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Determinants of state anxiety in parents of children with lymphadenopathy: A cross-sectional analysis

Lenfadenopatili çocukların ebeveynlerinde görülen kaygı düzeyini belirleyen faktörler: Kesitsel bir analiz

Sultan OKUR ACAR[1]
Mehmet Akif CANSIZ[2]

[1] Manisa City Hospital, Department of Pediatric Hematology and Oncology, Manisa, Türkiye
[2] Manisa City Hospital, Department of Child and Adolescent Psychiatry, Manisa, Türkiye

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Corresponding author
Sultan OKUR ACAR
ORCID ID: 0000-0002-5768-0890
sultanokur@gmail.com

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ABSTRACT

BACKGROUND
Pediatric lymphadenopathy is common and usually benign, but it can cause significant anxiety in parents. We quantified parental state anxiety in cases of pediatric lymphadenopathy and examined clinical and psychosocial correlates, including the use of online information sources.

METHODS
In a single-center cross-sectional study, the parents of 99 consecutive children referred for lymphadenopathy completed the State–Trait Anxiety Inventory (STAI). State anxiety (STAI-1) was the primary outcome and trait anxiety (STAI-2) was treated as a covariate. Child variables included age, sex, duration of lymphadenopathy, and lymph node dimensions (short- and long-axis diameter). Internet searching was recorded as yes/no and perceived helpfulness was also documented. We used parametric and nonparametric tests, correlation analyses, and multivariable linear regression to examine associations between STAI-1 and age, sex, duration, short-axis diameter, internet searching, and STAI-2.

RESULTS
The mean age of the children was 6.87 ± 4.33 years and 60.6% were male. The median duration of lymphadenopathy was 8.0 weeks. The mean short-axis diameter was 9.47 ± 3.67 mm and the mean long-axis diameter was 22.17 ± 7.37 mm. Epstein–Barr virus serology was negative in 98% of cases. The mean parental STAI-1 and STAI-2 scores were 39.59 ± 9.99 and 41.24 ± 8.52, respectively. Internet searching, reported by 43.4% of parents, was not associated with higher STAI-1 or STAI-2 scores, and scores did not differ according to whether the short-axis diameter was ≥10 mm. STAI-1 correlated negatively with duration of lymphadenopathy ($r = –0.204$, $p = 0.045$). In adjusted models, older age of the child ($B = 0.660$, $p = 0.002$) and larger short-axis diameter ($B = 0.562$, $p = 0.019$) independently predicted higher STAI-1 scores, whereas longer duration predicted lower STAI-1 scores ($B = –0.150$, $p = 0.002$). Multicollinearity was negligible (variance inflation factor ≤ 1).

CONCLUSION
Among parents of children evaluated for lymphadenopathy, acute anxiety was more strongly related to objective node size and child age than to internet searching. In contrast, shorter symptom duration, likely reflecting greater uncertainty, was associated with higher anxiety. Structured counseling and clear follow-up plans may help to mitigate parental distress in this setting.

KEYWORDS
Anxiety, Internet use, lymphadenopathy, parents, pediatric hematology, STAI

ÖZ

AMAÇ
Çocuklarda lenfadenopati yaygındır ve genellikle iyi huyludur, ancak ebeveynlerde önemli kaygıya neden olabilir. Ebeveynlerin durumsal kaygısını ölçtük ve çevrimiçi bilgi arama da dahil olmak üzere klinik ve psikososyal ilişkileri inceledik.

GEREÇ YÖNTEM
Tek merkezli kesitsel bir çalışmada, lenfadenopati nedeniyle sevk edilen ardışık 99 çocuğun ebeveynleri Durum-Özellik Kaygı Envanterini (STAI) doldurdu. Birincil sonuç durumsal kaygı (STAI-1) idi; özellik kaygısı (STAI-2) bir kovaryat olarak ele alındı. Çocuk değişkenleri arasında yaş, cinsiyet, lenfadenopati süresi ve lenf düğümü boyutları (kısa ve uzun eksen) yer aldı. İnternet araması (evet/hayır) algılanan yararlılıkla birlikte kaydedildi. Uygun parametrik/parametrik olmayan testler, korelasyonlar ve STAI-1'i yaş, cinsiyet, süre, kısa eksen, internet araması ve STAI-2 ile çok değişkenli doğrusal regresyon modellemesi kullandık.

