Covid-19 effects on male infertility

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ABSTRACT

This research was a trial to examine the impact of COVID-19 on the male genital system since the latter could be harmed by (COVID-19) infection, and this disorder possibly leads to infertility in males. Different research has confirmed the abnormal condition correlated with male fertility, also several reviews described the effect of COVID-19 on male fertility, also the genital system for males represented by semen fluid parameters. The results showed that the total sperms' count, viable survival sperms in addition to normal morphological sperms appearance declined among infected patients (99 *106 per mal, 36%, Homogenous Opalescent Gray), for total viable count, progressive motile sperm and normal morphology respectively) in comparison with (45*106 per mal, 29 %, Homogenous Opalescent Gray) with sluggish or non-movable abnormal morphology sperm among patients respectively). Therefore, this study aimed to investigate the effect of COVID-19 on the male genital system.

Keywords: COVID-19, genital system, infertility.

1.1 Introduction

Coronavirus has the shape of a sphere with a diameter from 80 to 160. Also, it is represented by a notable surface about 20 nm in length which surrounds the entire virus, presenting the corona appearance [1]. The interior of the virus contains a nucleocapsid of 6-8 nm in diameter. The formation of a nucleocapsid coronavirus is sudden, as it is accomplished by the RNA genome; so, this could cause defective in the process of RNA synthesis [2]. These viruses are considered the causes of fertility trouble which could interpose with the function of reproductive in men [3]. The respiratory system of this virus is considered the cause of the virulent pathogen COVID-19 and can affect men's health [4]. Another study conducted on the damaging of testicular tissues by COVID-19 might affect the amount of spermatozoa which leads to damage in male fertility [5]. The Balance in the production of sperm depends on the molecular and cell-controlling mechanisms and also could be affected by environmental factors, that could affect the function of fertility [6]. The examination of sperm depended on its biology and its effect on the infertility of the males. According to the picture below the sperm consists of three parts which are the head, piece, and tail. The first part includes the nucleus and acrosome, the second part represents the mitochondrion, and the last part represents the plasma membrane [7].

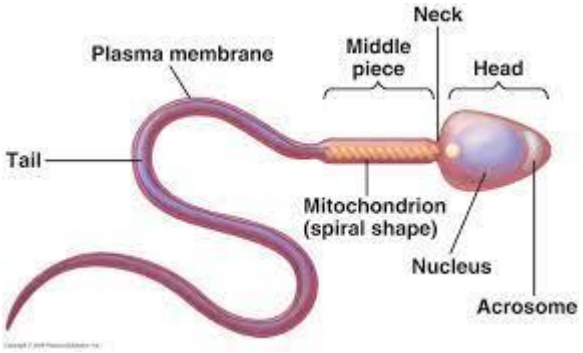

Fig. (1): The sperm structure

Depending on the published reports, an important marker of infection is the high temperature (>38 C^0), which causes further damage to the male fertility system represented by a decrease in the number of sperms [8]. It has been confirmed that during 28 to 77 days of fever, the number of sperm is reduced while the destroyed sperm in the seminal fluid increases [9]. Different mechanisms belong to the higher temperature affecting the male genital system: first, the fever is considered a harmful sign for testis cells; second, it could affect the tubules of seminiferous creating damage to its functions; third, the high temperature could decrease the secretion of the gland and this could affect the sperm quality and its viability [10,11].

