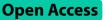# The effect of health literacy on patient compliance in patients to whom prostate biopsies were recommended

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Abstract

Background Transrectal ultrasound-guided prostate biopsy (TRUS-Bx) is the gold standard diagnostic method for prostate cancer. In people with low health literacy, accurate and early diagnosis rates decrease, making it difficult to maintain health and compliance with treatment. In our study, we investigated how health literacy and sociocultural parameters affected compliance and awareness in patients with suspected prostate cancer, for whom TRUS-Bx was planned.

Methods In the study, 98 male patients aged 50–80 years, recommended for TRUS-Bx, were included in our study. The data including age, prostate-specific antigen, prostate volume, digital rectal examination findings, education leveland area of residence of the patients included in the study were recorded. Health Literacy Survey-Turkey-Questionnaire 47 and Turkish Health Literacy Scale-32 forms were completed by the patients who agreed to participate in the study, and their scores were recorded. Patients scheduled for TRUS-Bx were divided into two groups: those who attended their appointments and underwent the biopsy, and those who did not attend their scheduled appointments. The effect of health literacy and other parameters on the TRUS-Bx requirement was examined between the two groups. Furthermore, 52 patients who underwent TRUS-Bx were divided into two groups as malignancy (malignant) detected and not-detected (benign) patients according to the pathology results, and the parameters were analyzed separately for these groups.

Results The education level of the patients who underwent the TRUS-Bx procedure was found to be statistically higher ($p = 0.026$). Health Literacy Survey-Turkey- Questionnaire 47 and Turkish Health Literacy Scale-32 scores were statistically significantly higher in the TRUS-Bx group ($p = 0.001$, $p < 0.001$, respectively). In the logistic regression analysis, education level, Health Literacy Survey-Turkey- Questionnaire 47 and Turkish Health Literacy Scale-32 were found to be important predictors for awareness of the requirement for TRUS-Bx.

Conclusion The study's findings indicate that patients with higher health literacy and education levels were more likely to receive an early diagnosis and promptly proceed with the recommended TRUS-Bx after visiting a urologist.

Keywords Prostate cancer, Health literacy, Biopsy

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Background

Prostate cancer is the second most common type of cancer seen in men. It accounts for 12.5% of all cancer cases in developed countries. Despite being common, it typically progresses slowly and has higher survival rates compared to other malignancies. However, many men with the disease experience a decreased quality of life due to declines in physical and mental health [1, 2].

Transrectal ultrasound-guided prostate biopsy (TRUS-Bx) and transperineal prostate biopsy are the commonly used diagnostic methods for patients with abnormal digital rectal examination (DRE) findings, elevated serum PSA values, and radiology results susceptive to prostate cancer [3]. Pathological diagnosis is essential for prostate cancer [4]. Numerous surveys conducted before and after the TRUS-Bx procedure have highlighted patients' anxiety and complications associated with it. Zisman et al. reported a pre-procedure anxiety rate of 64% [5].

Today, there is greater emphasis on the quality of the process of accessing and using health services than ever before. The importance of being aware of the protection and improvement of the patient's health has been revealed by studies conducted in recent years. Various scales have been developed to measure health literacy (HL) levels [6, 7].

Accurate and timely diagnosis rates decrease in people with low HL, making it difficult to maintain health and compliance with treatment [7]. Studies on prostate cancer have highlighted the importance of improving general health and quality of life. Increasing HL in patients with chronic diseases is seen as a crucial strategy to enhance overall health status [8, 9]. In our study, we explored how patients' HL and sociocultural factors influence their awareness of the necessity for TRUS-Bx operations planned due to suspected prostate cancer, as well as their compliance with the procedure.

Methods

This study was conducted prospectively in the urology clinic of Afyonkarahisar Health Sciences University Hospital between August 2022 and August 2023. The study included 121 male patients, aged 50–80 years, referred from our city and surrounding provinces. These patients, who visited the urology outpatient clinic, had elevated PSA levels, suspicious findings on DRE, and suspicious lesions in Multiparametric Prostate Magnetic Resonance Imaging (MpMRI). They were recommended to undergo either systematic or targeted TRUS-Bx. The necessity and harms of TRUS-Bx were explained to the patients by a single physician.

