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Relationship between the likelihood of suicide and aggression levels with 2D/4D ratios in patients diagnosed with polycystic ovary syndrome

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Abstract

This study aimed to examine the depression, suicide likelihood, aggression levels, and second-to-fourth finger measurements in patients diagnosed with polycystic ovary syndrome (PCOS). The study included patients diagnosed with PCOS from our hospital's endocrinology clinic and healthy controls matched for demographic characteristics. The Beck Depression Inventory (BDI), Suicide Probability Scale (SPS), and Buss-Perry Aggression Questionnaire (BPAQ) were administered. The second and fourth finger length of all participants were measured in centimeters using a digital vernier caliper. A total of 124 individuals (62 PCOS patients and 62 controls) participated in our study. Although the scale scores were higher in the PCOS group, the only significant difference was observed in the verbal aggression of the BPAQ. The study identified elevated levels of verbal aggression in PCOS patients. Based on these findings, these patients should be informed about and monitored for psychiatric symptoms.

Keywords: polycystic ovary syndrome, suicide likelihood, aggression, depression

1. Introduction

Polycystic ovary syndrome (PCOS) is a chronic disorder with a heterogeneous etiology characterized by cysts in the ovaries, anovulation, and various endocrine variations (1, 2). Imbalances in reproductive hormones such as estrogen, testosterone, LH, and FSH can affect the menstrual cycle, causing oligomenorrhea and/or amenorrhea (3). Based on The World Health Organization data, there are approximately 16 million women with PCOS in the world (4). Despite significant differences among individuals, it was that hyperandrogenism, menstrual abnormality, and cysts of various sizes in the ovaries. Patients diagnosed in adolescence are at risk for various comorbid diseases such as diabetes mellitus, obesity, infertility, cardiovascular and psychiatric disorders (5, 6). Psychiatric symptoms and diseases are often overlooked, with depressive and anxiety symptoms frequently accompanying PCOS (7, 8).

Studies in the literature report depression rates of 28-64%, anxiety disorders of 34-57%, and psychotic disorders of 5.6-21.3% in patients with PCOS (9). Some studies report an 8.1% rate of aggressive and impulsive behaviors and self-harm attempts in PCOS patients (10). Independent of anxiety levels, patients' anger levels increase, and anger control becomes difficult, which is associated with hyperandrogenism (11, 12). The literature shows a relationship between high levels of testosterone and serotonin with aggression and hostility (13).

Peripheral blood testosterone levels can be easily measured, and recent studies have also used finger measurements to calculate these levels. The ratio of second and fourth fingers(2D/4D) is suggested to be influenced by prenatal testosterone and closely related to adult blood testosterone levels (14). It is known that there are imbalances in reproductive hormones such as testosterone, LH, and FSH in polycystic ovary syndrome (2). Due to these hormonal imbalances and the effects of the disease itself, we previously reported an increased prevalence of various psychiatric symptoms and diseases, including aggression, hostility, and self-harm attempts in PCOS patients. Psychiatric symptoms with scales determined and examined the relationship between finger measurements and testosterone levels indirectly.

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2. Materials and methods

2.1. Inclusion and Exclusion Criteria

Patients diagnosed with PCOS based on the Rotterdam criteria (14) and who applied to the endocrinology clinic of Gaziosmanpaşa University Hospital were informed about the study. The written consent forms were obtained from all participants. Patients who had a general condition disorder, were receiving medical treatment for known mental illness, had alcohol or substance use disorder, or had mental retardation were excluded. In selecting the control group, individuals who applied to the endocrinology policlinic and were not diagnosed with PCOS were interviewed. Individuals who did not receive psychiatric treatment and formed the control. In addition, care was taken to select a group of these individuals that was similar in terms of demographic data to the patient group.

2.2. Data Collection Tools

All participants were administered a demographic data form followed by the Beck Depression Inventory (BDI), Buss Perry Aggression Questionnaire (BPAQ), and the Suicide Probability Scale (SPS). Additionally, the second and fourth fingers were measured by a vernier caliper.

