High temperature working conditions: Semen quality study and DNA fragmentation.

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Abstract
Fertility is an important part of human life and work is also of great importance, but sometimes work may interfere with human fertility as it affects the cellular content. This research was completed in workplaces with high heat content, where 60 samples were taken from men with high heat work and 30 from normal men. Through the results, there is a significant decrease in the number of sperms, their progressive movement, the normal shape of the sperm, as well as the quality of the sperm and the volume of semen. The existence of a substantial rise in DNA fragmentation level and the presence of a significant increase in malondialdehyde level in patients with high temperature working circumstances as compared to the control group. Human health and fertility are clearly impacted by the high temperatures. Male fertility declines, DNA is impacted, and free radicals increase, as seen via trials and research.
Keywords: High temperature, MDA, DNA fragmentation

1. Introduction

Spermatozoa are particularly particular cells that transfer DNA without harming the female reproductive tracts when conception is occurring [1,2]. the study that examined the damage to sperm DNA when it leads to male infertility, part of which is caused by environmental causes [3.4]. There are various percentages of sperm DNA fragmentation in fertile and infertile males, which may have an impact on the health of the progeny [5.6]. According to several research, sperm DNA fragmentation has a negative link with male conception. Males with high sperm DNA fragmentation rates exhibit infertility or have DNA damage in their progeny following ICSI. [25]. growth in sperm Many causes, such as pollution, infections, medicines, age, and way of life, can cause DNA fragmentation[7.8]. These variables mostly cause testicular apoptosis or increase the generation of reactive oxygen species, which fragment sperm DNA[9.10]. Pollutant exposure is common among urban dwellers, and it has a negative impact on health both before and after puberty. Studies have demonstrated that environmental contaminants, including those in the air and water that may be created artificially or naturally, have a detrimental effect on human fertility standards. The primary sources of air pollution are human-related, including emissions from traffic, industry, and agriculture. [11,12,13]. Sperm DNA fragmentation can happen in men with healthy sperm, although it is more likely in men with poor-quality sperm. High levels of DNA fragmentation, which may contribute to idiopathic male Very clean [15]. He came to the conclusion that even though sperm motility is good and for the quality of sperm, the temperature corresponds to the decrease in movement alone is insufficient to justify the radical changes in the rate of infertility in the pollution of cities. Future research on the impact of high temperatures is also linked to the DNA fragmentation, he said. to measure the fragmentation of sperm DNA [16,17]. Although 25% to 40% of male infertility has been observed to have higher levels of seminal ROS, oxidative stress—which manifests as an imbalance between reactive oxygen species (ROS), generation, and antioxidant defense capacity—is thought to be extremely important in male infertility. [18,19]. The fusion of eggs and spermatozoa, which is crucial in this area, is a functional process in which sperm produced in moderate amounts of ROS and has a distinct physiological role. However, excessive production of ROS, the antioxidant defense of sperm, and seminal plasma, which results in oxidative stress [20,21]. The plasma membrane secreting large quantities of polyunsaturated fatty acids and damage to repair mechanisms both make sperm more sensitive to excessive ROS. significantly compromises DNA integrity and the plasma membrane, which may lead to sperm deformation. Base attacks by ROS are well documented. The stability of this molecule makes DNA and phosphodiester vulnerable to fragmentation[22,23,24].

This study's objective is to determine the connection between reduced male fertility and residential exposure to high temperature pressures at work, as well as the degree of sperm damage, utilizing measured sperm from semen and the association between oxidative stress.

2. Materials and Methods

Patients

The periods for collecting samples were from July 2022 to January 2023 in Najaf Governorate, Iraq. Samples were taken at the Kufa Cement Plant and bakeries that are known for their high temperatures. Male patients from hot climates (n = 60) and healthy patients (n = 30) had serum and sperm samples taken from them. The participants in this research were between the ages of 28 and 43. Ninety samples in all were examined. Patients who provided both written

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and verbal consent for this study were used to identify all of the subjects.

working methods

The results were analyzed in the infertility center in Sadr Medical City, and all parameters were tested in the center using the ELISA device and other devices inside the center.

3. Results and Discussion

The results (Table 1) that there is a significant decrease in the number of sperms, their progressive movement, the normal shape of the sperm, as well as the quality of the sperm and the volume of semen.

The reason may be due to the effect of high temperature on the testicular cells, as it leads to a decrease in sperm production (25). It was also noted from the results. Figure No. (1) The presence of a significant increase in the malondialdehyde level in patients with High temperature working conditions compare with control Group, and in Figure No. (2) the presence of a significant increase in DNA fragmentation level in patients with High temperature working conditions compare with control Group, and the reason may be due This leads to an increase in programmed cell death, as well as an increase in free radicals, which in turn lead to the destruction of sperm tissue, including DNA damage(26,27).

Table 1 the parameter of semen parameters

Parameter	Patient	Control group
Sperm concentration million / ML	13.24 ±1.25	36.22±2.36
sperm progressive motility	11.36±2.66	57.36±3.87
sperm normal morphology percentage	15.25±1.68	70.35±2.64
Density of Semen	12%	53%
Sperm quality	13.32±1.65	59.14±1.69
Viability test	8.21±1.32	75.36±2.55
pus cell	2	1
Ph	7.01	7.3
Ejaculate volume (ml)	1.8	3.2

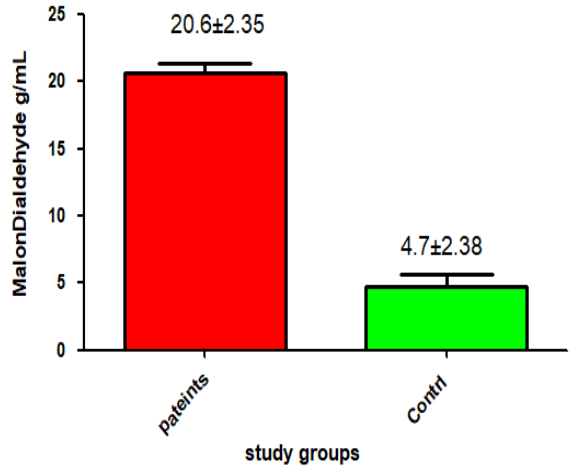

Figure (1) show malondialdehyde level in patients with High temperature working conditions compare with control Group .

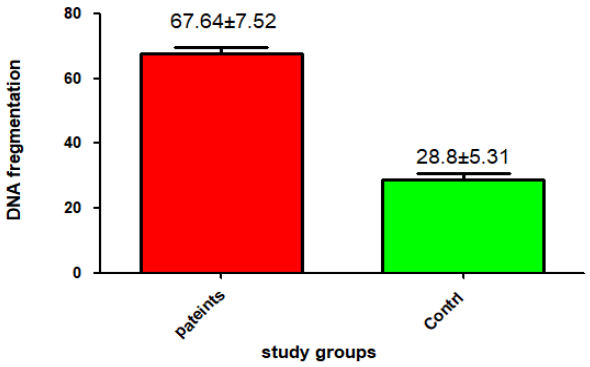

Figure (2) compares the degree of DNA fragmentation in patients working at high temperatures to the control group.

4. Conclusion

The high temperature has a clear effect on human health and fertility. Through experiments and research, it has been observed that male fertility decreases, DNA is affected, and free radicals rise.

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