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Mood, Attitudes toward Sexuality, and Marital Satisfaction in Diabetes and Control Subjects

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Abstract

Objective: The purpose of this study was to determine the relationship between mood, attitudes toward sexuality (ATS), feelings of empty nest syndrome (FENS) and marital satisfaction (MS) and sex hormones in type 2 diabetic patients and non-diabetic subjects.

Research design and Methods: We studied 50 non-diabetic subjects (25 male, 25 female) and 50 type 2 diabetic subjects using a cross-sectional design (25 male, 25 female). Inclusion criteria for type 2 diabetic patients were determined according to the American Diabetes Association Criteria. Mood, FENS, ATS and MS were evaluated. Sex hormones and insulin levels were assessed using RIA kits.

Results: Type 2 diabetic women had a higher score of depression (p=0.008) and anxiety (p=0.01) than did both the control and diabetic men. Diabetic patients had significantly higher scores of sleep alterations (p=0.03) and NSSD (p=0.02) than the non-diabetic subjects. In female subjects, estrogens (E) were inversely related to anxiety (p=0.02), and depression (p=0.04) and directly to ATS (p=0.002); dehydroepiandosterone sulfate was inversely related to MS (p<0.001). In all male and the non-diabetic male free testosterone (FT) was inversely related to depression (p=0.01 and p=0.005, respectively) and anxiety (p=0.005 and p<0.001, respectively).

Conclusions: The diabetic and non-diabetic females had higher level of depression and anxiety than did both the control and diabetic males. Diabetic males had higher scores of sleep alterations and NSSD than control male. E in female and FT in males had an inverse relationship with depression and anxiety. The role of sex hormones in mood alterations of both diabetic and non-diabetic subjects should be further studied.

Keywords

Mood; Attitudes; Sexuality; Marital satisfaction; Diabetes

Introduction

Type 2 diabetic patients have a higher risk of mood alteration than do healthy control subjects [1-4]. While reports on mood alterations vary among different studies, in part due to the different methodologies used and to other aspects of to the subjects' life situations [1-4], consistently a high proportion of women suffer physical and psychological symptoms, usually attributed to stage of the reproductive cycle [5,6]. The relationship between mood alterations and sex hormone levels in type 2 diabetic patients is not yet clear [1,3,5,6]. In type 2 diabetic and non-diabetic subjects it has been demonstrated that a short-term hypogonadism is enough to initiate symptoms of depression [7]. However, in O'Connor's study [8], treatment with testosterone did not increase or change aggressive behavior nor did it induce any changes in non-aggressive or sexual behavior.

The basis for mood alterations in patients with type 2 diabetes is unknown, but it is likely complex, involving interactions among psychological, physical, endocrine, and genetic factors [3,6,9]. However, a clear evidence of the effects of sex steroids in the cognition and brain activity, have been demonstrated [10]: a) Estrogens facilitate cognitive function, acting in the hippocampus, and the prefrontal cortex through the formation of synapses using the genomic pathways; and the so-called fast, non-genomic pathways (through alpha- and beta-receptors bound to the membranes, and through G proteins coupled to the estrogen receptor). b) Estrogens promote the synthesis of neurotrophins, modulate cholinergic neurotransmitters, and dopaminergic, and protect the brain against stress, and inflammation. c) *17B*-estradiol increases cognitive function in brain areas related to

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learning and memory (studies in animal models). d) *17B*-estradiol in the prefrontal region of postmenopausal women improves cognitive function and working memory, and attention. e) Progesterone has trophic effects on the brain development from adolescence to adulthood. f) Together, estrogens and progesterone act on neuronal function, forming synapses, increasing synaptic transmission and through neuroprotective effects. g) Progesterone receptors have been identified in regions of cognitive function such as frontal cortex, hypothalamus, thalamus, hippocampus, amygdala, and cerebellum. Also, it has been demonstrated a positive relationship between FSH and cognition; higher levels of FSH have been associated to better cognition. So, gonadotropins may also play a role in mediating cognitive performance [10].

Due to the evidence presented previously and the lack of studies in type 2 diabetics on the subject in question, the purpose of the present study was to extend this finding by comparing mood and sex hormone levels of type 2 diabetic male and female patients with those of control healthy subjects.

Research Designing and Method

Subjects were recruited after the protocol was approved by the Human Ethics Committee of our institution, and written informed consent was obtained from all participants. The study was conducted in accordance with the Declaration of Helsinki.

