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ORIGINAL RESEARCH

The Effect of Health Literacy on Preoperative Anxiety Levels in Patients Undergoing Elective Surgery

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Objective: This study aimed to determine preoperative anxiety levels, their associated factors, and the relationship between health literacy and preoperative anxiety in adult patients undergoing elective surgery.

Materials and Methods: This descriptive cross-sectional study was conducted in a tertiary hospital between December 21, 2021, and June 20, 2022, and included 466 adult patients. Participants were administered the demographic data and basic health status form, Health Literacy Scale (HLS), and Beck Anxiety Inventory (BAI). Statistical significance was set at $p < 0.05$.

Results: The participants' mean BAI score was low to moderate (9.28±10.85). The total HLS score was 105.89±24.42. For the BAI, a negative correlation was found between the access to information sub-dimensions of the HLS and BAI (p=0.043, r=−0.094). In addition, a negative correlation was detected between patients' age and HLS and its sub-dimensions (p<0.001, respectively [r=−0.188, r=−0.193, r=−0.205, r=−0.161]), and a positive correlation was observed among the HLS sub-dimensions (p<0.001, respectively [r=0.873, r=0.057, r=0.966, r=0.915]). Higher HLS and sub-dimension averages were observed in single, high school, university graduates, and civil servant participants. In addition, higher BAI averages were detected in females, homemakers, urban residents, participants living only with their children, and those with additional diseases (respectively, p<0.001, p<0.001, p=0.007, p=0.0034, p<0.01).

Conclusion: As the level of health literacy increased, preoperative anxiety levels decreased. Preoperative assessment and education are fundamental to perioperative patient care, particularly in the surgical setting.

Keywords: preoperative anxiety, health literacy, Beck Anxiety Inventory, anesthesia, surgery

Introduction

The surgical process is stressful and triggers emotional, cognitive, and physiological responses. Anxiety can be explained as feelings of uncertainty, uneasiness, apprehension, or tension that a person experiences in response to an unknown object or situation.[1] Preoperative anxiety (PA), generally considered a type of state anxiety related to impending surgery, is likely linked to individual personality traits and coping processes. A growing number of studies have indicated that PA is associated with increased and worse perioperative outcomes, including impaired wound healing, nausea, vomiting, and postoperative pain.[2] Although PA varies by country and region, according to the type of surgery, patients' sex and age; the prevalence of anxiety in the preoperative period ranges from 11% to 80% due to reasons such as separation from family, expectations of postoperative pain, type of surgery or procedures, first surgical intervention, fear of not waking up from surgery, inability to work after surgery, fear of anesthesia, and death.[3–8] Surgical anxiety can lead to cardiac problems, rehospitalizations, decreased quality of life, postoperative pain, increased analgesic use, prolonged hospital stays, adverse effects, experiences during patient recovery, and reduced patient satisfaction.[3,9,10]

In the information age, individuals are expected to be knowledgeable about their illnesses, detect symptoms, and make appropriate decisions. These decisions are often based on health-related knowledge, skills, and capacities. This is called health literacy (HL).[11] The World Health Organization (WHO) defines HL as cognitive and social skills related to individuals' abilities and desires to access, understand, and use health information to maintain and improve well-being.[12]

Received: 19 May 2023
Accepted: 22 July 2023
Published: 11 August 2023

Most patients may not express anxiety during the preoperative period unless asked. Therefore, patients should be carefully assessed and their PA levels should be determined. In addition, patients must understand the nature, risks, and benefits of surgical procedures; comply with instructions related to surgery; and make complex care decisions about interventions; thus, HL is essential.[13]

Clinicians and researchers have recently begun to evaluate PA.[14] Various tests, such as the State-Trait Anxiety Inventory (STAI), Amsterdam Preoperative Anxiety and Information Scale (APAIS), Hospital Anxiety and Depression Scale, Taylor Anxiety Scale, Hamilton Anxiety Scale, and Depression Anxiety and Stress Scale, were used to assess anxiety. These tests have proven useful for evaluating PA and general anxiety.[14] The Beck Anxiety Inventory (BAI) is another scale used to assess general anxiety in patients and has been incorporated into studies also in our country.[15,16] Although the literature on PA levels measured by the BAI in patients undergoing surgery is limited, we did not find any publications evaluating the relationship between PA levels measured by the BAI and HL levels.

This study was conducted at a training and research hospital in the western region of Turkey to determine the levels of HL and associated risk factors in patients undergoing planned surgery. The primary objective of this study was to investigate the relationship between HL status and PA levels. Second, we explored the interaction between PA and HL using demographic and basic health status-related data.

