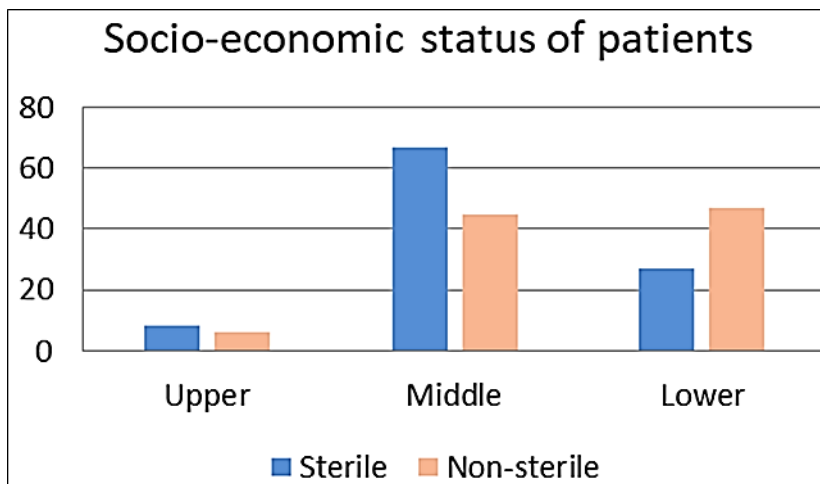
Table 1: High vaginal swab and maternal parameters

Maternal parameters	HVS culture		Fischer/Chi-Square	Significance (p)
	Sterile (%)	Nonsterile (%)		
Age of patients				
<19 years	5(5.0)	6(6.1)	3.296	0.192
20-29 years	76(74.5)	80(81.6)		
>30 years	21(20.5)	12(12.3)		
Socioeconomic Status				
Lower	27(26.5)	47(48.0)	9.937	0.007
Middle	67(65.7)	45(45.9)		
Upper	8(7.8)	6(6.1)		
Risk Factors				
Genital infection	7(6.8)	21(21.4)	0.347	0.951
UTI	3(2.9)	10(10.2)		
PROM	2(1.9)	5(5.1)		
Coitus	10(9.9)	23(23.5)		
None	80(78.5)	39(39.8)		

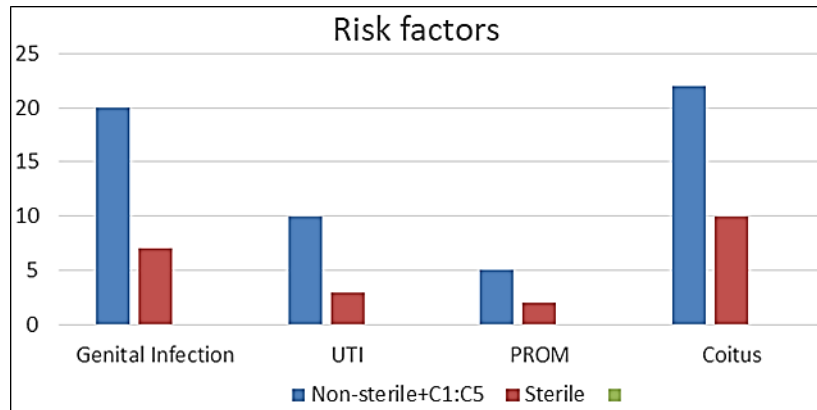
Maternal Complications				
Normal	95(93.3)	80(81.6)	6.994	0.136
Puerperal sepsis	2(1.9)	6(6.1)		
Wound infection	3(2.9)	5(5.1)		
Chorioamnionitis	0(0)	2(2.1)		
Episiotomy gaping	2(1.9)	5(5.1)		
Maternal CRP				
Positive	4(3.9)	21(21.4)	14.006	0.001
Negative	98(96.1)	77(78.6)		
Mode of delivery				
NVD	79(77.5)	72(73.4)	3.246	0.197
VBAC	0()	3(3.1)		
LSCS	23(22.5)	23(23.5)		



