Journal of
Controversies in Obstetrics & Gynecology and Pediatrics

Original Article

DOI: 10.51271/JCOGP-0071

The association between intolerance of uncertainty and depression, anxiety, and stress among women with gynecological cancer in Turkiye: a cross-sectional study

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Cite this article as: Şahingöz Alpargan M, Uslu Şahan F, Karadurmuş N Ayidaga T. The association between intolerance of uncertainty and depression, anxiety, and stress among women with gynecological cancer in Turkiye: a cross-sectional study. *J Controv Obstetr Gynecol Ped*. 2026;4(2):36-42. doi:10.51271/JCOGP-0071

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Received: 09.02.2026 ◆ **Accepted**: 22.04.2026 ◆ **Published**: 30.04.2026

ABSTRACT

Aims: This study aimed to examine the association between intolerance of uncertainty (IU) and psychological distress (depression, anxiety, and stress) in women with gynecological cancer in Turkiye.

Methods: This cross-sectional study was conducted between February and July 2024, and included 139 women diagnosed with gynecological cancer at a university hospital in Ankara, Turkiye. Data were collected using a personal information form, the Intolerance of Uncertainty Scale-12, and the Depression, Anxiety, and Stress Scale-21. Statistical analyses included independent-samples t-tests, analysis of variance, Pearson correlations, and hierarchical linear regression.

Results: The mean depression, anxiety, and stress scores were 6.78±5.47, 5.73±4.12, and 7.91±4.86, respectively. IU was positively correlated with depression (r=0.437, p=0.001), anxiety (r=0.394, p=0.001), and stress (r=0.516, p=0.001). Regression analyses showed that IU was independently associated with depression (β=0.389, p=0.001), anxiety (β=0.377, p=0.001), and stress (β=0.485, p=0.001) after controlling for selected sociodemographic and clinical variables.

Conclusion: Higher IU was significantly associated with greater psychological distress in women with gynecological cancer. These findings suggest that psychosocial care may benefit from greater attention paid to uncertainty-related distress.

Keywords: Intolerance of uncertainty, gynecological cancer, depression, anxiety, stress

INTRODUCTION

Gynecological cancers, including cervical, ovarian, endometrial, vaginal, and vulvar malignancies, constitute a major global health burden due to their high incidence, complex treatments, and substantial psychosocial impact.[1,2] According to GLOBOCAN 2022, they account for approximately 1.47 million new cases and 680,000 deaths worldwide.[1,3] In Turkiye, uterine corpus, ovarian, and cervical cancers similarly remain among the most common cancers in women, contributing significantly to the national burden.[3]

Women diagnosed with gynecological cancer frequently experience substantial psychological distress, particularly depression, anxiety, and stress.[4-6] Uslu-Sahan et al.[6] reported that higher distress levels were associated with unmet spiritual care needs and poorer quality of life in Turkish women. This burden is driven by treatment side effects, illness-related uncertainty, and concerns about fertility, sexuality, and family roles.[7-9] Meta-analyses and guidelines consistently document high rates of mood and anxiety disorders in oncology populations, with nearly one-third of patients experiencing clinically significant anxiety, highlighting the need for systematic psychosocial screening and support.[4,10-12] Women with ovarian cancer appear especially vulnerable, showing higher depression and anxiety levels than the general population.[12,13]

A growing body of evidence identifies intolerance of uncertainty (IU), defined as the tendency to perceive ambiguous or unpredictable situations as threatening, as a key cognitive mechanism underlying psychological distress.[14] IU increases threat appraisal, promotes persistent worry, and impairs emotion regulation.[15,16] In oncology populations, higher IU has been consistently associated with greater depression and anxiety, fear of disease progression, and poorer cognitive functioning, and it has been shown to mediate the effects of illness-related uncertainty on psychological outcomes, supporting its role

as a transdiagnostic vulnerability factor.[15,17,18] However, most of the available evidence has been derived from broader oncology populations, and the association between IU and psychological distress in women with gynecological cancer remains less clearly characterized.[15,16,18]

In Turkiye, women with gynecological cancer have been reported to experience substantial psychological distress and supportive care needs, which may contribute to an overall psychosocial burden.[6,19,20] Additionally, sexuality and reproductive health may be experienced as sensitive or stigmatized topics in the Turkish context, potentially limiting open communication and coping resources for some women.[21] Therefore, examining the association between IU and depression, anxiety, and stress in Turkish women with gynecological cancer may provide context-specific evidence to inform psychosocial assessment and supportive care. Accordingly, this study aimed to examine the association between IU and depression, anxiety, and stress among Turkish women with gynecological cancer, while accounting for selected sociodemographic and clinical characteristics. We hypothesized that higher IU would be associated with higher levels of depression, anxiety, and stress.

