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RESEARCH ARTICLE

ELECTROCARDIOGRAM PATTERN IN FEMALES SUFFERING FROM PREMENSTRUAL SYNDROME.

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Key words:-
Females; Premenstrual syndrome; ECG pattern; heart rate; Irritability; Depression; Headache; Constipation.

Abstract

Background: Premenstrual syndrome (PMS) is a common but ill understood condition and has significant impact on the quality of life of the females. In attempted to increase the understanding of this condition. **The aim of the work** was to find out whether there is an identifiable ECG pattern during the premenstrual period in females suffering from PMS. **Methods:** 44 female in the reproductive age were selected. A twelve lead ECG (ELI 100) was used to make recordings for each subject twice for one month, once before the menstrual bleeding started and the other after the menstrual bleeding stopped. Height and Weight also was obtained, fill a questioner that included personal information such as: age, age of menarche, date of the last menstrual bleeding. According to symptoms the forty four students were subdivided into two main groups. The first group was the PMS group (34 subjects) and the second group was the control group (10 subjects). **Results:** Findings showed a statistically non significant difference in the mean heart rate in the pre-menstrual phase between the two groups. Irritability was the most common symptom of PMS, found in 94% of the subjects, depression and emotional liability in 79%, bloating in 50%, headache and decreased ability to concentrate in 38%, constipation in 32% and finally edema in 15% of the subjects. **In conclusion** there was no significant change in the heart rate as recorded on the ECG during the premenstrual period among subjects with PMS. There is no specific ECG pattern which can be identified during the PMS.

Introduction:-

Women of reproductive age sometimes suffer from symptoms during the late luteal phase of their menstrual cycle, and these complaints are collectively termed premenstrual syndrome .The premenstrual syndrome (PMS) is a combination of mental and physical symptoms that arise in the luteal phase of the menstrual cycle. After the onset of menstruation, the symptoms disappear. Nearly 300 different symptoms have been reported and, for most women,

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these symptoms are self-limited. However 15% of women with PMS have symptoms so severe that it requires medical intervention. [1]

PMS is a common (prevalence rate 3-30 %) [2][3] but ill understood condition as regards its etiology, diagnosis and treatment, which has significant impact on the quality of life of the females. This study has attempted to increase the understanding of this condition. It aimed to identify a specific ECG pattern during the PMS.

Previous studies have identified higher resting heart rate due to decreased parasympathetic and increased sympathetic activity during the pre menstrual phase among females with Premenstrual syndrome.[4,5] Asessment of the prevalence of PMS among female medical students in Al-Ahsa, Saudi Arabia was done by a study.PMS was diagnosed in 35.6% of the cases.[6] A study hypothesized that there are core symptoms that discriminate PMS women from non PMS women. The study concluded that there are six core symptoms that discriminate PMS women from non PMS women. These symptoms are mood swings, anxiety, aches, cramps, decreased interest in activities and food cravings.[7]

A relationship between PMS and hypertension has been suggested by a study. Four hundred and forty seven subjects were included in the study.61% of these subjects have met the criteria of PMS. There was an increase in systolic and diastolic blood pressure in the early luteal phase of women with PMS. The study concluded that PMS might predict hypertension in the future of currently normotensive females. [8]

Another study compared a group of PMS with a group of healthy controls who had no PMS. Measurements of basal heart rate, systolic and diastolic blood pressure, respiratory rate and peripheral temperature were taken. The subjects the performed the 61 point relaxation technique. The parameters were then rerecorded .The study concluded that the 61 point relaxation technique reduced the sympathetic activity and reduced the high basal sympathetic tone in the PMS subjects due to stress. [9]

The hypotheses of finding an increase in heart rate and decrease in the PR interval during premenstrual syndrome due to decreased parasympathetic activity and altered autonomic function.

The aim of the work was to find out whether there is an identifiable ECG (electrocardiogram) pattern during the premenstrual period in females suffering from Premenstrual syndrome (PMS), which could help to understand PMS better.

Study design and subjects:-

The study was done in the research lab of physiology department, faculty of medicine, King Abdul-Aziz University. 44 female in the reproductive age were selected. All volunteers were consented. Subjects with psychiatric, mental diseases and epilepsies were not included in the study. A twelve lead ECG (ELI 100) was used to make recordings for each subject twice for one month, once before the menstrual bleeding started and the other after the menstrual bleeding stopped. ECG is the record of fluctuation potential that represents the algebraic sum of the action potentials of the myocardial fibers can be recorded from the surface of the body during the cardiac cycle.

