

Sex hormones, personality characters and professional status among Saudi females

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ABSTRACT

Objective: The relationship between male and female sex hormones (testosterone, estradiol and progesterone), personality characters and professional status was studied.

Methods: The study was conducted in Riyadh City, Kingdom of Saudi Arabia between September 2003 and May 2003. The participants completed a questionnaire consisting of personal information regarding age, profession, educational level and medical history. Then the participant went through an adjective checklist. Hormones were determined from blood samples provided by the participant.

Results: The result indicated that the higher the professional levels, the higher was the testosterone concentrations, but not estradiol or estrogen concentration. Furthermore, females with higher

testosterone concentration (university lecturers, bank managers, bank employee, medical doctors and technical workers) identify themselves as independent, strong, assertive, impulsive, resourceful, spontaneous, uninhibited, rational, patient and arguing. Whereas, females with lower testosterone concentrations (housewives and clerical workers) view themselves as civilized, socialized, calm, quite, sentimental, shy, nice, sensitive, warmhearted, sympathetic, thoughtful, warm, practical and kind.

Conclusion: The current study emphasizes the positive relationship between strong personality characters, high professional status and male sex hormone level (testosterone) in females.

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The most potent naturally secreted male type steroid hormone is testosterone. Testosterone has an anabolic (protein synthesis) and physically masculinizing effect. In males, it is secreted by the testes and for females, by the ovaries and adrenal glands. Research findings relating testosterone to sexual behavior are inconsistent and conflicting. Moreover, testosterone in human was studied relative to behaviors. Schindler¹ in 1979 conducted a study relating testosterone to normal personality and occupational choice among females. She found that testosterone concentration was significantly and positively correlated with a need for achievement and need for autonomy. In the same study, she found that female lawyers had significantly higher

testosterone concentrations than female nurses and athletes. Although a number of studies have demonstrated an association between serum testosterone levels and the personality trait, such as dominance in human males,² there have been less investigation of the possibility of a similar relationship between dominance and testosterone in human female. Lately, Grant and France³ conducted a simple adjective test (a questionnaire designed to measure dominance) and they measured plasma testosterone, they found that high score for dominance were associated with higher serum testosterone levels.³ Despite considerable speculation that testosterone is associated with

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aggression or status in women,⁴ availability of related literature is still scant.

The present study was carried out to explore the relationship between professional status (University lecturers, bank managers and bank employees, medical doctors, technical workers, clerical workers and housewives), personality characters and the hypothesized biological basis of testosterone among females. In addition, the relation of female sex hormones (estrogen and progesterone) to the professional status and personality characters was explored for their possible role in females.

Method. The participants were females between 25-40 years old (not under hormonal treatment), from the following professions: 1. Housewives. 2. Clerical workers. 3. Technical workers. 4. Bank managers and bank employee. 5. University lecturers and medical doctors. An informed consent was obtained describing the study and the tests. The participant filled a questionnaire. The questionnaire consists of personal information regarding age, profession, educational level and medical history. Then the participant goes through an adjective checklist of 300 adjectives often used to describe personality.^{5,6} The participants then are asked to check those adjectives that are descriptive to her. Then the relation of each adjective to testosterone, estradiol and progesterone was examined. In addition, the relation of sex hormone levels to professional status was examined. Blood sample was collected in ethylenediaminetetraacetic acid tubes on the sixth day of their menstrual cycle between 11:00 am - 1:00 pm. The sixth day of their cycle was chosen to avoid the sudden surge of hormones before and after evaluation. The time was selected as circadian fluctuation of testosterone peak at approximately 8:00 am and the lowest around 8:00 pm. Based on this fact, the present study samples were selected between 11:00 am - 1:00 pm, plasma were extracted and was frozen at -70°C until the assay time. Total testosterone, estradiol, progesterone level were determined by using commercially available enzyme linked immunoabsorbent assay kit (testosterone from Linear Chemicals, Spain, progesterone and estradiol from DRG Instruments, Germany). Sample tests were carried out in duplicate. The statistical analysis was performed using Excel for windows. Data were expressed as mean \pm standard error of the mean (SEM), 2 tailed t-test and multiple correlation was also used.

Results. A total of 261 agreed to participate. The average age was 34 ± 4 years. All were Saudis. Ninety-eight subjects were university lecturers and medical doctors, 35 were bank managers and bank employees, 46 were technical workers, 47 were housewives and 35 were clerical workers.