METHODS

Ethics

The study protocol was approved by the Researches Ethics Committee of the Faculty of Health Sciences at Hacettepe University (Date: 05.12.2023, Decision No: 2023/08-22). Following approval by the ethics committee, research authorization was obtained from the Education Planning Committee of the Gülhane Health Application and Research Center (Date: 10.01.2024, Decision No: 1). The study followed the Declaration of Helsinki and relevant guidelines and regulations. After being informed about the potential risks and benefits of the study, each participant provided written informed consent.

Study Design

This study employed a descriptive cross-sectional design, following the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[22]

Participants

Participants were recruited between February and July 2024 from the gynecological oncology inpatient and outpatient chemotherapy units of a university hospital in Ankara, Turkiye. A convenience sampling approach was used. Eligible participants were women who had received a diagnosis of gynecological cancer at least two months prior, were aware of their diagnosis, and were able to read, write, and understand Turkish. Additionally, participants provided informed consent after being informed about the study objectives. Patients with a pre-existing psychiatric disorder diagnosed prior to the cancer diagnosis or with severe visual, hearing, or speech impairments that could interfere with questionnaire completion were excluded from the study.

The required sample size was calculated using G*Power 3.1.9.2, based on a multiple regression model with a small-to-medium effect size (f^2=0.10), 95% power, and a significance level of 0.05. The minimum required sample size was 132 participants.[23] During the study period, 150 women were assessed for eligibility. Of these, 11 were excluded because they had received their diagnosis within the previous two months (n=7), had insufficient Turkish literacy (n=2), or had a pre-existing psychiatric disorder (n=4). The final sample consisted of 139 women. The recruitment yield was 92.7% (139/150).

Data Collection Tools

Data were collected using standardized instruments to assess participants' sociodemographic and clinical characteristics, IU, and levels of depression, anxiety, and stress.

Personal Information Form: The researchers developed a personal information form to collect participants' sociodemographic and clinical characteristics, including age, marital status, education, employment status, income level, cancer diagnosis, cancer stage, treatment type, and time since diagnosis. Treatment type was categorized as either single or combined treatment.

Intolerance of Uncertainty Scale: The 12-item Intolerance of Uncertainty Scale (IUS-12)[14] was used to assess participants' levels of IU. The Turkish version of the scale was validated by Sarıçam et al.[24] Items are rated on a 5-point Likert scale (1="not at all characteristic of me" to 5="entirely characteristic of me"), with total scores ranging from 12 to 60. Higher scores indicate greater IU. In the present study, Cronbach's α for the IUS-12 was 0.907.

Depression, Anxiety, and Stress Scale (DASS-21): DASS-21 was employed to measure participants' levels of depression, anxiety, and stress. The Turkish version was validated by Sarıçam.[26] The scale includes three 7-item subscales for depression, anxiety, and stress, scored on a 4-point Likert scale (0="did not apply to me at all" to 3="applied to me very much or most of the time"). In the present study, raw DASS-21 subscale scores were used, and interpretation was based on the cut-off values reported for the Turkish version (depression ≥5, anxiety ≥4, stress ≥8). Cronbach's α coefficients were 0.862 for depression, 0.783 for anxiety, and 0.819 for stress in the present study.

Data Collection Procedure

Data were collected through face-to-face interviews conducted by the first author. Participants who met the inclusion criteria were fully informed about the study's purpose, significance, and potential contributions. Written informed consent was obtained from all participants prior to data collection.

Participants completed the questionnaires independently; however, the researcher was able to provide clarification, if needed. For participants with reading difficulties, the researcher read the items aloud and indicated their responses to the questionnaires. Confidentiality was strictly maintained throughout the data-collection process. Each session lasted approximately 25–30 min per participant.