Materials and Methods

Study Design and Patient Selection

This prospective observational study was conducted between December 21, 2021, and June 20, 2022, after obtaining approval from the Health Sciences University Bursa Yuksek Ihtisas Training and Research Hospital Ethics Committee on December 15, 2021, with decision number 2011-KAEK-25 2021/12-17. The study was conducted in the anesthesiology and reanimation outpatient clinics of our hospital. Patients included in the study were those who were scheduled for any planned surgery, aged 18 and above, had at least primary school education, were Turkish-speaking, conscious, and communicative, classified as American Society of Anesthesiology (ASA) Groups I and II, cooperative, and voluntarily participated in the study. Illiterate patients, classified as ASA III–IV, who did not consent to participate, were pregnant, had dementia or psychiatric disorders, were excluded from the study.

Questionnaire Forms

Written informed consent was obtained from all the patients who agreed to participate in the study. A three-part questionnaire was administered at the anesthesiology outpatient clinic one week before the operation. All patients were adequately informed about the research and anesthesia methods to be applied. The first part of the form is prepared by the researchers and questions included patients' demographic and basic health status-related data; the second part is self-filling questionnaire consisted of the HLS to determine health literacy; and the third part is self-filling questionnaire contained the BAI to evaluate PA levels. The total time to complete all the questions was 20–25 minutes.[17,18]

Part 1: Demographic Data and Basic Health Status Form

This form consisted of questions about individuals' age, sex, occupation, education, marital status, income status, where they live and with whom, other diseases, medications they regularly use, previous surgery and anesthesia experiences, and information about the surgery they would undergo.

Part 2: Health Literacy Scale

This scale was developed by Sorensen et al (Health Literacy Survey in Europe-HLS-EU)[19] was simplified to 25 items by Toçi and Burazeri.[17] The validity and reliability of this scale were assessed by Aras and Bayık Temel.[18] The scale consists of 25 questions and four sub-dimensions: 1) access to information, with a score range of 5–25 (min.-max.); 2) understanding information, with a score range of 7–35 (min.-max.); 3) appraisal/evaluation, with a score range of 8–40 (min.-max.); and 4) application/use, with a score range of 5–25 (min.-max.). The total score obtained ranged from 25 to 125. Scale items are answered by participants in a Likert format, as follows: "5: No difficulty, 4: A little difficulty, 3: Some difficulty, 2: A lot of difficulty, 1: Unable to do it at all/ have no ability/ impossible". All items on the scale were

positively worded with no reverse-coded items. Low scores indicate inadequate, problematic, and weak HL, while high scores indicate sufficient and excellent HL. As the score increases, an individual's HL level increases.[17]

Part 3: Beck Anxiety Inventory (BAI)

This self-assessment scale measures the frequency of anxiety symptoms experienced by an individual. It consists of 21 items scored on a Likert-type scale, ranging from 0 to 3. The higher the total score, the higher the anxiety experienced by the individual. It was developed by Beck et al, and its validity and reliability in Turkey were evaluated by Ulusoy et al[20,21] Anxiety levels were assessed as follows: 0–7 points = normal anxiety, 8–15 points = mild anxiety, 16–25 points = moderate anxiety, and 26–63 points = severe anxiety.

All patients were scheduled for elective surgeries classified as minor, medium, or major, based on blood loss, pain intensity, invasiveness, required monitoring level, and length of hospital stay due to the surgical procedure. The types and sizes of the surgeries performed were grouped according to the list regulated in Article 22 of the Health Implementation Notification published by the Social Security Institution in the Official Gazette of Turkey.[22] Patients were informed of the size of their surgeries.[22] In the study, the answers given by the patients to the monthly income levels were determined according to the monthly minimum wage they received at the time of the study. Low income is the amount below the minimum wage.

Surgical Groups

Group A surgeries (intracranial mass, intracranial aneurysm, total gastrectomy, rectal and colon surgery, Whipple operation, total nephrectomy, percutaneous nephrolithotomy, long segment vertebral stabilization surgery, etc.); Group B surgeries (thyroidectomy, parathyroidectomy, retinal detachment, vitrectomy, partial nephrectomy, lumbar and cervical vertebra stabilization, tympanoplasty, rhinoplasty, total hip-knee surgery, meniscus arthroscopy, ureteroscopy, etc.) Groups C, D, and E surgeries are inguinal hernia, laparoscopic cholecystectomy, septoplasty, refractory surgery, D-J catheter insertion and removal, pilonidal sinus, anal fistulectomy, and hemorrhoidectomy, etc).[22]

Statistical Analysis

The power analysis was conducted after the study, as it was performed in patients who had surgery planned in the first 6 months. Accordingly, with 466 patients, a power of 99% and a significance level of 0.05 were determined using a two-tailed hypothesis test, and the effect size was set at 0.2.