Concerning the hypothesized differences in testosterone, estrogen and progesterone concentration among different profession. **Table 1** shows mean testosterone, estradiol and progesterone levels for different profession, as the table indicates, housewives (0.5 ± 0.2 nmol/L) and the clerical workers (0.6 ± 0.3 nmol/L), who showed low testosterone, with $t = 2.2$ (degrees of freedom [df] = 79). Whereas, the opposite was true for the other 3 groups, which consists of university lecturers and medical doctors (3.8 ± 1.07 nmol/L), bank managers and bank employee (4.1 ± 0.9 nmol/L) and technical workers (2.75 ± 0.2 nmol/L) showed the highest testosterone level. The t value was as follows: 3.4 (df = 131) for university lecturers and medical doctors, 4.6 (df = 68) for bank managers and bank employees and 8.3 (df = 78) for technical workers. The other interesting finding is that plasma estradiol and progesterone concentrations were not significantly different among different groups (**Table 1**).

Regarding personality characters and professional status (**Table 2**), university lecturers, bank managers and workers, medical doctors and technical workers identified themselves as follows: independent, strong, assertive, impulsive, resourceful, spontaneous, uninhibited, rational patient and arguing. Whereas, housewives and clerical workers mainly described themselves as follows: civilized, socialized, calm, quite, sentimental, shy, nice, sensitive, warmhearted, sympathetic, thoughtful, warm, practical, and kind.

Relation of adjective checklist with testosterone concentration for each profession. A statistical correlation was calculated between each adjective on the checklist and testosterone concentration for all professions participated in the study. The significant result for university lecturer and medical doctors is presented in **Table 3**, there is a positive correlation between high testosterone levels in this group and those characters (that is being independent, spontaneous, uninhibited, arguing and rational). Whereas, there is negative correlation between high testosterone concentration in this group and being quite, calm, shy, sentimental, nice and kind. Almost similar result was reached for the bank managers and bank employee group. Bank managers and employee showed high positive correlation between testosterone level and being competitive, independent, arguing, uninhibited, rational, spontaneous and strong. In addition, there was significant negative correlation between high testosterone concentration and being quite, calm, shy, sentimental, nice and kind (**Table 4**). Technical workers exhibited positive correlation with being civilized, uninhibited, arguing and spontaneous. Furthermore, they showed negative correlation between testosterone concentrations and being shy, sentimental, polite, sensitive and kind (**Table 5**).

Table 1 - Testosterone, estradiol and progesterone concentration for different profession (data expressed as mean \pm standard error of the mean) (N=261).

Profession	n	Testosterone (nmol/L)	Estradiol (pg/L)	Progesterone (nmol/L)
Housewives	47	0.5 \pm 0.2	97.6 \pm 13	0.98 \pm 0.2
Clerical workers	35	0.6 \pm 0.3	110 \pm 21	1.2 \pm 0.9
Technical workers	46	2.75 \pm 0.2	89.12 \pm 19	0.87 \pm 0.32
Bank managers and bank workers	35	4.1 \pm 0.9	79.3 \pm 23	1.43 \pm 0.45
University lecturers and medical doctors	98	3.8 \pm 1.0	87 \pm 16	0.87 \pm 0.43

On the other hand, housewives and clerical workers whose testosterone concentration was the lowest among the 5 groups, their adjective checklist showed a strong negative correlation between testosterone concentration and being shy, social, sentimental, warmhearted, sensitive, quite, calm, cheerful, polite, kind and thoughtful (Table 6).

Discussion. The focus of the research was on the relationship of professional status, personality characters and male and female sex hormones levels in females. The results of this study demonstrate a statistically significant correlation between women's profession, personality characters and serum testosterone. The level of estradiol and progesterone did not correlate with either professional status or with personality characters. The focus of the current study was on self reported personal identity. According to the questionnaire

Table 2 - The relationship between personality characters and profession (data expressed as percentage of total).

Personality characters	University lecturers, medical doctors N=98 %	Bank managers N=35 %	Technical workers N=46 %	Housewives N=47 %	Clerical N=35 %
Strong	31.6	68.5	39	19.1	11.4
Independent	86.7	91.4	45.6	14.8	34
Spontaneous	65.3	77	52	14.8	24
Arguing	55.1	91.4	65.2	8.5	11.4
Competitive	53	94	41	14.8	25.7
Uninhibited	63	91	65	14.8	31.4
Civilized	23	34	76	70	65.7
Thoughtful	23	17	28	87	74.2
Kind	22	8.5	28	74.4	42.8
Rational	76	94	45.7	31.9	22.8
Nice	19	11.4	50	65.9	65.7
Polite	43	14.2	26	95.7	68.5
Cheerful	30.6	25.7	43.4	63.8	54.2
Quite/ calm	3	8.5	34.7	76.5	85.7
Sensitive	34.6	31.4	26	70.2	85.7
Warmhearted	30.6	25	30.4	80.8	91.4
Sentimental	20	14.2	25.9	97.8	85.7
Social	31.6	25.7	34.7	80.8	68.5
Shy	18	2.85	23.9	95.7	34

Table 3 - Significant correlation of testosterone with adjectives from the adjective checklist for university lecturers and medical doctors ($p<0.05$).