BULGULAR
Çocukların %60,6'sı erkekti; ortalama yaş 6,87±4,33 yıldı. Lenfadenopati süresinin medyan değeri 8,0 hafta; ortalama kısa eksen 9,47±3,67 mm ve uzun eksen 22,17±7,37 mm idi. Epstein-Barr virüsü serolojisi %98 oranında negatifti. Ebeveynlerin ortalama STAI-1 ve STAI-2 değerleri sırasıyla 39,59±9,99 ve 41,24±8,52 idi. İnternet araması (ebeveynlerin %43,4'ü) daha yüksek STAI-1/2 ile ilişkili değildi ve STAI skorları kısa eksen ≥10 mm'ye göre farklılık göstermedi. STAI-1, süre ile negatif korelasyon gösterdi ($r = −0,204$, $p = 0,045$). Ayarlanmış modellerde, daha büyük çocuk yaşı ($B = 0,660$, $p = 0,002$) ve daha büyük kısa eksen ($B = 0,562$, $p = 0,019$) bağımsız olarak daha yüksek STAI-1'i öngörürken, daha uzun süre daha düşük STAI-1'i öngördü ($B = −0,150$, $p = 0,002$); çoklu doğrusallık ihmal edilebilir düzeydeydi (VIF≈1).

SONUÇ
Lenfadenopati açısından değerlendirilen çocukların ebeveynleri arasında, akut kaygı, internet aramalarından ziyade objektif lenf düğümü boyutu ve çocuk yaşıyla daha fazla ilişkiliydi, daha kısa semptom süresi ise (daha fazla belirsizliği yansıtarak) daha yüksek kaygı ile bağlantılıydı. Yapılandırılmış danışmanlık ve net takip planları, lenfadenopati kliniklerinde sıkıntıyı etkili bir şekilde azaltmaya yardımcı olabilir.

ANAHTAR KELİMELER
Ebeveynler, internet kullanımı, kaygı, lenfadenopati, pediatrik hematoloji, STAI

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Childhood lymphadenopathy is a common clinical finding most often caused by benign, self-limiting conditions. Infections, particularly viral upper respiratory tract infections, are the most frequent cause of lymphadenopathy in children. However, malignancies (e.g., leukemia and lymphoma), immunological disorders, and granulomatous infections should also be considered in the differential diagnosis. Diagnostic evaluation should take into account lymph node size, location, and duration, as well as the presence of systemic signs and symptoms. From the family's perspective, lymphadenopathy can cause substantial cancer-related fear, which in turn is a major driver of healthcare-seeking behavior (1,2).

Visits to pediatric hematology-oncology clinics often generate considerable stress and uncertainty for families. Receiving or even merely suspecting a diagnosis of a serious hematological or oncological condition can cause substantial emotional distress, particularly among parents. Such stressful encounters may adversely affect caregivers' well-being, their communication with health professionals, and their adherence to medical recommendations.

Parental anxiety is known to influence how medical information is interpreted and how decisions are made in pediatric settings. The State–Trait Anxiety Inventory (STAI), developed by Spielberger et al. (3), is one of the most widely used instruments for assessing transient (state) and dispositional (trait) anxiety in adults. It is frequently administered to caregivers whose children are undergoing evaluation or treatment (3,4).

Numerous studies have shown that parents of children with chronic illnesses, particularly cancer or hematological disorders, have higher anxiety scores than the general population (5,6). These psychological responses are shaped by multiple factors, including the child's clinical status, parental educational level, previous health-related experiences, and exposure to medical information online (7).

