

Original Research Article

## **A Comparative Study on Menstruation Characteristics of 15-20-Year-Old Women with Polycystic Ovary Syndrome (PCOS) in Shiraz, 2015**

**Solmaz Golestani<sup>1</sup>, Farideh Vaziri<sup>2</sup>, Homeira Vafaei cisakht<sup>3</sup>, Bahar Morshed Behbahani\*<sup>2</sup>**

<sup>1</sup>Department of midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

<sup>2</sup>Department of midwifery, Shiraz University of Medical Sciences, Shiraz, Iran

<sup>3</sup>Department of Gynecology and Obstetrics, Medical School, Shiraz University of Medical Sciences, Shiraz, Iran

### **\*Corresponding author**

Bahar Morshed Behbahani

Email: [morshe\\_b@yahoo.com](mailto:morshe_b@yahoo.com)

---

**Abstract:** Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in reproductive-aged women. This syndrome is a metabolic disorder causing a series of acute problems threatening health. Regarding the wide range of adolescent population on the state population pyramid as well as the high prevalence of this syndrome, the present study was conducted to investigate the menstrual period characteristics of adolescents afflicted with this syndrome in Shiraz city. This is a descriptive cross-sectional study conducted on 332 women with an age range of 15-20 years old (177 of whom were afflicted with PCOS and 155 were not) at Shiraz selected public centers and schools in 2015. The data collection instruments included individual information questionnaires such as the menarche age, menstrual disorders, and premenstrual syndrome (PMS). Data were analyzed through SPSS 16, using independent T-test, and Chi-Square test. The significant p-value was considered as less than 0.05. This study examined the relationship between PCOS and menstrual disorders, lower-abdominal pain in menstrual cycle interval, spotting between periods, and the amount of bleeding at the time of period ( $p < 0.05$ ). There was no significant relationship between PCOS and the menarche age, dysmenorrhea, and the menstrual period length ( $p > 0.05$ ). Among PMS physical and mental symptoms, there was only a statistically significant relationship in terms of the amount of edema between the patients afflicted with PCOS and the control group ( $p = 0.003$ ). The mean of all participants' menarche age was 12/8. The findings of this study indicated that, like most of the individuals afflicted with PCOS, the menstrual disorder symptoms are present in adolescents, too. Furthermore, PMS is frequently observed in teenagers. Therefore, due to the sensitivity of this age associated with mental issues, the afflicted adolescents need to be paid more attention so that the manifestations of symptoms and the related mental problems would not affect them to a larger extent.

**Keywords:** Menstruation Characteristics, Polycystic Ovary Syndrome

---

### **INTRODUCTION**

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in reproductive-aged women, the most common cause of hyperandrogenism and hirsutism, and the most common cause of heterosexual maturity at the expected puberty age [1]. The prevalence of this syndrome in Iran has been reported 14.6 percent, based on Rotterdam criteria [2].

One of the most accepted recent diagnostic criteria in this regard is the existence of at least two criteria of the three clinical-biochemical Rotterdam criteria including hyperandrogenemic symptoms, oligomenorrhea or anovulation, and PCOS sonographic evidence [3]. Anovulation may be manifested as

oligomenorrhea, primary amenorrhea or secondary amenorrhea [4]. Oligomenorrhea is defined as having 8 or less than 8 menstrual cycles per year or having menstrual cycles less than 26 days or more than 35 days [5]. The diagnostic criteria of PCOS are used for adolescents as well. In the past, it was believed that the irregular periods in the immediate years following the menarche age were due to the undeveloped hypothalamic-pituitary-ovarian axis; however, recent studies have indicated that the menstrual disorder in adolescents, especially if manifested as Oligomenorrhea, may be a sign of early PCOS [6]. There is a difference with respect to PCOS in adolescents and other age groups such that it is more difficult to diagnose this syndrome in adolescents. This

is due to the prevalence of menstrual disorders and anovulation in adolescents, particularly in the first two years following the first period [7].

Nowadays, it has been recognized that PCOS is a metabolic disorder causing a series of acute problems threatening health [8]. Moreover, there is a relationship between physical manifestations of PCOS and mental health reduction. This syndrome causes various mental problems including depression, anxiety, eating disorders, decreased sexual satisfaction, reduced quality of life, and increased risk of committing suicide [9]. Almost, 80 percent of the women afflicted with the syndrome experience at least a certain mental disorder during their life [10].