Data were analyzed using the SPSS 21.0 (version 21.0, SPSS, Chicago, IL, USA) software package. Descriptive statistics (number, percentage, mean ± standard deviation, maximum, and minimum) were used for data analysis. The independent samples *t*-test was applied for pairwise comparisons within groups, the ANOVA test was used for multiple comparisons of variables with normal distribution, and the Kruskal–Wallis Test was used for variables without normal distribution. The Scheffe post hoc test was applied to determine the source of significant differences in the mean scores. Pearson's correlation analysis was used to assess the relationships between the scales. Finally, the Shapiro–Wilk test was used to evaluate the normality of the data distribution. Statistical significance was set at $p<0.05$.

Results

In our study, 535 patients were evaluated over 6 months. Owing to incomplete data from 35 patients and 34 patients undergoing day surgery, 466 patients were included in the study. The mean age of the patients in the survey was 45.78 ±15.18 years, with 55.6% male and 71.8% married. It was determined that 37.3% of patients were primary school graduates, 71.9% were married, 19% were university graduates, and 51.7% were employed as workers. In addition, 51.7% of the patients had a low-income level, 83% resided in the city, and 87.1% lived with their families (Table 1).

It was found that 42.1% of the study group smoked, the mean body mass index (BMI) was 27.19±4.54 kg/m2, 75.5% of the patients had additional diseases, and 39.1% used medication regularly. Medications used included antihypertensive, antidiabetic, and antidepressant drugs. The study group comprised 16.1% of patients with hypertension, 45.3% with diabetes, and 6.5% with chronic diseases, such as coronary artery disease, heart failure, thyroid disorders, and Chronic Obstructive Pulmonary Disease. The proportion of patients who had previously undergone surgery was 70.2%, and 98.5% reported no

Table 1 Patient Distribution Based on Social-Demographic Characteristics

	Mean ± SD	Min-Max
Age (year)	45.78 ± 15.18	18.00–87.00
	N	%
Gender		
Female	207	44.4
Male	259	55.6
Educational Background		
Primary School	173	37.3
Secondary School	98	21.1
High School	106	22.6
University	89	19.0
Marital Status		
Married	335	71.9
Single	84	18.0
Divorced	47	10.1
Occupation		
Worker	241	51.7
Civil Servant	34	7.3
Homemaker	112	24.0
Retired	79	17.0
Region (Current Location)		
Province	387	83.0
District	31	6.7
Village - Town	48	10.3
Personal Monthly Income		
0–5999 TL	207	44.4
6000–11.999 TL	198	42.5
>12.000 TL	61	13.1
Currently Living With		
Family	406	87.1
Alone	32	6.9
With children	28	6.0

Abbreviations: N, number of patients; SD, Standard deviation; Min, Minimum value; Max, Maximum value; TL, Turkish Lira.

problems related to anaesthesia in previous surgeries. Among the participants, 64.2% had ASA II, and when examined by surgery type and size, Group B surgeries were the most common (42.5%). The highest proportion of patients visiting the clinic were scheduled for general surgery (30.5%). The proportion of patients who received general anaesthesia was 58.2% (Table 2).

The mean HLS for the study group was determined as 105.89±24.42. The mean scores for the sub-dimensions were as follows: access to information:20.85±5.27; understanding information:29.24±7.34; evaluation:34.24±8.17; and application:21.55±5.39. The highest score was obtained from the evaluation sub-dimension, whereas the lowest was from the access to information sub-dimension. Participants' HL levels were high (Table 3).

When examining the distribution of the mean scores for the HLS and its sub-dimensions according to the demographic variables of the participants, no significant difference was found in the mean scores of the HLS and its sub-dimensions based on the participants' gender ($p>0.05$) (Table 3).