Understanding the factors that contribute to parental anxiety during hematology-oncology consultations is crucial for developing effective communication strategies and supportive interventions. This study aimed to evaluate state and trait anxiety levels in parents of children referred to a pediatric hematology-oncology clinic for lymphadenopathy and to examine how those levels correlated with selected sociodemographic and clinical characteristics.

Materials and Methods

This single-center cross-sectional observational study included parents of children who were referred to the Pediatric Hematology-Oncology Outpatient Clinic of Manisa City Hospital for peripheral lymphadenopathy. Consecutive patients were enrolled at the time of their initial evaluations.

The primary objective was to quantify parental anxiety and identify clinical and psychosocial factors associated with it. Children under 18 years of age who were referred for an initial hematology-oncology evaluation because of peripheral lymphadenopathy and were accompanied by their primary caregiver (mother, father, or legal guardian) were included in the study. While the presence of palpable or measurable lymphadenopathy on physical examination or in an existing ultrasound report was sufficient for inclusion, all millimetric lymph node measurements used in the analyses were obtained from ultrasound reports. Short-axis diameters were abstracted from ultrasound imaging for all 99 evaluated children, ensuring a uniform measurement method across the cohort.

Parents were required to be able to communicate in Turkish, understand the study, and provide written informed consent. Children presenting for reasons other than lymphadenopathy, for whom lymph node enlargement was incidentally detected during examination, and for whom no follow-up was planned for this finding were excluded, as were parents who did not grant consent. In total, 99 consecutive parents were enrolled.

At the initial visit, data were obtained via a face-to-face structured interview using a standardized form. The first section captured child-level clinical information, including age, sex, the referring clinic or physician (e.g., general pediatrics, pediatric surgery, ear-nose-throat/otolaryngology) and the interval (weeks) since lymphadenopathy was first noticed. Laboratory results ordered as part of routine care, such as complete blood count, erythrocyte sedimentation rate, lactate dehydrogenase, uric acid, and, when available, Epstein–Barr virus serology, were abstracted from the medical records.

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Parents were also asked about systemic B symptoms (fever, night sweats, and unintentional weight loss).

For node-size analyses, the short-axis diameter was coded as a binary variable (≥10 mm vs. <10 mm), reflecting a commonly used clinical threshold that signals a "large" node to both clinicians and parents. For research purposes, size-derived measures based on the long and short axes, using equivalent diameter and elliptical area, were computed to better characterize node size; these derived metrics were used solely in the statistical analyses.

The second section of the data collection form captured psychosocial variables at the caregiver level. These included, as applicable, parental education level, any reported family history of malignant disease, whether the parent had searched the internet for information about the child's lymphadenopathy, and, if the internet was searched, how helpful or reassuring the parent had found the information to be. This section also assessed parental anxiety.

Parental anxiety was evaluated using the STAI. The reliability and validity of the Turkish version were established by Öner and Le Compte in 1985 (8). The STAI consists of two separate 20-item subscales. The state anxiety scale (STAI-State; referred to here as STAI-1) measures the respondent's immediate, situation-specific level of anxiety and was the primary outcome of interest in this study. The trait anxiety scale (STAI-Trait; STAI-2) reflects the respondent's general predisposition to anxiety and was treated as a potential confounding factor in the statistical models. Each item is rated on a four-point Likert-type scale, with higher total scores indicating higher levels of anxiety. Parents were asked to complete the questionnaire themselves; in cases where literacy was a concern, items were read aloud by a researcher in a neutral manner and responses were recorded verbatim.

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics 20. Continuous variables were summarized as mean ± standard deviation and/or median (minimum–maximum), whereas categorical variables were summarized as number and percentage. Distributional normality was assessed using the Shapiro–Wilk test. STAI-1 and STAI-2 data were available for 97 and 98 of the 99 parents, respectively, due to a small number of incomplete questionnaires. Analyses were performed using available-case (pairwise) deletion, and the effective sample size for each analysis is reported in tables.