Statistical Analysis

Data were analyzed using IBM SPSS Statistics version 23.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize participants' demographic, clinical, and scale characteristics. The normality of continuous variables was assessed prior to analysis. Comparisons of DASS-21 subscale scores across demographic and clinical variables were performed using Independent-samples t-tests and one-way analysis of variance (ANOVA). Relationships

between scale scores were examined using Pearson's correlation analysis. For each DASS-21 subscale outcome (depression, anxiety, and stress), hierarchical linear regression analyses were conducted in two steps. In model 1, variables that showed a significant association with the relevant outcome in univariate analyses ($p<0.05$) were entered. In model 2, IU was added to examine its independent association with the outcome. Regression assumptions were evaluated by examining multicollinearity (variance inflation factor and tolerance values), independence of residuals (Durbin–Watson statistic), normality of residuals using histograms and normal P–P plots, and homoscedasticity using scatterplots of standardized residuals against standardized predicted values. Two-tailed tests were used, and statistical significance was set at $p<0.05$.

RESULTS

Table 1 presents the sociodemographic and clinical characteristics of the participants. The mean age of the participants was 55.18±11.42 years (range, 25–84). Most participants had completed primary education (69.1%), were married (71.2%), were not employed (76.3%), and reported a monthly income approximately equal to their expenses (53.2%). Regarding cancer type and clinical characteristics, 47.5% of participants were diagnosed with ovarian cancer, 69.1% were in the early stages (stage 1 or 2), and 66.2% received combined therapy. The mean time since diagnosis was 16.93±21.97 months (range=2-108) (Table 1).

Table 1. Descriptive characteristics of the participants (n=139)

Characteristics	Mean±SD/n	Min–max/%
Age (years)	55.18±11.42	25-84
Education level		
Primary education	96	69.1
High school or above	43	30.9
Marital status		
Married	99	71.2
Single	40	28.8
Employment status		
Yes	33	23.7
No	106	76.3
Income level		
Less than expenses	32	23.0
Equal to expenses	74	53.2
More than expenses	33	23.7
Cancer diagnosis		
Cervical cancer	32	23.0
Endometrial cancer	41	29.5
Ovarian cancer	66	47.5
Cancer stage		
Early (stage 1-2)	96	69.1
Advanced (stage 3-4)	43	30.9
Treatment type*		
Single	47	33.8
Combined	92	66.2
Time since diagnosis (months)	16.93±21.97	2-108

SD: Standard deviation, Min: Minimum, Max: Maximum. *Single treatment includes surgery, chemotherapy, or radiotherapy; Combined treatment includes surgery+chemotherapy, chemotherapy+radiotherapy, surgery+chemotherapy+radiotherapy, surgery+hormone therapy, or surgery+ radiotherapy

Table 2 presents the results of the univariate analyses for the DASS-21 subscales (depression, anxiety, and stress). For the depression subscale, older age ($r=0.234$, $p=0.006$), primary education ($t=2.438$, $p=0.016$), and lower income than expenses ($F=3.879$, $p=0.023$) were associated with higher depression scores. For the anxiety subscale, older age ($r=0.244$, $p=0.004$) and unemployment ($t=-2.168$, $p=0.033$) were associated with higher anxiety scores. Regarding the stress subscale, older age ($r=0.195$, $p=0.021$) and lower income than expenses ($F=3.538$, $p=0.032$) were associated with higher stress scores.

Table 3 presents the descriptive statistics of the scales and the correlations between the DASS-21 subscales and IU. The mean scores for depression, anxiety, and stress were 6.78±5.47 (range=0–21), 5.73±4.12 (range=0-18), and 7.91±4.86 (range=0-21), respectively. The mean score on the IUS-12 was 41.88±12.12 (range=16-60). Based on the cut-off values reported for the Turkish version of the DASS-21, the mean depression and anxiety scores were above the symptom cut-offs, whereas the mean stress score was close to, but slightly below, the corresponding cut-off. Positive and significant correlations were found between IU and depression ($r=0.437$, $p=0.001$), anxiety ($r=0.394$, $p=0.001$), and stress ($r=0.516$, $p=0.001$).

