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MALE INFERTILITY: A LITERATURE REVIEW

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ABSTRACT
Infertility is a rising health problem affecting around 13% to 15% of couples all over the world. Various factors such as azoospermia, varicocele, accessory gland infection, immunological factors, congenital abnormalities, obstructive, and endocrine dysfunction all play their individual or combined roles in infertility. Routine semen analysis and assays for sperm chromatin integrity as described by WHO guidelines are the most widely utilized and best studied adjunctive diagnostics in male infertility. This article outlines male infertility, the etiology and the laboratory diagnosis associated with it and how these investigations plays a key role in the formulation of a treatment plan for patients with various degrees of fertility issues.

KEYWORDS: infertility, male, DNA, sperm, bacteria.

INTRODUCTION
The inability of couples to achieve a clinical pregnancy after 12 months of unprotected sexual intercourse is known as infertility, and it is a worldwide problem, affecting around 13% to 15% of all married and unmarried couples.[1] It may be possibly due to male or female factors or unexplained where after an elaborate workup no apparent reason for infertility is found.[2] A few of the male disorders includes azoospermia, varicocele, accessory gland infection, immunological factors, congenital abnormalities, obstructive, and endocrine dysfunction are the most common causes of infertility affecting men.[3] Infections of the male genitourinary tract account for up to 15% of the cases of male infertility.[4]About 30–50% of infertility cases are attributed to sperm defects.[5,6] Defective sperm conditions include very low sperm concentration, inadequate sperm motility and morphological abnormalities. The percentage of sperm cells exhibiting DNA fragmentation is represented by the DNA fragmentation index (DFI).[6] Infertile males were seen to have higher percentage of defective sperm carrying fragmented DNA than fertile males.[7–9] Therefore, DFI is recommended as an appealing fertility predictive element.[10–12]

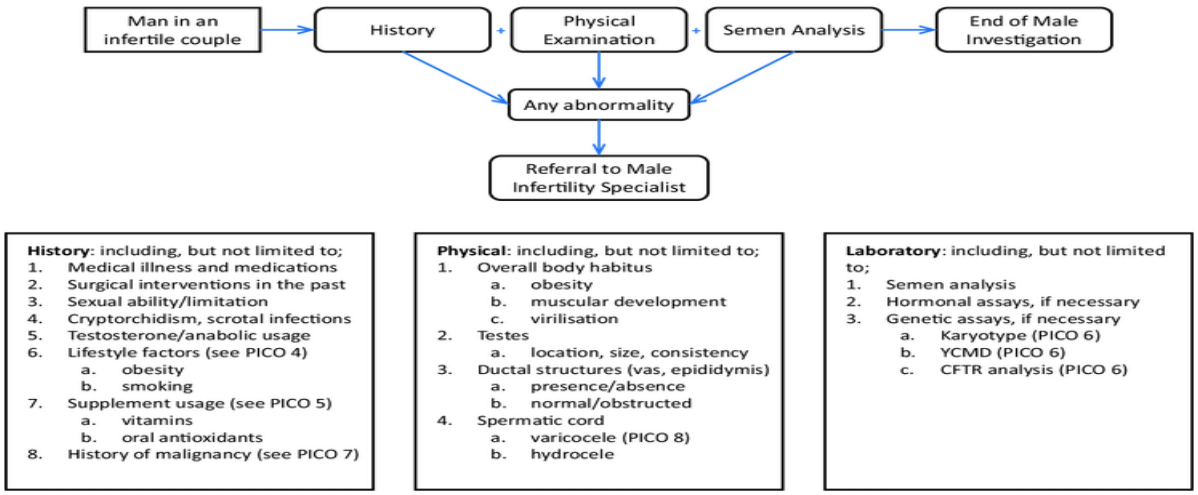

Figure 1: Flowchart summary for diagnosis of male infertility.

Causes of male infertility

Environmental, occupational, and modifiable lifestyle factors are few of the factors that have been documented to cause this decline of male fertility. Other factors associated with male infertility include lifestyle issues like smoking cigarettes, alcohol intake, use of illicit drugs, obesity, psychological stress, advanced paternal age, diet composition, and coffee consumption. Among other factors are testicular heat stress, intense cycling training, lack of sleep, and exposure to electro-magnetic radiation from mobile phones.[13] Other factors include genetics, injury to the groin area or due to chemotherapy.

