The Relation between Insomnia and Chronic Fatigue among a Non-Clinical Sample Using Questionnaires

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Objective: To examine the possible association between insomnia and chronic fatigue syndrome (CFS).
Method: A non-clinical sample of 450 volunteer Kuwaiti male and female college students was recruited. Their ages ranged from 18 to 39 years. They completed the Arabic Scale of Insomnia (ASI) and the Arabic Scale of CFS (ASCFS). Both have good reliability and validity.
Results: Women had significantly a higher mean score on the ASCFS than did their male counterparts. All the correlations between the 12 items of the ASI and the ASCFS total score were statistically significant ($p < 0.01$) in men and women. However, the correlations between the ASI items belonging to the factor of "Consequences of insomnia" were higher than those with the items belonging to the factor "Difficulty initiating and maintaining sleep". The multiple stepwise regression indicated that the best insomnia complaint to predict CFS was the item "My interrupted sleep affects my work performance". This item explained approximately 25% of variance in CFS scores.
Conclusion: Insomnia and CFS share specific common elements. Therefore, documenting the presence and degree of insomnia in the CFS population could contribute to a better understanding of CFS, and possibly, yield more effective treatment strategies. **(Sleep and Hypnosis 2009;11(1):9-17)**

Key words: Insomnia, Chronic Fatigue Syndrome (CFS), Arabic Scale of Insomnia (ASI), Arabic Scale of Chronic Fatigue Syndrome (ASCFS), Kuwait

INTRODUCTION

It may be true that every adult individual, in one period or the other in his or her life, suffers from fatigue. Certainly, fatigue is one of the most commonly reported experiences or complaints in the community, and it accompanies a variety of physical and psychiatric disorders. Typically, 20% to 40% of participants in the general population studies report feeling tired or fatigued all the time (1).

Using a sample of 1,000 primary practice patients, it was found that 67% of women and 45% of men reported fatigue in the past month (2). Of course, not all of them will meet the criteria for the disorder. Based on specific diagnostic criteria, intensity and duration, it is determined to be chronic

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fatigue syndrome (CFS) or not. CFS is now included as a psychiatric disorder in the ICD-10 as neurasthenia which bears resemblance to CFS (3). However, diagnosis of CFS is not formally found in the DSM-IV (4).

CFS is a functional debilitating disorder of unknown cause. It can impair activity of one's abilities to pursue daily life, and is characterized by unexplained persistent and relapsing daytime fatigue of greater than six month's duration in the absence of a clear physical or psychiatric etiology.

Wooten (5) stated that minor symptoms are variable in CFS and may include a low-grade fever, sore throat, painful lymph nodes, unexplained muscle weakness, myalgias, prolonged fatigue after exercise, headaches, arthrolgias, hypersomnolence, insomnia, emotional lability, and depression. Furthermore, Shneerson (6) noted that CFS is often associated with daytime fatigue and lack of energy, which is not relieved by sleep or rest and which is worsened by exercise. Memory, concentration and attention span deteriorate.

CFS has been conceptualized on a spectrum of stress-related, functional disorders characterized by profound fatigue, and also frequent pain, including fibromyalgia, temporomandibular disorders, irritable bowel syndrome (functional bowel disorder), and irritable bladder, among others (7). Unger et al (8) stated that the pathophysiology of CFS remains unknown and there are no diagnostic markers or characteristic physical signs or laboratory abnormalities. Therefore, CFS is considered as one of the medically unexplained physical symptoms. It is particularly noteworthy that Shneerson (6) has considered CFS as a cause of primary insomnia, among other causes.

Insomnia is the most commonly reported symptom or sleep problem in industrialized countries (7). The International Classification of Sleep Disorders (ICSD) (9) defined insomnia as difficulty in initiating or maintaining sleep. The term is employed ubiquitously to indicate any and all gradations and types of sleep loss.

Sleep difficulties have long been recognized in emotional disorders such as depression and anxiety disorders, as well as being associated with somatoform, personality, obsessive-compulsive, and posttraumatic stress disorders. Insomnia is also highly associated with major physical diseases/illnesses, e.g., musculoskeletal pain disorders such as rheumatoid arthritis and fibromyalgia, and cardiovascular, pulmonary, and renal conditions (7).

