

# The Influence of Benson Relaxation on Oxidative Stress Marker of Premenstrual Syndrome in Students of Khoy University of Medical Sciences

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## Abstract

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**BACKGROUND:** Premenstrual syndrome (PMS) is a common painful disorder in females. The use of Benson's relaxation technique with a focus on sensations affects a range of physical and mental symptoms, reduces stress, and subsequently leads to changes in oxidative stress indexes.

**AIM:** The present study aimed to determine the impact of Benson's relaxation technique on oxidative stress indexes of premenstrual syndrome in students in Khoy University of Medical Sciences.

**METHODS:** A quasi-experimental design with intervention and control groups was used in this study. The female nursing students at Khoy University of Medical Sciences were selected by convenience and were assigned by the simple random method to control and intervention groups, each of which with 30 samples. The data collection tool was a three-part questionnaire and a checklist for recording values. Data collection was done at two stages of before and after intervention on days 21 to 28 and the third day of menstruation by distributing questionnaires and a blood sampling. The Mean, standard deviation, frequency and percentage using descriptive statistics and Inferential statistically were utilised to analyse data through paired T-test, independent T-test, and Chi-square tests in addition to analysis of relations by using SPSS V25 at the p-value < 0.05.

**RESULTS:** According to the findings, most of the samples were single (90%), native (61.6%) and had PMS symptoms (83.3%). The participants' mean age was  $21 \pm 1.5$  years, and most of them had physical symptoms of headache, fatigue, behavioural symptoms of nervous tension and mood swing. The results indicated a significant difference between control and intervention groups in malondialdehyde2 (MDA2) and Total Antioxidant Capacity2 (TAC2) ( $p = 0.001$ ). The within-groups comparison indicated a statistically significant difference between the total MDA index with a mean difference of 0.126 and TAC index (-.122) of the intervention group ( $p = 0.001$ ).

**CONCLUSION:** The research results emphasised the importance of using Benson's relaxation techniques as an alternative medicine on the variability of levels oxidative stress markers and Consequently for reducing physical and mental symptoms.

## Introduction

The menstrual cycle is an important sign of proper function of the reproductive system in adult females, but sometimes this phenomenon is associated with painful symptoms that cause physical and psychological problems for women. This complex of physical, psychological and emotional symptoms, which occur periodically in the premenstrual period and disappear at the onset of the menstrual cycle, is called the premenstrual syndrome (PMS) [1]. PMS is a widely common menstrual disorder that occurs due to disorder in female sex hormones in the luteal

phase; and most females experience PMS symptoms [2], [3], [4]. The American College of Obstetricians and Gynecological Disease's Symptoms for premenstrual syndrome include at least an emotional symptom and a physical symptom that occur before menstruation, and their symptoms are improved after the onset of the period without any medication intervention [5], [6], [7]. The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) Criteria for the premenstrual syndrome mainly focuses on mood problems, thereby increasing functional impairment [5], [8]. The precise outbreak of PMS is unclear. About 70-90 percent of women are estimated to experience symptoms of premenstrual syndrome [4], [9], [10]. In a

study by Malmier et al., (2013) the prevalence of this syndrome was in Europe (21%), Africa (31%), Asia (22%) and South America (21%) [11]. According to conducted studies in Iran, the prevalence of premenstrual syndrome ranges was 42.2-82.5% among students [12]. In a study by Nourani (2009) in Tehran, it was determined that 65.5% of students had this syndrome [13].

Oxidative stress indices are involved in the pathogenesis of many diseases. Oxidative stress and antioxidant imbalance play major roles in the outbreak and development of various diseases. Since cell membranes generally consisted of saturated fats, the uncontrolled lipid peroxidation can cause cell damage and death through damage to DNA and direct inhibition of proteins [14], [15]. In this regard, MDA is the most important biological lipid peroxidation index in which free radicals damage cell membranes, and thus the MDA is created due to the lipid peroxidation. Unlike other free radicals, MDA is relatively stable and able to release inside or outside the cell and even access tissues far from the oxidation [3], [14], [16].

Premenstrual syndrome is associated with several stressors [17]. Therefore, it is important to study whether Created stress causes Oxidative damage. According to an overview of studies, there is not sufficient information about the oxidative and antioxidant status in people with PMS. PMS has a wide range of physical and mental problems, and depression and anxiety are the most common psychological problems [18], [19]. Contradictory findings have been provided about levels of oxidative stress markers in women with PMS. Some studies found that concentration of MDA, as an oxidative stress index, significantly increased in plasma of depression patients [20], [21], [22]. In a study by Duvan, a significant decrease from total antioxidant capacity was seen in depressed patients [23]. Some studies found that TAC decreased on the 21st day of the menstrual cycle, while the oxidation level increased in patients with PMS and the level of TAC was lower in the menstruation and luteal phase than the follicular phase in patients with the PMS [24].