Laboratory diagnosis

Male infertility is usually diagnosed through laboratory investigation in the Andrology laboratory alongside from the Microbiology laboratory wing.

Semen analysis

The patients were instructed to abstain for 3–5 days before providing semen sample by masturbation. After complete liquefaction, semen volume (mL), sperm concentration (106/mL), motility (%) and presence of round sperm (106/ml) were determined. The percent morphology was assessed from a stained smear under 100X oil immersion objectives by analysing 200 spermatozoa. The sample was considered normal if it had 1.5–6 ml volume, ≥ 15 million/mL sperm concentration, ≥40% progressive motility and ≥ 4% normal morphology.

A study on the male partner conducted in Riyadh, Saudi Arabia from June 2015 to June 2016 consisting of 94 men found that 53.19% Saudi men had low, 32.98% had moderate and 13.83% had high DFI, there was no correlation between Sperm DNA fragmentation and semen volume, sperm morphology and fertilization rate however sperm concentration and motility were negatively correlated in all DFI categories. Age, BMI and smoking all played a key role in moderate and high DFI categories.[14] However, according to a study conducted at Mexico City, Mexico showed that sperm morphology and acrosome reaction data had a positive association with the fertilization rate, however other semen parameter had no predictive value.[15]

Semen culture

Samples were seeded on Blood agar and EMB plates or MacConkey plates using a calibrated loop, and the plates were incubated overnight at 37°C in normal air with 5% CO2. The microorganisms were identified by Gram staining, catalase and coagulase tests.

A study conducted at an Infertility centre in Qom-Iran from June 2016 to September 2016 on a total of 150 infertile males and 150 control male showed that the prevalence of seminal infection among infertile males was 21%, 61.99%, 14.28%, 14.28% and 9.25% were contaminated with *Staphylococcus aureus*, coagulase negative *Staphylococcus, Streptococcus* and *E. coli* respectively. All the bacteria except *Streptococcus* caused significant decrease in sperm concentration. Sperm motility was significantly lowered by *E. coli* than the control group and presence of *E. coli* and *Staphylococcus aureus* led to the decline in normal morphology of sperms.[16] Another study was conducted at Justus Liebig University, Germany between May 2011 to May 2014 on a total of 71 male individuals with azoospermia that were enrolled through a fertility clinic showed that medical history suggested 7% uro-genital tract infection, 11% harboured STIs, 14% showed significant bacteriospermia, 15% had seminal inflammation. 17% fulfilled the MAGI definition and 27% had relevant pathogens.[17]

Sperm chromatin dispersion assay

The SCD assay was conducted using Halosperm G2® kit (Halotech®, Spain). At least 300 spermatozoa were scored under an inverted bright-field microscope for each sample. The normal sperm without fragmented DNA showed big or medium size halo and the sperm with fragmented or degraded DNA showed no halo.

A study conducted at Shanghai, China between May 2013 to August 2018 comprising of 461 men (linked with recurrent pregnancy loss) and 411 men (control) showed that DNA fragmentation was high in the RPL (42.30%) group than that of the control group. Further analysis showed that Sperm DNA fragmentation had a moderate reverse correlation with sperm progressive motility rate ($r = - 0.47$, $P < 0.001$) and total sperm count ($r = - 0.31$, $P < 0.001$) which tells us that SDF is linked with RPL.[18] Another study was conducted at Toyama University hospital, Japan between October 2012 to February 2014 consisting of 54 male patients and revealed that SDFI was 41.3 ± 22.2% (mean ± SD) and did not depend on the cause of infertility. Chronic alcohol use increased the SDFI to 49.6 ± 23.3% compared with 33.9 ± 18.0% in non-drinkers.[19]

CONCLUSION

To fight infertility, changes in lifestyle living such as reducing or quitting smoking, consumption of alcohol, drugs, psychological stress must be adhered. Activities such as exercising, eating a healthy balanced diet, meditation vice versa all have a roles to play to stimulate fertility. Infertility is battled all over the world and it is increasing day by day due to high environmental toxicity, heavy use of pesticides and fertilizers on agricultural crops and the use of growth hormones to stimulate fast growth in farm animals such as chickens, cows, pigs. These factors all play a role in decreasing fertility in both men and women. Thanks to the advancement of Assisted Reproductive Techniques (ART) such as IUI, IVF, IVF-ICSI, IVM and cryopreservation there is a treatment option for Infertility and a future for us all.

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