When examining the HLS and its sub-dimensions of access to information, understanding information, and application based on the marital status of the participants, a statistically significant difference was found ($p=0.013$ and $p<0.01$,

Table 2 Patient Distribution Based on Basic Health Parameters

Basic Health Parameters	N	%
Current Smoking Status		
Yes	196	42.1
No	270	57.9
Comorbidities		
Yes	352	75.5
No	114	24.5
Chronic Medication Use		
Yes	182	39.1
No	284	60.9
Prior Surgery Status		
Yes	327	70.2
No	139	29.8
Adverse Events in Previous Anaesthesia		
Yes	7	2.1
No	320	97.9
ASA		
I	167	35.8
II	299	64.2
Surgery Types		
Group A surgery	91	19.5
Group B surgery	198	42.5
Other (Group C, D, E surgeries)	177	38.0
Department		
General Surgery	141	30.3
Neurosurgery	91	19.5
Urologic Surgery	74	15.9
Orthopedic Surgery	67	14.4
Ear, Nose and Throat Surgery	34	7.2
Ophthalmic Surgery	37	7.9
Plastic Surgery	18	3.9
Thoracic Surgery	4	0.9
Type of Anaesthesia		
General anaesthesia	271	58.2
Regional anaesthesia (Spinal, Epidural Block)	167	36.1
Sedation + Local anaesthesia	28	5.7

Notes: Group A surgeries (intracranial mass, intracranial aneurysm, total gastrectomy, rectal and colon surgery, Whipple operation, total nephrectomy, percutaneous nephrolithotomy, long segment vertebral stabilization surgery, etc.); Group B surgeries (thyroidectomy, parathyroidectomy, retinal detachment, vitrectomy, partial nephrectomy, lumbar and cervical vertebra stabilization, tympanoplasty, rhinoplasty, total hip-knee surgery, meniscus arthroscopy, ureteroscopy, etc.) Groups C, D, and E surgeries are inguinal hernia, laparoscopic cholecystectomy, septoplasty, refractory surgery, D-J catheter insertion and removal, pilonidal sinus, anal fistulectomy, and hemorrhoidectomy, etc).
Abbreviations: N, number of patients; ASA, American Society of Anaesthesiologists.

respectively), but no significant difference was observed in the evaluation sub-dimension ($p>0.05$). Single participants had higher mean scores than married and divorced participants (Table 3).

A highly statistically significant difference was found in the HLS and its sub-dimensions of access to information, understanding of information, evaluation, and application based on the participants' education levels ($p<0.001$).

Table 3 A Comparative Analysis of Demographic Data, Basic Health Parameters, and the Health Literacy Scale

	Mean ± SD		Min-Max
Health Literacy Scale	105.89±24.42		25–125
Access to information	20.85±5.27		5–25
Understanding information	29.24±7.34		7–35
Value Assessment/Evaluation	34.24±8.17		8–40
Implementation/Use	21.55±5.39		5–25

Parameters (n=466)	**Sub-dimensions**				
	Health Literacy Scale	**Access to information**	**Understanding information**	**Value Assessment/ Evaluation**	**Implementation/ Use**
Gender					
Male	106.29±25.46	20.90±5.42	29.33±7.71	34.39±8.46	21.66±5.57
Female	105.39±23.15	20.81±5.10	29.14±6.88	34.05±7.82	21.38±5.17
P	0.692	0.851	0.777	0.660	0.579
Marital Status					
Married[a]	106.60±23.25	20.83±5.07	29.46±7.11	34.49±7.79	21.80±5.07
Single[b]	108.65±23.14	21.90±4.82	30.16±6.95	34.71±7.63	21.83±5.37
Divorced[c]	96.00±31.93	19.08±6.88	26.06±8.84	31.59±10.98	19.25±6.95
P	***0.011****	***0.013****	***0.005****	0.063	***0.008****
Post-Hoc	b>c‡, a>c‡	b>c‡, a>c‡	b>c‡, a>c‡		b>c‡, 1>c‡
Educational Background					
Primary School[d]	89.09±29.21	18.92±6.17	26.59±8.64	32.07±9.85	20.49±6.37
Secondary School[e]	104.74±22.87	20.59±4.86	29.16±6.64	37.04±7.70	20.94±5.64
High school[f]	113.57±17.14	22.35±4.01	31.66±5.13	36.50±5.96	23.03±3.83
University[g]	113.17±17.61	23.10±3.42	31.61±5.67	35.96±6.06	22.49±3.91
P	***<0.001****	***<0.001****	***<0.001****	***<0.001****	***<0.001***
Post-Hoc	g>f‡, g>d‡	g>e‡, g>d‡	g>d‡	g>d‡	g>d*
Occupation					
Worker[h]	108.18±23.46	21.42±4.96	30.03±6.99	34.92±7.91	21.80±5.83
Civil Servant[i]	114.44±17.02	22.88±3.53	32.44±8.89	36.29±5.88	22.82±3.95
Homemakers[j]	103.42±23.15	20.38±5.06	28.44±6.90	33.43±7.83	21.16±5.06
Retired[k]	98.72±29.43	18.91±6.43	26.62±8.89	32.41±9.77	20.77±6.26
P	***0.002****	***<0.001****	***<0.001****	***0.031****	0.197
Post-Hoc	i>k‡; i>j‡	i>j,k‡; h>k‡	i>j,k‡; h>k‡	i>j,k‡	