Patients who were illiterate or lacked the mental ability to understand written information were excluded from the study. Additional exclusion criteria included the presence of neurological diseases that impaired the ability to respond to questions, such as Alzheimer's and dementia, and a history of previous TRUS-Bx procedures. Patients diagnosed with psychiatric disorders, such as depression or generalized anxiety disorder, and those with neurodevelopmental disorders were also not included in the study. 23 patients who met the exclusion criteria were excluded from the study. As a result, the study continued with 98 patients. Age, PSA level, prostate volume, DRE findings, education level and area of residence of the patients included in the study were recorded.

The Health Literacy Survey-Europe (HLS-EU) has been recognized as a reliable and objective evaluation tool. After the scale was also accepted by the Turkish Ministry of Health in 2016, a Turkish version was created (Health Literacy Survey-Turkey-Questionnaire 47: HLS-TR-Q47). In addition, the same study group developed a 32-item Turkish Health Literacy scale (THLS-32) [10–12]. In the survey forms used in our study; Cronbach's alpha for HLS-TR-Q47 was determined as 0.95, and Cronbach's alpha for THLS-32 was determined as 0.927 [11, 12]. HLS-TR-Q47 and THLS-32 forms were filled in by the patients who agreed to participate in the study, and their scores were recorded. The individual index was calculated using the formula (arithmetic mean-1) X(50/3). Both scales were classified into four categories based on scoring: 0–25 points indicated insufficient HL, 25–32 points indicated problematic-limited HL, 33–42 points indicated adequate HL, and 42–50 points indicated excellent HL [11]. Education levels were categorized as primary school, secondary school, high school, and undergraduate. The area of residence of the patient was classified as village, town, district, or province. All surveys were conducted through face-to-face interviews during the patients' first outpatient clinic visit.

Patients scheduled for TRUS-Bx were divided into two groups: those who attended their appointment and underwent the biopsy, and those who did not attend their scheduled appointment. The patients who did not attend their appointments were contacted by phone to determine the reason for their absence. The reasons why patients did not have the procedure were that they thought the procedure was unnecessary, they wanted to reconsider it later, and they were afraid of the procedure. Patients who could not be reached by phone, who stated that they wanted to have the procedure performed at another centre, or who preferred to visit another centre for fusion prostate biopsy were excluded from the study. These patients were not included in the study since clear information could not be obtained about whether a biopsy was performed in another centre and the biopsy results could not be evaluated. Among the patients who scheduled an appointment and underwent the TRUS-Bx procedure, 52 patients were randomly selected using the randomizer.org website. Consequently, 52 patients

who attended their appointments and underwent treatment were classified as the TRUS-Bx group, while 46 patients who did not attend their appointments and therefore did not undergo the procedure were classified as the non-TRUS-Bx group. The mentioned parameters and especially the effect of HL on the TRUS-Bx requirement between the two groups were evaluated. Moreover, 52 patients who underwent TRUS-Bx were divided into two groups as malignancy-detected (malignant) and malignancy-not detected (benign) patients according to the pathology results, and the parameters were analyzed separately for these groups.

After obtaining ethical approval (Afyonkarahisar Health Sciences University Clinical Research Ethics Committee. 2011-KAEK-2, 2022/354), the data was recorded prospectively. It was conducted in accordance with the principles of the Declaration of Helsinki. The planned study was thoroughly explained to the patients, and written informed consent was obtained from each participant.

Statistical analysis

The IBM SPSS (Statistical Package for the Social Sciences) version 20.0 program was used for the statistical analysis of the study data. The Kolmogorov-Smirnov (K-S) test was used to check whether the variables had a normal distribution. In the comparison of binary groups, the Student's T test was used for parameters with a normal distribution, and the Mann-Whitney U test was used for parameters without a normal distribution. Evaluation of multi-well crosstabs was performed with the Chi-square test or Fisher Exact test. In multivariate analysis, using the possible factors determined in previous analyses, independent predictors of the outcome of TRUS-Bx requirement awareness were examined using the enter method and Binary logistic regression analysis. The Hosmer-Lemeshow test was used for the model of fit. $p < 0.05$ was considered as statistically significant result.