Premenstrual syndrome is one of the psychosomatic issues which are related to reproductive performance as well as affective disorders (mood disorders) such as anger, anxiety, and irritability [11]. Premenstrual syndrome (PMS) refers to a set of physical, psychological, emotional and behavioral symptoms periodically occurring at the luteal phase and considerably regressing in the remainder of the period cycle. The diagnostic criteria of the American College of Obstetricians and Gynecologists (ACOG) for PMS include at least an emotional symptom and a physical symptom which occur before menstruation and their symptoms stop after the beginning of the period without the help of medicine [12].

The aim of this study was to investigate the menstrual cycle characteristics such as PMS and menarche age of 15-20-year-old women afflicted with PCOS in Shiraz. Concerning the high prevalence of PCOS, the wide range of adolescent population on the State population pyramid, and the importance of adolescence health for the health condition of the following years, the significance of the present study becomes clear.

#### **METHOD**

This descriptive cross-sectional study was conducted on 177 women with PCOS and 155 women of the control group in Shiraz public clinics and two public schools from each district of the 4 educational districts in Shiraz, 2015. The participants were in the age range of 15-20. The two schools were selected based on stratified random sampling. The control group

participants were selected from the population of non-PCOS patients in the aforementioned clinics as well as the non-PCOS students in the schools having the needed criteria to take part in the study. The students were selected based on purposive sampling.

The criteria for participation in the study included: 1) aged 15-20 years old; 2) written and oral consent announcement; 3) having no background diseases like malignancy and Thalassemias which affect menstrual cycles; 4) not afflicted with primary Amenorrhea, adrenal gland disorders, thyroid, and hyperprolactinemia; 5) not afflicted with the known endocrinopathies like Cushing's syndrome; and 6) having passed the menarche age at least for two years. Sampling was done after receiving the participants' written consent. Data collection instrument was a questionnaire. Individual information, diseases, individual's drug use, some information about the menstrual period and PCOS symptoms were collected using a questionnaire as well as interview with the participants. Disease diagnosis was carried out using Rotterdam criterion. In the clinics, the individuals whose diseases were diagnosed by the gynecologist were considered as affected. In the schools, the students were also examined based on the Rotterdam criterion and then they took part in the study.

Similar studies have defined the regular menstruation as the period intervals between 26 to 35 days and the interval between different cycles not more than 4 days. PMS was investigated in this study based on the symptoms mentioned in Novak's book. The participants were asked to consider three successive periods and mark the symptoms they experience before menstruation, starting to regress at the beginning of the menstruation period without the help of medication. Data were analyzed using descriptive and inferential statistics (Chi-square test and T-test) in SPSS, version 16. The significant p-value was considered as less than 0.05 ( $p < 0.05$ ).

#### **FINDINGS**

332 participants took part in the study, divided into two groups: 177 women with PCOS and 155 non-PCOS women. The significance level was also considered as 0.05.

---

**Table 1: Comparison of the Menarche Age in the PCOS and Non-PCOS Groups**

Group variable	+pcos			Pcos-			p-value
	Mean±SD	min	max	Mean±SD	min	max	
Menarche age	12/7 ± 1/3	10	16	12/8 ± 1/1	10	16	0/694

**Table 2: Comparison of the Menstruation Period Qualitative Characteristics in the PCOS and Non-PCOS Groups**

Group variable	+pcos		-pcos		p-value	
	Number	Of%	Number	Of%		
Regular interval of menstruation	yes	13	7/3	118	79/7	001/0<
	no	166	92/7	30	20/3	
dysmenorrhea	yes	104	58/1	99	66/9	0/103
	no	75	41/9	49	33/1	
lower-abdominal pain between period intervals	yes	20	11/2	5	3/4	0/008
	no	159	88/8	143	96/6	
Spotting between periods	yes	25	14	3	2	0/001<
	no	154	86	145	98	