Notes: ‡Post-Hoc = Scheffe, our post-hoc analysis test was Scheffe. Marital Status: Married[a], Single[b], Divorced[c]: Upper numerical values[a,b,c] are written to indicate the ranking of the subgroups in order to number them during post-hoc analysis. Educational Background: Primary School[d], Secondary School[e], High school[f], University[g]: Upper numeric values[d,e,f,g] are written to indicate the ranking of the subgroups in order to number them during post-hoc analysis. Occupation: Worker[h], Civil Servant[i], Homemakers[j], Retired[k]: Upper numeric values[h,i,j,k] are written to indicate the the ranking of the subgroups in order to number them during post-hoc analysis. *p<0.05. **p<0.001.
Abbreviations: N, number of patients; SD, Standart Deviation; Min, Minimum; Max, Maximum; ASA, American Society of Anaesthesiologists.

Accordingly, the difference in the mean scores of the HLS and all sub-dimensions was higher for participants with a university education than those with a primary school education (Table 3). In addition, a statistically significant difference was found in the mean scores of the HLS evaluation sub-dimension based on participants' occupations. A highly statistically significant difference was found in the mean scores of understanding information and access to information sub-dimensions. However, no significant difference was found in the application sub-dimension (p=0.031, p<0.001, and p>0.05, respectively) (Table 3).

No significant difference was found in the mean scores of the HLS and its sub-dimensions based on participants' smoking status, ASA group, and the type and size of surgery they would undergo (p>0.05) (Table 3).

Our study's mean BAI score was 9.28±10.85. The mean BAI score for the female participants was statistically significant (p<0.001). A statistically significant difference was found in the mean BAI scores among the different

occupations (p<0.001), with homemakers having the highest mean BAI scores. A high level of statistical significance was found in BAI scores among those living in the city (p<0.01). Patient who live only with their children have low to moderate BAI levels (p=0.034). Patients who have comorbid disease also have low to moderate BAI levels (p=0.008). Finally, a statistically significant difference was found in BAI score averages among income levels (p=0.029), with lower-income individuals having higher BAI scores (Table 4).

No significant differences were found between marital status, education level, ASA classification, history of previous surgery, type and size of the surgery to be performed, anaesthesia method used, and BAI scores (p>0.05) (Table 4).

Table 4 Distribution of Beck Anxiety Inventory Scale Total Mean Scores According to Socio-Demographic Characteristics and Basic Health Variables (n=466)

Beck Anxiety Inventory		**Mean ± SD** **9.28±10.85**	**Min-Max** **0–58**
Parameters	**n**	**BAI** **Mean ± SD**	**BAI** **p**
Gender			
Male	259	7.31±9.64	***<0.001*****
Female	207	11.71±11.77	
Marital Status			
Married	335	9.52±11.10	0.537
Single	84	8.08±10.42	
Divorced	47	9.70±9.78	
Educational Background			
Primary School	173	10.46±11.32	0.103
Secondary School	98	8.10±9.57	
High School	106	8.98±12.81	
University	89	7.44±8.13	
Occupation			
Worker	241	8.69±11.10	***<0.001*****
Civil Servant	34	8.20±8.90	
Homemaker	112	12.21±11.56	
Retired	79	7.36±8.98	
Region (Current location)			
City	387	9.96±11.36	0.007
Country	31	7.45±9.14	
Village-Town	48	4.97±5.01	
Living With			
Family	406	9.25±10.85	***0.034****
Children	28	12.78±11.48	
Alone	32	6.56±9.56	
Personal Monthly Income			
0–5999 TL	241	10.05±11.01	***0.029****
6000–11.999 TL	214	8.24±10.65	
>12.000 TL	11	12.36±9.88	
Current Smoking Status			
Yes	196	9.59±10.87	0.593
No	270	9.05±10.84	

(*Continued*)

Table 4 (Continued).

