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Research Article

# Bacteriospermia: An Etiology of Oligospermia

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**Abstract:** Semen analysis is known to be important in determining male fertility and also in assessing infertility in men. Both primary and secondary infertility in male have various causes. One very important part of altered semen profile is the quantity of semen ejaculated and the quality of sperm cells in the ejaculate. Oligospermia is the most common cause of poor semen profile and bacteriospermia has been observed as one of the major causes of infertility in men. This study aimed at determining the relationship between bacteriospermia and oligospermia. In this cross-sectional study, 200 semen samples were collected for further analysis and cultured according to the standard laboratory methods. Semen samples were collected after 3-4 days of sexual abstinence in aseptic condition in a clean, dry, sterile and leak-proof container. The result gotten showed that out of 200 semen samples analyzed 64(32%) were oligospermic. The most common infective organism causing bacteriospermia in oligospermic semen isolated on culture was *Staphylococcus aureus* with prevalence of 26.6%. There was a non-significant negative correlation between bacteriospermia and oligospermia. This study has shown that bacteriospermia does not have any relationship with oligospermia as bacteriospermia affected more normospermic semen than oligospermic group. However, the study also showed that the most common bacteria causing bacteriospermia is *Staphylococcal aureus* followed by *Escherichia coli*.

**Keywords:** bacteriospermia, infertility, oligospermia, semen.

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## 1. Introduction

Healthy fertility is needed for the survival and continuation of the human race. Recently, however, reports have shown a decline in male fertility. Infertility affects approximately 15% of couples globally, Reproductive-aged couples worldwide in their numbers have been estimated to be faced with infertility challenges (Inhorn & Patrizio, 2015). Male infertility accounts for approximately 50% of these infertility cases (Vander & Wyns, 2018).

Oligospermia which is a medical condition characterized by a low sperm count, which affects the fertility of men. It is a common cause of male infertility, oligospermia have a prevalence rate of 15% in the general population. The following are factors affecting male fertility: steroid hormone disorders (O'Hara & Smith, 2015), hypogonadism

(Casarini *et al.*, 2020), genetic defects (Brugh & Lipshultz, 2004; Ferlin *et al*., 2006), spermatogenesis dysfunction (Gunes *et al*., 2015), ejaculation disorders (Fode *et al*., 2012) and reproductive infections (Reddy *et al*., 2006; Ochsendorf, 2008; Sarkar *et al*., 2011) In different countries and regions the incidence of infertility varies significantly. About 10% of male infertility in developed countries is related to infectious and immune factors (Bachir & Jarvi, 2014) while In developing countries the percentage is higher up to 50% (Ekwere, 1995), this may be due to poor health and medical conditions, differences in religious faith, medical resource, sanitary condition, and lifestyle.

Among other significant factors, pathogenic microbial infection and the immunological reaction it triggers are significant causes of male infertility. The testis and epididymis, like other immunological organs, effectively shield sperm from unfavourable immune reactions and resist pathogenic microbial infection (Fijak et al., 2011). The male reproductive system can become infected by many microorganisms, including bacteria, viruses, and parasites. This can set off a series of inflammatory reactions that reduce male fertility (Bukharin et al., 2000). Infertility has been associated with bacteriospermia, which is the presence of bacteria in semen. According to studies, bacteriospermia can increase the number of seminal leukocytes and reactive oxygen species, both of which can harm spermatozoa (Bukharin et al., 2000). Bacteria typically affect the reproductive tract retrogradely by infecting the urethra, seminal vesicles, prostate, epididymis, vas deferens, and testes. 15% of male infertility cases are due to bacteria like Chlamydia trachomatis, Neisseria gonorrhoeae, and Brucella (Schaeffer, 1998; La Vignera et al., 2011; Cai et al., 2014; Erdem et al., 2014). In addition, although Mycoplasma can infect the male reproductive system, it has no impact on male fertility. Yet, it can be passed on to females through sex, which lowers female fertility.

