Original Article

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Evaluation of Bacteriospermia as Etiology for Oligospermia: An Analysis

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Abstract

Introduction: Semen analysis is considered as the surrogate marker for male fecundity while assessing infertility in men. There are several reasons why a male could be suffering from infertility whether primary or secondary. A big part of altered semen profile is the quantity of semen ejaculated apart from the quality of sperms in the ejaculate. Oligospermia is the most common cause of poor semen profile and bacteriospermia is being cited is one of the major reasons for infertility in men.

Aim: The aim of this study is to correlate semen analysis on microscopy with semen culture to obtain the incidence and pattern of bacterial infection in patients suffering from oligospermia.

Materials and Methods: In this study, semen sample showing oligospermia was collected for further analysis and culture with antibiotic susceptibility test according to the standard laboratory methods. Semen was collected after 3-4 days of sexual abstinence in the aseptic condition in the clean, dry, sterile and leak-proof container.

Result: An overall semen analysis in our study showed that out of 528 semen samples analyzed 104 were oligospermic. The most common infective organism causing this oligospermia isolated on culture came out to be *Staphylococcus* species.

Conclusion: This study has demonstrated that abnormal semen analysis specially in terms of sperm quantity, quality, and bacterial infection is a major factor in infertile male having abnormal semen parameters.

Key words: Bacteriospermia, Infertility, Oligospermia, Semen

INTRODUCTION

Infertility is a common problem affecting 15% of couples attempting their first pregnancy. It is a common problem worldwide increasing in both incidence and prevalence. It is mainly of two types, primary infertility, and secondary infertility. Primary infertility means inability to conceive in the first attempt due to an unknown cause. It is the most common type of infertility while the 10% population suffering from secondary infertility suffers from a secondary cause like infection which is stopping them from conceiving. Two principal factors taken into consideration with regards to etiology are: Male causative factors and female causative factors. Male infertility is associated with a reduction in the quality of sperm or the quantity of sperm in the semen ejaculated. A male causative factor is associated with 50% of all infertility cases, such that about 30% of the cases of infertility are associated with male causative factors, while 20% are associated with combined male and female factors.[1]

Semen analysis is an essential parameter in giving a definitive diagnosis in infertile males. The beauty of semen analysis lies in its ease of testing and it being a routine outpatient department (OPD) procedure. Semen characteristics under study are the volume, pH, sperm concentration, motility, morphology, and vitality. Analysis of a semen sample may lead to various defects in the semen quality and quantity-like azoospermia, which means the absence of spermatozoa in the semen ejaculate, while in oligospermia, the count is <15 million/ml.[1] Isolation of microbes in seminal fluid especially in men suffering from oligospermia and

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infertility has been widely reported. While the exact role of microbial infection in the etiology of infertility is not very certain due to the limitations in diagnostic criteria and asymptomatic nature of infections, some possible effects on the properties of seminal fluid associated with fertility have been suggested, e.g., a decrease in the sperm quantity and motility. Pathogenic bacteria, which adversely affect certain organs and tissues of the body such as the testicles, epididymis, and production of sex hormone including those transmitted sexually are *Neisseria gonorrhoea*, and those transmitted through the urinary tract-like *Staphylococcus aureus*. Another pathogen implicated in the damage is the *ureaplasma urealyticum* infections which induce leukocytospermia consequently lead to sperm damage, decrease sperm numbers, and invariably impaired sperm motility. It has been seen that early diagnosis and treatment of infection are indeed necessary to avert the myriad of problems associated with male infertility.[2-4] This study was undertaken to analyze seminal fluid parameters and to isolate and identify the pathogens responsible for infertility.