Beck Anxiety Inventory		**Mean ± SD** **9.28±10.85**	**Min-Max** **0–58**
Parameters	**n**	**BAI** **Mean ± SD**	**BAI** **p**
ASA			
I	167	8.40±10.66	0.188
II	299	9.77±10.94	
Comorbid Disease			
Yes	352	10.11±11.23	***0.008****
No	114	6.70±9.12	
Previous Surgery History			
Yes	327	9.37±10.53	0.786
No	139	9.07±11.59	
Surgery Type			
Group A (major)	91	11.60±12.49	0.055
Group B (moderate)	198	8.30±9.90	
Group C, D, E (minor)	177	9.17±10.83	
Type of Anesthesia			
General anaesthesia	271	7.71±10.12	0.056
Regional anaesthesia	168	10.26±11.21	
Sedation + Local anaesthesia	27	9.11±10.79	

Notes: Group A surgeries (intracranial mass, intracranial aneurysm, total gastrectomy, rectal and colon surgery, Whipple operation, total nephrectomy, percutaneous nephrolithotomy, long segment vertebral stabilization surgery, etc.); Group B surgeries (thyroidectomy, parathyroidectomy, retinal detachment, vitrectomy, partial nephrectomy, lumbar and cervical vertebra stabilisation, tympanoplasty, rhinoplasty, total hip-knee surgery, meniscus arthroscopy, ureteroscopy, etc.) Groups C, D, and E surgeries are inguinal hernia, laparoscopic cholecystectomy, septoplasty, refractory surgery, D-J catheter insertion and removal, pilonidal sinus, anal fistulectomy, and hemorrhoidectomy, etc). Bold values: *p<0.05, **p<0.001.

Abbreviations: N, number of patients; Sd, Standart deviation; Min, Minimum value; Max, Maximum value; BAI, Beck Anxiety Inventory; ASA, American Society of Anaeshesiologists, TL, Turkish Lira.

The findings of the correlation analysis investigating the relationship between participants' age, BMI, and mean scores obtained from the scales are presented in Table 5. Accordingly, a moderate positive relationship was found between participants' age and BMI values (p<0.001, r=0.328); a low-level negative relationship was detected between age and HLS, access to information, understanding of information, and evaluation (n [p<0.001 (r=−0.188, r =−0.193, r =−0.205, r=−0.161]). A high-level negative relationship was found between the application levels (p=0.003, r=−1.133) (Table 5).

A weak negative relationship was found between BAI score and the mean scores of the access to information sub-dimension (r=−0.094, p=0.043). In contrast, no significant association was found between the BAI score and the mean scores of the HLS and the understanding of information, evaluation, and application sub-dimensions (p>0.05) (Table 5). A statistically significant positive correlation was found among the HLS subdimensions (p<0.001) (Table 5).

Discussion

This study evaluated the relationship between HL and PA levels in patients undergoing surgery at a training hospital. We found high HL levels among the patients who participated in our study. Average anxiety levels, considered low-to-moderate, were observed for BAI. A negative relationship was found between access to information, a sub-dimension of the HLS, and PA. A negative relationship was detected between patient age and HLS and its sub-dimensions, whereas a positive relationship was found among HLS sub-dimensions. No correlation was found between the other subdimensions and PA. High mean scores for marital status, education level, and occupational groups were observed in the HLS

Table 5 Analysis of the Correlation Between Health Literacy Scale and Other Parameters

		1	2	3	4	5	6	7	8
1. Age	r *p*	1	0.328** ***<0.001***	0.057 0.219	−0.188** ***<0.001***	−0.193** ***<0.001***	−0.205** ***<0.001***	−0.161** ***<0.001***	−1.133** ***0.003***
2. BMI (Body Mass Index)	r *p*		1	0.026 0.570	−0.044 0.342	−0.028 0.552	−0.068 0.144	−0.041 0.377	−0.018 0.697
3. Beck Anxiety Inventory	r *p*			1	−0.076 0.102	−0.094* ***0.043***	−0.075 0.108	−0.058 0.210	−0.061 0.187
4. Health Literacy Scale	r *p*				1	0.873** ***<0.001***	0.957** ***<0.001***	0.966** ***<0.001***	0.915** ***<0.001***
5. Access to information	r *p*					1	0.801** **<0.001**	0.773** **<0.001**	0.812** **<0.001**
6. Understanding the information	r *p*						1	0.893** ***<0.001***	0.812** ***<0.001***
7. Value Assessment/Evaluation	r *p*							1	0.885** ***<0.001***
8. Implementation/Use	r *p*								1

Notes: 1: Age, 2: BMI (Body Mass Index), 3: Beck Anxiety Inventory, 4: Health Literacy Scale, 5: Access to information, 6: Understanding the information, 7: Value Assessment/ Evaluation, 8: Implementation/Use. Bold values: *p<0.05, **p<0.001.

and its sub-dimensions. It was determined that females, homemakers, those living in the province and with children only, and those with other diseases had higher PA rates.

