

Optimizing Patient Experience in Ultrasound-Guided Breast Biopsies: A Study on Anxiety Levels in a Tertiary Care Hospital

Benazir Gul^{1*}, Mahwash Mansoor¹, Naseeb Ullah Tareen¹, Palwasha Gul², Atiqa Hassan¹ and Almas Mengal¹

¹Bolan Medical Complex Hospital, Quetta, Pakistan

²Nottingham University Hospital NHS Trust, Nottingham, UK

ABSTRACT

Background: Patients often express concerns and anxiety about image-guided procedures, especially if they have never undergone a biopsy before.

Objective: This study aims to assess patients' anxiety levels and explore the impact of effective communication in the context of ultrasound-guided breast biopsy procedures.

Methods: From November 2022 through June 2024, 71 women undergoing ultrasound-guided breast biopsies were enrolled in the study, which was conducted in the radiology department of Bolan Medical Complex Hospital, Quetta. This cross-sectional study surveyed seventy-one (71) patients undergoing their first ultrasound-guided breast biopsy. The participants gave informed consent about the procedure and then completed a brief verbal survey before and after the biopsy procedure. The anxiety levels were determined using the State-Trait Anxiety Inventory (STAI) at both pre- and post-procedure stages. The anxiety levels were specified as mild (20-38)/moderate (39-45) or severe (46-80).

Results: The average age of patients was 35 ± 5 years. Average pre-biopsy anxiety was 65.7 ± 8.9 points on a rating scale ranging from 20-80. Effective communication between the patient and the radiologist was associated with significantly lower levels of pre-procedure stress and anxiety. After the biopsies, it was noticed that the anxiety level was significantly decreased. Better patient and radiologist communication was also reported with lower anxiety scores post-biopsy. Patients with high stress and anxiety levels experienced more pain during the procedure hence proving a direct relationship between anxiety and pain.

Conclusion: Ultrasound-guided breast biopsies are generally better tolerated than anticipated. Effective pre-biopsy communication is crucial in reducing anxiety, which directly influences the level of pain experienced during the procedure.

Keywords: Anxiety, ultrasound guided, biopsies, prebiopsy anxiety, image guided biopsies.

INTRODUCTION

Breast biopsy is the procedure in which a tissue sample is taken from a breast lesion and sent for histopathological evaluation. It is typically indicated when a breast surgeon suspects a malignant mass or suspicion arises after screening mammography [1].

Breast cancer is the most diagnosed cancer, notably in low- and middle-income regions including Pakistan. It remains a critical public health dilemma due to its higher morbidity and mortality but also imposes a significant health cost [2].

Dealing with and coping with the psychological aspect of the health of women is of prime importance in all the phases of the disease, initiating from the first suspicion of malignancy to the different modes of treatment. Patients with suspected breast malignancy who are awaiting diagnosis often experience anxiety and employ various stress-coping mechanism. Patients in particular experience stress and specific fear about the procedure, both before the breast biopsy and later with the biopsy results. This emotional distress has been associated with

poorer outcomes of biopsy which include, increased pain and physical discomfort [3].

Peak levels of anticipatory anxiety and stress occur in women before ultrasound-guided biopsy procedures. It is observed that mean rates or scores for anxiety are reduced immediately after biopsy, still, the anxiety prevails at a rate above the normal level [4]. Previous studies have assessed anxiety levels in patients undergoing breast biopsies, our study provides a unique perspective by explicitly evaluating the impact of radiologist-patient communication on anxiety reduction in a tertiary care setting within our local healthcare context.

Pre-biopsy radiologist-patient communication is very effective. It involves patient-centered discussions, clear descriptions of procedures, giving enough time for specific queries, and expectations set according to the clinical situation and patient requirements [5].

There should be a focus on investigating the efforts made to address the patient's pre-biopsy anxiety as the anticipated pain was directly correlated with the level of pain experienced. Therefore, communication with patients before biopsy counseling about the expected average pain reported during biopsy is a preferred strategy. The effectiveness of proper communication

*Corresponding Author: Benazir Gul, Bolan Medical Complex Hospital, Quetta, Pakistan, Email address: benazirgul01@gmail.com
Received: July 23, 2024; Revised: March 18, 2025; Accepted: March 28, 2025
DOI: <https://doi.org/10.37184/nrjp.3007-5181.1.25>

between the performing radiologist and the patient has been strongly demonstrated to have a positive outcome on the patient's anxiety [6, 7].