Group differences were examined using the independent-samples t-test or the Mann–Whitney U test, depending on whether normality was confirmed, comparing parents who had searched the internet versus those who had not and parents of children with a lymph node short-axis diameter of ≥10 mm versus <10 mm. Associations between parental state anxiety and (i) the child's age, (ii) the duration of lymphadenopathy, and (iii) lymph node size were evaluated using Pearson or Spearman correlation coefficients as appropriate.

To identify independent correlates of acute parental anxiety, a multiple linear regression model was constructed with the STAI-1 score as the dependent variable. The following predictors were entered simultaneously: the child's age and sex, the duration of lymphadenopathy in weeks, the lymph node short-axis diameter in mm, whether or not the parent had sought information on the internet, and the parent's trait anxiety as reflected by the STAI-2 score. Model assumptions were checked, including approximate normality of residuals and multicollinearity (variance inflation factor). A two-sided value of $p < 0.05$ was considered statistically significant.

Ethics

The study protocol was approved by the İzmir Bakırçay University Ethics Committee (Approval No. 2302) and conducted in accordance with the Declaration of Helsinki and good clinical practice standards. Written informed consent was obtained from all legal guardians before participation.

Results

Patient and caregiver characteristics

A total of 99 children evaluated for lymphadenopathy, together with their accompanying caregivers, were included in the study. Of the children, 60.6% were male (n = 60). The mean age was 6.87 ± 4.33 years (median: 6.0 [3.0–9.0], range: 1.0–18.0). At presentation, lymphadenopathy had been present for a mean of 15.48 ± 18.20 weeks (median: 8.0 [1.25–21.0], range: 0.15–52.0). The mean short-axis diameter was 9.47 ± 3.67 mm (median: 10.0 [7.0–11.0], range: 2.0–25.0 mm) and the mean long-axis diameter

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was 22.17 ± 7.37 mm (median: 22.0 [17.0–26.0], range: 5.0–40.0 mm). The mean equivalent diameter (√[L × S]) was 14.34 ± 4.63 mm and the mean elliptical area ([π/4] × L × S) was 178.23 ± 108.67 mm2.

Most referrals originated from general pediatrics (82.8%), followed by pediatric surgery (7.1%), otolaryngology/ear-nose-throat (6.1%), pediatric infectious diseases (3.0%), and family medicine (1.0%). Epstein–Barr virus serology was negative in 98.0% of cases (n = 97). Overall, 51.5% of the children (n = 51) had a short-axis diameter of at least 10 mm (Tables 1 and 2).

Table 1. Descriptive statistics for continuous variables.

Variable	n (valid)	Mean ± SD	Median [P25–P75]	Min–max
STAI-1 (state)	97	39.59 ± 9.99	38.0 [33.0–47.0]	20.0–64.0
STAI-2 (trait)	98	41.24 ± 8.52	41.0 [36.0–46.0]	21.0–65.0
Age (years)	99	6.87 ± 4.33	6.0 [3.0–9.0]	1.0–18.0
Lymphadenopathy duration (weeks)	99	15.48 ± 18.20	8.0 [1.25–21.0]	0.15–52.0
Short axis (mm)	99	9.47 ± 3.67	10.0 [7.0–11.0]	2.0–25.0
Long axis (mm)	99	22.17 ± 7.37	22.0 [17.0–26.0]	5.0–40.0
Equivalent diameter, √(L × S) (mm)	99	14.34 ± 4.63	14.70 [10.15–17.32]	3.16–25.75
Elliptical area, (π/4) × L × S (mm²)	99	178.23 ± 108.67	169.65 [80.90–235.62]	7.85–520.72

STAI, State–Trait Anxiety Inventory; SD, standard deviation; P25, 25th percentile; P75, 75th percentile

Table 2. Distribution of categorical variables.