An announcement was made in King Abdul-Aziz university inviting volunteers to participate. Before recording physical measurements were obtained from each volunteer including: height and Weight.

Each subject was asked to fill a questioner that included personal information such as: age, age of menarche, date of the last menstrual bleeding, marital state, history of child birth (if the subject is married), medications that are taken for PMS (if there are any) and symptoms of PMS that the subject suffers from.

Each subject was asked to sign a consent form that was approved by the human ethical committee. According to symptoms the forty four students were subdivided into two main groups. The first group was the PMS group (34 subjects) and the second group was the control group (10 subjects). The number of subjects in this study was justified based on sample size calculation (calculation of power). Electrodes Standard position: limb; R arm; L arm; R leg(earth); L leg healthy volunteers were divided into two groups (PMS- pre-menstrual symptoms and NPMS-without pre-menstrual symptoms) of 32 volunteers each (n=32). The heart rate was measured (among other variables) in the Pre-menstrual, menstrual, post-menstrual and ovulatory phases. Findings showed a statistically significant difference in the mean heart rate in the pre-menstrual phase between the two groups.

The following table reproduced from the study shows a standard deviation (roughly equal in both groups) of about 7 in the Premenstrual phase. The difference in the mean heart rate between the two groups is about 6.

	Premenstrual	Menstrual	Postmenstrual	Ovulatory
PMS	90.91 (7.11)	89.53 (5.91)	81.75 (7.26)	89.03 (7.13)
NPMS	85.28 (7.01)	87.34 (7.53)	83.78 (7.09)	85.84 (9.46)

Results and Discussion:-

Table 1:-Various parameters obtained from the PMS Group.

	Heart rate (pre menstrual)	PR interval (pre menstrual)	Heart rate (post menstrual)	PR interval (post menstrual)	Height in cm	weight	age	Age of menarche
1	80	0.136	69.767	0.154	158	48	25	15
2	75.949	0.136	63.821	0.138	158	89	22	12
3	54.05	0.134	71.428	0.154	164	53	22	14
4	66.67	0.122	67.416	0.128	163	62	22	14
5	95.238	0.14	78.947	0.148	160	52.5	22	12
6	88.235	0.142	76.923	0.132	163	55	20	13
7	61.856	0.14	52.632	0.134	158	47	26	16
8	83.333	0.132	89.552	0.16	156	56	20	14
9	92.308	0.176	75.949	0.166	155	68.4	19	13
10	78.947	0.146	89.552	0.146	164	72	32	15
11	89.552	0.138	90.909	0.154	147	38.4	23	15
12	85.714	0.172	75.949	0.18	165	75	20	12
13	88.235	0.154	83.333	0.144	152	51	20	13
14	68.182	0.134	65.217	0.08	155	43	21	15
15	78.947	0.124	67.416	0.12	163	50	20	12
16	69.767	0.114	75	0.12	158	48	20	12
17	75.949	0.12	71.428	0.164	153	53	23	12
18	93.75	0.198	71.429	0.192	158	47.5	19	13
19	84.507	0.13	56.604	0.136	165	100	20	12
20	95.238	0.13	78.947	0.12	155	75	21	12
21	70.588	0.148	76.923	0.148	154	46	21	12
22	68.965	0.136	85.714	0.12	150	65	20	13
23	88.235	0.132	84.507	0.128	160	75.8	21	13
24	67.416	0.122	81.081	0.118	161	64	21	13
25	70.588	0.12	83.333	0.154	170	64	20	13
26	89.552	0.16	78.947	0.138	168.5	72.4	21	11
27	65.217	0.114	57.143	0.1	165	54	22	13
28	75	0.156	81.081	0.174	156	61	21	14
29	78.947	0.174	65.217	0.17	150	56.5	23	11
30	69.767	0.102	75.949	0.96	160	55	21	14
31	45.455	0.146	57.143	0.14	160	60	20	12
32	93.75	0.162	64.516	0.16	155	47	20	12
33	86.957	0.16	76.923	0.158	157	57	21	13
34	86.957	0.146	85.714	0.14	160	70	20	13