Considering all these factors, a survey was conducted on patients experiencing their first breast biopsy procedure to interpret their experience, by assessing the methods to improve the procedures and to further share the lessons learned with the patients and physicians. The primary research question of this study was to investigate the anxiety levels of patients and assess the role of effective patient communication during ultrasound-guided breast biopsy procedures.

METHODS

This cross-sectional study included patients undergoing their first core breast biopsy at a single tertiary care and teaching hospital *i.e.* Bolan Medical Complex Hospital, Quetta. The study was reviewed and approved by the hospital's Ethics Review Committee (ERC) before data collection ((IRB-16/2022-BMCH).

Informed consent was obtained from all participants before participation. Eligible patients were 18 years of age or older who were scheduled for an ultrasound-guided breast biopsy. Patients who had prior breast biopsy were excluded from the study. From November 2022 through June 2024, 71 women undergoing ultrasound-guided breast biopsies were enrolled in the study.

Inclusion criteria were individuals aged 18-80 years, with translation services provided if needed to eliminate language barriers. Participants had no prior history of biopsy and provided informed consent. Both single and multiple biopsies were included, with no significant difference in pain scores between the groups. Biopsies were performed on either a single breast or both breasts using a 16-gauge needle.

Exclusion criteria were mental retardation and physical disabilities that interfered with counseling. All participants were screened for comorbidities through a detailed medical history review, and clinical records were assessed when necessary to confirm eligibility. Most patients were referred by breast surgeons and the surgical team from the outpatient department.

State-Trait Anxiety Inventory (STAI) scale was used to measure levels of anxiety (range, 20-80). The anxiety levels were specified as mild (20-38)/moderate (39-45) or severe (46-80). STAI tool differentiates between state anxiety (temporary or situational) and trait anxiety (general or long-term).

The survey was conducted by a radiology resident on the day of the biopsy procedure. After obtaining informed consent, the residents provided basic education about the biopsy process and administered a structured paper-based oral survey to the participants.

The responses were recorded immediately before and after the procedure using a standardized questionnaire, which included:

- State-Trait Anxiety Inventory (STAI) Scale to assess anxiety levels.
- Likert Scale (0-10) to evaluate anticipated vs. actual pain levels.
- Questions about preparedness, expectations, and overall experience.

The effectiveness of communication was assessed using a patient-reported Likert scale (0-10), where 0 represented "not effective at all" and 10 indicated "highly effective." Additionally, we inquired about patients' understanding of the procedure, confidence level post-counseling, and whether their concerns were adequately addressed.

They were also asked to compare their anticipated and actual pain levels, both before and after the procedure. All these variables were calculated using a scale of 0 to 10-point called the Likert scale, with a 0-score showing no anxiety or pain and a 10 score notifying high concern or the highest level of pain experienced. Patients also replied to questions about their initial preparedness, and expectations for biopsy, and summarized their overall experience with biopsy.

Complete demographic details, any past or present history of anxiety, the level of patient education, the history of breast cancer in the family, relevant biopsy data, and histopathology results were calculated and written upon the chart review (**Fig. 1**).

A radiology resident collected the study consent from the participants on the day of the biopsy. Following the consent form, the resident provided biopsy basic education and techniques to the patient which included the thorough steps of biopsy, medications used for local anesthesia, biopsy marker placement if needed, and an aftercare plan. Later the consultant breast radiologist also reviewed and discussed the procedure with the patient, clarifying the risks, assuring safety, and answering the remaining queries.

Ultrasound-guided core biopsy was done with 16-gauge disposable needles with 1% lidocaine utilized for local anesthesia.

Data Analysis Plan

Descriptive Statistics: Demographic data, including age, education level, residence, and family history of breast cancer, were summarized using means, standard deviations, frequencies, and percentages. Patient concerns (e.g., fear of malignancy or pain) and biopsy experiences were analyzed and presented using figures and tables.

Anxiety Analysis: Pre- and post-biopsy anxiety levels, measured by the STAI scale, were compared using paired t-tests, with subgroup analysis based on demographic factors. The relationship between anxiety and procedural pain was assessed using the Pearson correlation.

Pain Analysis: Anticipated pain scores were compared to actual average and greatest pain levels during the biopsy using paired t-tests. The correlation between anticipated and actual pain was analyzed to identify significant trends.