Adjective correlation with testosterone	Correlation coefficient
Positive	
Independent	0.93
Spontaneous	0.73
Uninhibited	0.87
Arguing	0.86
Rational	0.81
Negative	
Quite/calm	-0.93
Shy	-0.84
Sentimental	-0.84
Nice	-0.81
Kind	-0.72

Table 4 - Significant correlation of testosterone with adjectives from the adjective checklist for bank and bank workers ($p<0.05$).

Adjective correlation with testosterone	Correlation coefficient
Positive	
Competitive	0.91
Independent	0.89
Arguing	0.87
Uninhibited	0.80
Rational	0.91
Spontaneous	0.70
Strong	0.68
Negative	
Quite/calm	-0.92
Shy	-0.76
Sentimental	-0.63
Nice	-0.74
Kind	-0.67

Table 5 - Significant correlation of testosterone with adjectives from the adjective checklist for technical workers ($p<0.05$).

Adjective correlation with testosterone	Correlation coefficient
Positive	
Civilized	0.70
Uninhibited	0.64
Arguing	0.64
Spontaneous	0.53
Negative	
Shy	-0.62
Sentimental	-0.61
Polite	-0.60
Sensitive	-0.60
Kind	-0.52

those who described themselves as feminine-sex typed women were found to exhibit the lowest concentration of testosterone level. That is female who possessed the stereotypic feminine personality had a low levels of the potent steroid hormone testosterone. As expected, female who possessed a high level of masculine characters had somewhat higher levels of testosterone levels than the caring feminine sex-typed females. Furthermore, those with higher testosterone levels described themselves as resourceful, spontaneous, impulsive, independent, strong, uninhibited, rational, patient and arguing. Those who are mainly university lecturers, medical doctors, bank managers, bank employee and technical workers, and in those groups with higher testosterone levels, positively correlated with the characters mentioned (spontaneous, impulsive, independent, strong, impulsive, resourceful, uninhibited, rational, patient and arguing). On the other hand, higher testosterone levels negatively correlated with being calm, quite, sentimental, shy, nice, sensitive, sympathetic and kind. Thus, it is reasonable to describe them as being action oriented confident uninhibited individuals. On the contrary, females with low testosterone levels, such as the housewives and clerical workers, characterized themselves as civilized, socialized, calm, quite, sentimental, shy, nice, sensitive, warmhearted, sympathetic, thoughtful, practical, and kind (Table 2).

The other interesting finding is the high serum testosterone levels in female working as university lecturers, medical doctors, technical workers bank managers, bank employee as compared to housewives and clerical workers. It is interesting at

Table 6 - Significant correlation of testosterone with adjectives from the adjective checklist for housewives and clerical workers ($p<0.05$).

Adjective correlation with testosterone	Correlation coefficient
Positive	
Civilized	0.86
Uninhibited	0.69
Strong	0.67
Competitive	0.80
Negative	
Shy	-0.73
Social	-0.65
Sentimental	-0.60
Warmhearted	-0.68
Sensitive	-0.79
Quite/calm	0.71
Cheerful	0.63
Polite	0.69
Kind	0.60
Thoughtful	0.69

this stage to point out that the relation between testosterone and professional status is opposite in males compared to females. In male's higher testosterone levels was found in production and service workers compared to professional and technical workers who had lower levels of testosterone.⁷ In females, as our study showed, the relation is opposite. Higher testosterone levels were found in professionals (university lecturers, medical doctors, technical workers, bank managers and employee). On the other hand, housewives and clerical workers showed the opposite relation, that is low testosterone plasma levels.