Subjects

Patients and controls were male and pre-, and postmenopausal female subjects from 40 to 65 years of age. A subject was considered diabetic according to American Diabetes Association criteria [11]. Patients included in this study did not have clinical signs or symptoms of metabolic decomposition (fatigue, polyuria, polydipsia or polyphagia). Consequently, their glycosylated hemoglobin was less than 7%. The diabetic participants did not have any complications such as liver problems or other endocrine disease, nor were they severely malnourished. The participants also did not use antihypertensive or antidepressive drugs. Female participants did not have preceding oophorectomy or genital surgery. None of them used either contraceptives or hormonal replacement therapy.

Procedure

Diabetic participants were recruited to participate in the study via advertisements publicized throughout Leon, Guanajuato, Mexico. Of 311 subjects evaluated 93 (29.9%) were diabetics (35 males and 58 females). Among those diabetic patients, only 50 met the inclusion criteria for our study (25 males and 25 females). They were age matched with 50 healthy control subjects (25 males and 25 females). Control and diabetic subjects all were evaluated for the following characteristics:

Anthropometric and clinical data

In order to better understand and control for the psychological effects of obesity, we measured body weight and height to calculate the BMI (kg/m^2) of each subject [12]. Waist, abdomen, and hip circumferences were measured to determine the abdomen and waist to hip indices. The percent body fat and lean body mass were determined according to the Jackson and Pollock method [13]. Sitting blood pressure was taken after a 5-10-minute period of rest.

Laboratory data

Fasting and postprandial (after an oral load of 75 grams of carbohydrates) glucose levels were determined using the glucose oxidase method (Boehringer Mannheim). The fasting lipid profile was assessed using the colorimetric spectophotometric method. Blood samples were centrifuged, and the serum was separated and frozen at temperatures below -20°C. These samples were subsequently used for analysis of follicle stimulating hormone (FSH), luteinizing hormone (LH), total testosterone (TT), estrogens (E), insulin (I), dehydroepiandrosterone sulfate (DHEA-SO_4), and sex hormone binding globulin (SHBG) levels using RIA kits.

Questionnaire

Patients and control subjects were interviewed to obtain clinical history, somatic and psychological conditions as in previous studies [1,6]. The questionnaire included five sections:

General data: Date of birth, marital status, and index of socioeconomic status (SECS), which was calculated according to: years of schooling, income and housing information. For diabetic subjects we collected clinical data, including time since diagnosis and clinical symptoms of diabetes. We ascertained the method of treatment, particularly if insulin had been used to control their symptoms, and for other important clinical history. Gyneco-obstetric antecedents: Women were asked about their age at menarche, menstrual characteristics, and number of children. Lifestyle: Included alcohol consumption, smoking habits, practice of physical exercise, occupation and religious habits.

Somatic and psychological symptoms: Symptoms of depression were evaluated using the Hamilton Scale [14]. This scale included nine aspects of mood and sleep alteration. These included difficulties falling asleep, alterations in midnight sleep or alterations in early morning sleep. The NSSD were evaluated according to our previous studies [1,6,14], and included: digestive problems, loss of sexual interest, and recent loss of weight. Anxiety index was based on 16 symptoms, which included breathlessness, palpitations, tremors, agitation, fear, and others, as described by the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR) [15]. The FENS, as described in our previous work [6,14], included 11 binary questions.

Attitudes toward sexuality (ATS): This aspect was assessed with 13 questions as described in our previous work and evaluated the participant's opinions on gender roles in society, such as the role of women as homemaker, the importance of physical attractiveness, and women's role in initiating sexual activity when postmenopausal [6].

Self-Esteem: Patients' sense of self worth was assessed using the Coppersmith test [14], previously validated on a Mexican population [16].

Marital Satisfaction: The marital satisfaction scale previously validated in our population by Pick and Andrade was used in this study [17]. This instrument includes 24 questions and assesses three aspects of the marital relationship: 1) satisfaction with marital interaction, 2) satisfaction with emotional characteristics of the spouse and 3) satisfaction with structural and organizational aspects of the spouse's personality.