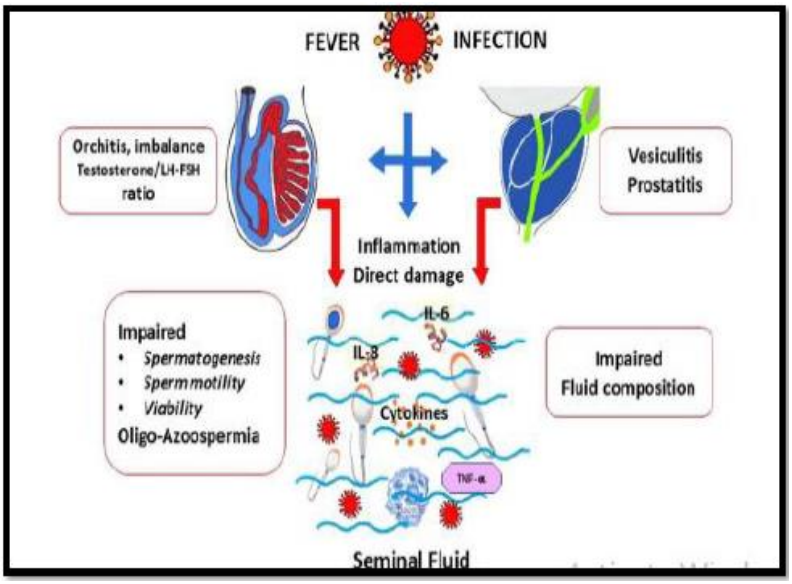

Fig. (2): Shows the effect of fever on the testis

Both females and males are exposed to COVID-19, but in men, the risk of infection increases, and the infection rate with COVID-19 in men is much higher than in women as shown in Figure 2 [12]. The infertility of males could be illustrated in different stages including testicular part, applaud part, and part of hormone [13]. About fifty of all infertility is caused by damage in the output of sperms (defects in the spermatogenesis process) and reduction in the perm number, viability, and morphology) [14]. These sections can be affected by different agents, including disease, drugs, other factors, lifestyle, etc. [15]. Sperm motility is the capability of the sperm movement toward the egg and inoculate it before it

fades away and decays [16]. The motility of sperm is a necessary factor as well as the sperm count and morphology, as the sperm must travel across the woman's tract to inoculate an egg [17]. A man diagnosed with small sperm motility may be examined with male infertility as the sperm are considered lazy and have defected in movement, so they couldn't arrive to the egg and fertilize it [18]. The normal count of sperm counts must be more than fifteen million/mL and 40% of sperm should be motile as the sperm number directly depends upon the hormone from the pituitary testis [19]. Human spermatogenesis is preserved by the self-regeneration and the development of spermatogonial stem cells (SSCs) [20]. It precisely could be regulated by the tubules of seminiferous in the testicular [21]. After SARS-CoV-2 goes inside the respiratory system, leading to an inflammation of the alveoli which at a particular stage could induce the macrophages, and neutrophils and secrete cytokines, so this inflammation causes endothelial cell contraction and vasodilation [22-24] as well as the SARS-CoV-2 could be examined in the blood and have the ability for causing the damage and the defective in multiple body member such as the kidney, brain, liver, neurons and seminiferous duct cells in the testis.as shown in figure 3[25,26].