MATERIALS AND METHODS

The aim and objective of this study were to establish infection as etiology for oligospermia and to see the prevalence and pattern of a bacterial pathogen in semen of infertile men. A prospective study was conducted Era's Lucknow Medical College, Lucknow, during January 2015 to December 2015. The research objective and methods were explained to the patients, and informed consent was taken from each patient before collection of specimen. In this study, semen sample showing oligospermia was collected for further analysis and culture with antibiotic susceptibility test according to the standard laboratory methods. Semen was collected after 3-4 days of sexual abstinence in the aseptic condition in the clean, dry, sterile and leak-proof container. The sample was taken to the laboratory for further analysis without any delay. The sample collected was evaluated in terms of its acceptability, proper labeling (full name, age, serial number of the patient, date and time of collection). The semen samples were cultured on the MacConkey agar (MA) and blood agar (BA) plates by the semi-quantitative culture technique using a standard calibrated loop. Known volume (0.001 ml) of mixed un-centrifuged semen was inoculated on the surface of MA and BA. The plates were then aerobically incubated at 37°C for 24 h. Any growth of bacteria ≥10,000 colony forming units (CFU/ml) on the 5% BA was considered to be significant.[4,5] The identification of bacterial isolates was done by standard microbiological techniques as described in Bergey's manual of systemic bacteriology which comprises of studying the colony characters, staining reactions, and biochemical tests.

RESULTS

An overall semen analysis in our study showed that out of 528 semen samples analyzed 104 were oligospermia, 240 were normospermia, and 184 were azoospermia (Figure 1). This could be attributed to increased or decreased quantity of ejaculate, hence the azoospermia patients were advised to repeat test after 3 weeks after 3 days of abstinence. Of the 104 oligozoospermia cases, 10 were oligoasthenozoospermic, 25 were oligotertaozoospermic, and 69 were simply oligozoospermic. In our study, out of the total 156 samples having increased pus cells (Figures 2 and 3); in them, 40 (25.64%) showed significant bacterial growth (Figure 4). Six different species of bacterial organisms were isolated (Figure 5). The most common isolates were *Staphylococcus* sps. (40%) followed by *Escherichia coli* (27.5%) and *Klebsiella* (25%). The prevalence of these three bacteria was significant in cultured samples ($P < 0.01$) as well as in total samples ($P < 0.01$). Furthermore, in our study, it was seen that there is significant risk of bacterial infection on infertility (odds ratio [OR] = 1.66 with 95% confidence interval [CI] as [1.06, 2.60], $P = 0.026$).

DISCUSSION

Semen analysis is the mainstay in the laboratory evaluation of infertility in males and helps us to define the severity

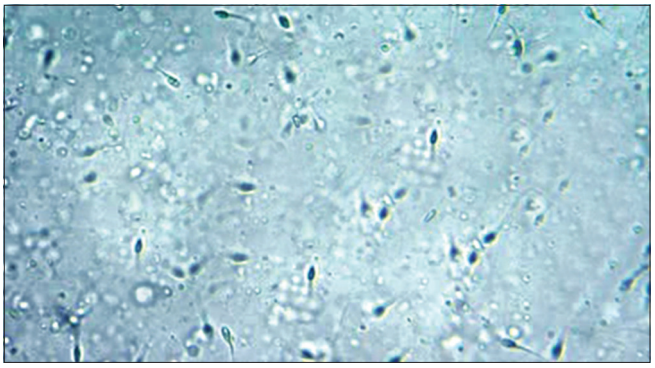

Figure 1: Microscopy of oligospermic semen

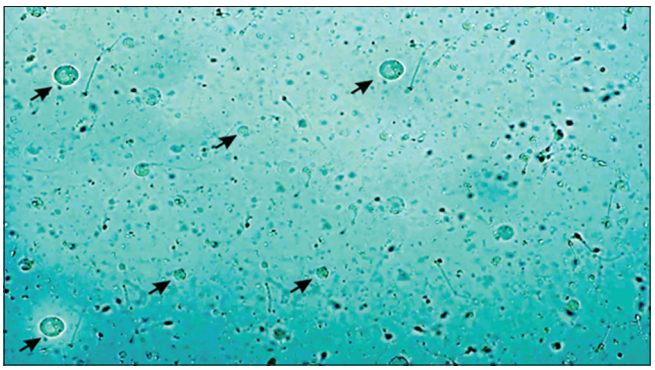

Figure 2: Microscopy of oligospermia with pus cells (arrows)