Table 2:- Various parameters obtained from the non PMS Group (controls)

	Heart rate (pre menstrual)	PR interval (pre menstrual)	Heart rate (post menstrual)	PR interval (post menstrual)	height	weigh t	age	Age of menarche
1	96.774	0.148	96.774	0.146	156	47.5	20	13
2	75.949	0.15	65.217	0.14	163	69	19	12
3	72.289	0.148	65.217	0.04	172.2	87	19	15
4	66.667	0.144	78.947	0.168	154	56	19	11
5	69.767	0.164	60.606	0.154	155	44.4	19	13
6	63.829	0.116	73.171	0.114	165	49.5	22	11
7	88.235	0.164	72.289	0.204	155	52	21	12
8	67.416	0.138	93.75	0.132	151	67	45	13
9	92.308	0.118	75	0.124	157	53	20	14
10	74.074	0.128	85.714	0.144	156	50	19	13

Table 3:- Distribution of symptoms among the PMS group.

Serial number	headache	irritability	bloating	edema	Emotional liability	Decreased ability to concentrate	depression	constipation
1	-	+	+	+	+	+	+	+
2	-	+	-	-	-	-	+	+
3	+	+	-	-	+	-	+	+
4	-	+	+	+	+	-	+	-
5	+	+	+	+	+	+	+	+
6	-	+	-	-	+	-	+	-
7	-	-	-	-	+	-	-	-
8	-	+	-	-	+	-	-	-
9	+	+	-	-	-	-	-	-
10	-	+	+	-	+	-	+	-
11	+	+	+	-	+	+	+	+
12	-	+	-	-	-	-	+	-
13	-	+	-	-	+	+	+	-
14	+	+	-	-	+	+	+	-
15	+	+	+	-	+	+	-	+
16	-	+	-	-	+	+	+	-
17	+	+	-	-	+	-	+	-
18	-	+	-	-	+	+	+	+
19	+	+	-	-	+	-	+	-
20	-	+	+	-	+	-	-	+
21	-	+	+	-	-	+	+	-
22	+	+	-	-	+	+	+	-
23	+	+	-	-	-	-	-	-
24	-	+	+	+	+	-	+	-
25	-	+	+	-	+	-	+	-
26	-	+	+	-	+	-	+	-
27	-	+	-	-	-	-	+	-
28	-	+	+	-	+	-	-	+
29	-	+	+	-	+	+	+	+
30	+	+	+	+	+	+	+	+
31	+	+	+	-	+	+	+	-
32	+	+	-	-	-	-	+	-
33	-	-	+	-	+	-	+	-
34	-	+	+	-	+	-	+	-

Table 4:- Results using the paired t test.

	P value	Inference
Premenstrual HR PMS vs Premenstrual HR ctl	0.4927	Not Significant
Postmenstrual HR PMS vs Premenstrual HR ctl	0.4615	Not Significant
PMS HR Premenstrual vs Postmenstrual	0.1926	Not Significant
Ctl HR Premenstrual vs Postmenstrual	0.6855	Not Significant
PR interval-Premenstrual PMS vs Ctl	0.5466	Not Significant
PR interval-Postmenstrual PMS vs Ctl	0.6080	Not Significant
PR interval in PMS Premenstrual vs Postmenstrual	0.6080	Not Significant
PR interval in Ctl Premenstrual vs Postmenstrual	0.6070	Not Significant

