The Effects of Cigarette or Hookah Smoking on Serum Levels of LH, FSH or Testosterone in Male Rats

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Abstract—Background and Aims: Studies show that there is an association between smoking and serum levels of sex steroid hormones. The main aim of this study was to determine the effects of cigarette or hookah smoking on serum level of LH, FSH or testosterone in male rats.

Materials and Methods: Male Wistar rats were randomly divided into control, cigarette, and hookah smoking groups of 10 in each. After 6 weeks, blood samples were collected using cardiac puncture method. Following serum collection, levels of LH, FSH or testosterone were measured by radioimmunoassay method. Data were statistically analyzed and compared between groups using ANOVA.

Results: The results indicated that serum FSH level was insignificantly increased in hookah and significantly increased in cigarette smoking rats compared with control animals (P<0.001). Serum levels of testosterone were decreased in cigarette or hookah smoking rats compared with control animals (P<0.001). Serum level of LH was insignificantly increased in hookah smoking rats, however, was not significantly changed in cigarette smoking animals compared with control rats.

Conclusion: Our findings show that cigarette or hookah smoking inhibits cellular testosterone releasing which is followed by decreased serum levels of testosterone in male rats.

Keywords—Cigarette, Hookah, LH, FSH, Testosterone, Rat.

I. INTRODUCTION

VARIOUS conditions such as alcohol or tobacco smoking can influence serum levels of sex steroid hormones leading to impairment of male reproductive system [1]. Tobacco smoking is today by far the most popular form of smoking; however, it is of greatest threat to public health. Many young adults are misled by the sweet, aromatic and fruity quality of hookah smoke, which causes them to believe it is less harmful than hot, acrid cigarette smoke [2]. Nicotine is an alkaloid that constitutes approximately 0.6–3.0% of the dry weight of tobacco. Studies show that various hormones including sex steroid hormones can modulate the effects of nicotine and nicotinic receptors in a differential manner [3]-[4]. Hypothalamic – pituitary - gonadal axis [5],[6], sex steroid hormones metabolism [7] and prostate or seminal vesicle functions are influenced by cigarette nicotine [8]. Changes at cellular and molecular levels in various tissues including reproductive tissues have also been reported following cigarette smoking [9]-[11]. Despite considerable amount of research devoted to study on the effects of cigarette smoking on reproductive system [12-15], there are few studies on the effects of hookah smoking on male or female reproductive system and research on hookah effects on body systems is mostly confined to respiratory or immune systems[13],[16]-[18]. On this basis, and according to public belief on safety of hookah smoking compared with cigarette smoking, the present study was exerted to determine the effects of hookah smoking in comparison with cigarette smoking on serum level of LH, FSH or testosterone in male rats.

II. MATERIALS AND METHODS

Adult Wistar rats weighing 200±30g were purchased and raised in our colony from an original stock of Pasteur institute (Tehran, Iran). The temperature was at 23±2°C and animals kept under a schedule of 12h light: 12h darkness (light on at: 08: 00 a.m.) with free access to water and standard laboratory chow. Care was taken to examine the animal for general pathological symptoms. Food was withheld for 12-14h before death. Rats were randomly divided into control, cigarette, and hookah smoking groups of 10 in each. To expose the animals to cigarette or hookah smoking, a special apparatus was used according to previous studies [19]. It had a vacuum suction and a glass box in a cube shape (aquarium shape) with the size of 30 × 40 × 80 cm for keeping the animals and a hood over the aquarium to evacuate the extra smoke to the environment. The animals were put in the box and exposed to cigarette or hookah smoking for 10 minutes. The procedure was repeated 10 times daily intervened with 5 minutes of rest. Control rats were simultaneously exposed to room air. After 6 weeks, blood samples were collected using cardiac puncture method. Following serum collection, levels of LH, FSH or testosterone were measured by radioimmunoassay method. Data were statistically analyzed and compared between groups using ANOVA.
III. RESULTS

Table 1 represents serum LH, FSH and testosterone levels in male rats.

<table>
<thead>
<tr>
<th>Hormone</th>
<th>LH P</th>
<th>FSH P</th>
<th>Testosterone P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.11±0.012</td>
<td>6.40±1.02</td>
<td>9.46±1.37</td>
</tr>
<tr>
<td>Cigarette smoking</td>
<td>0.11±0.001</td>
<td>17.84±3.16</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Hookah smoking</td>
<td>0.10±0.003</td>
<td>25.62±6.33</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Table I

SERUM LH, FSH AND TESTOSTERONE CONCENTRATION IN MALE RATS.

Data represent the mean ± SEM of 10 rats. P values are versus control (NS: Non-significant).

The results indicated that serum FSH level was insignificantly increased in hookah and significantly increased in cigarette smoking rats compared with control animals (P<0.001). Serum levels of testosterone were decreased in cigarette or hookah smoking rats compared with control animals (P<0.001). Serum level of LH was insignificantly increased in hookah smoking rats, however, was not significantly changed in cigarette smoking animals compared with control rats. There was no significant difference between serum FSH, LH or testosterone level in cigarette smoking compared with hookah smoking animals.

IV. DISCUSSION

The results indicated that serum testosterone level was decreased in cigarette or hookah smoking animals compared with control rats. In accordance with this finding, there are reports indicating the inhibitory effects of cigarette smoking on male reproductive system [19]-[22]. Our findings also showed that despite serum testosterone level decline, cigarette or hookah smoking did not influence serum LH level. This finding is consistent with findings of other studies in which it has been shown that cigarette smoking can influence pituitary function without significant effect on LH level [23]. Increased serum FSH level in cigarette or hookah smoking rats was also compatible to decreased serum testosterone level, since it is expected that FSH level to be enhanced following testosterone decline as a compensatory mechanism to elevate the testosterone level.

Serum testosterone decline following cigarette or hookah smoking is attributable to their content of nicotine [24]. The reports also demonstrated the carcinogenic effect of hookah smoking indicating the potentially destructive effects of hookah smoking constituents [25]. Direct toxic effect of nicotine on reproductive system has also been mentioned in previous studies [26]. Therefore, free radical formation leading to cellular deterioration following cigarette or hookah smoking is conceivable.

V. CONCLUSION

In conclusion, our findings shows that hookah smoking as well as cigarette smoking results in decreased serum testosterone level followed by increased serum FSH level, indicating the similar inhibitory effects of cigarette and hookah smoking on male reproductive system.

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REFERENCES