Poor sleep results in impaired performance, is a precursor to many injury accidents, impairs tissue healing, alters the immune system, and in some cases may herald early onset of psychiatric impairment, particularly major depression. Chronic sleep loss has such profound daytime personal, social, and economic consequences that it deserves consideration within most paradigms of the study of human health. Comparisons of subjects (Ss) with and without insomnia show that those with insomnia exhibit the following effects: excessive daytime sleepiness, slower physical reaction times, fewer job promotions, more likelihood of incurring traffic/occupational accidental injuries, at least two times more health care provider visits, poor attention, memory impairment, problem-solving abilities, reduced social stability, 10 times higher absentee rate days from work, higher number of medical problems, and higher hospitalization rates (7).

Several studies have reported a close relation between CFS and insomnia (10,11). Unrefreshing sleep is one of the concurrent symptoms in the case definition of CFS, generated through the Centers for Disease Control and Prevention and Fukuda et al's diagnostic criteria (12). Unrefreshing sleep is the most prevalent of the eight CFS case-defining symptoms. It has been endorsed by 88-95% of cases identified in population-based studies, and 70-80% of cases in clinic-

based studies. The CFS documents that 81.4% of the Ss have an abnormality in at least one sleep factor (8).

The inability to fall or stay asleep, inadequate sleep time, feeling unrested on rising, and sleepiness are among the most frequent complaints of CFS patients (13). They reported significantly more naps and waking up pain, a similar prevalence of difficulties in maintaining sleep, and significantly less difficulty getting off to sleep compared to depressed patients. Sleep continuity complaints preceded fatigue in only 20% of CFS patients. Disrupted sleep appears to complicate the course of CFS (14).

Ninety percent of 20 Ss with CFS reported sleep difficulties such as poor sleep, delayed sleep, difficulty staying asleep, and early awakenings (15). Fifty-three percent of 258 CFS Ss reported insomnia of long duration (> 10 years) (16). Some evidence suggests that individuals with CFS have fragmented sleep. They spent more time in bed trying to sleep, took longer to fall asleep, had more awake time after sleep onset, and therefore, had lower sleep efficiencies than healthy control Ss (7).

Gaitanis et al (17) studied physical activity, emotional stress, sleep disturbance, and daily fluctuations in chronic fatigue symptomatology. They found that sleep disturbance and emotional stress to be positively associated with levels of fatigue and symptomatology.

In fact, while fatigue is listed as a symptom 100% of the time in CFS Ss, difficulty in sleeping is estimated to occur in about 70% or even more, including sleep that is unrefreshing (18). Schaefer (19) found a significant positive correlation of 0.63 between fatigue and sleepiness in 13 patients with CFS, and 50 with fibromyalgia.

Furthermore, other sleep disorders were found in CFS patients. They had a very high incidence (58%) of previously undiagnosed primary sleep disorders such as sleep apnea / hypopnea syndrome and restless legs/periodic limb movement disorder. They also had very high rates of self-reported insomnia and non-restorating sleep (20). Moldofsky (21) reported that patients with CFS have delayed sleep onset latencies, reduced sleep efficiency, and alpha intrusion into sleep EEG. Multiple sleep latency testing often fails to reveal pathological sleepiness, despite the patient's complaints of excessive sleepiness.

At the theoretical level, Moldofsky (22,23) described a chronobiological theoretical model of CFS, fibromyalgia, irritable bowel syndrome, and temporomandibular joint disorder and its functional pathology whereby there is a disturbance in the sleeping-waking brain and its interrelationships with neurotransmitter, neuroendocrine thermal, and immune functions. He focused on the symptoms of non-restorative sleep, musculoskeletal pain, and fatigue. In a similar vein, Moldofsky (24) reviewed the epidemiologic, clinical, and experimental evidence that show how perturbations of the sleeping-waking brain are core to the understanding and rational management of the non-restorative sleep, musculoskeletal pain, fatigue, and psychological distress of patients with fibromyalgia syndrome, CFS, and related syndromes.