Several studies have investigated the relationship between bacteriospermia and oligospermia. A study by Karimian *et al*. (2019) found that 68% of men with oligospermia had bacteriospermia. Similarly, a study by Fijak and Pilatz (2018) found that 72% of men with oligospermia had bacteriospermia. These studies suggest that bacteriospermia may be a cause of oligospermia, but there is no concrete evidence of this claim and there are also limited literatures on the prevalence of bacteria involved in oligospermia. The aim of this study is to determine if bacteriospermia is a cause of oligospermia and also determine the prevalence of these bacteria.

## 2. Materials and Methods

### Study Design

This was a cross-sectional study was conducted in healthcare facilities in Port Harcourt to determine the relationship between bacteriospermia and oligospermia. Exactly 200 (two hundred) male participants were randomly recruited from different fertility clinic, and semen samples were collected from the participants and analyzed for the presence of bacteria and sperm count after obtaining ethical clearance and written consent from participants.

### Eligibility Criteria

*Inclusion criteria*

Participants were included in the study if they were men aged between 18 and 50 years who attended a fertility clinic.

*Exclusion Criteria*

Participants were excluded if they had a history of vasectomy, chemotherapy, or radiotherapy within the last 12 months.

**Subject Selection**

Subjects were selected randomly from different fertility clinics after ensuring that they met the criteria that made them suitable for inclusion.

**Sample Collection**

Before collecting any samples, each patient gave their informed consent after being told of the study's goals and the confidentiality of their data. After three to four days of abstention from sexual activity, semen samples were taken under aseptic conditions into a sterile, dry, clean, and leak-proof container. Without delay, the sample was taken to the lab for analysis. The sample was assessed for acceptability and accurate labelling (including patient's full name, age, and serial number as well as the day and time of collection) (Asiton-AAsifamabia et al., 2020).

**Sample Processing and Analysis**

Using the semi-quantitative culture technique and a calibrated reference loop, the semen samples were grown on MacConkey agar (MA) and blood agar (BA) plates. Semen was combined and injected onto the surface of MA and BA in a known volume (0.001 ml). After that, the plates underwent a 24-hour aerobic incubation at 37°C. Significant bacterial growth was defined as any increase of 10,000 colony forming units (CFU/ml) on the 5% BA (Momoh et al., 2011; Owolabi et al., 2013; Onosakponome et al. 2020). Standard microbiological methods, such as examining the characteristics of the colony, staining responses, and biochemical assays, were used to identify bacteria isolates.

**Statistical Analysis**

The data gathered from the laboratory analyses were subjected to descriptive statistics (proportion measurement) and inferential statistics (correlation coefficient) using SPSS version 23.0. Level of significance was set at 0.05.

## 3. Result

The overall semen analysis indicates that out of 200 samples collected and analyzed 64(32%) samples were shown to be oligospermic out of which 18(28.1%) had bacterial infection while 46(71.9) samples had no bacterial infection as shown in table 1, Table 4 and in figure 1 below. Exactly 136 semen samples were normospermic with 55(40.4%) samples infected and 81(59.6) samples not infected as seen in Table 2 and figure 2 below. From the infected semen samples 3 different bacteria species were

isolated. The most common in the oligospermic group was *Staphylococcus aureus* (26.6%) followed by *Escherichia coli* (1.6%), as shown in Table 5 below. There was no significant correlation between infection and oligospermia at $p<0.05$ as shown in table 7 below.

**Table 1.** Prevalence of infection on oligospermia

| No. of Oligospermia | No. of infection | No. of no infection | Prevalence |
|---|---|---|---|
| 64 | 18 | 46 | 28.1% |

