

CASE SERIES

SARS-CoV-2 infection affected sperm production and quality

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Abstract

Background

This study aims to determine the impact of the COVID-19 disease on the sperm quality of men in Saudi Arabia.

Subjects and methods

The subjects for the study were men seeking fertility treatment in the authors' hospital (DKIH, Jeddah). Our records indicated that a total of 9 men had semen analyses performed before and after the COVID-19 infection. These semen analyses were performed by standard methods. Seven (n=7) of the 9 patients had health issues, including risk factors for the COVID-19 disease, namely diabetes (n=4), obesity (n=1), obesity and hypertension (n=1), obesity with a history of gastric sleeve surgery (n=1), and no health issues (n=2).

Results

Semen volume, semen pH, % motile sperm, % progressive motility, % non-progressive motility, and % immotile sperm have decreased in quality but were statistically not significant after COVID-19 infection, but had a significant effect on sperm count per mL and total sperm concentration. If only the 6 affected patients were considered separately, the only parameter that appeared significantly affected was the sperm count per ml.

Discussion

The limitation of this report is its small sample size; therefore, the influence of chance on the present findings exists. Based on previous findings, the present findings are considered factual. COVID-19 negatively impacts the male reproduction parameters investigated.

Conclusion

In conclusion, the SARS-CoV-2 virus that caused the COVID-19 disease negatively impacted the sperm parameters of Saudi Arabian men, in particular the sperm count and total sperm concentration. The objective of this report is to determine whether COVID-19 infection have an impact on the sperm quality of men in Saudi Arabia.

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Introduction

It is well-documented that COVID-19, a corona virus disease caused by the SARS-CoV-2 virus (severe acute respiratory syndrome by corona virus type 2) was identified in 2019. Due to its rapid global spread, the disease was declared a global pandemic in March 2020. The devastating social, economic, and health effects of the pandemic are now well-known and well-

documented (Mosrefi et al., 2021). A number of workers (Pan et al., 2019; Holtmann et al., 2020; Donders et al., 2022) reported the virus was not found in the semen, except for one group that detected the virus in the semen. This was observed in men in both the acute and recovery stages of the disease (Li et al., 2019) and in testicular and Leydig cells (Perry et al., 2021),

but not after convalescence of 21 days (Holtmann et al., 2020), which suggests that the virus could cross the blood-testis barrier but is cleared soon after recovery (see reviews by Mosrafi et al., 2021; Mao et al., 2022). The virus is therefore not infectious in human semen (Holtmann et al., 2020). A meta-analysis and one more recent study noted that the disease could affect sperm quality (Xie et al., 2022; Donders et al., 2022).

The disease also severely affected Saudi Arabia (Al Otaibi and AlYami, 2020; Barzaid et al., 2020; Sultan et al., 2021; Tashkandi et al., 2021). In view of the impact of COVID-19 disease on male fertility reported elsewhere (Mosrefi et al., 2021; Xie et al., 2022), it is plausible that sperm parameters in Saudi men may also be affected after COVID-19 infection. We performed a retrospective case series study to determine the effect of COVID-19 infection on the sperm parameters pre-, and post-infection in 9 men seeking infertility treatment at the authors' hospital in the city of Jeddah, Saudi Arabia. The objective of this report is to determine whether COVID-19 infection has an impact on the sperm quality of men in Saudi Arabia.

Subject and methods

Subjects

The subjects for the study were men seeking fertility treatment in the authors' hospital (DKIH, Jeddah). Our records indicated that a total of 9 men had semen analyses performed before and after the COVID-19 infection. These semen analyses were performed by standard methods. Seven (n=7) of 9 patients had health issues that are risk factors for the COVID-19 disease. These were diabetes (4 patients), obesity (n=1), obesity and hypertension (n=1), obesity with a history of gastric sleeve surgery (n=1), and 2 (n=2) patients who had no health issues.

Semen analysis

The patients obtained semen specimen by masturbation. Semen analyses were performed according to standard procedures as per 2010 WHO guidelines. All semen analyses were performed by the same technologist, with the exception of two pre-COVID-19 infection semen analyses performed elsewhere prior to COVID infection. Sperm specimens were held for 30

minutes for liquefaction at 37 °C. Semen analysis was performed within an hour of ejaculation. Sperm concentration was assessed using a Makler chamber instead of the Neubauer chamber. Sperm motility was assessed manually and graded as progressive, non-progressive, or immotile. Sperm morphology was not performed during the COVID-19 pandemic due to safety reasons.

Statistical analysis

The MEDCALC™ statistical software was used for the statistical calculation of the paired T-test.

Results

Impact of COVID-19 on individual patients.

The sperm parameters of 5 of the 9 patients studied appear to be affected, 1 only moderately affected, and the remaining 3 patients were not negatively affected by the COVID-19 disease (Tables 1 and 2).

