



Effects of Cigarette Smoking on Urinary Testosterone Excretion in Men

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Abstract

Cigarette smoking is a major public health problem that is associated with high morbidity and mortality. This study was designed to investigate the relationship between cigarette smoking and concentration of testosterone in the urine. Forty young men age between 23 to 31 years were used for this study. The subjects were divided into two groups of 20 controls (non-cigarette smoker) and 20 experimental groups (cigarette smoker). 5ml of mid-stream urine was collected from each subject at 0700 hour and urine testosterone concentration was estimated using enzyme immunoassay method. The result showed that the urinary testosterone concentration of non-cigarette smokers was 4.35 ± 0.52 ng/ml, while the concentration in cigarette smokers was 2.81 ± 0.38 ng/ml with $p < 0.01$. It is concluded that cigarette smoking reduced urinary testosterone concentration among cigarette smokers.

Keywords: Cigarette Smoking, Testosterone, Males

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INTRODUCTION

Cigarette smoking is a major public health problem. Each year, tobacco is responsible for the deaths of about 3.5 million people. These numbers of deaths are increasing, and unless current trends of deaths are reversed, by the decade 2020-2030, it is estimated that tobacco will kill 10 million people a year with 70% of these deaths occurring in developing countries.¹ Cigarette smoking epidemic is at an earlier stage in Africa, Asia, South America and certain areas of Southern Europe where smoking is found predominantly among men². A survey conducted in Nigeria showed that 24.4% of males and 6.7% of females smoked cigarette on a daily basis³.

In male, cigarette smoking is associated with a decreased testosterone (a hormone which increases sexual urge) level, destruction of sperms, decreased sperm motility, relative infertility and impotence. Shrinkage of male genitalia was reported but insufficient to constitute a real deterrent to smoking⁴.

It was found that nicotine (the main bioactive biochemical substance in tobacco) inhibited steroidogenesis in mouse Leydig cells⁵. The chronic treatment with nicotine has been reported to cause decrease in fertilization ability in male animals⁶. It has also been found out that nicotine inhibits pulsatile luteinizing hormone (LH) secretion in males⁷. Cigarette smoking and intravenous nicotine infusion has also been associated with increases in prolactin levels^{8,9,10}.

This study was undertaken to find the relationship between cigarette smoking and urinary testosterone secretion among cigarette smokers in Ilorin.

MATERIALS AND METHODS

Forty men were recruited for this study at Tanke area of Ilorin. They were provided with written informed consent for participation in the study. All the men selected for the study were in good physical health as certified by physician at the university health centre. These subjects did not differ significantly with respect to age and body mass index. The characteristics of subjects are summarized in table 1.

Table 1: Subjects characteristics (Values are mean±S.E.M.)

	Age (years)	BMI (kg/m ²)
Non-Cigarette Smokers	28.6±1.6	24.4±1.5
Cigarette Smokers	29.3±1.3	23.1±0.7

Samples Collection and Procedures

5ml of urine was collected from each subject at 0700 hours in the morning into plain bottle and immediately taken to the laboratory for analysis of urine testosterone.

Testosterone Assay

Urine testosterone was determined by enzyme immunoassay method, using kits (catalog no. 2095Z) purchased from Diagnostic Automation Inc. (Calabasas, CA, USA).

RESULTS

The urinary testosterone concentration (Fig.1) in the control (non-cigarette smokers) was 4.35±0.52 ng/ml, while the concentration was 2.81±0.38 ng/ml in cigarette smokers, (p<0.01).

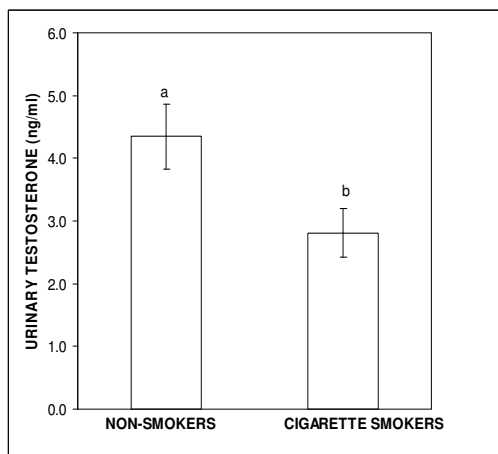


Fig.1: Urine testosterone (ng/ml) in the control (non-cigarette smokers) and cigarette smokers. Different letters on the bars indicate p<0.01.

DISCUSSION

Our study has shown that cigarette smoking decrease urinary excretion of testosterone. Various reasons have been adduced for the low level of plasma testosterone in cigarette smokers. It has been suggested that the low level of testosterone in cigarette smokers is

due to increased activity of liver 6- β -hydroxylase in cigarette smokers¹¹. The enzyme is known to increase the metabolism of testosterone. In vitro studies indicate that nicotine inhibits LH-stimulated steroidogenesis in isolated mouse Leydig cells⁵.

High nicotine cigarette smoking may stimulate rapid release of prolactin by increasing endogenous opioids¹², which in turn may inhibit dopamine release¹³. Yet, endogenous opioid peptides also inhibit release of hypothalamic luteinising hormone releasing hormone (LHRH), which regulates LH release from pituitary¹⁴. A cigarette smoking-related increase in endogenous opioid peptides might predict a decrease, rather than an increase in LH.

In the previous studies, cigarette smoking has been observed to result into increased prolactin levels^{8,9,15,16}. Similarly, intravenous infusion of nicotine has been associated with increased prolactin secretion¹⁰. Research results have reported that pathological hypersecretion of prolactin in men is associated with hypogonadism and/or impotence and this is due to the effects of prolactin on the central nervous system control of gonadotropin release and sexual behaviour^{17,18}. Prolactin may also have direct effects on the steroidogenic and gametogenic functions of human testis because its receptors (PRL-Rs) are localised in the human Leydig cells, spermatocytes and spermatids, and in the epithelium of the epididymis, vas deferens, prostate, and seminal vesicles¹⁹. Luteinising hormone (LH) stimulates the Leydig cells to secrete testosterone and the quantity of testosterone secreted increases approximately in direct proportion to the amount of LH available²⁰. Therefore, by reducing gonadotropin secretion, nicotine and cigarette smoking could reduce testosterone production.

Our study showed that urinary testosterone was lower in cigarette smokers compared to the non-cigarette smokers (Fig.1) in subjects that are age-matched and of similar body mass index (Table 1). This agrees with previous studies^{8,15,16}. Though there are many chemicals in cigarette smoke, we contend that nicotine, a major constituent of tobacco, could be responsible for the observed reduced

testosterone production among the cigarette smokers.

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