On comparing the two groups for socioeconomic status non-sterile group showed predominance of lower class 47(48.0%) as compared to upper class 6(6.1%) whereas in sterile group lesser patients were seen in lower class 27(26.5%) and the results were found to be statistically significant. (Chi square = 9.937, p =0.007). Table 1



The incidence of risk factors such as genital infections 21(21.4%), urinary tract infection 10(10.2%), previous history of Preterm labour (5.1%), history of coitus 23(23.5%) was more in the nonsterile group than in the sterile group 7(6.8%), 3(2.9%), 2(1.9%), 10(9.9%) respectively. However, the results obtained were not statistically significant (Chi square = 0.347, p =0. 951, Pearson Correlation = -0.058).



Out of 98 patients in the non-sterile group, 55.10% were primigravidae and the remaining 44.90 % were multigravidae. The total number of vaginal swab cultures processed were 200, out of which 98 showed growth, 60(61.2%) showed growth of mixed flora, 15(15.3%) gram negative bacilli, 20(20.4%) gram positive cocci and only 3(3.1%) showed growth of Candida.

Table 2: Microbial distribution among culture positive samples

Mixed growth	Growth of gram-negative bacilli	Growth of gram-positive cocci	Candida
60(61.2)	15(15.3)	20(20.4)	3(3.1)
Organisms	No. of isolates	%	
Escherichia coli	7	7.10	
Klebsiella pneumonia	3	3	
Klebsiella oxytoca	4	4	
Staphylococcus aureus	5	5.10	
Coagulase negative Staphylococcus	8	8.10	
Diphtheroids	30	31	
Enterococcus	4	4	
Candida	3	3	

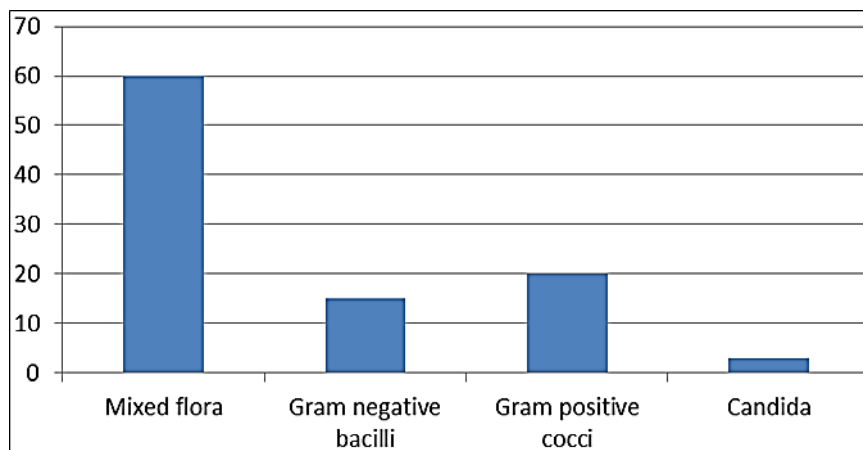
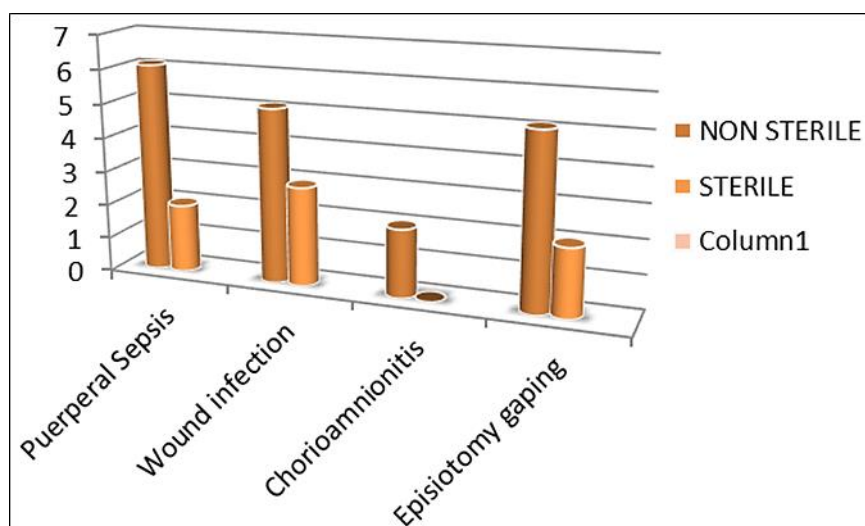