Analysis of data

Differences among responses to clinical, psychological and anthropometric variables of the four groups of subjects (male and female diabetics, control males and females) were determined by an ANOVA and differences between pairs of groups were compared using a post-hoc Least Significant Difference (LSD) Test. The Student's T-test for independent samples was performed to determine differences in sex hormone levels between diabetic and non-diabetic subjects. Differences in the life-style and socio-economic characteristics between diabetic and non-diabetic subjects were determined with Pearson Chi-square (χ^2) test. The relationship between psychological symptoms and sex hormone levels was assessed with a forward stepwise multiple regression analysis (with pairwise deletion of missing data). The dependent variables were scores from the tests of depression, NSSD, FENS, ATS and anxiety; the independent variables were the sex hormone levels. In the analysis of marital satisfaction, only individuals with a partner were included. The threshold level of significance used was $p < 0.05$. All statistical analyses were performed with STATISTICA, Stat-Soft, Inc. Tulsa, OK, U.S.A.

Results

Participants' general characteristics

The general characteristics of the diabetic and non-diabetic participants are presented in Table 1. There were no significant differences in age among participants in the study. Diabetic males and females had higher waist to hip ratio ($F=16.42$, $p<0.001$) than the non-diabetic controls.

Life-Style variables

Comparing diabetic and non-diabetic subjects, the results of χ^2 did not show significant differences in variables of lifestyle. In

civil status, 96% of male and 84% of female were married; 93% of the subjects were Catholics. Regarding occupation, 32% *vs.* 36% diabetic and non-diabetics males were workers and 28% *vs.* 48%, respectively, had a professional education. Among diabetic and non-diabetic females, 88% *vs.* 56% were housewives, 8% *vs.* 16%, had a professional education. Diabetic and non-diabetic subjects were not significantly different in regular physical exercise levels, with levels of 36% *vs.* 40%, respectively. Males exhibited a markedly different rate, with 54% *vs.* 36% for diabetics and non-diabetics, respectively. Tobacco use in diabetic *vs.* non-diabetic males was 3% and 32%, respectively, while 32% *vs.* 36% consumed alcohol occasionally. Conversely, 0% *vs.* 12% of diabetic and non-diabetics females, respectively, regularly used tobacco and 8% *vs.* 4%, respectively, consume alcohol occasionally.

Clinical data

There were no significant differences in time since diagnosis of diabetic for males and females, the mean and standard error of the mean were: (X ± SEM), 5.13 ± 1.14 and 4.8 ± 1.7 years, respectively. Between females, diabetics had an earlier age at menarche than non-diabetic controls, (X ± SEM), 12.4 ± 0.26 *vs.* 13.2 ± 0.32, t=-2.05, p=0.04, yet there were no other significant differences in gynecological or obstetric characteristics. Diabetic females had higher systolic and diastolic blood pressure (p=0.003) than the other groups of participants (Table 1). The use of oral hypoglycemiants and insulin for type 2 diabetic males and females were: 79.2% *vs.* 58.3% and 20.8% *vs.* 16.7%, respectively. Twenty five percent of the female diabetics did not use any medication at the time of interview.

Metabolic variables and sex hormones

Among the total group of subjects, diabetic females had higher levels of fasting and postprandial glucose (p<0.001) and higher fasting insulin levels (p<0.001) than the other three groups. Diabetic males had higher triglyceride levels (p=0.01) and VLDL (p=0.006) than did the diabetic and non-diabetic female subjects (Table 1). Diabetic males had significantly higher LH and SHBG serum levels than non-diabetic males (p=0.05 and p=0.02, respectively) (Table 2). There were no significant differences in sex hormone levels between the two groups of females.

Mood characteristics

In general, both groups of females (diabetics and non-diabetics), had higher scores of depression and anxiety than did both groups of males. For diabetic and non-diabetic males, the X ± SEM for depression were: 3.64 ± 0.71 *vs.* 3.52 ± 0.89, while for diabetic and non-diabetic females they were 6.04 ± 0.95 *vs.* 6.92 ± 0.87, respectively. For anxiety the results were: 4.04 ± 0.20 *vs.* 3.68 ± 0.77 and 6.61 ± 0.97 *vs.* 6.38 ± 0.95, (F=3.21, p=0.02). Diabetic and non-diabetic female subjects also had lower scores of self-esteems than diabetic and non-diabetic males; however, these results were not significantly different: 18.52 ± 0.83 *vs.* 17.92 ± 0.98 and 16.68 ± 0.67 *vs.* 16.24 ± 1.05, F=1.39, p=0.25, for those groups, respectively. Between the two female groups, there were non-significant differences in psychological symptoms. However, between the two groups of males, the diabetics had significantly higher levels of sleep alterations and NSSD than the non-diabetic subjects; scores for sleep alterations were: 2.28 ± 0.42 *vs.* 1.08 ± 0.33, t=2.25, p=0.03 for diabetics and control subjects, respectively, and for NSSD: 1.72 ± 0.31 *vs.* 0.92 ± 0.16, t=2.26, p=0.02, for diabetics and control subjects, respectively. Non-diabetic females had lower scores of marital satisfactions than the other three groups of subjects: 60.68 ± 1.94 *vs.* 57.56 ± 2.6 and 57.72 ± 2.46 *vs.* 51.04 ± 2.69, for diabetic and non-diabetic males and diabetic and non-diabetic females, respectively (F=2.77, p=0.04).