Figure (1): Age distribution among the PMS subjects

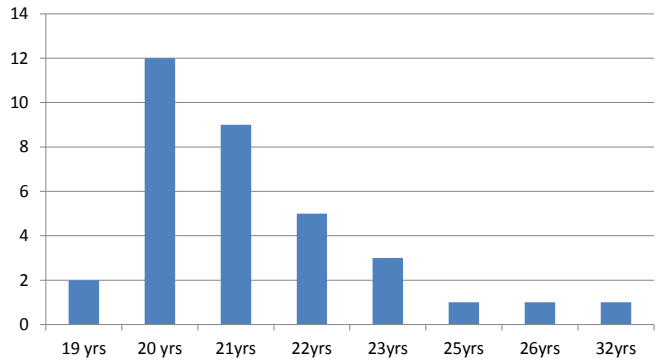


Figure (2): Age distribution among the Controls

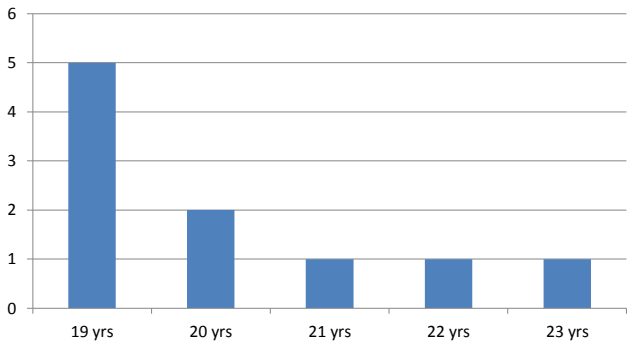


Figure (3): Weight Distribution among the PMS

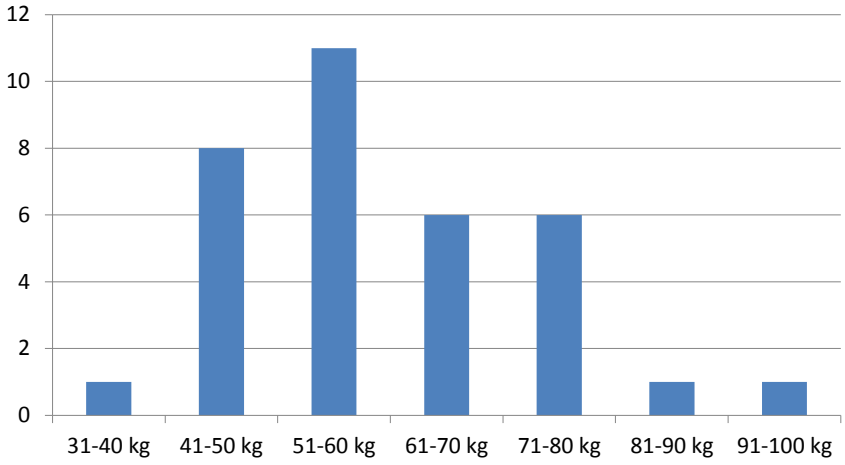


Figure (4): Weight Distribution among the Controls

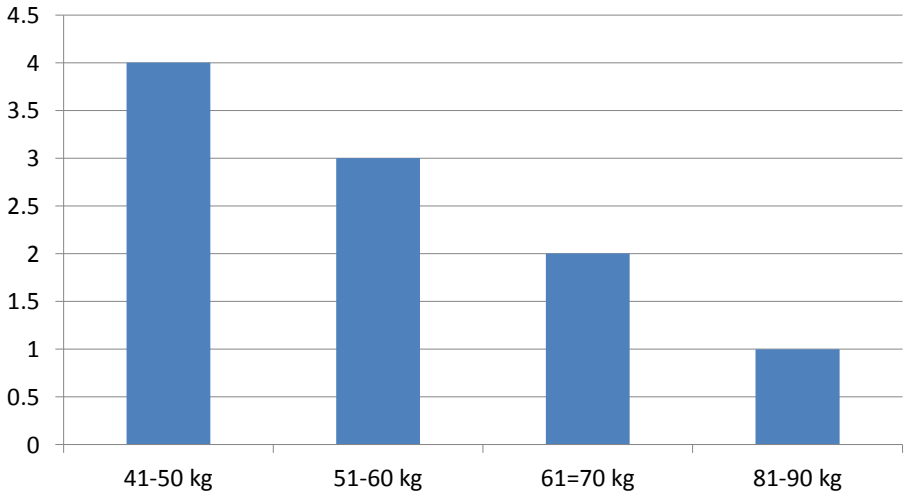


Figure (5): Age of Puberty among the PMS subjects.