**Table 3: Comparison of the Menstruation Period Quantitative Characteristics in the PCOS and Non-PCOS Groups**

group variable	+pcos			-pcos			p-value
	Mean±SD	min	max	Mean±SD	min	max	
menstrual period length	6/24 ± 1/93	2	12	6/25 ± 1/41	2	10	0/935
amount of bleeding	4/11± 1/6	1	6	4/54 ± 1/5	1	7	0/016

**Table 4: Comparison of the PMS Physical Symptoms in the PCOS and Non-PCOS Groups**

Group variable	+pcos		-pcos		p-value	
	number	Of%	number	Of%		
Headache	yes	25	14	19	12/9	0/784
	no	154	86	128	87/1	
Muscle cramp	yes	38	21/2	22	14/9	0/139
	no	141	78/8	126	85/1	
Weakness and fatigue	yes	76	42/5	56	37/8	0/397
	no	103	57/5	92	62/2	
edema	yes	5	2/8	16	10/8	0/003
	no	174	97/2	132	89/2	
Painful breasts	yes	47	26/3	29	19/6	0/156
	no	132	73/7	119	80/4	
Cold sweat	yes	17	9/5	8	5/4	0/166
	no	162	90/5	140	94/6	
dizziness	yes	22	12/3	12	8/1	0/217
	no	157	87/7	136	91/9	
Tingling in the limbs	yes	25	14	20	13/5	0/906
	no	154	86	128	86/5	
Blurred vision	yes	18	8/9	9	5/5	0/194
	no	161	91/1	139	94/5	

**Table 5: Comparison of the PMS Mental Symptoms in the PCOS and Non-PCOS Groups**

Group variable		+pcos		-pcos		p-value
		number	Of%	number	Of%	
depression	yes	31	17/3	25	16/9	0/919
	no	148	82/7	123	83/1	
Difficulty in concentrating	yes	29	16/2	22	14/9	0/740
	no	150	83/8	126	85/1	
Nervous and aggressive latest	yes	87	48/6	83	56/1	0/178
	no	92	51/4	65	43/9	
Mood irritability	yes	23	12/8	17	11/5	0/708
	no	156	87/2	131	88/5	

The mean age of the individuals with PCOS was 17.61 and that of non-PCOS individuals was 16.08. The menarche age means of all participants (both PCOS and non-PCOS groups), individuals with PCOS, and non-PCOS individuals, were  $12.8 \pm 1.2$ , 12.7, and 12.8, respectively; the independent T-test indicated that there was not a significant difference between the two groups ( $p=0.694$ ). (Table 1)

There was a significant relationship between PCOS and irregular menstruation disorders ( $p<0/001$ ), lower-abdominal pain between period intervals ( $p=0.008$ ), and spotting between periods ( $p<0.001$ ); however, there was no significant relationship between PCOS and dysmenorrhea ( $p=0.103$ ) (Table 2). The amount of bleeding (in terms of the number of pads used during the days of a period) in the PCOS group was lower and had a significant difference ( $p=0.016$ ) compared to non-PCOS group; yet, there was no statistically significant difference between PCOS group and non-PCOS group in terms of the menstrual period length (the mean of the number of bleeding days during menstrual period). (Table 3)

According to Chi-square test, the value of  $\alpha=0.05$ , and among the PMS physical symptoms, there was only a significant difference in terms of the amount of edema between patients afflicted with PCOS and the control group ( $p=0.003$ ) so that it was higher in non-PCOS individuals. (Table 4) Besides, there was not a significant relationship between this syndrome and any of the premenstrual mental symptoms ( $P>0.05$ ). (Table 5)

## DISCUSSION AND CONCLUSION

In this study, the mean of menarche age in all participants (both patient and control groups) was 12.8. Among the domestic studies conducted on the menarche age, Amin Alroaya *et al.*; in 1997 [13], Razaqi *et al.*; in 2004 [14], and Haqian *et al.*; in 2002 [15] have reported

the menarche age as 12.9, 12.6, and 12.5, respectively. The menarche age of the girls in other countries has also been reported as 12.5 [16], 12.4 [17], 12.8 [18], and 13 [19]. In the present study, the mean of menarche age was consistent with other studies conducted on Iranian girls as well as those with other nationalities.