Variable	Category	n	%
Sex	Male (1)	60	60.6
	Female (2)	39	39.4
Referring clinic	Pediatrics (1)	82	82.8
	Pediatric surgery (2)	7	7.1
	Otorhinolaryngology (3)	6	6.1
	Family medicine (4)	1	1.0
	Pediatric infectious disease	3	3.0
Internet searching status	Yes (1)	43	43.4
	No (2)	56	56.6
Online information's helpfulness	Helpful (1)	35	35.4
	Not helpful (2)	8	8.1
	Not applicable: did not search online (9)	56	56.6
Short-axis of ≥10 mm	No (0)	48	48.5
	Yes (1)	51	51.5

Total n = 99

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Parental anxiety levels

The mean parental STAI-1 score was 39.59 ± 9.99 (median: 38.0 [33.0–47.0], range: 20.0–64.0). The mean STAI-2 score was 41.24 ± 8.52 (median: 41.0 [36.0–46.0], range: 21.0–65.0) (Table 1). The distributions of STAI-1 and STAI-2 scores did not deviate significantly from normality (Shapiro–Wilk, $p > 0.05$), and the homogeneity of variances was supported in between-group comparisons (Levene's test, $p > 0.05$ for all).

Internet information- seeking and anxiety

Overall, 43.4% (n = 43) of parents reported searching the internet for information about their child's lymphadenopathy, while 56.6% (n = 56) did not. Of those who searched, 81.4% (n = 35) found the information useful or helpful, whereas 18.6% (n = 8) did not find it useful (Table 2). No significant differences were observed when comparing parents who searched the internet (ISS = 1) with those who did not (ISS = 2). For STAI-1, the means were 40.05 ± 10.54 (n = 43) versus 39.22 ± 9.61 (n = 54); the mean difference was 0.82 points, which was not statistically significant ($t(95) = 0.40$, $p > 0.60$; Cohen's $d = 0.08$; 95% CI: –3.25 to 4.89). Similar results were obtained for STAI-2 (ISS = 1: 40.70 ± 8.76, n = 43; ISS = 2: 41.67 ± 8.39, n = 55; $t(96) = –0.56$, $p > 0.50$; $d = 0.11$; 95% CI: –4.43 to 2.48) (Table 3).

Lymph node size and anxiety

There was no significant difference in STAI-1 scores between parents of children with a lymph node short-axis diameter of ≥10 mm (n = 50) and those with a diameter <10 mm (n = 47) ($t(95) = 0.028$, $p = 0.978$; Cohen's $d = 0.006$; 95% CI: –3.99 to 4.11). Similarly, STAI-2 scores did not differ between the two groups ($t(96) = 0.532$, $p = 0.596$; $d = 0.108$; 95% CI: –2.51 to 4.35). Taken together, these results suggest that crossing the commonly used 10-mm short-axis threshold does not, by itself, meaningfully increase parental anxiety.

Correlation analyses

Using Pearson correlation coefficients, parental state anxiety as reflected by the STAI-1 was not significantly associated with the child's age ($r = 0.182$, $p = 0.075$) or sex ($r = 0.096$, $p = 0.348$). However, STAI-1 scores showed a weak but statistically significant inverse association with the duration of lymphadenopathy ($r = –0.204$, $p = 0.045$), indicating that longer duration was associated with lower state anxiety (Table 4).

No significant association was observed between STAI-1 scores and maternal education ($\rho = –0.096$, $p = 0.350$). Likewise, node size metrics, including equivalent diameter ($\rho = 0.125$, $p = 0.221$) and elliptical area ($\rho = 0.126$, $p = 0.218$), were not correlated with STAI-1.

Among parents who searched online and rated the information as helpful (internet information-seeking [ISS] = yes; online information's helpfulness [OIH] = helpful; n = 35), STAI-1 showed no significant correlations with child age, duration of lymphadenopathy, or node size ($p > 0.05$ for all). Among parents who searched online and rated the information as unhelpful (internet information-seeking [ISS] = yes; online information's helpfulness [OIH] = unhelpful; n = 8), STAI-1 showed a strong positive correlation with lymph node long-axis diameter ($\rho = 0.85$, $p = 0.007$). Consistent positive correlations were also observed with equivalent diameter and elliptical area ($\rho = 0.74$, $p = 0.037$ for both). Given the very small subgroup size, however, these findings should be interpreted with caution and regarded as exploratory.