Effectiveness of Communication: The impact of radiologist and resident communication on anxiety reduction and patient preparedness was evaluated, with findings summarized in Fig. (1). Anxiety levels were compared between patients reporting effective vs. non-effective communication using independent t-tests.

Statistical Tests and Tools: Paired t-tests, independent t-tests, ANOVA, and Pearson correlation were used to analyze the data, with $p < 0.05$ considered statistically significant. SPSS was utilized for statistical analysis, and findings were visualized using tables and graphs. IBM SPSS Statistics, Version 26 was used.

RESULTS

The average age of patients was 35 ± 5 years, and 30% were formally educated, while most participants came from urban areas. Additionally, 20% had a family history of breast cancer (Table 1).

Patient anxiety levels were compared before and immediately after the procedure. The average pain score was significantly higher before the biopsy (5.0 ± 1.8) compared to the post-biopsy pain score (2.25 ± 2.1) (Table 2).

Average pre-biopsy anxiety was 65.7 ± 8.9 on a scale ranging from a score of 20 to 80 points, which falls in

Table 1: Distribution of patients' demographics.

Demographics	Statistics
Age in years, mean \pm standard deviation	35 ± 5
Formal Education, n(%)	21(30%)
Urban population, n(%)	49(70 %)
Family history of breast cancer, n(%)	14 (20 %)

Table 2: Results of patient's anxiety and pain scale.

		Statistics
Anxiety Score (STAI)	Pre-biopsy level of anxiety (scale: 20-80)	65.7 ± 8.9
	Post-biopsy level of anxiety (scale: 20-80)	23.8 ± 4.6
Pain Score (Likert)	Pre-existing pain expectation (scale 0-10)	5.0 ± 1.8
	Average pain level during biopsy (scale 0-10)	2.8 ± 2.6
	Greatest pain level during biopsy (scale 0-10)	3.3 ± 2.0
	Post-biopsy pain level (scale 0-10)	2.25 ± 2.1

the category of severe anxiety according to the STAI scale. It was observed that better communication between the patient and the radiologist performing biopsies was associated with significantly lower levels of pre-biopsy anxiety. Immediately after the procedure, participants' anxiety level was significantly decreased to 23.8 ± 4.6 , which falls into mild anxiety level according to the STAI scale.

Regarding the biopsy experience, (73.2%) of patients described it as better than anticipated before the procedure. Anxiety score was reported as decreased markedly from a mean score of 65.7 ± 8.9 at pre-biopsy to a post-biopsy mean score of 23.8 ± 4.6 .

The average and the greatest pain scores during the biopsy were 2.8 ± 2.6 and 3.3 ± 2.0 , respectively, which was significantly reduced compared to the pre-procedure mean pain score (5.0 ± 1.8) ($p < 0.001$). There was no significant difference in pain scores between those undergoing single vs. multiple biopsies,

Strong correlations were found between pre-biopsy stress anxiety levels and procedural pain ($r=0.60$, $p < 0.001$). A similarly positive correlation was seen between the anticipated and the actual procedural pain score ($r=0.50$, $p=0.005$).

When inquired about the primary concerns before the procedure, 51.8% of patients cited the possibility of a malignant outcome, followed by the fear of pain and discomfort during the biopsy procedure accounting for 40.6% of patients (Table 3). Seventeen patients 12.07% patients had a known history of diagnosed anxiety disorder. In the post-procedural survey, patients were

Table 3: Greatest worry before the biopsy.

Variables	Statistics
Malignancy	36(51.8%)
Pain, n(%)	29(40.6%)
Complications, n(%)	2(2.5%)
Social and family support, n(%)	3(3.9%)
Healthcare provider interaction, n(%)	1(2.4%)

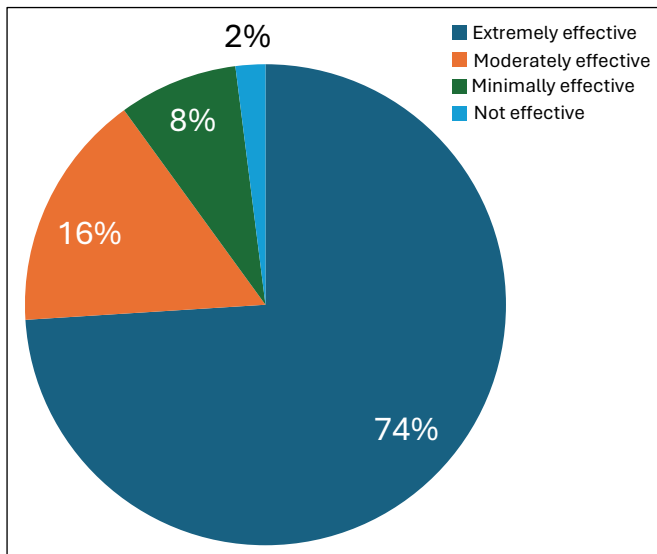


Fig. (1): Effectiveness of resident and radiologist communication preparation from patient perspective.

