SMOKING AS ETHIOLOGICAL FACTOR IN DEVELOPING INFERTILITY IN MEN

PUŠENJE KAO ETIOLOŠKI FAKTOR U RAZVOJU INFERTILITETA KOD MUŠKARACA

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Abstract

Introduction: Infertility is defined as absence of pregnancy in couples who are having regular sexual intercourses over a period of one year without using any contraception. Smoking, as numerous studies confirm, can be related to lower fertility in men, which is a result of decreasing the number of spermatozoids, decreasing of their motility as well as lowering of the level of morphologically normal sperm.

Methodology: The specimen was subjects who have been treated from infertility at the Clinic for Urology at the Clinical Center in Podgorica. According to their smoking status, they were divided into an examined and a control group. What was analyzed was the form, smell, the form and biochemical composition of ejaculates, whereby a particular attention was paid to the volume of ejaculates, the number and motility of spermatozoids and to the presence of possible abnormality in them.

Results: The analysis of obtained data from smokers and non-smokers ejaculates established that there is statistically significant difference in ejaculates volume, total and progressive motility of spermatozoids and the presence of abnormal spermatozoids, in the favor of non-smokers. Namely, it is evident that in non-smokers, the ejaculate volume is larger, there is a higher motility of spermatozoids and there is smaller number of abnormal spermatozoids. At the same time, it has been established that there is no statistically significant difference in number of spermatozoids between smokers and non-smokers.

Discussion: Tobacco smoke is highly dangerous for entire human organism. Chemical substances contained in tobacco smoke affect male reproductive organs directly affecting testis and their capacity to produce spermatozoids in a process of spermatogenesis. Studies have proved that those men who are smokers have 17% less spermatozoids than non-smokers. Smoking not only reduces the number of spermatozoids, but it also affects its quality. Some researches have proved that the quantity of sperm has increased eight times in men who stop smoking.

Conclusion: Results of the research on relation of smoking to infertility in men have shown that the ejaculate volume is larger in non-smokers than in smokers, the total motility of spermatozoids is better as well as the progressive motility of spermatozoids. Apart from that, it has been established that smoking disease causes higher percentage of abnormal forms of spermatozoids. Therefore, each smoker should be encouraged to stop smoking, especially if pregnancy is planned.

Key words
infertility in men, smoking, ejaculates volume, characteristics of spermatozoids

Ključne reči
infertilitet muškaraca, pušenje, volumen ejakulata, karakteristike spermatozoida.
unidentified causes of infertility. Today, the male factor in infertile couples has been identified in 30% - 50% of cases and female factor in 40% - 70%, and in some 20 % of couples there is a joint, male-female factor.

Causes for occurring of male infertility are quite diverse. Pre-testicular factors are: hypogonadism (decreased level of male sex hormones), smoking, consumption of alcohol or drugs. Testicular factors are: sperm characteristics (teratospermia i.e. abnormal morphology), oligospermia (decreased volume), azoospermia (absence of sperm) and genetic mutations of Y chromosomes. Post-testicular factors are: obstruction or lack of Vas deference (the duct that carries sperm), infections and retrograde ejaculation (advancement of the ejaculate towards the urinary bladder) (3).

Experience of numerous authors confirms that smoking could be a significant factor for incidence of infertility. Namely, smoking as the most widespread preventable addiction disease led to significant increase in number of men who have problems with infertility (4). Experimental studies show that in rats that have been exposed to tobacco smoke and in which the nicotine and cotinine level was increased, negative effect on spermatogenesis and fertility was identified (5). Smoking, which many studies confirm, can be related to lower fertility in men as a result of decreased number of spermatozoids and lower motility of spermatozoids as well as of decreased level of morphologically normal sperm. (6). Also, some of these researches confirmed that there is a connection between smoking disease in men and the quality of their semen, whereby the quality was of significantly better quality in non-smokers (7).

Normal morphology and motility of spermatozoids are only some of the criteria that should be met, so that a successful fertilization occurs. They have to be capable of capacitation, acrosomic reaction, and nuclear decondensation. They have to have the capacity of penetration through the cervical mucous plug, cumulus oophorus, ZP (zone pellucida) and VM (vitellina membrane) and the capacity to bind to the ovum. For all these reasons the research of ejaculates does not only include determining of number of spermatozoids, its motility and evaluation of morphological irregularities, but it is also about determining physical properties of semen liquid, establishing biochemical composition of semen and morphological analysis of ejaculates (8).

2. AIM OF THE PAPER

Establishing relation between smoking and infertility in men.