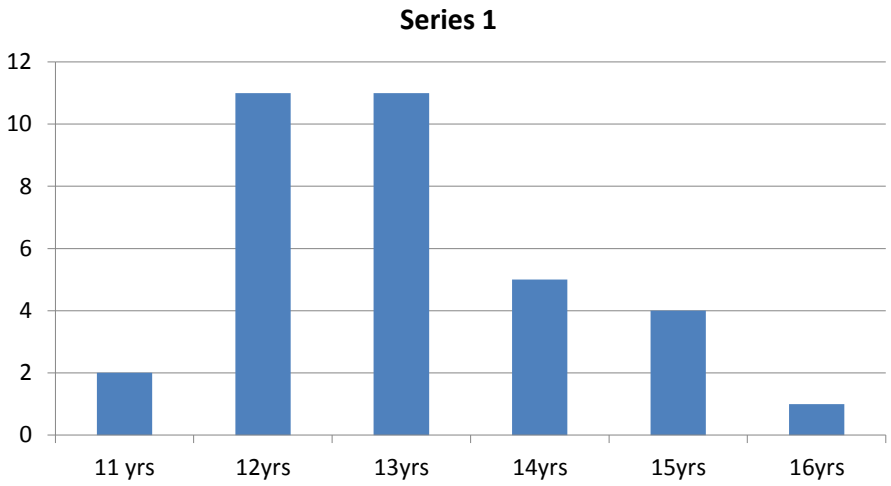


Figure (6): Age of Puberty among the Controls

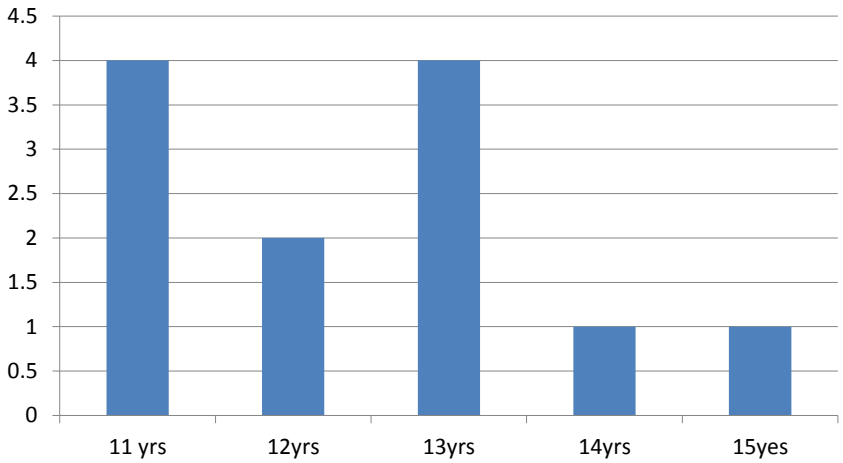


Figure (7): Pre & Post Menstrual Heart Rate among the PMS

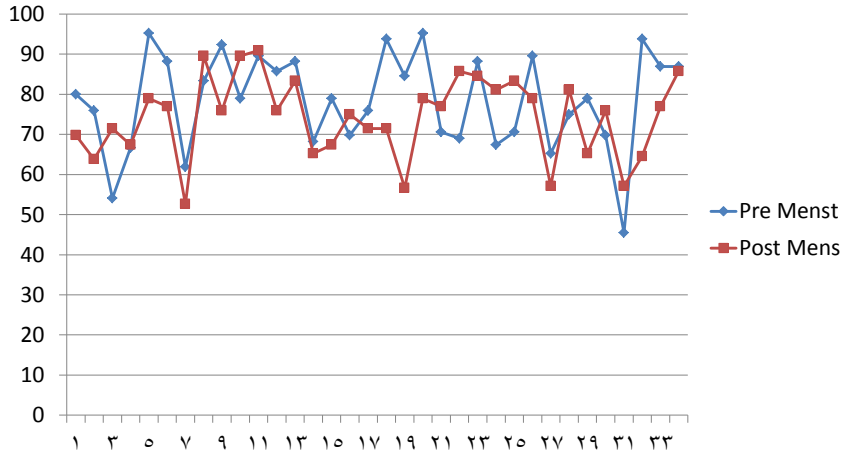


Figure (8): Pre & Post Menstrual Heart Rate among the Controls