Table 4 presents the results of the hierarchical linear regression analyses examining the factors associated with depression, anxiety, and stress. No multicollinearity was detected, as the variance inflation factor values were below 10 and tolerance values exceeded 0.1. Durbin–Watson statistics ranged from 1.388 to 1.524, indicating independence of residuals. Visual inspection of residual histograms, normal P–P plots, and scatterplots of standardized residuals against standardized predicted values suggested no major deviation from normality or homoscedasticity. For depression, model 1 was significant ($F=5.672$, $p=0.001$), explaining 11% of the variance (adjusted $R^2=0.09$). Lower income was significantly associated with higher depression scores ($\beta=0.209$, $p=0.011$). After IU was added in model 2, the model remained significant ($F=11.564$, $p=0.001$) and explained 26% of the variance (adjusted $R^2=0.23$). IU was independently associated with higher depression scores ($\beta=0.389$, $p=0.001$), while income level remained significantly associated with depression ($\beta=0.158$, $p=0.038$). For anxiety, model 1 was significant ($F=4.862$, $p=0.009$), accounting for 7% of the variance (adjusted $R^2=0.05$). Older age was significantly associated with higher anxiety scores ($\beta=0.218$, $p=0.013$). In model 2, the inclusion of IU significantly improved model fit ($F=11.768$, $p=0.001$), explaining 21% of the variance (adjusted $R^2=0.19$). IU was independently associated with higher anxiety scores ($\beta=0.377$, $p=0.001$), and age remained significantly associated with anxiety ($\beta=0.181$, $p=0.026$). For stress, model 1 was significant ($F=5.691$, $p=0.004$), explaining 8% of the variance (adjusted $R^2=0.06$). Older age ($\beta=0.181$, $p=0.030$) and lower income ($\beta=0.198$, $p=0.018$) were significantly associated with higher stress scores. After adding IU, model 2 showed a marked increase in explained variance ($R^2=0.31$; adjusted $R^2=0.29$; $F=19.949$, $p=0.001$). IU was independently associated with higher stress scores ($\beta=0.485$, $p=0.001$).

DISCUSSION

This study examined the association between IU and depression, anxiety, and stress among women with gynecological cancer in Turkiye. Higher IU was significantly associated with greater psychological distress and remained independently associated with depression, anxiety, and

Table 2. Univariate analysis of DASS-21 subscales

Characteristic	Depression			Anxiety			Stress		
	Mean±SD	t/F/r	p	Mean±SD	t/F/r	p	Mean±SD	t/F/r	p
Age (years)	-	0.234	0.006	-	0.244	0.004	-	0.195	0.021
Education level									
Primary school	7.52±5.75	2.438	0.016	6.10±4.43	1.623	0.107	8.28±5.11	1.336	0.184
High school or above	5.12±4.43			4.88±3.22			7.09±4.20		
Marital status									
Married	6.58±5.68	-0.681	0.497	5.45±4.19	-1.227	0.222	7.80±4.99	-0.440	0.661
Single	7.28±4.96			6.40±3.90			8.20±4.57		
Employment status									
Yes	6.27±4.70	-0.605	0.546	4.61±3.04	-2.168	0.033	7.06±3.60	-1.156	0.168
No	6.93±5.70			6.08±4.36			8.18±5.18		
Income status									
Less than expenses	8.97±6.23[a]	3.879	0.023	6.97±4.84	1.985	0.141	9.78±5.38[a]	3.538	0.032
Equal to expenses	5.81±5.26[b]			5.26±3.88			7.09±4.76[b]		
More than expenses	6.82±4.61			5.58±3.76			7.94±4.13		
Diagnosis									
Cervical cancer	8.19±5.53	2.023	0.136	6.25±4.54	0.383	0.683	8.06±5.00	1.322	0.270
Endometrial cancer	7.10±5.00			5.73±4.05			8.83±5.11		
Ovarian cancer	5.89±5.63			5.47±3.99			7.27±4.61		
Cancer stage									
Early (stage 1–2)	5.45±0.56	0.114	0.909	4.09±0.42	0.055	0.956	4.93±0.50	-0.290	0.772
Advanced (stage 3–4)	5.57±0.85			4.25±0.65			4.77±0.73		
Treatment type									
Single	7.13±5.80	0.539	0.591	6.17±4.71	0.906	0.366	8.17±5.50	0.443	0.658
Combined	6.60±5.32			5.50±3.80			7.78±4.53		
Time since diagnosis (months)	-	-0.078	0.359	-	-0.019	0.825	-	0.084	0.326