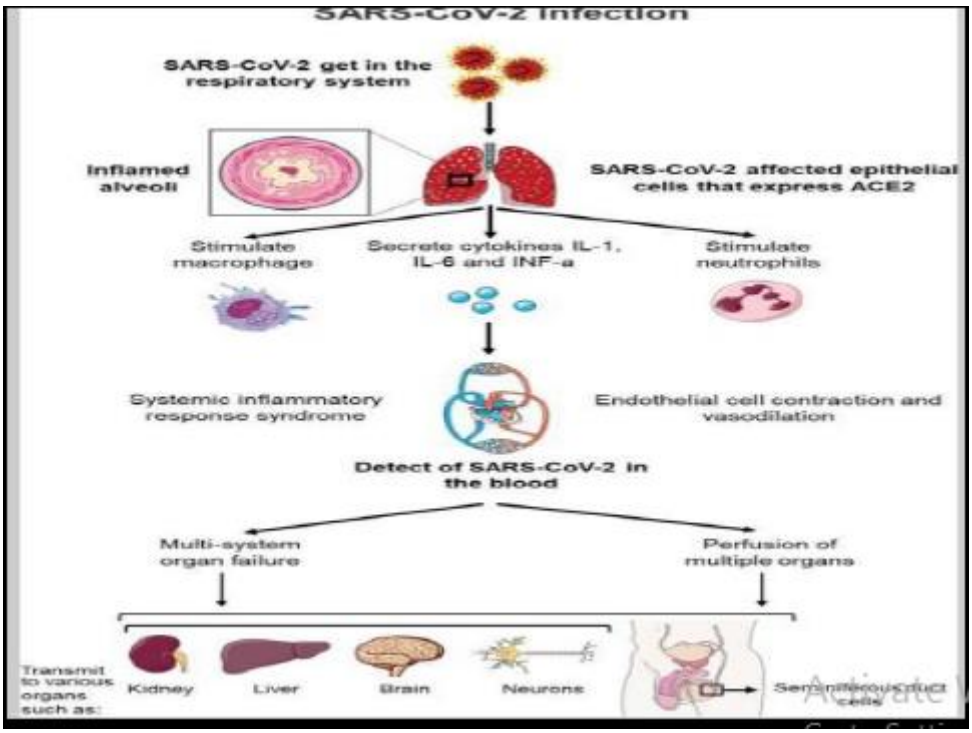

Fig. (3): SARS-CoV-2 infected different organs

2. Material and Methods

2.1 The Collection of Samples

The samples represented by semen were collected from 50 COVID-19 males and 50 healthy subjects. The results of sperm analysis were performed by AL-Nahrain University – High Institute for Diagnosis of Infertility and Aided Technologies for Childbearing.

2.2 Patients Group

Its group consists of 50 of COVID-19Paients with a range of ages from (20 -50) years old.

2.3 Control Group

Its group consists of 50 Volunteers with a range of ages from (20 -50) years old.

2.4 Data collection

The clinical data were gained from clinical archives, while the data of healthy controls were obtained by the recorded history of their visiting to the hospital. The question depended on the standardized data from the hospital. All the samples of semen were collected by masturbation immediately into sterile tubes [27].

Methods

2.5.1 Seminal fluid analysis

The samples of semen of patients were obtained in a sterile container containing a 2 to 7-day abstention period. The analysis of semen in the laboratory has been done according to the WHO laboratory manual 5th edition 2010 [28].

2.5.2 Sperm Vitality

On a clean slide, a drop of seminal was dropped, and then two drops of 1% aqueous Eosin Y were added to it, waiting for fifteen seconds. Then, two drops of 10 % Nigrosin were added, mixing and taking 10µL of the mixture was placed on another slide. A unique smear was made and allowed it to air dry. Using the objective lens with oil, the sperm with white and pink color were counted which represent the dead sperm while the live sperm stayed unstained. About two hundred sperms were counted and the sperms with white color were detected under a phase of a microscope and could be classified as types speedy, slow, and immotile [29].

Statistical analysis

All the analyses were done using SPSS statistical software. The variables were given as mean ± standard deviation (SD) or median and interquartile ranges (IQR). Semen parameters were analyzed using Wilcoxon signed rank test and the statistical significance was defined as P values of <0.05.

4. Results and Discussion

4.1 Results

Demographical pictures of the studied group's increase in fever were present in all the patients. With known signs such as cough, headache, and muscle pain as shown in Table. Table 4 -1 shows the parameters of the study participants.

Table 4.1: Demographical picture of the studied groups

Parameter	Patients with Covid- 19 (Average age 20 to 50 years)	Controls (Average age 20 to 50 years)	P-Value
Sperm total count (10^6 per ml)	4.5	99	<0.05
Progressive motile sperm (min 32%)	29	36	<0.05
Immotile sperm	39	13	<0.05
Appearance (Homogenous Opalescent gray)	Normal	Normal	-
Liquefaction Time (25 times)	Normal	Normal	-
Sperm PH (7.2-8)	7.5	7.9	<0.05
Volume (1.5-5 ml)	2.0	2.7	<0.05
Leukocyte (< 5 cells HPF)	12.2	3.5	<0.05

4.1.1 Sperm Total Count

The figure below explains the differences in sperm total count between controls and patients with COVID-19 which indicates smaller sperm count in patients when compared with controls.