Generally, being well-educated is a fundamental determinant of health. The accurate perception and application of health-related messages are essential for treating and preventing diseases. Individuals with higher education levels are more likely to participate in activities related to maintaining and improving their health. In a study by Çetin et al, the patient's mean age was 50.03±11.42 years, and the total mean score of health HLS was high (100.82±15.62).[11] In a study by Çimen and Bayık Temel, the total mean score of HLS in the elderly with chronic diseases was low (87.96±13.89).[23] In another study, the HL levels of patients undergoing elective surgery were evaluated, and it was found that 37.3% of the participants had limited HL.[24] In our study, the mean age of the participants was 45.78±15.18 years, and the total mean score of HLS was high (105.89±24.42). The younger age of our sample group, the majority being workers and civil servants, may have elevated HL levels due to health education in the workplace and mandatory participation in these educational activities. Another reason could be the increased use of television, the internet, social media, and other communication tools when people stay home to protect their health and maintain a healthy lifestyle after the COVID-19 pandemic. As HL is a perception, individuals' perceptions and awareness can affect this situation. Furthermore, patients today prefer to play an active role in their treatment and care, and want to be involved in decisions related to their treatment. All these factors can be achieved at higher HL levels.[12]

Health Literacy is generally influenced by demographic, cultural, and psychosocial factors, overall literacy levels, individual characteristics, experiences related to the disease, and factors related to the healthcare system.[19] The HL demographic factors included age, sex, marital status, income, education, and employment status. In general, HL is lower among older individuals, females, singles, and those with lower levels of education.[25–27] It has been found in the literature that HL becomes insufficient as age increases.[28] Similarly, in our study, it was found to be highly significant that HLS decreased with increasing age. The relationship between cognitive function loss and HL results in elderly individuals not benefiting from health services.[29] In our study, no significant differences were found between HLS and sex, smoking status, ASA group, or type of surgery to be performed. Contrary to the literature, when examining marital status, singles were found to have significantly higher HLS and all sub-dimensions, except for value attribution.[12]

The general literacy level is also related to HL; however, a high literacy level does not necessarily mean high HL. Although research has found that individuals with low literacy levels have difficulty understanding health information, those with high literacy levels may have low HL.[30] Regarding education level, our study found significance in the high HLS and all sub-dimensions among those who received high school and university education.

The BAI is considered the gold standard for measuring anxiety because it assesses short, simple, and general anxiety.[31] Furthermore, BAI, which has an advantage in distinguishing anxiety that often overlaps with depression, includes patients' feelings within the last week before surgery and their current feelings; its short duration of application is also advantageous.[23] In recent years, it has been used in studies evaluating anxiety during the preoperative period.[32]

Continuing with the information provided, we often see in many studies that the STAI-I scale is frequently used in PA evaluations.[33,34] However, there are limitations to the practical application of the STAI-I and STAI-II scales in the preoperative period, such as length and difficulty in understanding questions individually while answering.[35] ROC analysis was performed in a study where a significant positive relationship was found between the STAI-I-STAI and STAI-II-STAI. When the threshold value for STAI-I was taken as 40, a value of 8.5 was predicted for BAI.[36] In other words, a threshold value of 8.5, equivalent to the classification of moderate anxiety (BAI; 8–15) when measuring general anxiety, has become the threshold value for PA. Consistent with the literature, in our study, average anxiety levels considered low-medium were observed for the BAI and were in line with the literature.[36,37]

Different results were observed for sex and anxiety. In some studies, anxiety levels were higher in women during the preoperative period,[34,38] while in others, PA levels were higher in men.[39,40] Preclinical studies have shown that fluctuations in estrogen and progesterone levels play a role in the etiology of mood and anxiety disorders, which may explain the higher risk of anxiety in women.[41] The results of our study showed that anxiety levels were higher in women. The higher anxiety level in women can be attributed to women being more comfortable expressing their emotions than men.