DASS-21: Depression, Anxiety, and Stress Scale, SD: Standard deviation, a, b: Groups with different letters for each variable in the same column are significant. Bonferroni test t: Student's t-test, F: One-Way Analysis of Variance (ANOVA), r: Pearson correlation

Table 3. Relationship between sociodemographic characteristics, depression, anxiety stress, and intolerance of uncertainty

Scale	Mean	SD	Min–max	Intolerance of uncertainty	
				r	p
Depression	6.78	5.47	0-21	0.437	0.001
Anxiety	5.73	4.12	0-18	0.394	0.001
Stress	7.91	4.86	0-21	0.516	0.001
Intolerance of uncertainty	41.88	12.12	16-60	-	-

SD: Standard deviation, Min: Minimum, Max: Maximum, r: Pearson correlation

stress after controlling for selected sociodemographic and clinical variables. These results support the view that IU may represent an important transdiagnostic cognitive correlate of psychological distress in oncology populations. From a psychological perspective, individuals with higher IU may be more likely to perceive illness-related ambiguity, uncertainty about prognosis, and treatment-related unpredictability as threatening, thereby intensifying worry, emotional distress, and difficulties in coping.[15-18] However, because of the cross-sectional design, these findings should be interpreted as associations rather than evidence of temporal or causal relationships.

In our study, the mean depression score was above the symptom cut-off reported for the Turkish version of the DASS-21, suggesting the presence of depressive symptoms among women with gynecological cancer. In univariate analyses, older age, lower education, and lower income were associated with higher depression scores, consistent with previous research linking sociodemographic disadvantage to poorer psychological outcomes in oncology populations.[27,28] After adjusting for selected sociodemographic and clinical variables, IU remained independently associated with depression, indicating that IU may be an important cognitive vulnerability related to persistent distress in cancer survivors.[15,16,18,29] Difficulty tolerating ambiguity regarding disease progression, treatment outcomes, and future life roles may increase worry, emotional distress, and depressive affect.[15-18] In clinical practice, these results highlight the value of paying closer attention to how patients respond to uncertainty during psychosocial assessment.[30-32]

In the present study, the mean anxiety score was above the symptom cut-off reported for the Turkish version of the DASS-21, indicating the presence of anxiety symptoms in the sample. Univariate analyses showed that older age and unemployment were associated with higher anxiety scores. This pattern is consistent with previous evidence showing that anxiety is common in oncology populations and may be shaped by social and clinical stressors.[5,30] After adjustment, IU remained independently associated with anxiety, together with older age, in line with prior research suggesting that IU may function as an important cognitive vulnerability factor in cancer populations.[16,29] Greater IU may heighten attention

Table 4. Hierarchical linear regression analysis of the determinants of DASS-21 subscales

Dependent variable	Independent variables[a]	Model 1				Model 2				DW	Collinearity statistics	
		B	SE	β	p	B	SE	β	p		Tolerance	VIF
Depression	Age	0.078	0.043	0.162	0.072	0.074	0.039	0.156	0.061	1.440	0.821	1.218
	Education (1=primary)	1.616	1.053	0.137	0.127	0.896	0.977	0.076	0.361		0.808	1.237
	Income (1=income <expenses)	2.708	1.053	0.209	0.011	2.050	0.976	0.158	0.038		0.977	1.024
	Intolerance of uncertainty					0.176	0.034	0.389	0.001		0.956	1.046
	F (p)	5.672 (0.001)				11.564 (0.001)						
	R^2	0.11				0.26						
	adjR^2	0.09				0.23						
	R^2 change	-				0.15						
Anxiety	Age	0.079	0.031	0.218	0.013	0.065	0.029	0.181	0.026	1.524	0.906	1.103
	Employment (1=no)	0.853	0.836	0.088	0.309	0.926	0.773	0.096	0.233		0.914	1.094
	Intolerance of uncertainty					0.128	0.026	0.377	0.001		0.991	1.009
	F (p)	4.862 (0.009)				11.768 (0.001)						
	R^2	0.07				0.21						
	adjR^2	0.05				0.19						
	R^2 change	-				0.14						
Stress	Age	0.077	0.035	0.181	0.030	0.060	0.031	0.141	0.053	1.388	0.988	1.012
	Income (1=income <expenses)	2.281	0.950	0.198	0.018	1.581	0.833	0.137	0.060		0.979	1.021
	Intolerance of uncertainty					0.195	0.029	0.485	0.001		0.976	1.025
	F (p)	5.691 (0.004)				19.949 (0.001)						
	R^2	0.08				0.31						
	adjR^2	0.06				0.29						
	R^2 change	-				0.23						