Relaxation techniques can be utilised to control the physical and behavioural symptoms of premenstrual syndrome [25]. The relaxation methods, which are new techniques and the core of anxiety and stress treatment, refer to the establishment of a general relaxation state that is opposed to stimulating states like anxiety [26], [27]. Relaxation is done in many ways. In this regard, Benson's muscle relaxation method is more useful because it does not require special equipment, is cost-effective, easy to learn and can be applied in all age groups [28], [29]. Benson's relaxation is a non-invasive and non-pharmacological effective treatment for reducing anxiety levels and improving conditions of patients with PMS [11], [29]. Teymouri et al. (2015) found that Benson's relaxation significantly decreased the level of apparent anxiety in patients undergoing cardiac surgery [11]. Despite a

great number of studies on oxidative states in psychiatric disorders, few studies have been conducted to measure oxidant and antioxidant indices in patients with PMS and the impact of Benson's relaxation on these indices. Therefore, the present study aimed to determine serum levels of MDA as lipid peroxidation and antioxidant capacity index in nursing students with premenstrual syndrome and the impact of Benson's relaxation on changes in the indices.

## Material and Methods

A quasi-experimental design with intervention and control groups was used in this study. At the first stage, personal and social data of samples was recorded and measured using a standard questionnaire by Abraham and Taylor (1990) containing 17 symptoms (11 behavioral and 6 physical signs) [30]. According to the American College of Obstetricians and Gynecologists (ACOG), diagnostic criteria of PMS include at least an emotional sign and a physical sign that occur before the menstruation and are improved after the onset of the period without any pharmacological intervention [6]. The sample size was obtained equal to 30 for each group according to the research by Duvan et al., (2011) at the power = 0.80, alpha = 0.05 and effect size = 0.65 [23]. The research was conducted after obtaining permission from the Ethics Committee of faculty with the code number of IR.UMSU.REC.2018.17.

The selection criteria for each subject were as follows: age range of 18-25 years; a menstruation cycle between 21-35 days and not varies more than 4 days; not the past or present diagnosis of psychiatric illness; no history of practising a Benson relaxation technique within the past 6 months and no prescription medication use. Any subject who failed to meet each of these criteria was excluded from the study.

Among participants with PMS, the present research investigated 60 female students after receiving their informed consent concerning the inclusion criteria, such as being interested in participating in research and non-use of other methods of pharmacological and non-pharmacological treatment by a random allocation in experimental and control groups in Khoy University of Medical Sciences. Amounts of oxidative indices were recorded in intervention and control groups with blood sampling without relaxation technique on days 21 to 28 after the menstruation, and after applying Benson's relaxation in the experimental group on the third day after menstruation. To this end, venous blood samples were taken from all participants for the measurement of MDA activity and total antioxidant capacity. After centrifugation and serum isolation of serum, samples

were kept at -20°C until the analysis. The spectrophotometry was used to measure the amount of MDA of serum samples. Instructions of a standard lipid peroxidation measurement kit Nalondi™ made in Navand Salamat Company of Urmia were used to measure malondialdehyde. Afterwards, an estimate of the potential content of different antioxidants, which interacted with each other, was obtained by measuring TAC. The TAC of serum samples was done using a spectrophotometry model according to instructions of Naxifer™ kit for antioxidant capacity of biomolecules based on the Ferric reducing antioxidant power (FRAP) and also the Single-electron-transfer (SET) mechanism. The relaxation method was used after taking a blood sample from two groups before the intervention for the experimental group. According to Benson's relaxation method, the students were placed in the best position where they felt relaxed, and they closed their eyes. In this situation, she would choose words that always reminded her of relaxation and started to breathe deeply through nose and exhalation through the mouth with repeated those words in mind. At the same time, they relaxed muscles from the tip of toes, continued to Upper limb muscles to achieve full expansion of muscles. The program was done twice a day for 20 minutes. The data collection tool was a three-part questionnaire: The first part included demographic and anthropometric questions; the second part was related to questions of physical, emotional and behavioural symptoms of premenstrual syndrome with 17 items on a 0-4 point Likert scale; the 5-option Likert scale and in the third part was recorded values of oxidation stress indexes, lipid oxidation, and total antioxidant capacity. The recorded raw data in forms were coded and entered into SPSS 25. Data analysis was performed through descriptive statistics (frequency, percentage, mean and standard deviation) and inferential statistics (paired t-tests, independent t-tests and Chi-square) at a significance level of  $P < 0.05$  and Kolmogorov-Smirnov test was utilised to determine the normal distribution.