Among parents who did not search online (ISS = no; n = 54), STAI-1 scores were significantly inversely correlated with the duration of lymphadenopathy ($\rho = –0.399$, $p = 0.003$), and there was a borderline positive trend with child age ($\rho = 0.263$, $p = 0.055$). No significant associations were observed with node size metrics in this subgroup ($p > 0.05$ for all) (Table 5).

Taken together, these subgroup analyses suggest that, among parents who did not search online, anxiety tended to decrease as the duration of lymphadenopathy increased, consistent with habituation and reduced uncertainty. In contrast, in the small subgroup that searched but did not find the information helpful, anxiety appeared to be more sensitive to the physical size of the lymph node.

A multiple linear regression model was then fitted with STAI-1 score as the dependent variable. The following predictors were entered simultaneously: the child's age and sex, the duration of lymphadenopathy in weeks, the lymph node short-axis diameter in mm, whether or not the parent had sought information online, and the parent's trait anxiety (STAI-2 score). Among the results (Table 6), lymphadenopathy

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duration remained independently and inversely associated with STAI-1 (B = –0.150, β = –0.272, p = 0.002; 95% CI: –0.244 to –0.055). Short-axis diameter positively predicted STAI-1 (B = 0.562, β = 0.207, p = 0.019; 95% CI: 0.094 to 1.029). Age was independently and positively associated with STAI-1 (B = 0.660, β = 0.282, p = 0.002; 95% CI: 0.252 to 1.067). Trait anxiety (STAI-2) was a strong predictor (B = 0.554, β = 0.475, p < 0.001; 95% CI: 0.356 to 0.751). Finally, sex (p = 0.357) and internet information-seeking (p = 0.703) were not significant. Multicollinearity diagnostics indicated a stable model, with variance inflation factors of approximately 1.0–1.08 and condition index of ≤21.9. Even after adjustment for trait anxiety, the two clinical parameters of symptom duration and short-axis diameter were independently associated with acute parental anxiety. Specifically, a longer duration of lymphadenopathy was related to lower state anxiety, whereas a larger short-axis diameter was related to higher state anxiety.

Parental education level

The distribution of education levels was as follows: not literate, 1.0%; primary school, 24.2%; middle school, 15.2%; high school, 30.3%; associate degree, 13.1%; and bachelor's degree, 16.2%. There were no significant differences in parental state or trait anxiety across educational levels (STAI-1: H(5) = 5.42, p = 0.367, $\varepsilon^2 \approx 0.005$; STAI-2: H(5) = 6.71, p = 0.243, $\varepsilon^2 \approx 0.019$). Although mean rank scores suggested a tendency toward lower anxiety among parents with a bachelor's degree for both scales, this pattern did not reach statistical significance.

Table 3. STAI scores by internet searching status (t-test).

Scale	ISS = Yes (n)	Mean ± SD	ISS = No (n)	Mean ± SD	Mean diff. (Yes – No)	t (df)	p (two-tailed)	95% CI of diff.	Cohen's d
STAI-1	43	40.05 ± 10.54	54	39.22 ± 9.61	0.82	0.40 (95)	>0.60	–3.25 to 4.89	0.08
STAI-2	43	40.70 ± 8.76	55	41.67 ± 8.39	–0.98	–0.56 (96)	>0.50	–4.43 to 2.48	0.11

ISS, Internet searching status; SD, standard deviation; df, degrees of freedom; CI, confidence interval; STAI, State–Trait Anxiety Inventory

Table 4. Pearson correlations of STAI-1 with selected variables.

Independent variable	r	p	n
Age (years)	0.182	0.075	97
Lymphadenopathy duration (weeks)	–0.204*	0.045	97
Sex (0 = Female, 1 = Male)	0.096	0.348	97

STAI:,State–trait anxiety inventory; *, significant at p < 0.05

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Table 5. Spearman correlations between STAI-1 and clinical variables by subgroup.