Results

The mean (SD) age of the 98 patients included in the study was 67.17 ± 6.95 years, with no significant difference observed between the groups in terms of age ($p = 0.931$). There was no statistically significant difference in terms of PSA levels and prostate volume between the groups ($p = 0.579$, $p = 0.839$, respectively). The DRE findings of the groups were similar ($p = 0.507$, and $p = 0.880$, respectively). Regarding the education levels, 14 (26.9%) patients in the TRUS-Bx group and 23 (50%) patients in the non-TRUS-Bx group were primary school graduates. The education level of the patients who underwent the TRUS-Bx procedure was found to be statistically higher ($p = 0.026$). When the residential areas where the patients lived between the groups were examined, it was observed that the patients in the TRUS-Bx group lived in larger areas with higher populations ($p = 0.015$). HLS-TR-Q47 and THLS-32 scores were statistically significantly higher in the TRUS-Bx group ($p = 0.001$, $p < 0.001$, respectively) (Table 1).

The 52 patients who underwent TRUS-Bx were divided into two groups as those with malignant and benign pathology, and the same parameters were compared for both two groups. Age, PSA levels, PSA density, and malignant findings on DRE were significantly higher in the group with malignant pathology ($p = 0.010$, $p = 0.014$, $p < 0.001$, $p = 0.001$, respectively). Prostate volume was significantly higher in the benign group ($p = 0.003$). There was no statistically significant difference between the groups in terms of education level, and area of residence ($p = 0.346$, $p = 0.387$, $p = 0.194$, respectively). HLS-TR-Q47 and THLS-32 scores were statistically significantly higher in the malignant group ($p = 0.007$, $p < 0.001$, respectively) (Table 2).

Binary logistic regression analysis was used to identify the possible independent predictors for patients recommended for TRUS-Bx who proceeded with the operation, determining which factors contributed most to this outcome. Age, PSA level, prostate volume, PSA density, DRE findings, education level, the area where the patient lives, HLS-TR-Q47, and THLS-32 were used as predictors. The model predicting the awareness of TRUS-Bx

Table 1 Comparison of the demographic and clinical data of the groups

	Underwent TRUS-Bx N=52 n %	Did not have TRUS-Bx N=46 n %	p
Age (years) (mean±SD)	67.12±6.66	67.24±7.34	0.931
PSA (ng/mL) (median)	10.15*	12*	0.579
Prostate volume (cc) (mean±SD)	60.00±30.80	55.15±15.31	0.839
DRE	35 (67.3)	28 (60.9)	0.507
Benign	17 (32.7)	18 (39.1)	
Malign			
Education level	14 (26.9)	23 (50)	**0.026**
Primary school	9 (17.3)	11 (23.9)	
Secondary school	15 (28.8)	7 (15.2)	
High-school	14 (26.9)	5 (10.9)	
Undergraduate			
Area type	8 (15.4)	18 (39.1)	**0.015**
Village	17 (32.7)	17 (37)	
Town	10 (19.2)	5 (10.9)	
District	17 (32.7)	6 [13]	
Province			
HLS-TR-Q47 (mean±SD)	21.43±5.68	17.45±6.30	**0.001**
THLS-32 (mean±SD)	31.83±7.59	23.50±8.83	**<0.001**

(*=median, TRUS-Bx: Transrectal ultrasound-guided prostate biopsy, PSA: prostate-specific antigen, DRE: Digital rectal examination, HLS-TR-Q47: Health Literacy Survey-Turkey- Questionnaire 47, THLS-32: Turkish Health Literacy-32)

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Table 2 Demographic and clinical data of patients who underwent TRUS-Bx regarding the pathology results