Demographic Data Form: It includes questions about personal demographic data such as age, marital status, education, and employment status, as well as clinical assessment questions such as previous and current psychiatric treatment, alcohol/substance use, and any medical conditions requiring treatment.

Beck Depression Inventory (BDI): This scale is to determine the presence and severity of depressive symptoms, it consists of 21 questions, each scored between 0-3. The sum of these scores indicates the severity of depressive complaints. The validity and reliability study (TR) was conducted (15, 16).

Buss Perry Aggression Questionnaire (BPAQ): It was evaluated to level and dimensions of aggression, it consists of four subscales: physical aggression, anger, hostility, and verbal aggression. Physical aggression relates to causing physical harm to others, anger assesses the emotional aspect of aggression, hostility assesses the cognitive aspect, and verbal aggression assesses verbal attacks on others. The validity and reliability study (TR) was conducted by Demirtaş Madran (17, 18).

Suicide Probability Scale (SPS): Developed by Cull and Gill to evaluate individuals' potential suicide risk, it consists of four subscales: hopelessness, suicide ideation, hostility, and negative self-evaluation. Each subscale examines a different theoretical approach to suicide, allowing a multidimensional assessment of the concept. The validity and reliability study (TR) was conducted by Tugcu and the final validation study was also done by Atlı (19, 20).

2D and 4D Finger Length Measurement and 2D/4D Ratio Calculation: 2. and 4. finger lengths of all participants were measured in centimeters using a digital Vernier caliper, with a sensitivity of 0.01 mm. This measuring from the basal line at the proximal part of the finger on the palmar side to the pulp. Measurements were taken at least twice by the same person to ensure reliability (21). The 2D/4D ratio was calculated by dividing the second finger length by the fourth finger length.

2.3. Statistical Analysis of Data

All calculated data were evaluated using the SPSS for Windows 20 (Statistical Package for Social Sciences for Windows 20). Demographic data were presented as mean ± standard deviation and percentage (%). The demographic and clinical variables were analyzed with Chi-square test. Kolmogorov-Smirnov test was used to examine the normality of the distribution of the scales. The T-test and the Mann-Whitney U test were analyzed. p-value of less than 0.05 was considered statistically significant in all calculations.

3. Results

3.1. Distribution of Demographic Data of Participants

Sixty-two patients were included to the study. In PCOS group mean age was 24.30±4.99 years, the control group mean age was 23.75±2.83 years (p=0.772). Among the participants, 79.83% (99 individuals) were single, and 80.64% (100 individuals) were university students. There were no diagnosed psychiatric disorders in either group, although 4 individuals (6.45%) in the PCOS group reported previous suicide attempts. The demographic features are presented in Table 1.

Table 1. The distribution of demographic characteristics of participants

	PCOS diagnosed patient group N=62	Healthy control group N=62	P
Marital status			
Married	19 (30.64%)	5 (8.06%)	
Single	42 (67.74%)	57 (91.93%)	0.003
Other	1 (1.61%)	0 (0.00%)	
Education level			
Literate	1 (1.61%)	0 (0%)	
Primary school graduate	5 (8.06%)	0 (0%)	0.001
High school graduate	15 (24.19%)	3 (4.83%)	
University graduate	41 (66.12%)	59 (95.16%)	
Employment status			
Regular income job	16 (25.80%)	12 (19.35%)	
Irregular income job	2 (3.22%)	0 (0%)	0.001
Housewife	8 (12.90%)	2 (3.22%)	
Student	28 (45.16%)	48 (77.41%)	
Unemployed	8 (12.90%)	0 (0%)	
Economic level			
Low	17 (27.41%)	6 (9.67%)	0.010
Middle	18 (29.032%)	12 (19.35%)	
High	27 (43.54%)	41 (66.12%)	

Chi-square test was used for the calculations. Values in the table are presented as n (percentage) (%)

3.2. Distribution of Quantitative Variables of Participants

The normal distribution of the SPS total score and hopelessness subscale scores examined with the Kolmogorov-Smirnov Test showed normal distribution. Other variables did not follow normal distribution. Although the BDI scores were higher in PCOS group, there was no statistically significant difference (p=0.141). Similarly, although the scores for the SPS were higher in PCOS group, no statistically significant difference was found (p>0.05). For the Buss Perry Aggression Questionnaire, although all subscales were higher in the patient group, a statistically significant difference was found only in the verbal aggression subscale (p=0.048). The quantitative variables of the groups are given in Table 2.