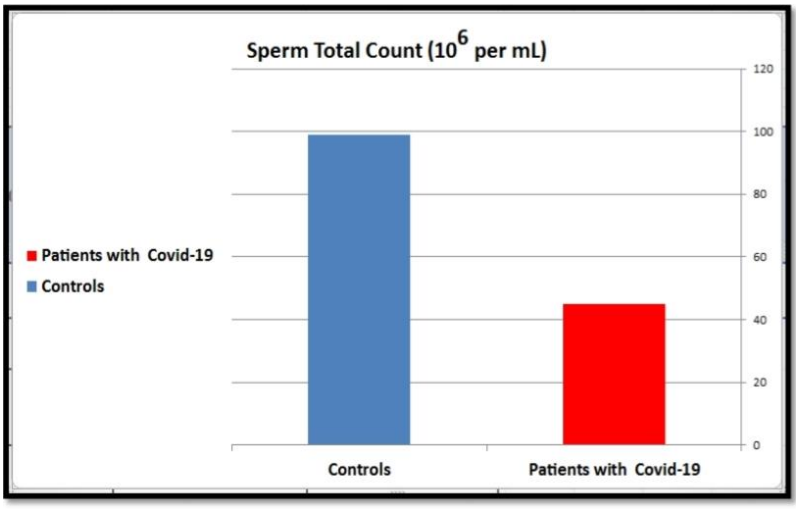

Fig. (4-1): Sperm Total Count

4.1.2 progressive motile sperm

The figure below explains the difference in progressive motile sperm between controls and patients with COVID-19 which indicates the decrease in the progressive motile sperm in patients compared with controls

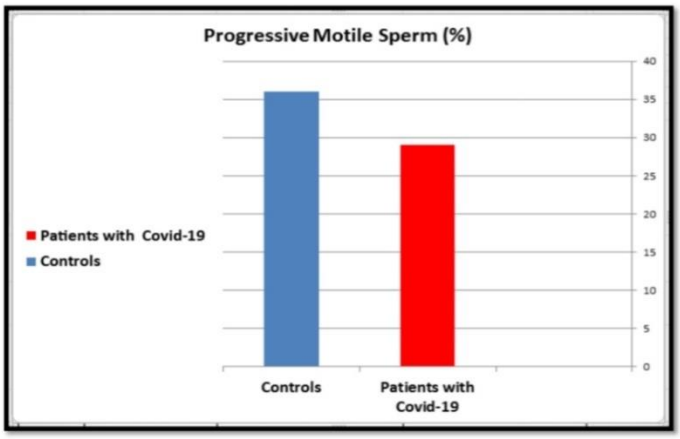

Fig. (4-2): Progressive Motile Sperm

4.1.4 Sperm Immobility

The figure below explains the difference in sperm immobility between controls and patients with COVID-19 which indicates the decrease in sperm immobility in controls compared with patients.

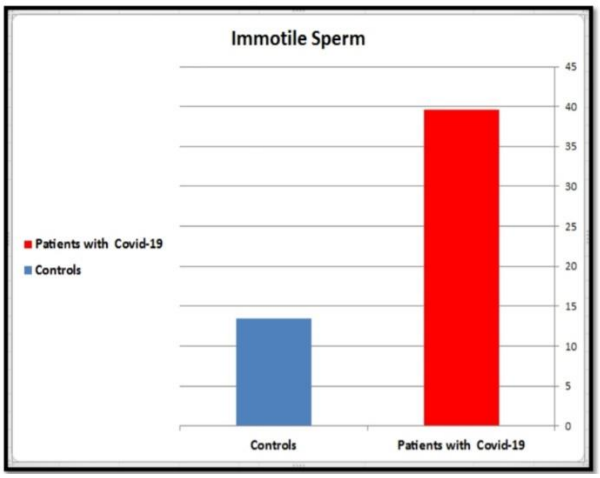

Fig. (4-3): Immotile Sperm

4.1.5 Sperm PH

The Figure below shows the differences in PH between controls and patients with COVID-19 which indicates the increase in the pH in controls compared with patients

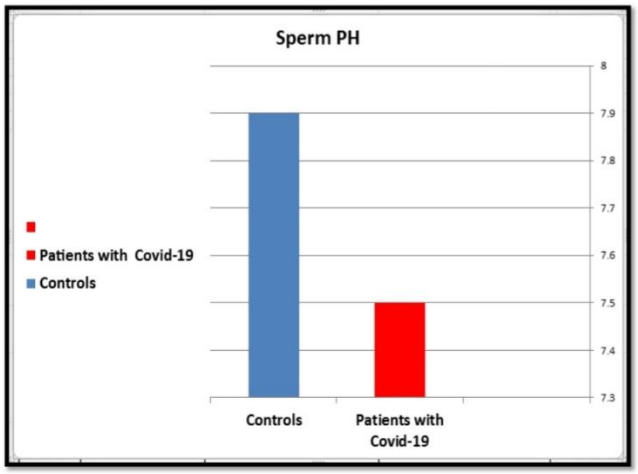

Fig. (4-4): Sperm PH

4.1.6 Sperm Volume

The Figure below explains the differences in sperm volume between controls and patients with COVID-19 which indicates the decrease in the sperm volume in patients compared with controls.