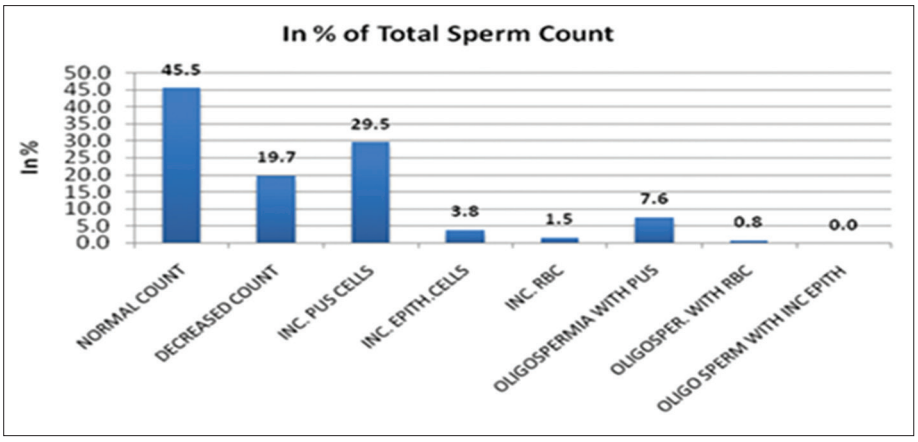

Figure 3: All the semen analyzed the percentage incidence of various parameters seen

of the male factor in primary as well as secondary infertility. Semen analysis gives the physician indications about the normal or abnormal testicular functioning as well as the integrity of the male genital tract which may help in the treatment of the patient.[6-8] As seen in our study, out of the total samples analyzed, 40 (25.64%) showed significant bacterial growth. Six different species of bacterial organisms were isolated. The most common isolates were *Staph* (40%) followed by *E. coli* (27.5%) and *Klebsiella* (25%). The prevalence of these three bacteria was significant in cultured samples ($P < 0.01$) as well as in total samples ($P < 0.01$). This matches the findings of a study where similar results were obtained.[9-11] Furthermore, in our study, it was seen that there is a significant risk of bacterial infection on infertility (OR = 1.66 with 95% CI as [1.06, 2.60], $P = 0.026$).

Increased bacterial infection, especially *Staphylococcal* infection, has been seen as an important factor in causing oligozoospermia as evident in our study (Table 1).[12,13]

Furthermore, an overall semen analysis in our study showed that out of 528 semen samples analyzed 104 were oligospermia, 240 were normospermia, and 184 were azoospermia (Figure 3). This could be attributed to increased or decreased quantity of ejaculate, hence the azoospermia patients were advised to repeat test after 3 weeks after 3 days of abstinence. Out of the 104 oligozoospermia cases, 10 were oligoasthenozoospermic, 25 were oligotertaozoospermic, and 69 were simply oligozoospermic. On the other hand, high volume semen could result in over dilution of the sperm cells, hence low sperm concentration.[14-16]

Other factors attributing to altered semen analysis results can be altered consistency of the semen, where the too thick and too light specimens have lower sperm concentrations than those with normal consistency.[17] It has been seen that increased sperm concentration is associated with prolonged abstinence while improved motility is associated with a shorter period of abstinence but with lower sperm density. However, the sperm morphology does not vary with length of sexual abstinence. The incidence of asthenozoospermia and teratozoospermia is significantly higher in oligospermic semen than in normospermic semen.[18]