Chart 3: Microorganisms detected in HVS culture

Highest number of isolates found were of Diphtheroids (31%), followed by Coagulase negative Staphylococcus (8.10%), Escherichia coli (7.10%), Staphylococcus aureus (5.10%), Klebsiella oxytoca & Enterococcus (4%), Klebsiella pneumonia (3%) and Candidal growth was seen in 3% of cases. In our study, out of the 98 subjects who tested positive for high vaginal swabs, 23(23.5%) patients underwent caesarean section, whereas 72(73.4%), patients underwent normal vaginal deliveries with 3 VBACs (3.1%). The most common indication was acute foetal distress (30%), followed by non-progress of labor (27%). Whereas in the sterile group, previous caesarean section with ultrasound documented scar thinning was the most common indication seen in 33% of the cases followed by acute fetal distress (28%). However, the statistical analysis showed no significance, (Chi Square=3.246, p=0.197). The rate of Puerperal sepsis in the nonsterile group was more than the sterile group (6.1% vs 2%). Caesarean scar wound infection and episiotomy gaping were seen in 5.1% of nonsterile group compared to 2.9% and 1.9% in the sterile group. The results were not statistically significant. (Chi square = 6.994, p = 0.136).



Maternal morbidity in relation to High Vaginal Swab culture positivity.

However, CRP positivity was seen 21.4% of the nonsterile patients compared to 3.9% in the sterile group and the results were statistically significant (Chi square=14.000, p =0.001).

Table 3: Outcome for newborns in relation to HVS culture

Foetal Outcome	HVS culture		Statistical test	Significance (p)
	Sterile (%)	Nonsterile (%)		
Birth weight			T	
Mean \pm Std. Deviation	2.727 \pm 0.48 Kg	2.657 \pm 0.58 Kg	0.914	0.362
Perinatal morbidity			Pearson Chi-Square	
Normal	84(82.2)	66(67.3)	7.083	0.029
Significant	18(17.8)	30(30.6)		

Morbidity				
Foetal death	0(0)	2(2.1)		
Perinatal Morbidity Profile				
Septicaemia	2(1.9)	8(8.1)	14.861	0.062
Birth Asphyxia	2(1.9)	5(5.1)		
RDS	2(1.9)	4(4.1)		
NNJ	7(6.8)	11(11.2)		
Seizure	1(1.0)	0		
TTNB	3(2.9)	0		
MAS	0(0)	2(2.1)		
Other	1(1.0)	2(2.1)		
Normal	84(82.6)	66(67.3)		
Period of gestation				
Early preterm	3(2.9)	4(4.1)	5.241	0.155
Late preterm	7(6.8)	11(11.2)		
Term	89(87.4)	81(84.7)		
Post term	3(2.9)	0		

The mean birth weight in the sterile group was 2.727 ± 0.48 kg, whereas in the nonsterile group, the mean birth weight was 2.657 ± 0.58 kg with no statistical difference ($T=0.914$, $p=0.362$). More number of Preterm deliveries (early + late preterm) were noted in the nonsterile group compared to sterile group, 17 versus 10, but no statistical significance was demonstrated (Chi square = 5.241, $p = 0.155$). Significant combined neonatal morbidity was seen in 30.6% of the neonates born to mothers in the nonsterile group compared to 17.8% in the sterile group and the results were found to be statistically significant (Chi square-6.896, $p=0.032$). However, on taking individual neonatal morbidity necessitating admission to NICU into account a greater number of septicaemias 8(8.1%), perinatal asphyxia 5(5.1%) and RDS 4(4.1%) were seen in nonsterile group as compared to sterile group 2(1.9%), 2(1.9%), 2(1.9%) respectively. However, results were no significant between two groups (Chi Square =14.861, $p=0.06$).