3. MATERIALS AND METHODS

The specimen in this research was all patients who have been treated from infertility at Andrology out-patient department at the Urology and Nephrology Clinic of the Clinical Center of Montenegro. Their age ranged from 20 to 49 years. In total, the research included 150 patients and all of them were divided into the group of examinees, which was composed of smokers, and the control group, which was composed of non-smokers.

The instrument of the research was examination of spermogramme. The sample for testing is obtained by masturbating into a container 20 min. to one hour before examining its quality. Before masturbation, the patient is given instructions on sexual abstinence, which must not be shorter than two days and not longer than 5 days, and the recommendable period is 3 – 4 days. If the patient is not capable to produce the semen in the laboratory, he is advised to do it at home under condition that he delivers the semen within one hour.

He has to make sure that the semen does not get cold or that it is not exposed to large temperature variations. After measuring the period of liquefaction, the organoleptic properties were determined. They include the volume, acidity (Ph), color and consistency of the examined sperm. What was analyzed was the ejaculate volume, the number of spermatozoids, their motility – total and progressive, as well as the presence of possible abnormalities on the spermatozoids.

The ejaculates analysis was performed according to the WHO criteria. While examining infertile subjects we used the following scheme of differentiation:

- General anamnesis
- Andrological anamnesis
- Phimosis and paraphimosis
- Andrological examination (outer genitalia, internal genitalia, ejaculate volume – it should range from 2 – 6 ml. , ejaculate acidity, microscopic examination, biochemical examination, prostate examprimate)

According to the aim of the paper, we collected the information on examinees focusing on the separate group they belonged to and we observed the characteristics of a particular phenomenon. Depending on the type of the feature, we applied parametric and non-parametric statistical methods when analyzing our data.

4. RESULTS

The research included 150 examinees that have been treating their male infertility. The examined group consisted of 88 and the control group of 62 examinees.

In most cases the age of examinees ranged from 30 – 35 years.

By comparing the ejaculate volume in infertile examinees that belonged to the group of smokers (4.22 ml.) to the group of infertile examinees that did not have smoking habit (their ejaculate volume was 4.39), shown in table no.1, a statistically significant difference was obtained in ejaculate volume of infertile patients according to their smoking habit (T = 394, p< 0.05).

By comparing the number of spermatozoids in 1 ml. of ejaculate (Chart 1) in infertile examinees that belonged to the group of smokers 10.47x106 ml. to the same number in infertile non-smokers, no statistically significant difference was obtained (T=243, p>0.05).

![Fig 1. Number of spermatozoids in 1 ml of ejaculate in smokers and non-smokers](image-url)

Table 4.1: Distribution of ejaculate volume in infertile examinees according to smoking habit

<table>
<thead>
<tr>
<th>Statistical parameter</th>
<th>Smokers</th>
<th>Non-smokers</th>
<th>p&lt;0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ejaculate volume</td>
<td>88</td>
<td>62</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>Average value</td>
<td>2.23</td>
<td>2.24</td>
<td>0.74</td>
</tr>
<tr>
<td>SD</td>
<td>0.7</td>
<td>0.95</td>
<td></td>
</tr>
<tr>
<td>MED</td>
<td>3.2</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>Min</td>
<td>1.4</td>
<td>1.1</td>
<td></td>
</tr>
<tr>
<td>Max</td>
<td>4.8</td>
<td>4.9</td>
<td></td>
</tr>
</tbody>
</table>

*Values of statistical parameters are expressed in %.
The next parameter to be compared was total motility of spermatozoids in those examinees who belonged to the group of smokers (37.13%) to the group of infertile examinees without smoking habit (43.57%) (table no. 2). Here there is statistically significant difference in total motility of spermatozoids in favor of non-smokers (p<0.05). It is evident that the total motility of spermatozoids was significantly lower in infertile examinees that had smoking habit.

Table no. 2: Distribution of total motility of spermatozoids in infertile examinees according to smoking

<table>
<thead>
<tr>
<th>Total motility of spermatozoids</th>
<th>n</th>
<th>Average value</th>
<th>SD</th>
<th>MED</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smokers</td>
<td>88</td>
<td>37.13</td>
<td>10.23</td>
<td>48</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>Non-smokers</td>
<td>62</td>
<td>43.57</td>
<td>15.76</td>
<td>31</td>
<td>28</td>
<td>42</td>
</tr>
</tbody>
</table>

p<0.05 *Values of statistical parameters are expressed in %

The research included monitoring of progressive motility of spermatozoids. In the examined group of smokers, the progressive motility of spermatozoids was 8.03%, whereas at the same time, in non-smokers it was 9.05 (table no. 4). Table 3 shows that there is statistically significant difference in progressive motility of spermatozoids between the examined infertile smokers and non-smokers patients (T=381, p<0.05). It is evident that smoking habit reduces progressive motility of spermatozoids.