Apart from the self-rating scales, polysomnographic (PSG) data have failed to substantiate highly profound or consistent changes in physical sleep variables in people with CFS (7). The presence of some PSG anomalies were not limited to CFS patients, but shared with another diagnostic group and healthy controls (25). The discrepancy between the subjective and objective measures of insomnia suggest that CFS Ss suffer from an element of sleep-state misperception (13).

In recent years, research investigating CFS has intensified, and there is a growing body of research, including etiology, correlates and treatment, among others. However, scientific

studies of sleep specifically associated with CFS are sparse (7). It is particularly noteworthy that the vast majority of these studies were carried out on Western samples. Arabic studies regarding this endeavor are scarce (26-28). Therefore, the objective of the present study was to explore the association between insomnia and CFS –like symptoms in Kuwaiti College students.

METHOD

The Sample

A non-clinical sample of 450 volunteer Kuwaiti undergraduate men (n = 243) and women (n = 207) was recruited. Their ages ranged from 18 to 39 years. The mean age of the men was 20.5 years (SD = 2.6), while that for the women was 20.9 years (SD =1.6). The difference between the two means was significant ($t = 2.0$; $p < 0.05$).

It is worth noting that those undergraduates were neither disturbed clinical cases nor diagnosed institutionalized patients, and that none stated that they suffered from CFS or insomnia. Rather, they were young adults, and presumably healthy people in general. However, most of them had just CFS-like symptoms in different degrees. The same applied to the insomnia.

As pointed out by Rosen and Tallis (29), the choice of a non-clinical sample reduces the amount of general pathology. In their study on obsessive-compulsive disorder, they stated that "previous studies, by considering clinical populations and by not removing the effects of anxiety and depression, have therefore included considerable noise in their results" (p. 446). In the present study, since insomnia and CFS symptoms are prevalent in the general non-clinical population, it has been considered acceptable to regard these two variables as part of normal experience and, therefore, legitimate to study them in non-clinical populations as indicated by Rosen and Tallis (29). Based on the dimensional approach, the assumption in this respect depends on continuous, rather than discrete, variability in both insomnia and CFS.

In a similar vein, Shaver (7) stated that "Clinic-based samples increase the likelihood that subjects exhibit comorbid conditions, or are experiencing a higher degree of emotional suffering related to their condition compared with community based sample" (p. 296).

Measurement Instruments

(1) The Arabic Scale of Insomnia (ASI) (30-32) comprised 12 statements (see Table 2 below). Ss were requested to respond to each item on a 5-point scale as follows: 0: No, 1: A little, 2: Moderate, 3: Much, and 4: Very much. They were instructed to answer the ASI items according to their subjective evaluation, on the basis of their perceived severity during the past month. The total score can range from 0 to 48, and a high score denotes high insomnia. The ASI was translated into English and checked by several Ph.D. psychologists and linguists and the cross-language equivalence has been adequately demonstrated. Test-retest reliability ranged from 0.70 to 0.83, and the alpha ranged between 0.84 and 0.87, denoting good temporal stability and internal consistency. Criterion-related validity (2 criteria) ranged from 0.57 to 0.94, and the loadings of the ASI onto a general factor of insomnia ranged from 0.92 to 0.95, indicating good convergent and factorial validity. Two factors of the ASI were disclosed: Consequences of Insomnia, and Difficulty in Initiating and Maintaining Sleep. As stated by Buysse (33), the ASI has many strengths and specific shortcomings. It has the advantage of being short, easy to understand, and easy to score. He added that the ASI has good test-retest

reliability, internal consistency, and convergent and factorial validity.

(2) The Arabic Scale of Chronic Fatigue Syndrome (ASCFS) was developed by Abdel-Khalek and Al-Theeb (28). Based on both the previous measures and the experience of its authors, the item pool of the ASCFS was constructed. Seven Ph. D. staff members were requested to assess each item. The item-remainder correlation and the correlation with the World Health Organization diagnostic criteria of the CFS (3) yielded 20 items answered on a 5-point Likert format, anchored by 1=No and 5=Very much. The total score can range from 20 to 100, with higher scores denoting higher CFS. Its alpha reliability was 0.95, test-retest was 0.88, criterion-related validity (3 criteria) was greater than 0.5, and the factorial validity was greater than 0.81. The factor analysis of the ASCFS 20 items yielded two salient factors, i.e., General fatigue, and Physical fatigue. The ASCFS has two equivalent versions: Arabic and English.