3.3. Calculation of 2D/4D Ratios

The 2D/4D ratio for PCOS group was calculated as 1.017±0.040 for the right hand and 1.026±0.046 for the left hand. It was 1.028±0.041 for the right hand and 1.026±0.038 for the left hand in control group. The p-values were 0.193 for the right hand and 0.631 for the left hand.

3.4. Correlation Analysis Results

The depression scale was positively and significantly correlated with all subscales of the SPS. The depression scale was also positively correlated with the hostility subscale of the BPAQ (p<0.05). The SPS was positively correlated with the BPAQ (p<0.05) (Table 3).

Table 2. Analysis of quantitative variables of the groups

	PCOS diagnosed patient group N=62	Healthy control group (N=62)		P
SPS	***Mean ± SD***	***Mean ± SD***	**F**	
Hopelessness	29.43±6.76	24.70±5.65	2.234	0.516
Total Score	69.07±15.09	67.35±13.01	0.613	0.498
	Median	**Median**	**Z**	
BDI	67.24	57.76	-1.471	0.141
SPS				
Negative self-evaluation	61.85	63.15	-.200	0.841
Hostility	65.20	59.80	-.841	0.400
Suicide ideation	67.54	57.46	-1.587	0.112
BPAQ				
Physical aggression	67.89	57.31	-.1.611	0.107
Hostility	64.34	60.66	-.571	0.568
Anger	67.81	57.19	-1.650	0.099
Verbal aggression	68.86	56.14	**-1.979**	**0.048***
Total score	67.61	57.39	-1.585	0.113

Abbreviations used in the table: SPS: Suicide Probability Scale, BDI: Beck Depression Inventory, BPAQ: Buss Perry Aggression Questionnaire. The significance test for the difference between the two means is given above the table; the Mann Whitney U test is used below. The values above the table are presented as mean ± standard deviation, and the values below are presented as median values. *p<0.05

Table 3. Correlation analysis results of the patient group

	BDI	SPS-NSE	SPS-H	SPS-Host	SPS-SI	SPS-T	BPAQ-PA	BPAQ-H	BPAQ-A	BPAQ-VA	BPAQ-T
BDI	1	.334	.674	.665	.587	.683	.432	.576	.614	.200	.570
SPS-NSE	.334	1	.545	.387	.395	.708	.309	.532	.270	.272	.439
SPS-H	.674	.545	1	.701	.656	.943	.439	.691	.562	.218	.616
SPS-Host	.655	.387	.701	1	.651	.797	.510	.639	.581	.317	.634
SPS-SI	.587	.395	.656	.651	1	.746	.315	.417	.405	.163	.402
SPS-T	.683	.708	.943	.797	.746	.1	.499	.727	.559	.282	.661
BPAQ-PA	.432	.309	.439	.510	.315	.499	.1	.537	.708	.546	.858
BPAQ-H	.576	.532	.691	.639	.417	.727	.537	1	.650	.468	.822
BPAQ-A	.614	.270	.562	.581	.405	.559	.708	.650	1	.464	.870
BPAQ-VA	.200	.272	.218	.317	.163	.282	.546	.468	.464	1	.664
BPAQ-T	.570	.439	.616	.634	.402	.661	.858	.822	.870	.664	.1

Abbreviations used in the table: BDI: Beck Depression Inventory, SPS-NSE: Suicide Probability Scale - Negative Self-Evaluation, SPS-H: Suicide Probability Scale – Hopelessness, SPS-Host: Suicide Probability Scale - Hostility, SPS-SI: Suicide Probability Scale - Suicide Ideation, SPS-T: Suicide Probability Scale - Total Score, BPAQ-PA: Buss Perry Aggression Questionnaire - Physical Aggression, BPAQ-H: Buss Perry Aggression Questionnaire – Hostility, BPAQ-A: Buss Perry Aggression Questionnaire – Anger, BPAQ-VA: Buss Perry Aggression Questionnaire - Verbal Aggression, BPAQ-T: Buss Perry Aggression Questionnaire - Total Score

Pearson and Spearman correlation analysis tests were used for the calculations. "r" values are provided in the table

4. Discussion

In our study, we examined the presence and severity of depressive symptoms, aggression levels, and the likelihood of suicide in PCOS and healthy controls. We also compared finger measurements between the groups.