The mean age of menarche in individuals with PCOS and the control group was 12.7 and 12.8, respectively, indicating no significant difference between the two groups ( $p=0/694$ ). Sadrzadeh *et al.*; in 2003 conducted a study in an infertility clinic in Netherlands and reported that the age of onset of menarche in patients with PCOS was significantly higher compared to the control group [20]. Carroll *et al.*; in 2012 conducted a study on 18-45-year-old women regarding the hypothesis claiming the body mass index (BMI) and DNA variants are able to predict the menarche age in the girls afflicted with PCOS. They examined 522 women with PCOS and 472 in the control group in terms of the menarche age and observed that there was a strong inverse relationship between BMI and the menarche age in individuals with PCOS. Furthermore, there was a relationship between a kind of variant on chromosome 6 and the lower menarche age in women with PCOS. Generally, there was a relationship between the menarche age and the affliction status of PCOS, the reported weight at 10-14 years old, the present rate of BMI, and the patients' genotype (LIN28B gene) [21].

Regarding the above-mentioned studies and contradictory results of different studies, one cannot conclude an agreement with respect to the relationship between the menarche age and PCOS. In this study, 92.7 percent of patients with PCOS and 20.3 percent of non-PCOS individuals had irregular periods. Lower-abdominal pain between period intervals was reported in 11.2 percent of patients with PCOS and 3.4 percent of non-PCOS individuals. 14 percent of patients with

PCOS and 2 percent of non-PCOS individuals experienced spotting between periods; moreover, 58.1 percent of patients with PCOS and 66.9 percent of non-PCOS individuals were afflicted with dysmenorrhea.

There was a significant relationship between PCOS and menstruation disorders ( $p < 0.001$ ), lower-abdominal pain between period intervals ( $p = 0.008$ ), and spotting between periods ( $p < 0.001$ ), but it did not have a significant relationship with dysmenorrhea ( $p = 0.103$ ). Besides, there was no significant difference between the patients with PCOS ( $6.24 \pm 1.93$ ) and non-PCOS individuals ( $6.26 \pm 1.42$ ) with regard to the mean of the number of bleeding days during menstrual period (menstrual period length) ( $p = 0.935$ ). However, the amount of bleeding reported in terms of the number of pads used during the days of a period in the PCOS group ( $4.11 \pm 1.6$ ) was lower and had a significant difference ( $p = 0.016$ ) compared to non-PCOS group ( $4.54 \pm 1.5$ ).

Michelmore *et al.*; in 1999 conducted a study on 18-25-year-old girls and showed that 65 percent of the patients with PCOS and 45 percent of those in the control group had irregular periods [22]. Soltani *et al.*; in 2007 studied Hamadan high school girls, of whom 33.6 percent said to have irregular periods, 18.4 percent of whom experienced spotting between two menstruation periods, and 78.1 percent of whom were afflicted with dysmenorrhea [23]. In this study, the rate of menstrual irregularity has been higher compared to that of other studies (92.7% of the patients with PCOS and 20.3% of non-PCOS women). Its rate in non-PCOS women has been even higher than many of the aforementioned studies. This great difference may be due to the low age group in the study. Since the menstruation cycle evolution is a gradual process, the establishment of regular menstrual cycles may take 5 years after the menarche age. Bora in 2016 conducted a study on 172 18-45-year-old women afflicted with PCOS in India, of whom 59.8 percent were reported to have irregular periods [24]. Regarding the 60-percent prevalence of menstrual irregularity in Bora's study and also regarding its 18-45-year-old age group, the high prevalence of menstrual irregularity in the present study can be justified.

Many studies have regarded PCOS as a major factor in menstrual irregularity occurrence in adolescence [19, 25-28]. The recent studies have indicated that the menstrual disorder in adolescents, especially if manifested as Oligomenorrhea, may be a sign of early PCOS [29-32]. Furthermore, the menstrual irregularity in the early years following the menarche

age can be regarded as a disorder index for psychosocial adjustment of 13-19-year-old girls [33]. Jarvelaid *et al.*; in 2005 conducted a study on high school girls to investigate the prevalence of menstrual irregularity in the early years following the menarche age and the biopsychosocial factors associated with menstrual irregularity. 40 percent of the girls had irregular periods. The risk factors associated with menstrual irregularity included a BMI less than 17.5, poor relationship with parents, lack of desire and satisfaction for going to school, and a high level of depression. [26].