Variable	ISS = Yes & OIH = Helpful	ISS = Yes & OIH = Not helpful	ISS = No
Age (years)	0.108 (0.535)	0.233 (0.578)	0.263 (0.055)
Lymphadenopathy duration (weeks)	–0.278 (0.106)	0.036 (0.933)	–0.399 (0.003)
Short axis (mm)	–0.053 (0.760)	0.528 (0.179)	0.086 (0.534)
Long axis (mm)	–0.045 (0.796)	0.850 (0.007)	0.104 (0.456)
Equivalent diameter, √(L × S) (mm)	–0.019 (0.915)	0.738 (0.037)	0.117 (0.398)
Elliptical area, (π/4) × L × S (mm²)	–0.017 (0.922)	0.738 (0.037)	0.118 (0.395)

ISS, Internet searching status; OIH , online information's helpfulness; cells show ϱ (p), two-tailed
Group sizes:,Helpful, n = 35; Not helpful, n = 8; Did not search, n = 54

Table 6. Multiple linear regression for STAI-1 (adjusted for STAI-2).

Predictor	B	SE	β (standardized)	t	p	95% CI (lower–upper)
Constant	12.669	6.708	–	1.889	0.062	–0.660 to 25.999
Lymphadenopathy duration (weeks)	–0.150	0.048	–0.272	–3.150	0.002	–0.244 to –0.055
Short axis (mm)	0.562	0.235	0.207	2.388	0.019	0.094 to 1.029
Age (years)	0.660	0.205	0.282	3.215	0.002	0.252 to 1.067
Sex (1 = Male, 2 = Female)	–1.646	1.777	–0.081	–0.927	0.357	–5.178 to 1.885
Internet searching (1 = Yes, 2 = No)	–0.663	1.736	–0.033	–0.382	0.703	–4.111 to 2.786
STAI-2 (trait)	0.554	0.099	0.475	5.578	<0.001	0.356 to 0.751

Dependent variable:,STAI-1 (state anxiety)
Collinearity diagnostics:,Variance inflation factor ≈ 1.0–1.08; condition index ≤ 21.9 (no problematic multicollinearity)

Discussion

This study examined parental anxiety at the time of referral to a pediatric hematology-oncology clinic for lymphadenopathy and explored factors associated with this anxiety. Overall, parents' STAI-1 scores fell within the mild-to-moderate range, and a history of seeking information on the internet was not associated with these scores. Although a short-axis diameter of ≥10 mm did not, by itself, produce a significant difference in anxiety, multivariable analysis

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showed that a greater short-axis diameter and older age of the child were positively associated with STAI-1 scores, whereas a longer duration of lymphadenopathy was negatively associated. As expected, parental STAI-2 scores emerged as a strong predictor of state anxiety.

Most cervical lymphadenopathy in childhood is benign and self-limiting, typically reflecting a reactive response to infection, and contemporary clinical guidance generally favors observation when no red-flag features are present. Against this epidemiological backdrop, parental "cancer fear" may not align with medical reality and is often fueled by uncertainty. The anxiety levels observed in our cohort and the absence of a distinct effect at the 10-mm threshold are consistent with this framework.

The inverse association between lymphadenopathy duration and anxiety suggests two possible mechanisms: (i) many reactive nodes gradually regress over the course of several weeks, thereby reducing acute uncertainty, and (ii) families progressively reappraise the perceived threat as they gain information and experience (habituation/adaptation). This interpretation is consistent with the generally benign and self-limiting nature of pediatric lymphadenopathy.

The positive association between short-axis diameter as a continuous measure and anxiety is also notable: as morphologic "thickness" increases, parents may perceive the risk as higher. Conversely, the absence of a group difference at the 10-mm threshold suggests that parental risk perception is shaped less by a sharp threshold and more by graded, integrative cues (e.g., perceived firmness or tenderness, symptom duration, and accompanying features). The strong effect of trait anxiety is expected and underscores the importance of distinguishing between the state and trait components of the STAI when interpreting parental anxiety in clinical contexts (7).