Sex hormones serum levels and psychological symptoms

In Table 3, the results of a stepwise multiple regression analysis is presented. In both groups of females (diabetic and non-diabetic), estrogen levels were inversely related to depression and anxiety, and directly related to ATS. DHEA-SO_4 was directly related to ATS and negatively to MS and self-esteem. In the total group of males, free testosterone levels were inversely related to depression and anxiety. In the total group of males, as well as in the diabetic subjects, SHBG was directly related to FENS. In the non-diabetic males, free testosterone was inversely related to depression, anxiety, and FENS. In this last group, DHEA-SO_4 was directly related to NSSD and indirectly to self-esteem.

Discussion

In this study, we demonstrated the relationship between sex hormone levels and mood in diabetic patients and non-diabetic control subjects. Estrogen serum levels (in females) and free testosterone (in males) exhibited significant and inverse relationships with depression and anxiety. Some investigators explain the influence of sex hormones on mood in female subjects [11,18,19]. The explanation of these findings is that in female subjects with advancing age, sex hormone levels decrease and therefore affect change on specific regions of the brain [10,20]. In contrast, in men there is currently not enough information regarding the role androgens play in modulating change at the level of the central nervous system [21].

In this study we found that ATS show a direct relationship with the estrogen serum levels for diabetic and non-diabetic female subjects. However, testosterone and free testosterone had an indirect relationship with ATS in the control subjects. These results demonstrate that in the female subjects, those with higher estrogen serum levels had higher score of ATS, but the score decrease when free or total testosterone levels increased. Studies of the relationship of sex hormones and sexual desire in humans have produced varying and contradictory findings [21-23]. For example, it was demonstrated in two studies with a large sample size that estrogens had no effect on either sexual function [21] or on sexual satisfaction [22].

Although diabetes is related to psychological changes [9], we did not find significant differences in psychological evaluation scores between diabetic and non-diabetic females. However, diabetic males had significantly higher scores of sleep alteration and non-specific symptoms of depression (lost of sexual desire, weight loss, and loss of appetite), than non-diabetics males. Male diabetic subjects also had significantly higher LH and SHBG levels than non-diabetic males (p=0.04 and p=0.01, respectively). Iranzo et al. [24] did not find significant differences in androgen, LH, FSH, 17-*B* estradiol, SHBG, and prolactin serum leves between patients suffering idiopathic REM sleep disorder with healthy controls.

Recently, it has been demonstrated that metabolic variables play an important role in sleep disturbances [25]. In this study, we demonstrate three important findings that support this hypothesis: i) the male and female diabetic subjects show significantly higher triglyceride and VLDL serum levels than did the control group of female subjects; ii) diabetic males had significantly higher scores of sleep alterations and non-specific symptoms of depression than non-diabetics males; and iii) we observed an indirect relationship between HDL and sleep-alterations in the group of male subjects (diabetic and non diabetic) (β=0.27, p=0.008). The significance of this relationship held true when we analyzed only diabetic males (β=0.41, p=0.04).

In this study as well as in others [26,27], symptoms of depression and anxiety were significantly greater in females than in males. The reasons for this gender difference can be explained in different ways: i) in female subjects with advancing age, sex hormone levels decrease, and this could be related with alterations in cognition and brain activity [10]. These findings have not been well demonstrated in males [20]; and ii) the socio-cultural factors, education, and other circumstances that differentially effect males and females could explain the differences in psychological symptoms seen between genders [20]. Future studies will be necesary to evaluate the effects of the progression of the disease on sex hormone levels. With this information, we will be able to better understand the effects of diabetes on mood alterations and how these changes vary with gender [28,29].

Obesity is another variable associated with several psychological alterations, such as low self-esteem, depression and anxiety [14]. Consistent with this hypothesis, we found that in both diabetic and non-diabetic female subjects there is a significant inverse correlation between self-esteem and abdomen to hip ratio. For the diabetic males, we found an inverse correlation between BMI and NSSD.