Studies in the literature report increased rates of depression in PCOS patients (6, 9). One of meta-analysis reported a 42% rate of depression in PCOS patients based on 24 studies, a significantly higher rate (22). Another study found high depression scores in PCOS patients, with factors such as age, residence, occupation, having children, and body mass index influencing the severity of depression (23). More severe depression levels were reported in obese patients (24, 25). In a cross-sectional study, 40% of PCOS patients did not have depressive disorders, with 7% having severe, 18% moderate, and 35% mild depressive disorders (7). Our results were similar.

Suicidal thoughts and behaviors in PCOS are a newly

researched area, with conflicting results. Some studies report no difference in lifetime suicide attempts and thoughts between PCOS patients and the general population (9), while others report increased risk of active suicidal thoughts and attempts (26, 27). Active suicidal thoughts, plans, and attempts are significant risk factors. Infertility accompanying PCOS increases the risk of active suicidal thoughts, with depressed infertile women using dysfunctional coping styles in response to stress, leading them to consider suicide as a coping mechanism (26). Another study reported increased risk of suicidal thoughts and attempts during the initial diagnosis of PCOS, with comorbid psychiatric and organic diseases also being risk factors (27). Similarly, another study found PCOS patients at risk for future self-harm and suicidal thoughts, with increased emotional dysregulation and self-harm behaviors (28). In our study, SPS scores for suicidal thoughts, hopelessness, hostility, and total scores were higher in the patient group, although not statistically significant. This result may be due to the demographic characteristics and lack of additional psychiatric and comorbid diseases in the participants. In the literature, studies on demographic characteristics and suicide rates and probabilities report that suicidal ideation is more common in young, single and female individuals. The probability of suicide is calculated to be higher in single women compared to married women (29-31). Since our study participants were young and mostly single, a statistical difference may not have been detected. Larger-scale studies with more comprehensive groups are needed for healthier results.

The relationship between polycystic ovary syndrome and psychological variables is an area that is poorly understood, including the relationship between anger management and PCOS. However, in recent years, research has been conducted on this subject and efforts are being made to shed light on this issue (32-35). Some studies report high rates of anger and anger control problems in PCOS patients, with self-harm behaviors related to anger control issues. These studies suggest that hormonal imbalances cause these anger control problems (32). A study using the State-Trait Anger Expression Inventory found that PCOS patients had difficulty controlling anger (33). Another study using the Barratt Impulsiveness Scale (BIS) found no difference (11). In a study conducted using the Anger and Aggressiveness (STAXI-II) scale, excessive anger expression and anger control problems were reported in the PCOS patient group (34). Our results showed increased verbal aggression levels in patients, with no statistically significant difference in other BPAQ subscales. It is thought that the differences between studies in the literature may be due to many issues such as the age of the participants, marital status, hormonal balance, weight, and differences between the scales applied. Since our study was conducted on young adults.

Finally, we examined 2D/4D finger ratios in PCOS patients. Prenatal testosterone activity affects 2D/4D lengths and their ratio in both hands. The 2D/4D is shaped up to the 14th week of the fetal period, with high fetal testosterone levels increasing ring finger length, lowering the 2D/4D (36, 37). Recent studies show that not only prenatal testosterone levels but also testosterone levels in later life and the active hand can change 2D/4D (38). In recent years, studies have begun to be conducted on the 2D:4D ratio in PCOS patients (39-42). In one of these studies, the 2D:4D was shown as a potential biomarker in the development of PCOS (39). One study reported that the 2D:4D in the PCOS patient group was lower than in controls (40). Moreover, in one study, the 2D:4D was associated with anger control problems independent of PCOS disease (41). In a meta-analysis in the literature, it was also reported that a low 2D:4D ratio was associated with higher testosterone levels (42). In fact, similarly in our study, 2D/4D ratios were lower in the patient group for both hands, but no significant difference. The small number of patients and the parameters we could not determine regarding the control group may have been effective in this result.