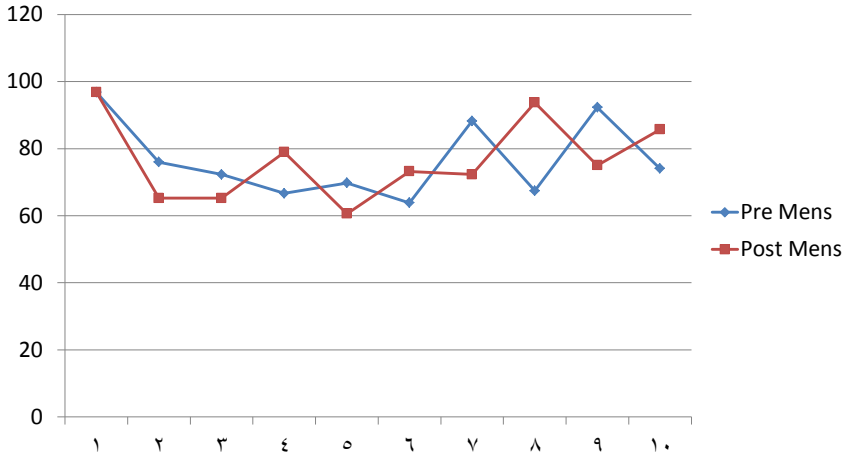


Figure (9): Pre & Post Menstrual PR interval among the PMS

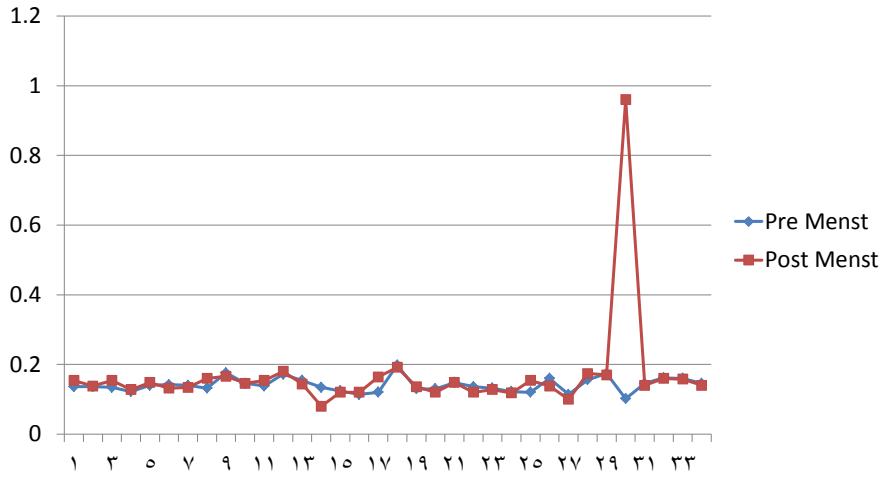


Figure (10): Pre & Post Menstrual PR interval among the Controls

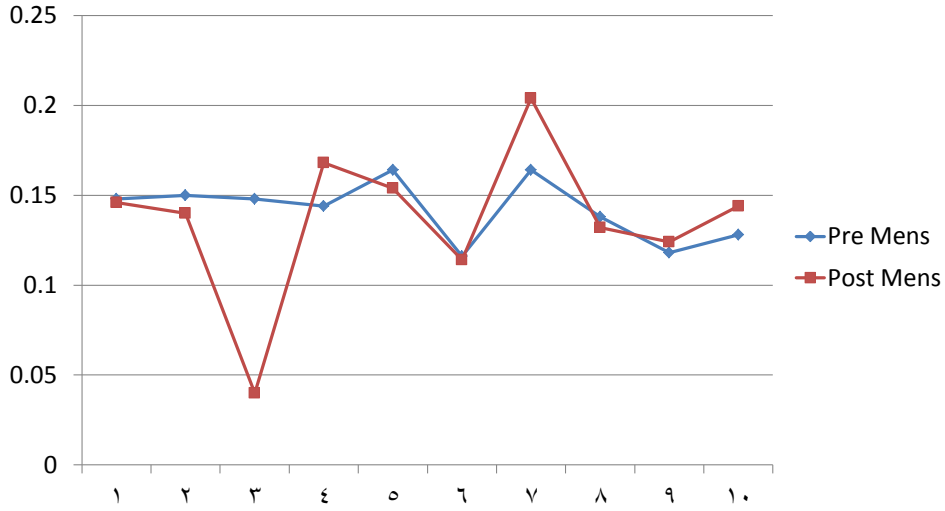
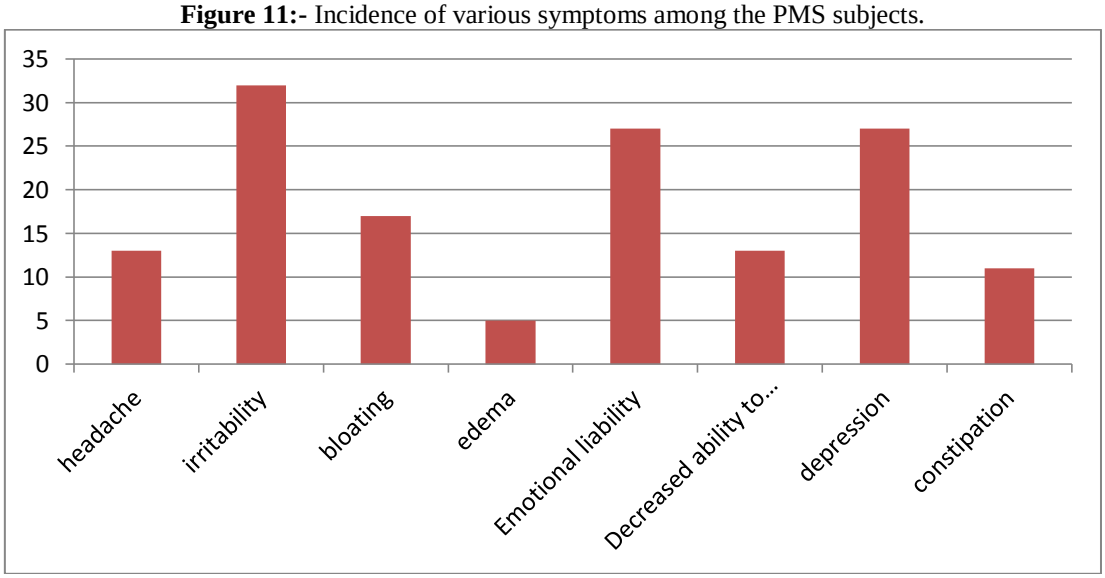