DASS-21: Depression, Anxiety, and Stress Scale, B: Unstandardized coefficient, β: Standardized coefficient, SE: Standard error, DW: Durbin-Watson, VIF: Variance inflation factor. Predictors included in the final model were those statistically significant in univariate analyses (p<0.05). a: Only variables significant in univariate analyses were entered into the regression models.

to illness-related ambiguity and future-oriented threat, thereby amplifying anticipatory worry and anxiety during the cancer experience.[15-18] Supportive care may therefore benefit from addressing uncertainty-related cognitions and coping responses in women with elevated anxiety.

In our sample, the mean stress score was close to the symptom cutoff reported for the Turkish version of the DASS-21, suggesting a notable level of stress symptoms. In univariate analyses, older age and lower income were associated with higher stress scores, consistent with previous research reporting elevated stress and maladaptive coping among women with gynecological cancer.[28] In the adjusted model, IU showed the strongest association with stress, in line with evidence linking IU to heightened affective symptoms in oncology populations.[16] For women coping with ongoing treatment demands and uncertainty about recovery, high IU may make everyday illness-related demands feel less manageable, contributing to tension, emotional overload, and perceived stress.[15-18] This pattern underscores the importance of supportive care that addresses both uncertainty-related cognitions and socioeconomic vulnerability.

Limitations

This study has several limitations that should be considered when interpreting the findings. Owing to the cross-sectional design, the directionality and temporal ordering of the observed associations cannot be established, and causal inferences should be avoided. Data were collected from a single university hospital in Turkiye using a convenience sample, which may limit the generalizability of the findings to other settings or populations and increase the risk of selection bias. Additionally, reliance on self-report measures may introduce social desirability or recall bias. Although several clinical characteristics were included, recurrence status and metastatic disease were not available in the dataset and therefore could not be examined as potential confounders.

CONCLUSION

This study showed that higher IU was significantly associated with higher levels of depression, anxiety, and stress among women with gynecological cancer in Turkiye, even after adjusting for selected sociodemographic and clinical characteristics. These findings highlight the importance of considering uncertainty-related cognitive responses in psychosocial care for this patient group. Routine psychosocial assessment that considers IU, together with evidence-based interventions such as IU-focused cognitive-behavioral and acceptance-based approaches, may help strengthen coping with uncertainty and reduce emotional burden. Future longitudinal and multi-center studies are needed to clarify temporal relationships and further examine the role of IU in psychological adaptation among women with gynecological cancer.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study protocol was approved by the Researches Ethics Committee of the Faculty of Health Sciences at Hacettepe University (Date: 05.12.2023, Decision No: 2023/08-22). Following approval by the ethics committee, research

authorization was obtained from the Education Planning Committee of the Gülhane Health Application and Research Center (Date: 10.01.2024, Decision No: 1).

Informed Consent

Written informed consent was obtained from all individual participants prior to their inclusion in the study. Participants were fully informed about the study's aims, procedures, potential risks and benefits, and their rights—including the right to withdraw at any time without consequence. All participants voluntarily signed a written informed consent form.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

The authors received no financial support for the conduct or publication of this research.

Author Contributions

Concept: MŞA, FUŞ, NK, TA; Design: MŞA, FUŞ, NK, TA; Control: MŞA, FUŞ, NK, TA; Resources: MŞA, FUŞ, NK, TA; Materials: MŞA, FUŞ, NK, TA; Data Collection and/or Processing: MŞA, FUŞ, NK, TA; Analysis and/or Interpretation: MŞA, FUŞ, NK, TA; Literature Review: MŞA, FUŞ, NK, TA; Article Writing: MŞA, FUŞ, NK, TA; Critical Review: MŞA, FUŞ, NK, TA.

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