An interesting finding of our multivariable model was that the child's age was an independent predictor of higher parental state anxiety, even after adjustment for trait anxiety and lymph node size. We speculate that parents may perceive lymphadenopathy in older children as less common and therefore more alarming. In addition, older children's greater awareness of and questions about serious illness may heighten parental worry. Further longitudinal research is required to clarify how age-related differences in risk perception and family communication influence this association.

The neutral overall association between internet information-seeking and anxiety in our cohort is consistent with the mixed findings in the literature. Online health information can exacerbate anxiety in some individuals, a situation known as "cyberchondria," particularly when the information is fragmented, alarmist, or poorly tailored to the clinical situation. In contrast, structured and trustworthy digital resources may promote understanding and provide reassurance, especially for parents with adequate e-health literacy. Although limited by small numbers, our subgroup findings suggest that the perceived usefulness of online information may be more important than the mere act of searching (9,10).

From a clinical standpoint, providing structured counseling at the initial consultation, together with a clear follow-up plan including red flags, return criteria, and review timings, may help reduce unnecessary investigations and clinician burnout while also lowering parental anxiety. Evidence from pediatric surgery and anesthesia shows that written or video-based information for parents can reduce anxiety as measured by the STAI; similar strategies could be adapted for lymphadenopathy clinics. In addition, standardized evaluation pathways incorporating history taking, physical examination, red-flag screening and, when indicated, ultrasound and targeted laboratory tests are likely to improve clinical efficiency as well as family satisfaction (11-13).

This study has several strengths, including the consecutive enrollment of participants, concurrent assessment of both state and trait anxiety, and the linkage of psychological outcomes to clinical parameters through multivariable modeling. However, its cross-sectional single-center design precludes causal inference and carries a risk of referral bias.

The anxiety measures relied on self-report; although the STAI is a valid and reliable instrument, scores may vary depending on the clinical context at the time of assessment. Lymph node measurements were obtained from ultrasound examinations and existing reports, which introduces potential variability in observer interpretation and imaging protocols.

The commonly used cut-off of a short-axis diameter of ≥10 mm is a pragmatic heuristic and may not fully capture biological continuity. While the total sample size was adequate

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for the primary analyses, statistical power was limited for subgroup comparisons and for some parameters in the multivariable models, increasing the risk of type II error. In particular, subgroup analyses based on the perceived helpfulness of online information involved small numbers of individuals and should therefore be regarded as exploratory.

Furthermore, the absence of an external comparison group (e.g., parents of healthy children or those presenting with clearly reactive lymphadenopathy in primary care) restricts the interpretation of the relative magnitude of the STAI scores observed in this cohort. Information-seeking on the internet and its perceived helpfulness were based on subjective reports, and some subgroups were small, resulting in imprecise estimates. Without follow-up data, it was not possible to evaluate trajectories of anxiety over time or clinical outcomes (e.g., spontaneous resolution or the need for further testing/biopsy). Therefore, the findings should be interpreted in the context of a single-center cross-sectional cohort study and should ideally be confirmed in larger multicenter prospective studies with standardized imaging and communication protocols and, where feasible, external control groups.

Conclusion

Pediatric lymphadenopathy is most often benign, but it can elicit substantial parental anxiety. In our cohort, anxiety increased with greater short-axis diameter and older child age, but decreased as symptom duration lengthened, consistent with diminishing uncertainty. Internet searching was not an independent determinant. In clinical practice, structured counseling, guidance toward reliable information sources, and the integration of stepwise evaluation algorithms are recommended to enhance safety and improve the overall experience of families.

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Authorship contributions

Study conception and design: S.O.A., M.A.C.; data collection: S.O.A., M.A.C.; analysis and interpretation of results: S.O.A., M.A.C.; draft manuscript preparation: S.O.A., M.A.C. All authors reviewed the results and approved the final version of the article.

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Ethical committee approval

Informed consent was obtained from all patients' legal guardians prior to inclusion. The study protocol received approval from the Izmir Bakırçay University Ethics Committee (Approval No. 2302) and adhered to the principles of the Declaration of Helsinki and good clinical practice standards.

Conflict of interest

The authors report no conflict of interest.

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