PMS was one of the other points investigated in the present study. The most common physical symptoms of PMS were weakness and fatigue (42.5% of the patients with PCOS and 37.8% of the control group), breast pain (26.3% of the patients with PCOS and 19.6% of the control group), muscle spasms (21.2% of the patients with PCOS and 14.9% of the control group), paresthesia (14% of the patients with PCOS and 13.5% of the control group), and headache (14% of the patients with PCOS and 12.9% of the control group), respectively. Among the PMS physical symptoms, there was only a significant difference in terms of the amount of edema between patients afflicted with PCOS and non-PCOS individuals ( $p = 0.003$ ) so that it was higher in non-PCOS individuals. The most common mental symptoms of PMS were nervousness and aggression (48.6% of the patients with PCOS and 56.1% of the control group), depression (17.3% of the patients with PCOS and 16.9% of the control group), difficulty concentrating, and mood irritability, respectively. There was no significant relationship between PCOS and any of the PMS mental symptoms including depression, difficulty concentrating, nervousness and aggression, and mood irritability ( $P > 0.05$ ).

Bakhshani *et al.*; in 2012 conducted a study on 14-18-year-old students and indicated that the most common mental symptoms were fatigue (51.4% of students) (fatigue and lethargy were categorized as mental symptoms in their study), anxiety and worry, appetite changes, sleep disorder, and decreased interest in work and social activities, respectively. Besides, the most common physical symptoms included breast pain (100% of students), gastric pain, backache, joint or muscle pain, and pain in hands and feet, respectively [34]. A study conducted on 18-40-year-old women in 6 big cities in Brazil indicated that the most common mental symptoms were anxiety, restlessness, irritability, anger, aggression, mood swings, and crying. Also, the most common physical symptoms were headache, muscle spasms, and breast swelling or pain [12]. Furthermore, Silva *et al.*; in 2006 conducted a study and

showed that the most common symptoms were breast pain, abdominal pain, fatigue, irritability, nervousness, and headache [35].

This phenomenon has been extensively studied on adults although the presence of which in adolescents has been diagnosed recently [12]. Some PMS symptoms may lead to negative serious consequences for adolescents, their families and social relationships such as low self-esteem, low stress tolerance, and feeling of insufficiency [34]. The results of the studies conducted by Wilson *et al.*; on high school students indicated that most female adolescents consider PMS as a problem significantly affecting their education and performance [36]. Previously, there was an accepted medical belief claiming that dysmenorrhea is prevalent in adolescents but PMS is not. Contrary to that belief, the results of the present study are consistent with other studies [34, 37, 38] indicating that PMS is a major problem among adolescents intervening family, educational, and social activities. Hence, it seems necessary to provide adolescents with an educational program in schools to increase their general information about physiology of menstruation and the relationship between hormonal changes and symptoms; moreover, it is recommended that prevention strategies should be used and efficient early treatments should be done to facilitate the adjustment and improvement of the quality of life as well as the health development of adolescent girls, an instance of which can be an improvement in adolescents' dietary styles.

Therefore, according to the findings of the present study, like most of the individuals afflicted with PCOS, the menstrual disorder symptoms and PMS are also present in adolescents and there is no difference between adolescents and adults in this regard. Furthermore, PMS is frequently observed in teenagers. Thus, due to the sensitivity of this age and the mental issues associated with it, the afflicted adolescents need to be paid more attention so that the manifestations of symptoms and the mental problems related to PCOS would not affect them to a larger extent.

#### ACKNOWLEDGEMENTS:

The authors would like to thank Shiraz University of Medical Sciences, Shiraz, Iran and also Center for Development of Clinical Research of Nemazee Hospital and Dr. Nasrin Shokrpour for editorial assistance.