Although no significant relationship was found between educational level and BAI in our study, the lowest BAI rate was observed among those who received university education. This can be explained by better-educated individuals aware of the risks associated with surgery and anaesthesia. Another explanation could be that these individuals can better express themselves in anxiety scale questions directed to them. Our study found the highest anxiety value among those with low-income status. In a survey by Bahar et al, income status significantly affected the average anxiety score.[42]

Our study found no significant difference between the ASA classification and BAI. A few studies have found a substantial relationship between anaesthetic complications (eg, cardiac arrest, hypotension, and aspiration) and ASA classification however, a relationship between ASA status and PA has not been reported before.[43]

In line with the literature; we found individuals with additional diseases have been found to have increased PA.[44] This may be because any postoperative complication that developed in patients undergoing surgery could be due to other diseases.

In contrast to the literature;[45] we found that the type or size of surgery did not add extra stress to patients' baseline anxiety states. Although the average BAI in group A surgeries was low-moderate (11.60±12.49), it was not statistically significant. This may be explained by the fact that the surgical departments provided sufficient and explanatory information to the patients about the surgeries they would undergo in our hospital.

In our study, we observed that hospitalization and the prospect of surgery did not increase the anxiety levels in this population. This may be attributed to strong family relationships or high anxiety levels regarding the country's living standards.

Study Limitations

Our study has several limitations that should be considered when interpreting the results. First of all, as the study population was derived from a single center and did not include patients with high levels of preoperative anxiety, such as those undergoing cardiovascular surgery, caesarean section, etc., it may introduce a selection bias and limit the applicability of the results to other settings or populations. Second, the study's cross-sectional design prevented us from establishing causal relationships between variables. A longitudinal study design might provide more insight into the temporal relationships between the factors examined and the development of PA. Self-report questionnaires could also

contribute to response bias, particularly when measuring sensitive topics like anxiety levels. Furthermore, we did not consider the potential influence of healthcare professionals' communication skills and patient-centered care on patients' anxiety levels. Lastly, we did not evaluate the impact of PA on postoperative outcomes, such as pain, recovery time, and patient satisfaction. Therefore, future studies should investigate the relationship between PA and postoperative outcomes to better understand the clinical implications of addressing anxiety in surgical settings.

Despite these limitations, our study provides valuable insights into the factors associated with PA. These findings may help healthcare professionals to identify patients at risk of increased anxiety and to develop targeted interventions to reduce anxiety levels and potentially improve surgical outcomes.

Conclusion

The aim of this study was to evaluate the relationship between PA and HL. No correlation was found between HLS and BAI except access to health-related information. We suggest that improving patients' access to health-related information may significantly reduce PA levels. When we searched the literature, we did not find any study examining the relationship between PA (measured with BAI) and HL. The lack of a publication similar to our study can be interpreted as a limitation and strength of the study.

There are different results in the literature regarding the relationship between PA levels and educational status, and no consensus has been reached. There is also no consensus between HL and education levels. In addition, even if individuals have similar levels of education, their reading, writing, comprehension and calculation skills may be different. Therefore, it is stated that HL level, not education level, should be taken into consideration when evaluating individuals in health-related issues.[46] The effect of educational level on PA may actually be due to the effect of educational status on HL. The most important reason for this idea is that the relationship between educational level and PA is found in very different ranges in the literature. Perhaps, if the HL level of the patients in these studies could have been evaluated, a clearer relationship with PA could have been shown. In the light of all this information, it was considered appropriate to assess HL rather than educational status when evaluating PA levels, but more studies examining the relationship between HL, educational level and PA are needed.

In addition, we think that in the near future, the level of HL of patients in the preoperative period can be evaluated and PA levels can be reduced by increasing HL regardless of educational level with appropriate trainings.

Understanding the risk factors associated with PA can help healthcare professionals plan targeted interventions to ensure a safer and less stressful surgical experience for patients. Future research should focus on assessing the impact of PA on postoperative outcomes such as pain, recovery time and patient satisfaction.

Ethics Approval and Consent to Participate

The study was reviewed and approved by the Health Sciences University Bursa Yuksek Ihtisas Training and Research Hospital Ethics Committee with the ethical no - (2011-KAEK-25 2021/12-17) and written informed consent was obtained from participants. This study was conducted in accordance with the Declaration of Helsinki.

Acknowledgments

We wish to thank all the patients who participated in the study.

Disclosure

The authors report no financial and nonfinancial competing interests in relation to this work.

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