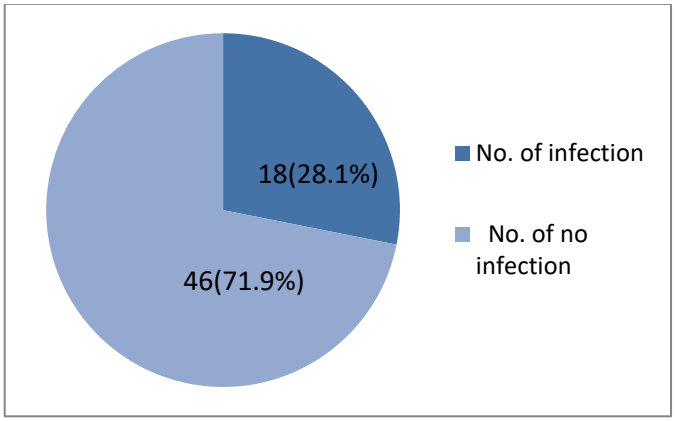


**Figure 1.** Prevalence of infection on oligospermia

**Table 2.** Prevalence of infection on Normospermia

| No. of Normospermia | No. of infection | No. of no infection | Prevalence |
|---|---|---|---|
| 136 | 55 | 81 | 40.4% |

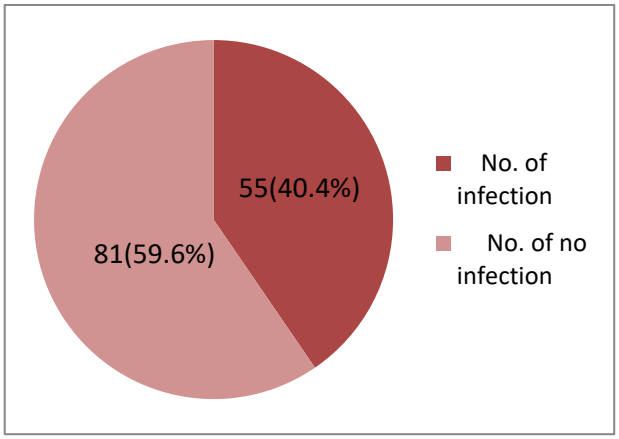


**Figure 2.** Figure 2: Prevalence of infection on Normospermia

**Table 3.** Showing frequency for the bacteria isolates in subjects

| Variables | Frequency(F) | Percentage(%) |
|---|---|---|
| Escherichia coli | 14 | 7.0 |
| Klebsiella spp. | 5 | 2.5 |
| Stahylococcus aureus | 54 | 27.0 |
| No growth | 127 | 63.5 |

| | | |
|---|---|---|
| Total | 200 | 100.0 |

**Table 4.** Showing prevalence of low sperm count

| No. Examined | No. Normal | No. of low count | Prevalence |
|---|---|---|---|
| 200 | 136 | 64 | 32% |

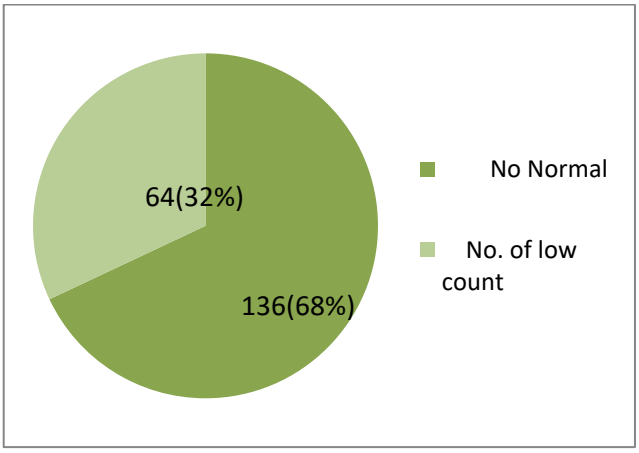


**Figure 3.** Pie chart showing prevalence of low sperm count

**Table 5.** Showing frequency distribution for bacteria isolates in oligospermia

| Variables | Frequency(F) | Percentage(%) |
|---|---|---|
| Escherichia coli | 1 | 1.6 |
| Staphylococcus aureus | 17 | 26.6 |
| Klebsiella Spp. | - | - |
| No growth | 46 | 71.9 |
| Total | 64 | 100.0 |

**Table 6.** Showing frequency distribution for culture normal Sperm count

| Variables | Frequency(F) | Percentage(%) |
|---|---|---|
| Escherichia coli | 13 | 9.6 |
| Staphylococcus aureus | 37 | 27.2 |
| Klebsiella Spp. | 5 | 3.7 |
| No growth | 81 | 59.6 |
| Total | 136 | 100.0 |