The primary limitation of this study is the relatively small sample size, which may have impacted the results. A larger cohort could potentially yield different and more robust findings. Additionally, evaluating participants with self-report scales, not determining anxiety levels, and not conducting structured clinical interviews for DSM-5 diagnosis in psychiatry are other limitations. If the DSM-5 clinical interview had been conducted, no psychiatric diagnosis would have been missed. In addition, evaluating patients with scales administered by the interviewer rather than self-reporting scales could have revealed existing psychiatric symptoms. These limitations restrict the generalization and interpretation of our results. Larger sample groups and detailed future research with more comprehensive laboratory parameters are needed to expand the literature in this area. In conclusion, our study examined the presence and severity of depressive symptoms, aggression levels, 2D/4D finger ratios, and the likelihood of suicide in PCOS patients using self-report scales compared to healthy controls. Our results showed that although depression scores and many subscales of the SPS were higher in PCOS patients. Only the verbal aggression subscale showed a statistically significant difference, but the 2D/4D did not differ among the participants. PCOS patients are at risk for many comorbid diseases, both psychiatric and metabolic (5-10). Therefore, this situation should be taken into consideration when evaluating patients, following them up, and planning treatment. Maybe, considering our results, psychiatric comorbidity and treatment support methods should be considered at the time of initial diagnosis in PCOS patients. And PCOS should also be included in international guidelines.

Ethical Statement

The study protocol was approved by the Clinical Research Ethics Committee of Tokat Gaziosmanpaşa University (Date: 28.07.2022, No: 22-KAEK-152).

Conflict of interest
All of the authors declare that there are no conflicts of interest in connection with this paper.

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Authors' contributions
Concept: F.Ö., Design: F.Ö., M.Ç., Data Collection or Processing: M.Ç., Analysis or Interpretation: B.D., Literature Search: F.Ö., Writing: F.Ö.

References

1. Escobar-Morreale, HF. Polycystic ovary syndrome: definition, aetiology, diagnosis and treatment. Nat. Rev. Endocrinol. 2018; 14 (5): 270.

2. Bulsara J, Patel P, Soni A, Acharya S. A review: Brief insight into Polycystic Ovarian syndrome. Endocrine and Metabolic Science. 2021; 3: 100085.

3. Bharathi RV, Swetha S, Neerajaa J, Madhavica JV, Janani DM, Rekha SN, et al. An epidemiological survey: Effect of predisposing factors for PCOS in Indian urban and rural population. Middle East Fertility Society J. 2017; 22 (4): 313–316.

4. El Hayek S, Bitar L, Hamdar LH, Mirza FG, Daoud G. Poly cystic ovarian syndrome: an updated overview. Front Physiol. 2029; 7:124.

5. Goodarzi MO, Dumesic DA, Chazenbalk G, Azziz R. Polycystic ovary syndrome: etiology, pathogenesis and diagnosis. Nat. Rev. Endocrinol. 2011; 7 (4): 219-231.

6. Doretto L, Mari FC, Chaves AC. Polycystic ovary syndrome and psychotic disorder. Frontiers in Psyc. 2020; 11: 545724.

7. Hasan M, Sultana S, Sohan M, Parvin S, Rahman MA, Hossain MJ, et al. Prevalence and associated risk factors for mental health problems among patients with polycystic ovary syndrome in Bangladesh: A nationwide cross—Sectional study. PLoS One.2022; 17(6): e0270102.

8. Sadeeqa S, Mustafa T, Latif S. Polycystic ovarian syndrome-related depression in adolescent girls: a review. J Pharm Bioallied Sci. 2018; 10:55–59.