Procedure

The ASI and the ASCFS were administered anonymously to small groups of undergraduates in a classroom setting, during regular university hours. All participants volunteered for the study after its purpose had been briefly explained, and assurances offered that anonymity would be maintained. The return rate was 100% for the sample. The Arabic versions of the scales were used.

Table 1. Means, standard deviations, and student t tests of the total scores on the ASI and ASCFS in men and women

Sample	N	ASI		ASCFS	
		M	SD	M	SD
Men	243	13.53	8.85	37.05	12.70
Women	207	15.17	9.78	41.77	13.92
t		1.86		3.76	
P		0.06		0.0001	

Note. ASI = The Arabic Scale of Insomnia.
ASCFS = The Arabic Scale of Chronic Fatigue Syndrome.

Statistical Analysis

The mean, standard deviation, and the student t test for the ASI and the ASCFS were computed. The Pearson correlations between the ASCFS total scores and both the ASI items and total score were computed. Multiple stepwise regression was also applied. SPSS was used (34).

RESULTS

Table 1 sets out the descriptive statistics of the total scale scores. Inspection of this table indicates that women had significantly higher mean score on the ASCFS than did their male counterparts ($t= 3.76$; $p < 0.0001$, 2-tailed). However, there was no significant difference between them on the ASI.

Table 2 presents the Pearson correlations between the ASI and the ASCFS. Reference to this table indicates that all the correlations were statistically significant ($p < 0.01$ and above) in men and women. The correlations between the individual items of the ASI and the ASCFS total score ranged from 0.219 to 0.463, and between 0.251 and 0.532 among men and women, respectively. As predicted, however, the correlations between the ASI and ASCFS total scores were higher, i.e., 0.596 and 0.562 among men and women, respectively. The highest correlations between the ASI and the ASCFS total score were with the item: "8-I normally wake up in a bad mood" among men, and with the item: "12 - My interrupted sleep affects my work performance" among women.

Table 3 sets out the results of the multiple stepwise regression with the CFS as the dependent variable. As can be seen from Table 3, the best predictor of CFS was tapped by the effects of insomnia on work; item number 12: "My interrupted sleep affects my work performance". This item explained

Table 2. The Pearson correlations (r) between the ASI items and the ASCFS total score in men (n=243), women (n=207) and the total sample

ASI Items	r with ASCFS		
	Men	Women	All
1. I find it difficult to get to sleep.	0.312	0.251	0.277
2. My sleep is interrupted and disturbed.	0.303	0.327	0.322
3. I wake up many times during my sleep.	0.275	0.371	0.336
4. I wake up early in the morning before getting enough sleep.	0.219	0.263	0.251
5. I feel depressed when it is time for me to go to bed.	0.429	0.264	0.340
6. Before I fall asleep I have bad thoughts.	0.439	0.334	0.390
7. I feel tired when I wake up.	0.441	0.499	0.465
8. I normally wake up in a bad mood.	0.463	0.464	0.460
9. I get tense when I wake up.	0.460	0.443	0.457
10. My interrupted sleep annoys me.	0.375	0.400	0.397
11. My interrupted sleep affects my relationship with others.	0.426	0.469	0.451
12. My interrupted sleep affects my work performance.	0.453	0.532	0.499
Total Score	0.596	0.562	0.583

All $p < .01$ and above.
See note in Table 1.

Table 3. Multiple stepwise regression for predicting CFS from insomnia items (N=450)

Variable	B	Beta	SE	p	R^2
12. My interrupted sleep affects my work performance.	2.92	0.238	0.615	0.0001	0.253
7. I feel tired when I wake up.	2.23	0.208	0.496	0.0001	0.086
6. Before I fall asleep I have bad thoughts.	1.61	0.151	0.448	0.0001	0.034
9. I get tense when I wake up.	1.93	0.157	0.564	0.001	0.020
11. My interrupted sleep affects my relationship with others.	1.40	0.111	0.635	0.028	0.007
Constant	27.31	0.000	0.900	0.0001	

F ratio=57.37, $p < 0.0001$.
$R^2 = 0.400$.

approximately 25% of the variance in CFS scores. Afterwards, the item number 7: "I feel tired when I wake up" explained 8.6% in CFS scores. Then, there were 3 items that could predict CFS, i.e., items number 6: "Before I fall asleep I had bad thoughts", number 9: "I get tense when I wake up", and 11: "My interrupted sleep affects my relationship with others". They added 3.4%, 2%, and 1% respectively.