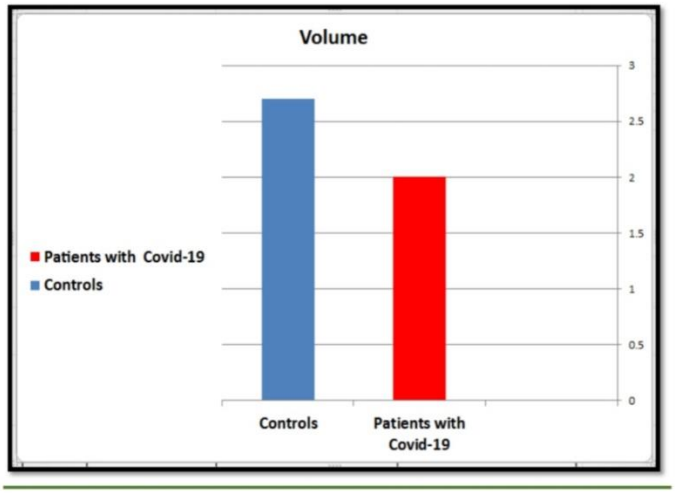

Fig. (4-5): Sperm Volume

4.1.7 White Blood Cells

The Figure below shows the differences in White blood cells between controls and patients with covid-19 which indicates the increase in the WBC in patients compared with controls.

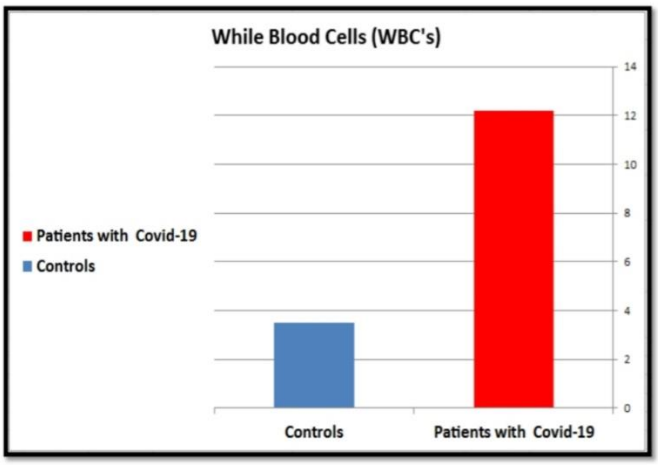

Fig. (4-6): While Blood Cells

4.2 Discussion

In this research, the indicator of semen, as the amount of sperm as well as its motility were lower than the normal value, whereas the leukocytes of semen were higher than the normal values. Other semen indicators such as the volume, density, number, and morphology of sperm were reduced by the first sampling. This result was detected by another study done by Best *et al* [30]. As the count of sperm was reduced during COVID-19 disease, this caused the affecting of the disease on the male sexual system resulting in a decrease in the quality of semen [31], the parameters that were affected are the semen viscosity and Sperm vitality. The reduction in sperm count is due to the formation of reactive oxidative stress (ROS). The genital system for males is balanced between ROS production and the efficiency of antioxidants in a healthy person [32]. Throughout this disease, the over-induction of ROS damages the sperm and the seminal. Oxidative stress disturbs the sperm causing DNA damage. The entry of any foreign body could raise the levels of leukocytes in the body including the seminal showing the sperm agglutination [33]. Several studies published that all the younger males with COVID-19 must have a seminal test every 74 days during the infection until their semen quality becomes normal [34]. The first sign of COVID-19 could be an increase in temperature, leading to damage in the blood testis exposing the sperm cells and tissues of the testis to cytokines and other moderators in the body [35]. Which causes an inflammatory state and increases the immunological response of the seminiferous epithelium as well as the supplement glands resulting in a decrease in the semen count [36].

5.1 Conclusion

This study concluded that the sperm count improved after about sixty days of infection and the patients with COVID-19 must noticeable to both the number and the quality of semen, and might require medical interference if needed within the next 2 months of healing, to progress the fertility of male patients.

Ethical approved

The ethical approval was obtained by AL-Nahrain University – High Institute for Diagnosis of Infertility and Aided Technologies for Childbearing.

Conflict of interest: None

Funding: None

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