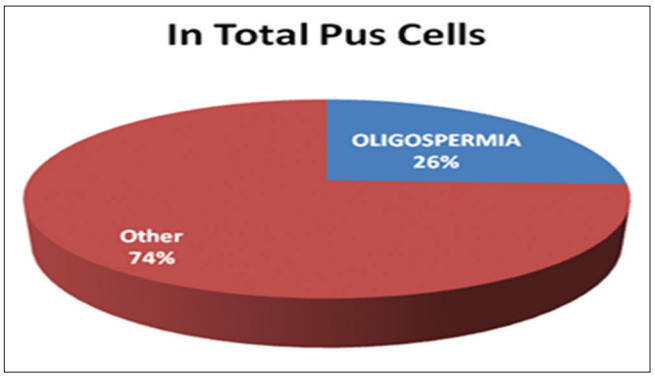

Figure 4: Samples with pus cells in semen 26% had accompanying oligospermia

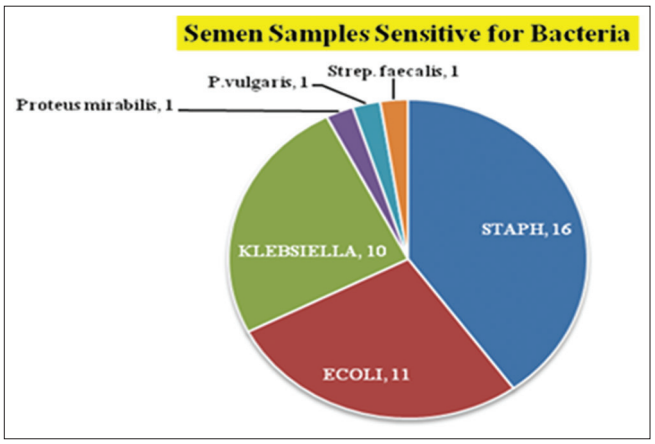

Figure 5: Distribution of various bacterial species on culture and sensitivity of oligospermic samples with pus cells

In a study done, it was seen that the most common isolated organism in semen was *S. aureus* (40%) followed by *E. coli*

Table 1: Percentage prevalence of various bacteria with *P* value being significant for *Staphylococcal* species

Bacteria	*N*	Prevalence (%)	95% CI for prevalence		*P* value for H0:Prevalence=0
			Lower	Upper	
Staphylococcal	16	3.03	1.57	4.49	<0.001
E. coli	11	2.08	0.87	3.30	0.001
Klebsiella	10	1.89	0.73	3.06	0.002
P. mirabilis	1	0.19	−0.18	0.56	0.317
P. vulgaris	1	0.19	−0.18	0.56	0.317
S. faecalis	1	0.19	−0.18	0.56	0.317
Total	40	7.58	5.32	9.83	<0.001

S. faecalis: Streptococcus faecalis, P. vulgaris: Proteus vulgaris, P. mirabilis: Proteus mirabilis, E. coli: Escherichia coli, CI: Confidence interval

(25%), *Klebsiella pneumoniae* (16.7%), *Citrobacter* species (6.7%), *Proteus* species (05%), and *Staphylococcus epidermidis* (3.3%). Two *Candida albicans* (3.3%) were also isolated. These findings match with our study findings except that we did not see candida species as a cause of oligospermia.[8-10] It has been seen that these isolated microorganism showed 100% sensitivity to piperacillin-tazobactam among the aminoglycosides, amikacin demonstrated (80%) sensitivity. Ceftazidime (78%) and cefotaxime (78%) showed similar sensitivity patterns. Ofloxacin (75%) and ciprofloxacin (73%) showed better sensitivity when compared to amoxicillin-clavulanic acid (30%) and co-trimoxazole (22%). Erythromycin (20%) and tetracycline (18%) were found to be least sensitive.[11]

However, not many studies have been done to conclude the correlation of semen analysis with bacterial infections in cases of infertility and a proper workup of every male visiting the OPD with such a complaint is the need of the hour.

CONCLUSION

This study has demonstrated that abnormal semen analysis specially in terms of sperm quantity, quality, and bacterial infection is a major factor in infertile male having abnormal semen parameters. The presence of pathogenic microorganisms will affect the semen quality and results in infertility. The most common organism being the *Staphylococcal* species. This can be easily diagnosed by semen culture which is generally overlooked by the physician, hence our study advocates semen analysis and culture as the diagnostic tool to treat infertility.

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