asked to sum up their biopsy procedure experience, 59.1% reported it was better than expected, 13(18.3%) reported it was as expected, and 22.5% found the experience worse than anticipated.

Patients were also asked to rate and mention the effectiveness of the radiology in preparing and counseling them for the procedure, with 73% reporting that the resident's interaction was extremely helpful and effective (**Fig. 1**).

DISCUSSION

Every year it is reported that over 1.6 million patients in the USA need breast biopsy, with the majority undergoing image-guided tissue biopsies. Needle biopsy recommendation and preference are higher as compared to excisional biopsy for the reasons that they are cost-effective, efficient, and result in less patient physical distortion and morbidity. Needle tissue biopsy is a reliable and safe procedure with minimal false-negative results and no significant complications and morbidity. An image-guided breast biopsy is recommended for lesions with a moderate to high suspicion of malignancy and is commonly performed using ultrasound, stereotactic, or MRI-guided techniques [8].

As image-guided biopsy is considered the preferred method to detect breast diseases, it is imperative to properly investigate the psychological factors that can influence the patient's pre and post-biopsy experience. This study aimed to explore whether pre-biopsy emotional distress would directly relate to biopsy-related physical discomfort and pain in women undergoing ultrasound-guided biopsy. The measure of general anxiety, the procedure worries, and the concerns

about the biopsy report would be subject to these outcomes [9].

Despite the safety and efficacy of image-guided breast biopsies, they often have a significant psychological influence on patients. Anxiety is often at its peak on the biopsy day, escalating at each step of the workup, starting from the initial/screening mammogram and breast ultrasound to the recommendation of breast biopsy and then ultimately to the advice of the biopsy day and time. Previous studies concluded that anxiety levels decrease after the biopsy, but they remain high and elevated above the baseline level until the biopsy outcome is known [10].

Our study demonstrated that the psychological distress present before an ultrasound-guided breast biopsy is directly connected with pain and discomfort during the breast biopsy. These results are comparable with the previous studies that have shown that emotional stress before breast biopsy is directly correlated with enhanced levels of pain as well as physical discomfort [11].

Several factors impact the women's experiences of psychological distress at the time of biopsy. Greater optimism, lower skepticism, increased knowledge, imparting self-regulatory strategies that are problem-solving, and seeking information and emotional support may help in the recovery of emotional well-being. For women receiving a diagnosis of breast cancer, lack of social support, cognitive negligence, and negative perceptions of life events may lead to post-biopsy psychosocial distress which ends on the same day of the procedure [12].

Patient anxiety related to biopsy often stems from fears of pain or the possibility of a malignancy outcome. This is particularly evident in patients who have never undergone a biopsy in the past. Our study demonstrated a significant decrease in stress and anxiety after the first ultrasound-guided biopsy, approximately 73% of patients reported that their overall experience was better than expected. The pain experienced during the biopsy was significantly lower than anticipated. These findings are consistent with other studies that show the actual pain felt during the procedure is often less than what was anticipated. Sharing this information with patients before the procedure can provide reassurance, especially for those who are anxious about the biopsy [13].

Allocating additional time for biopsy preparation and discussion should be needed for patients to help address their concerns and anxiety. Pre-biopsy levels of stress and anxiety along with expected pain were associated with greater pain during the procedure, supporting

findings from studies results underscore the value of discussing positive patient experiences with those who are fearful and anxious, helping to reduce their distress [14].

One of the studies concluded that listening to music along with guided meditation can lower biopsy pain during the procedure. Moreover, the music significantly lowered the patient's anxiety and fatigue without harming consultant radiologists and patient interaction and communication [15].