	Benign N=31 n %	Malign N=21 n %	p
Age (years) (mean ± SD)	65.19 ± 6.58	69.95 ± 5.33	**0.010**
PSA (ng/mL) (median)	7.7*	16*	**0.014**
Prostate volume (cc) (mean ± SD)	68.81 ± 32.65	47.00 ± 22.86	**0.003**
PSA Density (median)	0.11*	0.31*	**< 0.001**
DRE	27 (87.1)	8 (38.1)	**0.001**
Benign	4 (12.9)	13 (61.9)	
Malign			
Education level	8 (25.8)	6 (28.6)	0.387
Primary school	6 (19.4)	3 (14.3)	
Secondary school	11 (35.5)	4 [19]	
High-school	6 (19.4)	8 (38.1)	
Undergraduate			
Area type	3 (9.7)	5 (25)	0.194
Village	13 (41.9)	4 [20]	
Town	7 (22.6)	3 [15]	
District	8 (25.8)	8 (40)	
Province			
HLS-TR-Q47 (mean ± SD)	19.73 ± 4.86	23.93 ± 75.97	**0.007**
THLS-32 (mean ± SD)	28.70 ± 7.30	36.46 ± 5.410	**< 0.001**

(*=median, TRUS-Bx: Transrectal ultrasound-guided prostate biopsy, PSA: prostate-specific antigen, DRE: Digital rectal examination, HLS-TR-Q47: Health Literacy Survey-Turkey- Questionnaire 47, THLS-32: Turkish Health Literacy-32)

Table 3 Logistic regression analysis of parameters affecting awareness of TRUS-Bx necessity

Risk factors	TRUS-Bx requirement	
	OR (%95 GA)	p value
Age (years)	0.914 (0.833–1.001)	0.053
PSA (ng/mL)	0.992 (0.979–1.004)	0.188
Prostate volüme (cc)	1.023 (0.999–1.048)	0.065
PSA Density	1.025 (0.996–1.055)	0.096
DRE	0.509 (0.128–2.031)	0.339
Education level	1.918 (1.123–3.276)	**0.017**
Area type	1.847 (1.043–3.271)	**0.035**
HLS-TR-Q47	1.181 (1.046–1.335)	**0.007**
THLS-32	1.139 (1.055–1.231)	**0.001**

(OR: estimated relative risk shown with Odd's ratio, CI: confidence interval, TRUS-Bx: Transrectal ultrasound-guided prostate biopsy, PSA: prostate-specific antigen, DRE: Digital rectal examination, HLS-TR-Q47: Health Literacy Survey-Turkey- Questionnaire 47, THLS-32: Turkish Health Literacy-32)

requirement was significant (χ2 [8]=8.0, p=0.426) and could explain 53.6% of the variance in reincarceration (Nagelkerke R2=0.536). The model correctly predicted 76.5% of those who underwent TRUS-BX and 73.9% of those who did not undergo TRUS-Bx (75.3% in total). Education level, the area where the patient lives, HLS-TR-Q47, and THLS-32 were found to be important predictors for awareness of TRUS-Bx requirement. Among these parameters, the most clinically important determinant was identified to be education level (OR=1.918, p=0.017) (Table 3).

Discussion

According to the definition of the World Health Organization, "health literacy" means "cognitive and social skills that determine the motivation and ability of individuals to access, use and understand the information in ways that promote and maintain health". Based on this definition, individuals with adequate health literacy (HL) levels display a higher tendency to comprehend information provided by experts and make rational decisions regarding the situations they encounter, in contrast to patients with low HL levels [13, 14].

In most of the malignant diseases, delay in treatment has a negative effect on the outcomes [15, 16]. Although prostate cancer is considered to be a relatively slow-progressing disease compared to other malignancies, studies have shown that delay in treatment adversely affects outcomes after radical treatment, especially in prostate cancer patients in the intermediate and high-risk groups [17]. Now, in the presence of necessary clinical indicators, the correct and timely application of biopsy procedures, which are used in the definitive diagnosis of prostate cancer, also directly affects treatment plans [4].

There are studies showing that positive changes in HL levels would lead to positive improvements in the diagnosis and treatment of many diseases. Demirbaş et al. pointed out that increased HL level positively affects the diagnosis of erectile dysfunction [18]. Goodwin et al. stated that there was a parallelism between HL level and general health status in patients with prostate cancer [19].