By comparing percentages of abnormal forms of spermatozoids in infertile examinees belonging to groups of smokers and non-smokers, the value was 46.45% in smokers whereas in group of infertile examinees that did not have smoking habit it was 42.82% (table 4). It is evident that there is statistically significant difference in relation to presence of abnormal spermatozoids in both smokers and non-smokers as to the total structure of spermatozoids (T= 386, p<0.05).

The obtained data show that in examinees that were smokers there is significantly higher percentage of abnormal forms of spermatozoids.

5. DISCUSSION

Today, smoking has all features of a pandemic and it has been estimated that worldwide there is 1.3 billion smokers, out of which 70% falls to developing countries. This disease represents the leading factor of mortality in mid-age period in 54% men and 32% women and the trend is increasing. In 2002, 4 million deaths have been recorded due to smoking and it has been estimated that in 2020 there is going to be 10 million. The intensity and duration of smoking as well as the degree of nicotine addiction are directly related to deterioration of health (8).

Some four thousand various chemical substances have been identified in tobacco smoke, and some of them poisonous by themselves. Therefore, it is obvious why tobacco smoke affects all cells and tissues of a human organism. Chemical substances affect male reproductive organs directly thus affecting testes and their capacity to produce spermatozoids in a process of spermatogenesis. (9; 10). These mechanisms can affect hormonal control of spermatogenesis or they can directly affect the germinal epithelium, and Sertoli’s cells in seminiferous tubules(11). Studies have proved that men smokers have 17 percent less spermatozoids than non-smokers. Smoking not only reduces the number of spermatozoids but also its good quality. Researches have proved that in men who stop smoking, the quantity of sperm has increased up to eight times (12).

Five out of six men in which no increase of number or quality of spermatozoids occurred are long-term chronic smokers, whereas three men in whom an improvement occurred were only temporary smokers (13, 14, 15).

Apart from this, there are numerous pieces of evidence on increase of abnormal forms of spermatozoids as well as on decrease of motility and number of spermatozoids in men that have smoking habit (16).

6. CONCLUSION

● Results of the research on relation of smoking to infertility in men have proved that:
● Ejaculate volume is significantly larger in non-smokers than in smokers.
● In non-smokers, there is statistically significant higher total motility of spermatozoids.
● It is evident that smoking disease decreases progressive motility of spermatozoids.
● Smoking disease causes higher percentage of abnormal forms of spermatozoids.
● Therefore, every smoker should be encouraged to stop smoking, particularly if pregnancy is planned.
Apstrakt

Uvod: Infertilitet se definiše kao izostanak trudnoće nakon jedne godine, kod parova koji imaju redovne seksualne odnose, a bez upotrebe kontracepcije. Pušenje, kako je potvrđeno brojnim studijama, može biti povezano sa slabijim fertilitetom kod muškaraca, kao i s manjim brojem spermatozoida. Radi se o značajnoj varijabli koja može uticati na trudnoću kod parova.

Čel: utvrđivanje povezanosti infertiliteta kod muškaraca i pušenja.

Metodologija: Uzorak su činili ispitanci koji su liječeni od infertiliteta na Uroškoj klinici u Podgorici, koji su podijeljeni na ispitivanu i kontrolnu grupu prema pušačkom statusu. Analiziran je miris, izgled i biokemijski sastav ejakulata, kao i postojanje eventualnih abnormalnosti na njima.

Rezultati: Ova studija pokazala je da postoje značajne razlike u volumenu ejakulata, ukupnoj i progresivnoj pokretljivosti spermatozoida i postojanju eventualnih abnormalnosti spermatozoida, na račun nepušača. Naime, u pušačima je postojala veća vreme potrebna za osvrtom na volumen ejakulata, broj i pokretljivost spermatozoida i postojanje eventualnih abnormalnosti.


Zaključak: Duvanski dim utiče na reproduktivnu funkciju muškaraca i povećava rizik od infertiliteta. Stoga, svakog pušača bi trebalo ohrabrivati da prestane da puši, pogotovo ako se planira trudnoća.

LITERATURA

2) http://www.ttc.rs/muskinfiltritet.php