Miller *et al.* highlighted that post-biopsy anxiety was linked to better communication with radiologists and staff. At our hospital, a nurse and resident assisted in counseling and educating the patients before the procedure, answering their queries, and ensuring understanding. Radiologists further looked after the patient's understanding of the procedure, answering the remaining questions and asking for informed consent. Patients have expressed satisfaction and comfort with this approach, feeling grateful for the opportunity to speak with healthcare providers multiple times and to have their concerns fully addressed. This approach has been shown to decrease patient anxiety and improve the overall biopsy experience [16, 17].

The present study has shown that the psychological preparation of patients before invasive procedures can affect their adaptation and recovery. These techniques are generally useful in reducing patients' anxiety during stressful procedures. These procedures may also shorten the duration of hospital stay, reduce the need for sedatives, improve postoperative mental well-being, and reduce recovery time, fear, and anxiety before and after the procedure [18, 19].

Ensuring patient comfort and effective pain management, even in minimally invasive biopsy procedures, requires techniques that minimize anxiety and optimize analgesia. Prioritizing these aspects can enhance the overall patient experience and procedural success [20].

CONCLUSION

Ultrasound-guided interventions are generally well tolerated by the patients than they initially anticipate. It is crucial to emphasize the importance of transferring precise and clear information to the patients before the biopsy. Lower levels of anxiety correlate directly with reduced discomfort and pain during the procedure. By addressing the anxiety associated with breast biopsies, healthcare providers can improve patient comfort, enhance compliance with diagnostic procedures, and

potentially lead to better overall outcomes in breast cancer diagnosis and treatment.

ETHICS APPROVAL

The study received approval from the Ethical Review Board of Bolan Medical Complex Teaching Hospital (IRB-16/2022-BMCH). All procedures performed in studies involving human participants followed the ethical standards of the institutional and/or national research committee and the Helsinki Declaration.

CONSENT FOR PUBLICATION

Informed consent was obtained from the participants of the study.

AVAILABILITY OF DATA

The data that support the findings of this study is openly available in the Radiology Department at Bolan Medical Complex Hospital and is easily accessible.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ACKNOWLEDGEMENTS

The authors sincerely acknowledge Dr. Pari Gul Associate Professor for her invaluable support and guidance throughout this study.

AUTHORS' CONTRIBUTION

Benazir Gul: Study conception and design, data collection, analysis and interpretation of results, and manuscript preparation.

Mahwash Mansoor: Data collection, analysis and interpretation of results, and manuscript preparation.

Naseeb Ullah Tareen: Data collection, analysis, and interpretation of results, and manuscript preparation.

Palwasha Gul: Study design, Data collection, analysis and interpretation of results, and manuscript preparation.

Atiqa Hassan: study conception and design and data collection.

Almas Mengal: Data analysis and interpretation of results, and manuscript preparation.

REFERENCES

1. Van Breest Smallenburg V, Nederend J, Voogd AC, Coebergh JW, van Beek M, Jansen FH, *et al.* Trends in breast biopsies for abnormalities detected at screening mammography: a population-based study in the Netherlands. *Br J Cancer* 2013; 109(1): 242-8.
DOI: <https://doi.org/10.1038/bjc.2013.300>
2. Khan NH, Duan SF, Wu DD, Ji XY. Better reporting and awareness campaigns needed for breast cancer in Pakistani