## Results

Most of the participants were single (90%), native (61.6%), had PMS symptoms (83.3%) and medium family income (76.7%). The research results indicated that the mean age of participants was  $21 \pm 1.5$  years, and they had a mean BMI of  $22.58 \pm 2.60$ . The two groups were almost identical in terms of the distribution of a qualitative and quantitative variable, and there was no statistically significant difference between control and intervention groups (Table 1) indicating the consistency of groups.

**Table 1: Demographic and Anthropometric Characteristics of the Studied Groups n: 60**

Groups Frequency Variables	Intervention n: 30		Control n: 30		P-value	
	NO (%)		NO (%)			
Marriage	Married	2 (6.7)	4 (13.3)		0.389	
	Single	28 (93.3)	26 (86.7)			
Habitat	Native	12 (40)	11 (36.7)		0.791	
	Non-Native	18 (60)	19 (63.3)			
Menorah	Yes	4 (13.3)	6 (20)		0.488	
	No	26 (86.7)	24 (80)			
semester	2	13 (65)	7 (35)		0.037	
	4	7 (41.2)	10 (58.8)			
	6	8 (38.1)	13 (61.9)			
	8	2 (100)	0 (0)			
Groups Statistical Indicator Variables	Intervention Mean $\pm$ SD <sup>1</sup>		Control Mean $\pm$ SD		F	P-value
Age	21 $\pm$ 1.49		20.70 $\pm$ 2.23		1.27	0.542
Height (cm)	163.03 $\pm$ 4.92		164.23 $\pm$ 4.53		0.36	0.330
Weight (Kg)	59.93 $\pm$ 6.64		61.13 $\pm$ 9.71		2.32	0.578
BMI (kg/m <sup>2</sup> )	22.58 $\pm$ 2.60		22.64 $\pm$ 3.24		0.04	0.940
Average score	16.40 $\pm$ 89		16.23 $\pm$ 1.02		1.75	0.483

<sup>1</sup>Standard Deviation.

According to the findings of this research, most participants had physical symptoms of headache and subsequent fatigue. In behavioural symptoms, most participants had experienced nervous tension and mood swing (Table 2).

**Table 2: Ranking, intensity symptom and sign of PMS of the studied groups n: 60**

Statistical Indicator Symptom & sign PMS	Mean $\pm$ SD	Ranking
Headache	2.62 $\pm$ 0.783	1
Palpitation	1.33 $\pm$ 0.629	17
Over Wight	1.53 $\pm$ 0.812	14
Physical Fatigue	2.57 $\pm$ 0.909	2
Mastalgia	2.03 $\pm$ 1.057	7
Weaknesses	1.95 $\pm$ 0.891	9
Nervous tension	2.37 $\pm$ 0.938	3
Anxiety	2.20 $\pm$ 0.988	5
Irritability	1.98 $\pm$ 1.049	8
Crying	1.68 $\pm$ 0.911	11
Mood change	2.25 $\pm$ 0.895	4
Behavioral Desir to consume sweets	2.13 $\pm$ 1.112	6
Dizziness	1.45 $\pm$ 0.699	16
Insomnia	1.65 $\pm$ 0.860	12
Increased appetite	1.60 $\pm$ 0.924	13
Forgetfulness	1.48 $\pm$ 0.873	15
Depression	1.90 $\pm$ 0.951	10

Findings of the research indicated that there was a significant difference between control and intervention groups in the MDA2 and the TAC2 index's ( $p = 0.001$ ) (Table 3).

**Table 3: Mean, standard deviation and t-test analysis between a group of oxidative parameters**

Group Statistical Indicator Variables	Intervention n: 30		Control n: 30		F	P-Value
	Mean	SD	Mean	SD		
MDA1	0.98	0.12	0.96	0.148	0.28	0.492
MDA2	1.04	0.11	0.86	0.21	8.67	0.001
TAC1	1.02	0.35	1.01	0.40	0.40	0.566
TAC2	1.14	0.18	0.96	0.06	29.42	0.001

According to the within-group comparison, there was a significant difference ( $p = 0.006$ ) in the total MDA index with a mean difference of 0.126. In the within-group comparison of the intervention group, there was a significant difference in the TAC index with a mean difference of -0.122 ( $p = 0.001$ ) (Table 4).