**Table 7.** Correlation table showing relationship between infection and Oligospermia

| r-value | p-value | N | Remark |
|---|---|---|---|
| -0.118 | 0.09 | 200 | N/S |

Very weak negative relationship

**Table 8.** Percentage prevalence for the various bacteria

| Bacteria | N | Prevalence (%) | 95% CI for prevalence | | p-value |
|---|---|---|---|---|---|
| | | | Lower | Upper | |
| E.coli | 14 | 7.0 | 3.5 | 11.0 | >0.05 |
| Klebsiella | 5 | 2.5 | 0.5 | 5.0 | >0.05 |
| S.aureus | 54 | 27.0 | 21.0 | 33.0 | >0.05 |
| Total | 73 | 36.5 | 25.0 | 45.0 | |

## 4. Discussion

Semen analysis is valuable in the laboratory assessment of infertility in males and help in determining the severity of the male influence in primary and secondary infertility. The physician is given prompt information about both the normal and abnormal testicular functioning as well as the integrity of the male genital tract through the semen analysis. This in turn helps in the treatment of the patient (Onemu *et al.,* 2001*;* Moses *et al.,* 2013).

From the result of this study it is shown that out of 200 samples collected and analyzed 64(32%) samples were shown to be oligospermic (32%) out of which 18(28.1%) had bacterial infection while 46 samples had no bacterial infection as shown in table 1, Table 4 and in figure 1 below. Exactly136 semen samples were normospermia with 55(40.4%) samples infected and 81 samples not infected as seen in Table 2 and figure 2 below.

From the infected semen samples 3 different bacteria species were isolated. The most common in the oligospermic group was *Staphylococcus aureus* (26.6%) followed by *Escherichia coli* (1.6%), as shown in Table 5 below. And in the normospermic group been *staphylococcus aureus* (27.2%) followed by *E. coli* (9.6%) and *Klebsiella spp.*(3.7%). In a study carried out by Ochsendorf (2008) and another study carried out by World Health Organization. WHO (2010) The results showed that S. aureus (40%) was the most prevalent isolated organism in semen, followed by E. coli (25%), Klebsiella pneumoniae (16.7%), Citrobacter species (6.7%), Proteus species (05%), and Staphylococcus epidermidis (3.3%). Moreover, two (3.3%) Candida albicans were identified. These results are in concord with the result obtained from this study except that candida species was not included because A fungus, that is. Yet this research contradicts a study by Vilvanathan et al. (2016), which found that E. faecalis was the pathogen most frequently found in bacteriospermia (30%), followed by Staphylococcus aureus (20%). According to these investigations, the most common isolate in various groups may differ, but S. aureus is still one of the most dangerous pathogens.

There was no significant correlation between infection and oligospermia at $p<0.05$ as shown in table 7 below. This implies that bacterial infection is not the cause of oligospermia as many may have thought. This finding from the study demonstrated that there was no relation between bacterial infection and oligospermia and this finding is in consonance conclusion of Vilvanathan *et al.* (2016) who concluded in his

study that asymptomatic bacteriospermia did not correlate with abnormal semen parameters. Similarly, Bussen et al. (1997) reported no relationship between bacteriospermia and fertility markers. This can also suggest that infection may not be a cause of male infertility when sperm count is the subject matter. However, whether bacterial infection is the cause of male fertility with the consideration of other markers such as sperm activity, morphology, and so on, is not within the scope of this study. This study only considered the relationship between bacterial infection and sperm count. Of course, it is important to mention that sperm count alone does not determine male fertility or sperm functionality.

## 5. Conclusion

This study has shown that bacteriospermia has no etiological effect on oligospermia as bacteriospermia affected more normospermic semen than oligospermic group. However, the study also showed that the most common bacteria causing bacteriospermia is *Staphylococcal species* followed by *Escherichia coli*. This study is only limited to sperm count and not sperm function, therefore subsequent study may look into the relationship between bacteriospermia and complete sperm functionality.

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