- women. *Cancer Manag Res* 2021; 13: 2125-9.
DOI: <https://doi.org/10.2147/CMAR.S293332>
3. Drageset S, Lindstrøm TC. The mental health of women with suspected breast cancer: the relationship between social support, anxiety, coping and defence in maintaining mental health. *J Psychiatr Ment Health Nurs* 2003; 10(4): 401-9.
DOI: <https://doi.org/10.1046/j.1365-2850.2003.00620.x>
4. Maimone S, Morozov AP, Wilhelm A, Robrahn I, Whitcomb TD, Lin KY, *et al.* Understanding patient anxiety and pain during initial image-guided breast biopsy. *J Breast Imaging* 2020; 2(6): 583-9.
DOI: <https://doi.org/10.1093/jbi/wbaa091>
5. Soo MS. Interventional procedures: patient-centered approach. In: Kuzmiak C, Ed. 2019; *Interventional Breast Procedures*. Cham: Springer pp. 1-19.
DOI: https://doi.org/10.1007/978-3-030-13402-0_1
6. Soo MS, Shelby RA, Johnson KS. Optimizing the patient experience during breast biopsy. *J Breast Imaging* 2019; 1(2): 131-8.
DOI: <https://doi.org/10.1093/jbi/wbz018>
7. Bick U, Trimboli RM, Athanasiou A, Balleyguier C, Baltzer PA, Bernathova M, *et al.* Image-guided breast biopsy and localisation: recommendations for information to women and referring physicians by the European Society of Breast Imaging. *Insights Imaging* 2020; 11(1): 12.
DOI: <https://doi.org/10.1186/s13244-019-0803-x>
8. Chhatwal J, Alagoz O, Burnside ES. Optimal breast biopsy decision-making based on mammographic features and demographic factors. *Oper Res* 2010; 58(6): 1577-91.
DOI: <https://doi.org/10.1287/opre.1100.0854>
9. Wallis M, Tarvidon A, Helbich T, Schreer I. Guidelines from the European Society of Breast Imaging for diagnostic interventional breast procedures. *Eur Radiol* 2007; 17: 581-8.
DOI: <https://doi.org/10.1007/s00330-006-0386-1>
10. Kutay E, Milch H, Sayre J, Joines M, Hoyt A, Li B, *et al.* Fear of the unknown: the benefits of a patient educational handout on breast biopsy markers. *J Breast Imaging* 2022; 4(3): 285-90.
DOI: <https://doi.org/10.1093/jbi/wbac016>
11. Hayes Balmadrid MA, Shelby RA, Wren AA, Miller LS, Yoon SC, Baker JA, *et al.* Anxiety prior to breast biopsy: relationships with length of time from breast biopsy recommendation to biopsy procedure and psychosocial factors. *J Health Psychol* 2017; 22(5): 561-71.
DOI: <https://doi.org/10.1177/1359105315603479>
12. Soo AE, Shelby RA, Miller LS, Balmadrid MH, Johnson KS, Wren AA, *et al.* Predictors of pain experienced by women during percutaneous imaging-guided breast biopsies. *J Am Coll Radiol* 2014; 11(7): 709-16.
DOI: <https://doi.org/10.1016/j.jacr.2014.02.010>
13. Dorfman CS, Lamb E, Van Denburg A, Wren AA, Soo MS, Faircloth K, *et al.* The relationship between holding back from communicating about breast concerns and anxiety in the year following breast biopsy. *J Psychosoc Oncol* 2018; 36(2): 222-37.
DOI: <https://doi.org/10.1080/07347332.2017.1415289>
14. Miller SJ, Sohl SJ, Schnur JB, Margolies L, Bolno J, Szabo J, *et al.* Pre-biopsy psychological factors predict patient biopsy experience. *Int J Behav Med* 2014; 21(1): 144-8.
DOI: <https://doi.org/10.1007/s12529-013-9290-8>
15. Akın ME. Effect of music on anxiety and pain during ultrasound-guided core needle breast biopsy: a randomized controlled trial. *Diagn Interv Radiol* 2021; 27(3): 360-5.
DOI: <https://doi.org/10.5152/dir.2021.20776>
16. Miller LS, Shelby RA, Balmadrid MH, Yoon S, Baker JA, Wildermann L, *et al.* Patient anxiety before and immediately after imaging-guided breast biopsy procedures: impact of radiologist-patient communication. *J Am Coll Radiol* 2013; 10(6): 423-31.
DOI: <https://doi.org/10.1016/j.jacr.2013.02.007>
17. Harding MM. Effect of nurse navigation on patient care satisfaction and distress associated with breast biopsy. *Clin J Oncol Nurs* 2015; 19(1): E15-20.
DOI: <https://doi.org/10.1188/15.CJON.E15-E20>
18. Lanini I, Amass T, Calabrisotto CS, Fabbri S, Falsini S, Adembri C, *et al.* The influence of psychological interventions on surgical outcomes: a systematic review. *J Anesth Analg Crit Care* 2022; 2(1): 31.
DOI: <https://doi.org/10.1186/s44158-022-00051-5>
19. Meletti DP, Meletti JF, Camargo RP, Silva LM, Módolo NS. Psychological preparation reduces preoperative anxiety in children: a randomized and double-blind trial. *J Pediatr (Rio J)* 2019; 95(5): 545-51.
DOI: <https://doi.org/10.1016/j.jped.2018.05.015>
20. Akın ME. Pain levels of patients undergoing ultrasound-guided biopsies and associated factors: a cross-sectional study. *J Health Sci Med* 2022; 5(1): 336-41.
DOI: <https://doi.org/10.32322/jhsm.1038232>