Figure 11:- Incidence of various symptoms among the PMS subjects.



This study attempted to identify an ECG pattern if present during the premenstrual phase of females with premenstrual syndrome. The hypotheses of finding an increase in heart rate and decrease in the PR interval was based on the previous studies which identified an increase in heart rate during premenstrual syndrome, [10], [11] decreased parasympathetic activity [12] [13] altered autonomic function. [14] [15] [16]

Matsumoto et al. (2006), found decreased sympathovagal activity in all phases of the menstrual cycle in subjects with Pre Menstrual Dysphoric Disorder (PMDD). The same study also identified decreased heart rate variability in the premenstrual period among subjects with PMS. [17]

The changes in heart rate identified by earlier studies were not identified in this study. Out of the 34 females with PMS only one female had symptoms severe enough to warranty medication. Perhaps ECG recordings on females with more severe symptoms may yield results consistent with the earlier works. It is also possible that heart rate variability (HRV) if recorded in the same females may provide evidence of decreased parasympathetic activity as it is a more sensitive indicator.

Our results are consistent with results obtained by Ozisik HI (2005) who concluded that the sympathetic skin response was similar during the late luteal and follicular phases of both PMS subjects and non PMS subjects.[18]

This study identified irritability as the most common symptom where 94% of the PMS subjects suffered from irritability. The next common symptoms were depression and emotional liability with 79% of the PMS subjects. Then there was bloating with 50% of the subjects. After that there were headache and decreased ability to concentrate with 38% of the subjects suffering from them. Then comes constipation with 32% percentage and finally comes edema with only 15% of the subjects suffering from it.

Conclusion and Recommendations:-

In conclusion there was no significant change in the heart rate as recorded on the ECG during the premenstrual period among subjects with PMS. There is no specific ECG pattern which can be identified during the PMS. So considering the PMS patients, authors recommend to identifying the heart rate variability on the same subjects on whom we have performed ECG; ECG recording in subjects with more severe symptoms than the present group of females; Measurement of blood pressure during and after the premenstrual period in PMS which is expected to be higher during the premenstrual period; Recording of an EEG (electroencephalogram) pattern in PMS subjects; Measurement of endorphins in PMS which are expected to be low; 5-CT scan of the brain in PMS to identify significant edema; Vitamin D and calcium level measurement in subjects with PMS which are expected to be low; Effect of vitamin D supplementation in PMS subjects; Levels of monoamines in PMS subjects with various degrees of symptoms.

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