#### REFERENCES

1. Berek J. Gynecology, Novak's and Berek. Lipincott, 15th ed, 2012.
2. Tehrani FR, Simbar M, Tohidi M, Hosseinpanah F, Azizi F. The prevalence of polycystic ovary syndrome in a community sample of Iranian population: Iranian PCOS prevalence study. *Reprod Biol Endocrinol*. 2011;9(39):39.
3. Eshre R. Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. *Fertil steril*. 2004;81:19-25.
4. Warren-Ulanch J, Arslanian S. Treatment of PCOS in adolescence. *Best practice & research Clinical endocrinology & metabolism*. 2006 Jun 30;20(2):311-30.
5. Azziz R, Woods KS, Reyna R, Key TJ, Knochenhauer ES, Yildiz BO. The prevalence and features of the polycystic ovary syndrome in an unselected population. *The Journal of Clinical Endocrinology & Metabolism*. 2004 Jun 1;89(6):2745-9.
6. Avvad CK, Holeuwerger R, Silva VC, Bordallo MA, Breitenbach MM. Menstrual irregularity in the first postmenarchal years: an early clinical sign of polycystic ovary syndrome in adolescence. *Gynecological endocrinology*. 2001 Jan 1;15(3):170-7.
7. Chang RJ, Coffler MS. Polycystic ovary syndrome: early detection in the adolescent. *Clinical obstetrics and gynecology*. 2007 Mar 1;50(1):178-87.
8. Speroff L, Fritz MA, editors. *Clinical gynecologic endocrinology and infertility*. lippincott Williams & wilkins; 2005.
9. Shakerardekani Z, Nasehi A, Eftekhar T, Ghaseminezhad A, Ardekani MA, Raisi F. Evaluation of depression and mental health status in women with poly cystic ovary syndrome. *Journal of Family and Reproductive Health*. 2011;5(3):67-71.
10. Shwarz M. Addressing polycystic ovary syndrome in outpatient mental health practices: A brief intervention to increase awareness. Temple University; 2015.
11. Braverman PK. Premenstrual syndrome and premenstrual dysphoric disorder. *Journal of pediatric and adolescent gynecology*. 2007 Feb 28;20(1):3-12.
12. Georgantopoulou C, Field S. Treatment of premenstrual syndrome with the desogestrel-only pill (Cerazette) in an adolescent girl. *Journal of pediatric and adolescent gynecology*. 2009 Jun 30;22(3):e1-3.
13. Vasheghani F, Jafari GH. Polycystic ovarian disease in the females 15-45 years old referring