**Table 4: Mean, standard deviation and t-test analysis within a group of oxidative parameters**

Stage Statistical Indicator Variables	Pre (28day) MDA1-TAC		Post (3day) MDA2-TAC		Differ ence	t	P-value	
	Mean	SD	Mean	SD				
Intervention	MDA	.983	.12	.86	.21	.13	2.94	.006
	TAC	1.02	.04	1.14	.18	-.12	-3.86	.001
Control	MDA	.98	.15	1.01	.11	-.03	-2.89	.512
	TAC	1.01	.04	1.05	.06	-.04	4.59	.413

## Discussion

The present study aimed to investigate the impact of Benson's relaxation on oxidative stress indices in nursing students suffering from PMS at Khoy Faculty of Medical Sciences. The research findings indicated that most of the students had physical and psychological symptoms and a high prevalence of PMS symptoms. Bastani et al. (2017) found that about one-third of studied students had PMS symptoms in Bushehr Province [29]. Nourani also found that 65.5% of students suffered from PMS in Tehran [13]. The results were consistent with the findings of the present study.

There are contradictory reports on changes in lipid peroxidation and total antioxidant index in patients with premenstrual syndrome [31]. Results of the present study indicated that there was a significant difference between oxidative stress indices and psychological and physical symptoms among students with PMS under the influence of Benson relaxation compared to the control group. Mental and physical exercises, which cause a relaxed response, have been used to prevent and treat various diseases throughout the world. In a study by Astin et al., (2003) the exercises reduced energy consumption, psychosocial pressure and increased Nitric oxide, and it was believed that the exercises were the opposite of response to stress [32]. Serum levels of MDA and TAC were examined in a case-control study on 20 individuals with PMS and 21 ones in the control group. The Results of this study indicated higher levels of MDA and reduction of TAC in the intervention group compared to the control group on the 21st day of the menstruation. Therefore, increasing the antioxidant level and reducing total antioxidant capacity may occur in PMS, which may be the cause or consequence of different stress symptoms in PMS. The findings of this study were consistent with the results of the reviewed study. In this study the impact of Benson's relaxation on the oxidative stress index of MDA and TAC has been analysed, the research findings indicated a lower amount of MDA and a significant increase in total antioxidant level in the intervention group. The higher total antioxidant in the intervention group indicated that high levels of antioxidants led to the reduced activity of released radicals, which in turn reduces the damage caused by the lipid peroxidase products. Based on the results of this study the changes in MDA level reflected the

effects of free radicals and abnormalities in the body so that the toxicity of free radicals could be a contributing factor or the cause of the disorder. Oxidative stress using reactive oxygen species can lead to cell/tissue damage and eventually, death. Harmful effects of pro-oxidants vary considerably by age, physiological status, and diet of different organisms [33].

Tuladhar (2010) investigated the effect of oxidative stress on premenstrual syndrome in women aged 20-40 years with PMS and indicated that symptoms of PMS could decrease by controlling and reducing factors affecting the oxidative stress [28] also results of a research by Kara et al., (2012) indicated a significant difference in oxidative levels in patients with anxiety [34]. Regarding the effect of stress and anxiety on oxidative stress, it is concluded that non-pharmacological methods are effective on oxidative stress by investigating the effects of relaxation methods on reducing anxiety [10]. Results of the present study indicated that Benson's relaxation method decreased oxidative level and increased antioxidant activity in studied students. In this regard, Lotfi et al., (2007) found that muscular relaxation training has a significant effect on the reduction of psychological and physical symptoms of premenstrual syndrome [35] Mohammad Abbasi et al., (2017) also conducted a study on the effectiveness of Benson's relaxation method on stress reduction [36]. It was found that the use of relaxation supplements could be effective in reducing stress in patients. Furthermore, the results of research by Mirzaei et al. (2012) indicated that cognitive-behavioural stress management training was effective in reducing psychological problems and premenstrual syndrome symptoms [37]. The Results of the above studies confirmed the findings of the present study.

In conclusion, relaxation responses are clinically effective for relieving symptoms in a variety of stress-related disorders, such as PMS. Benson's relaxation was accompanied by a decrease in oxidant factors and a decrease in free radicals and an increase in total antioxidant capacity. These changes partially reduced the negative effects of stress and reduced mental and physical symptoms in people with premenstrual syndrome. The result of the study emphasised the importance and effects of Benson relaxation as a complementary therapeutic program on oxidative marker levels and thus the reduction of physical and psychological symptoms in people with PMS.

## Ethics

The research was conducted after obtaining permission from the Ethics Committee of faculty with the code number of IR.UMSU.REC.2018.17.

## Human and Animal Rights

Among participants with PMS, the present research investigated 60 female students after receiving their informed consent concerning the inclusion criteria, such as being interested in participating in research and non-use of other methods of pharmacological and non-pharmacological treatment by a random allocation in experimental and control groups in Khoy University of Medical Sciences.

## Consent for Publication

Informed and written consent was obtained from all the subjects.

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