Discussion

Our study was a hospital based, retrospective study to study the fetomaternal outcome in patients who tested positive for vaginal swab cultures. Out of the 200 subjects that were included in the study, 98(49%) tested positive for various pathogens which was comparable to the study by Tellapragada *et al.* (47.8%).¹³

Majority of the samples showed mixed flora followed by gram negative bacilli, which was comparable to the study conducted by Dr. Rajani Uday *et al.*, where mixed growth 74.6%, gram negative bacilli 2.9%, gram positive cocci 8% and higher percentage of Candida 8% was reported.¹⁴

Similar patterns of microorganisms isolated from the vaginal swabs were observed in various studies conducted by M.R. Nahaei *et al.* and Fareha Khatoon *et al.*^{15,16} In the study conducted by Neha *et al.* the most common organism found in High Vaginal Swab culture was Enterococcus faecalis 18%, followed by Escherichia coli 12%, Staphylococcus aureus 12.66%,

Staphylococcus haemolyticus 6.66%, and Candida albicans 4.66%.¹⁷ Although a similar group of organisms was also found in a study by Pandey *et al.*,¹⁸ the most common organism isolated was E. coli, followed by Staphylococci, Streptococci, and atypical coliforms.

Positive HVS cultures were seen more in the lower class compared to the middle and upper class and the results were found to be statistically significant. (Chi square = 11.163, p =0.025). Similar results were also demonstrated by Charu *et al.*¹⁹ Poor personal hygiene, delay in seeking medical help, improper nutrition leading to anaemia and increased susceptibility to infections, could be the cause.

The incidence of Caesarean section in the sterile and non-sterile groups was comparable to the study by Mahajan *et al.* (sterile group -24.1%; nonsterile 22.7%).¹⁹

In a study conducted by Akhter *et al.*, sexual activity along with infection of the genital tract was more amongst Primigravidae.²⁰ This was comparable to our study where positive vaginal swab cultures were obtained in 55.10% of primigravidae. The incidence of various maternal morbidity factors in our study in the nonsterile group was higher than that seen in sterile group though being not significant (Chi square= 6.994, p=0.136) such as Puerperal Sepsis 6.1%, Caesarean scar wound infection 5.1%, Episiotomy gaping 5.1% and chorioamnionitis 2.1% was comparatively lower than the study by Mahajan *et al.*

Although, the incidence of preterm deliveries (early + late) was more in the nonsterile group 15.3% versus the sterile group 10%, but the results were statistically insignificant (Chi square = 5.241, p = 0.155). Smaller sample size could be attributable.

Significant neonatal morbidity requiring admissions were seen in 33.7% of nonsterile cases compared to 17.4% sterile cases (Chi square=7.083, p=0.029). This contrasted with the study done by Afolabi *et al.* (18.8%).²¹ On further breakdown of profile of neonatal morbidities leading to NICU admission no significant difference was noted among the two groups (Chi Square=14.861, P=0.06). These results corresponded with Charu *et al.* for the combined neonatal morbidity, but no significance was found on analysing each condition individually statistically.¹⁹

CONCLUSION

Though the rate of preterm deliveries, PROM was not significantly different in the sterile versus non sterile cases, significant neonatal morbidity was seen in cases with high vaginal swab cultures. Hence, high vaginal swab culture remains a useful screening procedure that can be used for all antenatal patients so that maternal and neonatal morbidity can be averted. But larger studies are needed to effectively prove the efficacy of this screening tool.

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