- to endocrine and gynaecology clinic of Imam khomeini hospital of sari township. 2000-2001. Journal of Mazandaran University of Medical Sciences. 2002 Sep 15;12(36):52-9.
14. Razzaghi Azar M, Moghimi A, Sadigh N, Montazer M, Golnari P, Zahedi Shulami L, Van Buuren S, Mohammad Sadeghi H, Zanganeh Kazemi A, Fereshtehnejad SM. Age at the onset of puberty and menarche in Iranian girls and boys. Razi Journal of Medical Sciences. 2006 Apr 15;13(50):71-82.
  15. Hagian K, Delavar Aghajani M. Menarche age in Adolescence. Sci J Birjand Univ Med Sci. 2002;8(1).
  16. Materii W. Rozw. Causes of menstrual disorder in adolescent girls-a retrospective study. Endokrynol Diabetol Chor Przemiany Materii Wieku Rozw. 2006;12(3):205.
  17. Dzhorbenadze MT, Kristesashvili DI, Chopikashvili NA. Menstrual function in adolescent girls in Tbilisi. Georgian medical news. 2006 Jan(130):37-40.
  18. Juhasz AG, Vincze G, Krasznai Z, Csorba R, Major T. Dysmenorrhea in adolescent girls. Orvosi hetilap. 2005 Jan;146(1):27-32.
  19. WIKSTEN-ALMSTRÖMER MA, Linden Hirschberg A, Hagenfeldt K. Menstrual disorders and associated factors among adolescent girls visiting a youth clinic. Acta obstetricia et gynecologica Scandinavica. 2007 Jan 1;86(1):65-72.
  20. Sadrzadeh S, Klip WA, Broekmans FJ, Schats R, Willemsen WN, Burger CW, Van Leeuwen FE, Lambalk CB. Birth weight and age at menarche in patients with polycystic ovary syndrome or diminished ovarian reserve, in a retrospective cohort. Human Reproduction. 2003 Oct 1;18(10):2225-30.
  21. Carroll J, Saxena R, Welt CK. Environmental and genetic factors influence age at menarche in women with polycystic ovary syndrome. Journal of Pediatric Endocrinology and Metabolism. 2012 Jun 1;25(5-6):459-66.
  22. Michelmore KF, Balen AH, Dunger DB, Vessey MP. Polycystic ovaries and associated clinical and biochemical features in young women. Clinical endocrinology. 1999 Dec 1;51(6):779-86.
  23. SOLTANI F, SHOBEIRI F. Menstrual patterns and its disorders in high school girls.
  24. Bora C. A Cross-Sectional Study Of Women Of Assamese Community Suffering From Polycystic Ovarian Syndrome (PCOS). International Educational Scientific Research Journal. 2016 May 2;2(5).
  25. Bieniasz J, Zak T, Laskowska-Zietek A, Noczyńska A. Causes of menstrual disorders in adolescent girls--a retrospective study. Endokrynologia, diabetologia i choroby przemiany materii wieku rozwojowego: organ Polskiego Towarzystwa Endokrynologów Dzieciecy. 2005 Dec;12(3):205-10.
  26. Järvelaid M. The effect of gynecologic age, body mass index and psychosocial environment on menstrual regularity among teenaged females. Acta obstetricia et gynecologica Scandinavica. 2005 Jul 1;84(7):645-9.
  27. Bhate K, Williams HC. Epidemiology of acne vulgaris. British Journal of Dermatology. 2013 Mar 1;168(3):474-85.
  28. Adams HP. Adolescent menstrual health. Pediatric endocrinology reviews: PER. 2006;3:138-45.
  29. Avvad CK, Holeuwerger R, Silva VC, Bordallo MA, Breitenbach MM. Menstrual irregularity in the first postmenarchal years: an early clinical sign of polycystic ovary syndrome in adolescence. Gynecological endocrinology. 2001 Jan 1;15(3):170-7.
  30. Van Hooff MH, Voorhorst FJ, Kaptein MB, Hirasing RA, Koppelaar C, Schoemaker J. Endocrine features of polycystic ovary syndrome in a random population sample of 14-16 year old adolescents. Human reproduction. 1999 Sep 1;14(9):2223-9.
  31. Rachmiel M, Kives S, Atenafu E, Hamilton J. Primary amenorrhea as a manifestation of polycystic ovarian syndrome in adolescents: a unique subgroup?. Archives of pediatrics & adolescent medicine. 2008 Jun 2;162(6):521-5.
  32. Van Hooff MH, Voorhorst FJ, Kaptein MB, Hirasing RA, Koppelaar C, Schoemaker J. Predictive value of menstrual cycle pattern, body mass index, hormone levels and polycystic ovaries at age 15 years for oligo-amenorrhoea at age 18 years. Human Reproduction. 2004 Feb 1;19(2):383-92.
  33. Hickey M, Balen A. Menstrual disorders in adolescence: investigation and management. Human reproduction update. 2003 Sep 1;9(5):493-504.
  34. Bakhshani N, Hasanzadeh Z, Raghbi M. Prevalence of premenstrual symptoms and premenstrual dysphoric disorder among adolescents students of Zahedan. Zahedan

- Journal of Research in Medical Sciences. 2012 Jan 1;13(8):29-34.
35. Silva CM, Gigante DP, Carret ML, Fassa AG. Population study of premenstrual syndrome. *Revista de saúde pública*. 2006 Feb;40(1):47-56.
36. Wilson CA, Keye WR. A survey of adolescent dysmenorrhea and premenstrual symptom frequency: a model program for prevention, detection and treatment. *Journal of Adolescent Health Care*. 1989 Jul 1;10(4):317-22.
37. Vichnin M, Freeman EW, Lin H, Hillman J, Bui S. Premenstrual syndrome (PMS) in adolescents: severity and impairment. *Journal of pediatric and adolescent gynecology*. 2006 Dec 31;19(6):397-402.
38. Derman O, Kanbur NÖ, Tokur TE, Kutluk T. Premenstrual syndrome and associated symptoms in adolescent girls. *European Journal of Obstetrics & Gynecology and Reproductive Biology*. 2004 Oct 15;116(2):201-6.