In 1979, Purifoy and Koopman⁸ reported that testosterone in women increased with the status of their occupation. They found higher serum testosterone levels in female students, professional, managerial and technical workers compared to housewives and clerical workers. They concluded that career-orientation in females might indicate a more masculine personality, manifested as assertiveness and independence. A similar study showed that women with high concentration of non-protein bounded and bioavailable oestradiol, but not testosterone, had fewer declines on cognitive testing and were less likely to develop cognitive impairment. They occluded that the higher concentration of endogenous estrogen prevent cognitive decline and suggests that the non-bound or loosely bound forms are more closely correlated with cognitive function than is the total estrogen.⁹ In 1980, Ehlers et al¹⁰ studied women who were patients in a neurological clinic, they found a significantly higher testosterone among relatively aggressive patients compared to less aggressive ones. On the other hand, Dabbs et al¹¹ in 1988 found no difference in testosterone between 84 women in prison and 15 college women, but women convicted of unprovoked violence had higher testosterone than other prisoners. Others found no significant relationship between testosterone and extent of criminal violence among 87 female inmates, but testosterone was significantly related to the aggressive dominant behavior while the women was in prison.¹²

Baucom et al¹³ in 1985 found that females with higher testosterone concentration perceived themselves as self-directed, action-oriented and resourceful. Whereas, those with lower testosterone concentration, perceived themselves as conventional, socialized and possessing a caring attitude. In men high levels of testosterone seems to be associated with dominance. Sometime dominance is expressed aggressively, such as antisocial behavior, rebellion against authority and law breaking. The correlation between testosterone and education and between income was studied by Dabbs et al⁷ in 1991. They found out that the status

of occupation in men, correlates with testosterone. Professionals and technical workers had lower levels of testosterone compared to service and production workers.¹⁴ The unemployed had the highest level of testosterone.^{7,15} The relation of testosterone levels and professional status is not clear. Most probably, the relation is opposite in men compared to women. High level of testosterone in men is found in unemployed and low status profession. Whereas in women, a higher level of testosterone is associated with higher professional status. In another study conducted on the allied health profession students, they were tested on the 4 types of gender-related personality categories (androgynous, masculine, feminine, undifferentiated) and actual career choice. Findings indicated that the largest percentage of students enrolled in the nursing, respiratory therapy, radiologist technology and medical technology programs were androgynous personalities, the dental hygiene program have more female students enrolled while paramedic programs have more male students.¹⁶

It is known that stress increase testosterone concentration in woman^{5,6} and accordingly, the stress that university lecturers, medical doctors, bank managers, bank employee and technical workers experience in their daily life might contribute to the higher levels of testosterone found in those groups. And it might also explain the characters that they mainly described themselves with such as being spontaneous, independent, strong, impulsive, resourceful, uninhibited, rational, patient and arguing. Most likely it is a cause effect type of relationship, that is the more stress in life, the more testosterone secreted, and consequently the stronger their personality will be.

Our study focused on the relationship of self reported characters against testosterone concentration in different professions. The adjectival correlates provide some additional clarity regarding how those women with different testosterone concentrations perceive themselves. The adjectives with highest positive correlates indicates that women with higher testosterone concentrations view themselves as spontaneous, impulsive, independent, strong, impulsive, resourceful, spontaneous, uninhibited, rational, patient and arguing. Those are mainly as mentioned earlier the university lecturer, medical doctors, bank manager, bank employee and the technical workers. The current study conducted on Saudi females in Riyadh, Kingdom of Saudi Arabia (KSA). Females in this society relatively live in a restricted environment, due to the social ties, rules and regulations which was inherited over the generation. Although, a lot of changes have had happened over the last few years and accordingly the social ties

lessened a little bit. But still the social tie is existing and the people have to stick to it to a certain extent. It is quite important to clarify some of the mixing up between Islam as a religion and some social practices in some Islamic countries such as KSA. Islam as a religion is reasonably fair religion for males and females. Encouraging females to educate themselves as far as they wish and there is no Islamic restriction regarding working or holding any professional position. Females in KSA are active as females anywhere in the world if not more. Sometimes they have to resist some social norms and practices in order to proceed further. The system in KSA as a matter of fact is in need for more of the female expertise, due to the fact that in almost every institution, company, university or any governmental department, there is the female section of that place. And this demands female workers ranging from the cleaners and up to the head manager. For this reason results of the current study did not differ from that of Grant and France³ in 2001 or Baucom et al¹³ in 1985 for a very simple reason, that professions anywhere in the world requires certain qualities and carry with them the same responsibilities.

Overall, the current study contributes to our knowledge of psychological correlates of testosterone. The major focus of this study was the relation between testosterone concentration, professional status and personality characters in females. The present findings broaden our knowledge of hormonal levels, personality characters and professional status in females, by showing that masculinity and femininity related to professional status and in turn related to hormones in particular testosterone, but not estradiol and progesterone.

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