Of the two (n=2) patients who had no health issues, the sperm parameters of 1 of these 2 men were not affected by the COVID-19 infection. Prior to the COVID-19 infection, the second patient had severe oligoathenozoospermia. The sperm quality prior to COVID-19 infection was: sperm count: 0.3 million/ml; total sperm count: 1.35 million; progressive motility: 10%; non-progressive motility: 12%; and non-motile: 78%. This appears to be further aggravated by the COVID-19 infection (sperm count: 0.1 million/ml; total sperm count: 0.4 million, progressive motility: 0%, non-progressive motility: 4%, non-motile: 96%.

After recovering from COVID-19 infection, one diabetic patient had improved sperm parameters, one was not affected, one was affected but the parameters remained normal, and the other patient had oligozoospermic sperm characteristics. Prior to the COVID-19 infection, all four diabetics had normal sperm parameters.

Among the 3 obese patients, the semen parameters of 2 patients were severely affected, while the other 1 patient's sperm parameters dropped in value, but were still within the normal range.

Table 1: Key semen parameters in nine (n=9) patients prior to and after COVID-19 infection

Description	Comparative Pre and Post COVID-19 semen values (Mean ± 1SD; n=9)		Significance p value (n=9)
	Pre-COVID-19	Post COVID-19	
Semen Parameter	Pre-COVID-19	Post COVID-19	(n=9)
Semen volume	3.8+1.4	3.6+0.9	0.0837
Semen pH	7.7+0.2	7.6+0.2	0.4224
Sperm count per ml	45.5+40.0	38.2+47.3	0.0015
Total sperm count	145.9+143.4	116.0+129.8	0.0096
% motile sperm	48.3+12.9	35.7+22.6	0.2924
% progressive motility	31.7+18.5	24.2+19.6	0.2724
% non-progressive motility	13.0+3.0	11.8+4.9	0.4207
% immotile sperm	53.7+14.3	64.0+22.5	0.3146

Table 2: Key semen parameters in six (n=6) patients prior to and after COVID-19 infection

Description	Comparative Pre and Post COVID-19 semen values (Mean ± 1SD; n=9)		Significance p value (n=9)
	Pre-COVID-19	Post COVID-19	
Semen Parameter	Pre-COVID-19	Post COVID-19	(n=9)
Semen volume	3.4+1.3	3.8+0.8	0.1517
Semen pH	7.7+0.2	7.7+0.2	0.8693
Sperm count per ml	32.0+32.6	14.6+20.8	0.0263
Total sperm count	111.0+106.0	58.3+128.6	0.2777
% motile sperm	48.8+13.8	25.3+20.7	0.4686
% progressive motility	27.2+19.9	14.5+16.4	0.6067
% non-progressive motility	13.2+2.9	11.3+6.0	0.3408
% immotile sperm	57.2+15.2	74.2+20.9	0.6207

Overall impact of COVID-19 on sperm parameters.

Overall, the quality of key sperm parameters such as semen volume, pH, motile sperm, progressive motility, non-progressive motility, and immotile sperm decreased after COVID-19 infection but was not statistically significant (Tables 1 and 2). The sperm parameters significantly affected by COVID-19 infection were sperm count per ml and the total sperm count (Table 1), however if only the 6 affected patients were considered separately, the only parameter that appear significantly affected was the sperm count per ml. The total sperm count although appears to have dropped after COVID-19 infection but was not statistically significant (Table 2) which is basically due to small sample size otherwise it would have been statistically significant.

Discussion

Foremost, the limitation of this report is that the sample size is small therefore the influence of chance on the present findings exists. Nevertheless, based on previous findings and meta-analysis (Pazir et al., 2021; Mosrafi et al., 2021; Donders et al., 2022; Mao et al., 2022; Xie et al., 2022) it is accepted the present findings as factual and could be considered as reflecting actual effects of COVID-19 disease on the male reproduction parameters investigated. Therefore the authors are inclined to concede that the COVID-19 disease impacts sperm parameters negatively. In particular, the semen volume, sperm count, concentration and progressive motility are affected in patients investigated which is in keeping with the findings of a meta-analysis by Xie et al., 2022). However, only the sperm count and concentrations are statistically lower than the levels noted prior to COVID-19 infection. The other sperm parameters, although affected, were not statistically significant primarily due to the small sample size. It is felt that the actual numbers of patients affected by COVID-19 may have been more but were not made known by the patients to preserve their privacy.

Some 27 viruses, including the mumps, Zika, and HIV viruses have been detected in semen (Pazir et al., 2021). It is therefore entirely possible some viruses could gain access to and infect the male reproductive system's organs

(Ternavasio-de la Vega et al., 2010; Zea-Mazo et al., 2010; Gornet et al., 2016; Zafer et al., 2016;). For instance the HBV, HCV, HIV viruses, could also damage the integrity of sperm DNA and semen parameters in addition to disease transmission (Garolla et al., 2013) which could affect male fertility . Likewise the SARS-CoV-2 virus is no exception (Mosrafi et al., 2021). Our findings are in agreement with this suggestion.

Conclusion

In conclusion, as noted elsewhere, the SARS-CoV-2 virus that caused the COVID-19 disease and pandemic impacted the sperm parameters of Saudi Arabian men negatively, in particular the sperm count and total sperm concentration.

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