9. Gomaa MA, Desoky AA, Amer D, Alaa D, Khalil MA. Impulsivity, depression, and suicide in female patients with polycystic ovary syndrome and infertility. Middle East Current Psyc. 2023; 30(1):116.

10. Gul A, Gul H, Ergur AT, Özen NE. Anxiety-anger relationship in hyperandrogenemia: a comparative study with polycystic ovary syndrome (PCOS) and healthy control adolescents. J Psychiatry Behavioral Sci.2028; 8:27.

11. Barabasz-Gembczyk A, Mędrala W, Rodek P, Alli-Balogun B, Chrobak J, Cwynar M, et al. Correlation between selected clinical symptoms and severity of aggression, impulsiveness and their selected behavioral manifestations in patients with polycystic ovary syndrome phenotype A. Metabolites. 2023; 13(5): 646.

12. Vetulani, J. Neurochemistry of impulsiveness and aggression. Psychiatr. Pol. 2013, 47, 103–115.

13. Sorokowski P, Kowal M. Relationship between the 2D: 4D and prenatal testosterone, adult level testosterone, and testosterone change: Meta-analysis of 54 studies. American Journal of Biological Anthropology. 2024; 183(1): 20-38.

14. Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group (2004) Revised 2003 consensus on diagnostic criteria and long-term health risks related to polycystic ovary syndrome. Fertil Steril 81:19–25.

15. Beck AT. An inventory for measuring depression. Arch Gen Psychiatry 1961;4(6):561-71.

16. Hisli N. Beck Depresyon Envanteri'nin Üniversite Öğrencileri için Geçerliği, Güvenirliği. Psikoloji Dergisi. 1989;6(23):3-13.

17. Buss AH, Perry. The Aggression Questionnaire. J Pers Soc Psych. 1992; 63: 452-9.

18. Demirtaş Madran HA. Buss-Perry Saldırganlık Ölçeği'nin Türkçe Formunun Geçerlik ve Güvenirlik Çalışması. Türk Psikiyatri Derg. 2012; (23):1-6.

19. Cull JG, Gill WS. Suicide probability scale, Western Psychological Services, 1990, Los Angels.

20. Atlı Z, Eskin M, Dereboy Ç. İntihar Olasılığı Ölçeğinin (İOÖ) klinik örneklemde geçerlik ve güvenirliği. Klinik Psikiyatri Derg. 2009; 12(3): 111-124.

21. Bahçelioğlu M. Fertil-İnfertil Kişilerde El 2. ve 4. Parmak Uzunluk Oranlarıyla, Sperm ve Hormon Değerleri Arasındaki İlişkinin Araştırılması. Gazi Üniversitesi, Tıp Fakültesi Anatomi Anabilim Dalı, Uzmanlık Tezi, 2002, Ankara, (Doç. Dr. Afitap ANIL)

22. Wang Y, Ni Z, Li K. The prevalence of anxiety and depression of different severity in women with polycystic ovary syndrome: a meta-analysis. Gynecological Endocrinol. 2021; 37(12): 1072-1078.

23. Dybciak P, Humeniuk E, Raczkiewicz D, Krakowiak J, Wdowiak A, Bojar I. Anxiety and depression in women with polycystic ovary syndrome. Medicina. 2022; 58(7): 942.

24. Alur-Gupta S, Lee L, Chemerinski A, Liu C, Lipson J, Allison K, et al. Racial differences in anxiety, depression, and quality of life in women with polycystic ovary syndrome. F S Rep. 2021; 2: 230–237.

25. Lin H, Liu M, Zhong D, Ng EHY, Liu J, Li J, et al. Prevalence and Factors Associated With Anxiety-Like and Depression-Like Behaviors in Women With Polycystic Ovary Syndrome. Front. Psychiatry. 2021; 12: 709674.

26. Shani C, Yelena S, Reut BK, Adrian S, Sami H. Suicidal risk among infertile women undergoing in-vitro fertilization: Incidence and risk factors. Psychiatry Res. 2016; 240: 53- 59.

27. Hsu TW, Kao YC, Tsai SJ, Bai YM, Su TP, Chen TJ, et al. Suicide attempts after a diagnosis of polycystic ovary syndrome: a cohort study. Annals of Int Med. 2024; 177(3):335-342.