Variables	Control Female	Type 2 Diabetic Female	Control Male	Type 2 Diabetic Male	F	*p*
Age (years)	49.6 ± 7.8	49.9 ± 8.4	50.0 ± 8.5	50.2 ± 7.7	0.02	0.99
SECS	3.3 ± 1.0	2.7 ± 0.8||	3.6 ± 0.6|| †	3.2 ± 0.9†	5.64	0.001
BMI (Kg/m^2)	29.5 ± 5.9†	30.9 ± 4.3‡*	26.9 ± 2.4‡ †	28.7 ± 4.5	3.89	0.021
Abdomen: Hip	0.96 ± 0.07	0.98 ± 0.08†	0.93 ± 0.06†	0.97 ± 0.04	2.08	0.107
Waist: Hip	0.84 ± 0.07§ ¶ †	0.88 ± 0.06|| †	0.91 ± 0.06* §	0.96 ± 0.04* || ¶	16.42	< 0.001
% Body Fat	27.5 ± 5.1¶ **	28.6 ± 5.5|| #	17.5 ± 3.2# **	18.4 ± 5.0|| ¶	36.10	< 0.001
Systolic BP	123.6 ± 12.5§	143.4 ± 25.7§	130.8 ± 16.4	130.4 ± 16.2	4.9	0.003
Diastolic BP	81 ± 8.9† §	93.3±15.2§	88.1 ± 17.7†	89.5 ± 11.0	3.5	0.02
FGL (mg/dL)	91.7 ± 11.0¶ #	170.2 ± 52.4# **	94.6 ± 10.9|| **	169.2 ± 51.7|| ¶	33.94	<0.001
PGL (mg/dL)	98.4 ± 18.8¶ #	252.9 ± 75.8# **	97.2 ± 26.8|| **	237.1 ± 98.6|| ¶	43.95	<0.001
FI (mUI/mL)	12.9 ± 10.2* §	32.53 ± 23.6† *	17.0 ± 10.0† ‡	30.9 ± 18.2‡ §	6.21	<0.001
PI (mUI/mL)	120.1 ± 131.3	108.1 ± 67.2	108.1 ± 84.6	104.7 ± 86.6	0.12	0.95
TCh (mg/dL)	208.4 ± 48.0	218.7 ± 49.4	228.7 ± 45.0	218.9 ± 54.9	0.69	0.56
TG (mg/dL)	142.5 ± 53.4† ‡	192.2 ± 85.0†	182.8 ± 66.8	214.5 ± 96.3‡	3.79	0.01
HDL (mg/dL)	46.5 ± 10.6	44.8 ± 10.0	49.3 ± 10.3	42.0 ± 6.9	2.52	0.06
VLDL (mg/dL)	28.5 ± 10.7†||	38.5 ± 17.0†	36.5 ± 13.4	44.0 ± 19.1||	4.37	0.006

SECS=Socioeconomic Status; Abd: Hip=Abdomen to Hip Ratio; Systolic BP=Systolic Blood Pressure; Diastolic BP= Diastolic Blood Pressure; FGL=Fasting Glucose; PGL=Postprandial Glucose; FI=Fasting Insulin; PI=Postprandial Insulin; TCh=Total Cholesterol; TG=Tryglicerides. Post-hoc Less Significant Differences Test: †p<0.05; *p<0.05; ‡p<0.01; §p<0.01; ||p<0.001; ¶p<0.001; #p<0.001; **p<0.001

Table 1: Show significant differences in anthropometric and metabolic variables between diabetic patients and control subjects Mean ± SD

Sex Hormones	Type 2 Diabetics Female	Control Female	T	*p*	Type 2 Diabetics Male	Control Male	T	*p*
LH (IU/L)	11.96 ± 1.34	15.21 ± 2.48	-1.14	0.26	12.00 ± 3.31	5.4 ± 0.62	-1.95	0.05
FSH (IU/L)	15.01 ± 1.90	14.46 ± 1.79	0.21	0.83	11.53 ± 3.54	5.17 ± 0.68	-1.76	0.08
E (pg/mL)	134.71 ± 25.21	130.89 ± 30.90	0.09	0.92	62.18 ± 4.74	67.12 ± 6.80	0.60	0.55
TT (ng/dL)	0.24 ± 0.06	0.38 ± 0.20	-0.69	0.49	4.73 ± 0.31	4.34 ± 0.22	-0.97	0.55
FT (pg/mL)	1.23 ± 0.23	1.52 ± 0.50	-0.53	0.59	44.32 ± 9.60	51.53 ± 5.30	0.66	0.51
DHS (ng/mL)	87.57 ± 11.28	102.35 ± 11.18	-0.93	0.36	146.6 ± 20.69	147.9 ± 18.30	0.045	0.96
SB (mg/dL)	63.55 ± 5.86	61.42 ± 6.71	0.24	0.81	50.52 ± 4.84	35.52 ± 3.64	-2.48	0.02