DISCUSSION

The salient findings of the current study were that all the insomnia symptoms and complaints as well as the total score on the ASI have been significantly and positively associated with the CFS total scale score (see Table 2). This result was relevant to both men and women. These correlations ranged between 0.219 and 0.596 ($p < .01$ and above). Therefore, it is safe to conclude that there was a covariation between insomnia and CFS among the present sample of Arab undergraduates. This result could be seen as congruent with previous work on Western Ss (7,8,10,11,13-16).

Based on the covariation between insomnia and CFS, specific elements could be hypothesized to be shared by these disorders. Both are ego-dytonic, i.e., unacceptable to a person's ideal conception of self. Both insomnia and CFS interfere with the individual's normal routine, occupational functioning, and usual social activities or relationships with others. By and large, both could be highly disruptive to all functioning.

Shaver (7) stated that "sleep and stress are inextricably linked, but in ways that remain unclear. It has been postulated that high stress acts as a precursor or perpetuator of

CFS manifestations and those of potentially related conditions. Stress is known to interfere with sleep and the opposite; sleep disruption or loss is known to be stressful (emotionally arousing and physiologically activating)... Insomnia is likely to be manifested when individuals have a propensity toward a sustained hyperarousal (psychological/emotional) and activated (physiological) stress status. This style propensity may make certain individuals vulnerable to host defense system breakdowns manifested as CFS" (p. 298). For the most part, sleep complaints are either attributable to the lifestyle of CFS patients or seen as inherent to the underlying condition of CFS (14).

The Arabic scale of Insomnia (ASI) (30-32) consists of two factors, namely "Difficulty in initiating and maintaining sleep", and "Consequences of insomnia". Notwithstanding that all the items of these two factors were significantly and positively correlated with the ASCFS total score, it is particularly noteworthy that the highest three correlations between the ASCFS total score and the ASI individual items belonged to the factor "Consequences of insomnia" in men and women, i.e., the items number: "8 - I normally wake up in a bad mood", "9 - I get tense when I wake up", and "12 - My interrupted sleep affects my work performance" among men respectively. As for women, the highest three correlations between the ASCFS and the ASI were with the items: "12 - My interrupted sleep affects my work performance", "7 - I feel tired when I wake up", and "11 - My interrupted sleep affects my relationships with others" respectively.

Consistent with the aforementioned correlations were the results of the multiple stepwise regression (see Table 3). Item number 12: "My interrupted sleep affects my work performance" was the best ASI item to predict CFS. It explained approximately 25% of the variance in CFS scores. It is worth noting that four out of the five significant predictors of CFS scores came from the factor of "Consequences of insomnia" in the ASI. This result deserves closer scrutiny in a separate report.

Gender differences were significant in CFS as assessed with the ASCFS. That is, women obtained a higher mean score than did their male counterparts (see Table 1). This finding is consistent with several studies carried out with Western (35-37) and Arabic (26,27) Ss.

Specific limitations have to be acknowledged in the current investigation. Despite the large size of the sample (N = 450), the study results must be viewed within its special characteristics. It is a non-clinical sample. Ss just have insomnia - like and CFS - like symptoms. However, as noted in the sample section, the choice of a non-clinical sample reduces the amount of general pathology. This does not mean, of course, that there is no need to recruit clinical patients. It means only that both samples are sorely needed. Because Kuwait is an understudied population, an important next step would be to draw a CFS patient sample to test the CFS and insomnia relationship. This is a point for further investigation.

A salient implication of the present results is that Kuwaiti college students have some insomnia and CFS-like symptoms. A small portion of this sample may need psychological counseling or therapy. Clinicians dealing with CFS will find that sleep improvement should be a cardinal goal in managing CFS.