Tobias-Machado et al. examined the relationship of health literacy with prostate cancer screening compliance and cancer aggressiveness. As a result of the study, illiterate men were less likely to seek prostate cancer screening. Illiterate men had a higher risk of having aggressive prostate cancer [20]. We excluded illiterate patients from our study due to difficulties they could encounter in completing the surveys. However, our findings revealed a correlation between higher education levels, an increased understanding of the significance of the TRUS-Bx procedure, and a higher likelihood of undergoing the procedure. On the other hand, there was no association between education level and the presence of benign or malignant pathology among patients who underwent the TRUS-Bx procedure.

In their review conducted in 2023 investigating the effect of health literacy on prostate cancer patients under active surveillance, Beyer et al. stated that health literacy plays an important role in the treatment process of prostate cancer patients. Although there is limited evidence about patients under active surveillance, the importance of health literacy in patients with localized prostate cancer in choosing the active surveillance method and subsequently complying with treatment has been emphasized

[21]. In our study, it is noteworthy that health literacy is higher in patients with malignant pathology. Prostate cancer does not cause symptoms in the early stages and is usually diagnosed with screening tests. We think that the detection rate of malignant pathology is higher because patients with high health literacy apply for more screening tests. In our study, the high level of health literacy, especially in patients with malignant pathology, shows the importance of health literacy in diagnosing prostate cancer in the early stages. Higher cooperation in treatment decision-making and treatment compliance can be expected in prostate cancer patients with high health literacy.

Another notable issue in our study is that, although both surveys were scored out of 50 points, the THLS-32 survey scores were higher. In developing countries, it is often more effective to adapt literacy surveys to the demographic characteristics of the specific country and region rather than relying solely on direct language validation.

Although the relationship between HL and many diseases has been investigated in the literature, no study has been found to evaluate patient compliance with HL and TRUS-Bx. Our study's results showed a strong relationship between TRUS-Bx requirement and HL as in different pathologies. The analyses showed that the education level of the patients who underwent TRUS-Bx was statistically higher, and HLS-TR-Q47 and THLS-32 scores were statistically significantly higher in the TRUS-Bx group. In the logistic regression analysis, education level, HLS-TR-Q47 and THLS-32 were found to be important predictors for awareness of TRUS-Bx requirement.

The findings of this study have shown that in patients who were recommended TRUS-Bx for reasons such as PSA elevation, DRE findings and lesion detection in MpMR after admission to the urology outpatient clinic, high HL and education level contributed to early diagnosis and the process of going to the diagnosis.

There are some limitations of our study. The most significant limitation of our study is that it was conducted in a single centre, which may result in a homogeneous patient population. Another limitation is the generally low education level of the patients, which can negatively impact their reading comprehension and response accuracy, potentially leading to biased questionnaire results. However, our study has several strengths. An appropriate patient data form was completed, and patients were consistently informed by a single physician, ensuring uniformity in communication. Additionally, a suitable environment was provided for patients to complete the health literacy (HL) surveys. Performing logistic regression analysis to identify predictors affecting awareness further strengthens the validity of our findings.

Conclusion

Similar to other diseases, high levels of HL are expected to positively influence the prostate cancer diagnosis process mediated by TRUS-Bx. This improvement in health literacy can lead to earlier medical intervention for patients, thereby reducing the mortality and morbidity associated with prostate cancer. Given the benefits of enhancing health literacy, it is crucial for countries, particularly those with low HL levels, to prioritize this issue in their health policies. Further studies with larger sample sizes are needed to confirm these findings.

Abbreviations

TRUS-Bx	Transrectal ultrasound-guided prostate biopsy
DRE	Digital rectal examination
HL	Health literacy
HLS-EU	Health Literacy Survey-Europe
HLS-TR-Q47	Health Literacy Survey-Turkey- Questionnaire 47
THLS-32	Turkish Health Literacy Scale-32
MpMR	Multiparametric Prostate Magnetic Resonance Imaging
PSA	Prostate-specific antigen

Declarations

Competing interests
The authors declare no competing interests.

Ethical approval and consent to participate
This study was approved by the Afyonkarahisar Health Sciences University Clinical Research Ethics Committee (2011-KAEK-2, 2022/354). All methods were carried out in accordance with the relevant guidelines and regulations of the Helsinki Declaration. Written informed consent was obtained from all participants.

Consent for pubilcation
Not applicable.

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