LH=Luteinizing Hormone; FSH=Follicle Stimulating Hormone; E=Estrogens; TT=Total Testosterone; FT=Free Testosterone; DHS=Dehydroepiandrosterone Sulfate Hormone; SB=Sex Hormone Binding Globulin; T=Student´s T test for Independent Samples

Table 2: Serum levels of sex hormones in diabetic patients and non-diabetic control subjects Mean ± SEM (Note that diabetic subjects had significantly higher levels of both LH and SHBG)

Although different investigators have demonstrated the relationship between obesity and psychological problems, there has not yet been any published data regarding the effects of obesity on the production of sex hormones, and the effects of these variables on the brains of diabetic patients. In this study we found that male subjects with higher BMI had lower levels of total testosterone. Testosterone also showed an inverse relationship with weight for non-diabetic males.

In type 2 diabetic males, a negative relationship was observed of waist to hip ratio with estrogen serum levels (p=0.002). However, in type 2 diabetic female subjects, total testosterone (p=0.001) and DHEA-SO_4 (p=0.01) showed a direct relationship with weight. So, it is important to clarify the role of weight, BMI and obesity in the production of androgens in female diabetic subjects and estrogens in the case of male diabetic subjects, and how these hormones levels affect the central nervous system.

Conclusion

In conclusion, the diabetic and non-diabetic females had an overall higher level of mood alteration than did the males from both groups. Diabetic males had higher scores of sleep alteration and non-specific symptoms of depression than did control males. The estrogen serum levels in female and free testosterone in males had

Type 2 Diabetic Females				Type 2 Diabetic Males			
Anxiety							
Estrogens	-0.46	-2.53	0.01				
TT	0.40	2.21	0.04				
Sleep Alterations							
TT	0.60	3.46	0.002				
ATS							
Estrogens	0.40	2.22	0.03				
SB	-0.38	-2.11	0.04				
Self-Esteem				***FENS***			
DHS	-0.52	-2.89	0.009	SB	0.49	2.72	0.01
Marital satisfaction				***Marital Satisfaction***			
DHS	-0.53	-2.80	0.008	TT	-0.39	-2.05	0.05
Non-Diabetic Females				**Non-Diabetic Males**			
Anxiety				***Anxiety***			
Estrogens	-0.45	-2.38	0.02	FT	- 0.66	- 4.18	<0.001
FENS				***FENS***			
Estrogens	-0.64	-3.22	0.004	FT	-0.48	-2.56	0.01
FSH	-0.40	-2.01	0.05	***NSSD***			
ATS				DHS	0.41	2.13	0.04
FT	-0.41	-2.35	0.02	***Sleep Alterations***			
Estrogens	0.40	2.31	0.03	SB	0.42	2.18	0.03
Self-Esteem				***Self-Esteem***			
FT	-0.39	-2.01	0.05	DHS	-0.47	-2.50	0.02
Marital Satisfaction				***Depression***			
DHS	-0.41	-2.14	0.04	FT	- 0.49	-3.14	0.005
FT	-0.48	-2.56	0.01	DHS	0.54	3.21	0.004
				TT	-0.46	-2.73	0.01

ATS=Attitudes Toward Sexuality; FENS=Feelings of Empty Nest Syndrome; NSSD=Non- Specific Symptoms of Depression; LH=Luteinizing Hormone; FSH=Follicle Stimulating Hormone; TT=Total Testosterone; FT=Free Testosterone; DHS=Dehydroepiandrosterone Sulfate Hormone; SB=Sex Hormone Binding Globulin

Table 3: Results of forward stepwise Multiple Regression Analysis for Diabetic and Non-Diabetic Female

inverse relationships to depression and anxiety. In both diabetic and non-diabetic females, DHEA-SO4 had an inverse relationship with marital satisfaction. More studies must be done to elucidate the role of sex hormones in mood alterations of both diabetic and non-diabetic subjects.

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