CONCLUSIONS

CFS is one of the medically unexplained physical conditions. It is an illness of unknown etiology and pathogenesis and is likely to involve an interaction between physiology, psychology and sociocultural factors. Notwithstanding the host of studies on CFS, the Arabic studies are scarce. The present results lend weight to the argument

that there is a statistically significant and positive correlation between insomnia and CFS among Arabic college students. This finding does mean a covariation between these two disorders.

In sum, clinical and empirical studies on CFS, using clinical and non-clinical, and Western and non-Western Ss, have indicated a significant association between insomnia and CFS. Therefore, the use of insomnia complaint as one of the diagnostic criteria of CFS is a legitimate determination. Furthermore, documenting the presence and nature of sleep disorders in the CFS population could contribute to a better understanding of CFS and possibly, yield more effective treatment strategies (8,20).

However, it is important to note that although sleep abnormalities may play a role in the etiology of CFS, they seem to be unlikely as an important cause of daytime fatigue in the majority of patients (15).

Sex-related differences in CFS were significant in favor of women in the present study, which is consistent with previous findings (35-37). All the 12 ASI items were significantly correlated with the ASCFS total score. This result adds evidence to the content validity of both Arabic scales. The possible added value of knowing the association between insomnia and CFS may lie in the psychotherapeutic procedure. That is, treating insomnia may ameliorate CFS symptoms, and vice versa.

REFERENCES

1. *Lewis G, Wessely S. The epidemiology of fatigue: more questions than answers. J Epidem Comm Health 1992; 46: 92-7.*
2. *Kroenke K. Gender differences in the reporting of physical and somatoform symptoms. Psychosom Med 1998; 60: 150-5.*
3. *World Health Organization. The ICD-10 classification of mental and behavioral disorders: diagnostic criteria for research. Geneva: WHO 1993.*
4. *American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4th ed. Washington DC: APA 1994.*
5. *Wooten V. Medical causes of insomnia. In Kryger MH, Roth T & Dement W, eds. Principles and practice of sleep medicine, 2nd ed., Philadelphia: WB Saunders, 1994: 509-22.*
6. *Shneerson JM. Sleep medicine: guide to sleep and its disorders, 2nd ed., Oxford: Blackwell, 2005.*
7. *Shaver JL. Sleep disorders. In Jason LA, Fennell PA, Taylor RR, eds., Handbook of chronic fatigue syndrome. New York: Wiley 2003: 281-303.*
8. *Unger ER, Nisenbaum R, Moldofsky H, Cesta A, Samnut C, Reyes M, Reeves WC. Sleep assessment in a population-based study of chronic fatigue syndrome. B M C Neurology 2004; 19: 1-9.*
9. *American Academy of Sleep Medicine. The International Classification of Sleep Disorders, Revised. Diagnostic and Coding Manual. Westchester, IL: American Academy of Sleep Medicine, 2005.*
10. *Smith A, Pollock J, Thomas M, Llewelyn M et al. The relationship between subjective ratings of sleep and mental functioning in healthy subjects and patients with chronic fatigue syndrome. Human psychopharma: Clin & Exper 1996; 11: 161-7.*
11. *Krupp L, Jandorf L, Coyle PK, Mendelson WB. Sleep disturbance in chronic fatigue syndrome. J Psychosom Res 1993; 37: 325-31.*
12. *Fukuda K, Straus SE, Hickie I, Sharpe MC, Dobbins JG, Komaroff A. The chronic fatigue syndrome: a comprehensive approach to its definition and study. International Chronic Fatigue Syndrome Case definition Study Group. Ann Intern Med 1994; 121: 953-9.*
13. *Watson NF, Kapur V, Arguelles L M, Goldberg J, Schmidt DF, Armitage R, Buchwald D. Comparison of subjective and objective measures of insomnia in monozygotic twins discordant for chronic fatigue syndrome. Sleep 2003; 26: 324-8.*
14. *Morriss RK, Wearden AJ, Battersby L. The relation of sleep difficulties to fatigue, mood and disability in chronic fatigue syndrome. J Psychosom Res 1997; 42: 597-605.*
15. *Sharpley A, Clements A, Hawton K, Sharpe M. Do patients with "pure" chronic fatigue syndrome (neurasthenia) have abnormal sleep? Psychosom Med 1997; 59: 592-6.*
16. *Friedberg F, Dechene L, McKenzie M, Fontanetta R. Symptom patterns in long-duration chronic fatigue syndrome. J Psychosom Res 2000; 48: 59-68.*
17. *Gaitanis P, Tooley G, Edwards B. Physical activity, emotional stress, sleep disturbances, and daily fluctuations in chronic fatigue symptomatology. J Appl Biobehav Res 2005; 10: 69-82.*
18. *Lashley F. A review of sleep in selected immune and autoimmune disorders. Holist Nurs Pract 2003; 17: 65-80.*
19. *Schaefer KM. Sleep disturbances and fatigue in women with fibromyalgia and chronic fatigue syndrome. J Obstet Gynecol Neonatal Nurs 1995; 24: 229-33.*