28. Williams S, Fido D, Sheffield D. Polycystic Ovary Syndrome and Non-Suicidal Self-Injury: A community-based study. In Healthcare. 2021; 10 (6): 1-10.

29. Alptekin K, Duyan V. İntihar ve İntihar Girişimi. Yeni İnsan Yayınevi. 2021; 8. Baskı.

30. Özdeş T, Erkol Z, Hosukler E, Turan T, Gündoğdu V, Kurtoğlu Özdeş E. A 16-Year Retrospective Study Examining Socio-Demographic Factors among Suicide Decedents in Bolu Province, Northwestern Turkey. Int J Sci: Basic and Applied Res. 2023; 70(1):86-98.

31. Oyuncakçı S, Güloğlu B. 25-40 Yaş Aralığındaki Bireylerde intihar Olasılığı, Psikolojik Sağlamlık, Affetme ve Olumlu-Olumsuz Duygular Arasındaki ilişkinin incelenmesi: Kesitsel

Araştırma. Turkiye Klinikleri J Health Sci. 2022; 7(1):262.

32. Balikci A, Erdem M, Keskin U, Zincir SB, Guelsuen M, Ozcelik F, et al. Depression, anxiety, and anger in patients with polycystic ovary syndrome. Nöro Psikiyatri Arşivi. 2014; 51(4): 328.

33. Borghi L, Leone D, Vegni E, Galiano V, Lepadatu C, Sulpizio P, et al. Psychological distress, anger and quality of life in polycystic ovary syndrome: associations with biochemical, phenotypical andsocio-demographic factors. Journal of Psychosomatic Obstetrics & Gynecology. 2028; 39(2):128-137.

34. Borghi L, Leone D, Vegni E, Galiano V, Lepadatu C, Sulpizio P, et al. Psychological distress, anger and quality of life in polycystic ovary syndrome: associations with biochemical, phenotypical andsocio-demographic factors. J Psychosom Obstet Gynecol. 2018; 39(2): 128-137.

35. Yin X, Ji Y, Chan CLW, Chan CHY. The mental health of women with polycystic ovary syndrome: a systematic review and meta-analysis. Arch Women's Mental Healt. 2021; 24, 11-27.

36. Pandit VK, Setiya M, Yadav S, Jehan M. Digit ratio (2D: 4D): A potential anatomical biomarker for predicting the risk of development of polycystic ovarian syndrome. IOSR J Dent Medi Sci. 2016; 15(8): 58-64.

37. Roy R, Kundu R, Sengupta M, Som P. Association between digit length ratio (2D: 4D) and polycystic ovarian syndrome (PCOS)—A study among eastern Indian population. J Anatomic Soci India. 2018; 67: 14-19.

38. Benderlioglu Z, Nelson RJ. Digit length ratios predict reactive aggression in women, but not in men. Hormon Behav. 2004; 46(5): 558-564.

39. Richards G, Browne WV, Aydin E, Constantinescu M, Nave G, et al. Digit ratio (2D: 4D) and congenital adrenal hyperplasia (CAH): Systematic literature review and meta-analysis. Hormon Behav. 2020; 126: 104867.

40. Krajmer P, Spajdel M, Kubranska A, Ostatnikova D. 2D:4D finger ratio in Slovak autism spectrum population. Bratisl Lek Listy 2011; 112: 377-379.

41. Demirci EÖ, DB Öztop. Dikkat eksikliği ve hiperaktivite bozukluğu olan erkek çocuk ve ergenlerde agresyon, empati ve 2D: 4D parmak oranlarının ilişkisi. In Yeni Symp.2015; 53: 2-8.

42. Can Z. Sağlıklı Bireylerde Parmak Uzunluk Oranlarının (2d: 4d); El Tercihi, Nonverbal Zeka, Görsel, İşitsel ve Verbal Yetenekler, Motor Beceri ve Serebral Lateralizasyon ile İlişkisi (Master's thesis, Afyon Kocatepe Üniversitesi, Sağlık Bilimleri Enstitüsü), 2018.