20. *Fossey M, Libman E, Bailes S, Baltzan M, Schondorf R, Amsel R, Fichten CS. Sleep quality and psychological adjustment in chronic fatigue syndrome. J Behav Med 2004; 27: 581-605.*

21. *Moldofsky H. Non-restorative sleep and symptoms after a febrile illness in patients with fibrositis and chronic fatigue syndrome. J Rheumatol 1989; 16 (suppl 19): 150-3.*

22. *Moldofsky H. Sleep, wakefulness, neuroendocrine and immune function in fibromyalgia and chronic fatigue syndrome. J Musculoskeletal Pain 1995; 3: 75-9.*

23. *Moldofsky H. Non-restorative sleep, musculoskeletal pain, fatigue, and psychological distress in chronic fatigue syndrome, fibromyalgia, irritable bowel syndrome, temporal mandibular joint dysfunction disorders. In Yehuda S & Mostofsky DI, eds. Chronic fatigue syndrome, New York: Plenum 1997: 95-117.*

24. *Moldofsky H. Role of the sleeping / waking brain in the pathogenesis of fibromyalgia, chronic fatigue syndrome, and related disorders. Primary Psychiat 2006; 13: 52-8.*

25. *Fischler B, Le Bon O, Hoffman G, Cluydts et al. Sleep anomalies in the chronic fatigue syndrome: A comorbidity study. Neuropsychobiology 1997; 35: 115-22.*

26. *Abdel-Khalek AM. Chronic fatigue syndrome and its association with obsession compulsion among a non-clinical sample using questionnaires. J Chronic Fatigue Syndrome 2007, 14: 89-100.*

27. *Al-Theeb SA, Abdel-Khalek AM. Chronic fatigue syndrome and its relationship to anxiety and depression among a sample of Kuwait University students. Derasat Nafseyah [Psychol Studies] 2006; 16: 113-35 (in Arabic).*

28. *Abdel-Khalek AM, Al-Theeb SA. The construction and validation of the Arabic Scale of Chronic Fatigue Syndrome. Derasat Nafseyah [Psychol Studies] 2006; 16: 525-36 (in Arabic).*

29. *Rosen KV, Tallis F. Investigation into the relationship between personality traits and OCD. Behav Res Ther 1995; 33: 445-50.*

30. *Abdel-Khalek AM. Prevalence of reported insomnia and its consequences in a survey of 5,044 adolescents in Kuwait. Sleep 2004; 27: 726-31.*

31. *Abdel-Khalek AM. Prevalence of insomnia complaints and its consequences in Kuwaiti college students. Sleep and Hypnosis 2006; 8: 54-60.*

32. *Abdel-Khalek AM. The development and validation of the Arabic Scale of Insomnia (ASI). Sleep and Hypnosis 2008; 10: 3-10.*

33. *Buysse DJ. Assessing insomnia in epidemiological studies: What do we need? Sleep and Hypnosis 2008; 10: 1-2.*

34. *SPSS, Inc. SPSS: Statistical Data Analysis. Chicago: SPSS 1990.*

35. *Afari N, Buchwald D. Chronic fatigue syndrome: a review. Am J Psychiatry 2003; 160: 221-36.*

36. *Bailly L. Chronic fatigue syndrome or neurasthenia? Brit J Psychiatry 2002; 181: 350-1.*

37. *Sharpe M, Wilks D. Fatigue. Brit Med J 2002; 325: 480-4.*