

Validity and reliability test of the knowledge level questionnaire of cancer patients undergoing radiotherapy

Uji Validitas dan Reliabilitas Kuesioner Tingkat Pengetahuan Pasien Kanker yang Menjalani Radioterapi

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ABSTRACT

Background: Radiotherapy is one of the main modalities in cancer treatment. The success of this therapy is strongly influenced by the knowledge of patients about the disease and radiotherapy. The researcher developed a questionnaire to measure the level of knowledge among cancer patients undergoing radiotherapy.

Objective: This study aimed to assess the validity and reliability of a knowledge-level questionnaire for cancer patients receiving radiotherapy at Dr. M. Djamil General Hospital, Padang.

Methods: This research employed a quantitative approach with a cross-sectional design. A total of 30 cancer patients undergoing radiotherapy were included as respondents using a consecutive sampling technique. The questionnaire instrument was developed by the researcher and consisted of 25 items covering five domains of knowledge: cancer, radiotherapy, side effects, self-care, and nutrition.

Results: Validity testing was conducted using Pearson's correlation analysis, while reliability was assessed using Cronbach's Alpha. Out of the 25 items, 19 were statistically valid ($p < 0.05$), with correlation coefficients (r) ranging from moderate to strong (0.470–0.745). The Cronbach's Alpha value for the valid items was 0.904, indicating excellent reliability.

Conclusion: The developed questionnaire was proven to be both valid and reliable for measuring the knowledge level of cancer patients undergoing radiotherapy. This instrument has the potential to be used in clinical practice and research to support more targeted educational interventions.

Keywords: cancer, knowledge, radiotherapy, reliability, questionnaire, validity

ABSTRAK

Latar Belakang: Radioterapi merupakan salah satu modalitas utama dalam penanganan kanker. Keberhasilan terapi ini sangat dipengaruhi oleh tingkat pengetahuan pasien terhadap penyakit dan radioterapi. Peneliti mengembangkan

sebuah kuesioner untuk mengukur tingkat pengetahuan pasien kanker yang menjalani radioterapi.

Tujuan: Penelitian ini bertujuan menilai validitas dan reliabilitas kuesioner tingkat pengetahuan pada pasien kanker yang menjalani radioterapi di RSUP Dr. M. Djamil Padang.

Metode: Penelitian ini merupakan studi kuantitatif dengan pendekatan cross-sectional. Sebanyak 30 pasien kanker yang menjalani radioterapi diikutsertakan sebagai responden menggunakan teknik consecutive sampling. Instrumen kuesioner dikembangkan oleh peneliti dan terdiri dari 25 item pertanyaan yang mencakup lima domain pengetahuan: kanker, radioterapi, efek samping, perawatan diri, dan nutrisi. Uji validitas dilakukan dengan analisis korelasi Pearson, dan reliabilitas dinilai menggunakan Cronbach's Alpha.

Hasil: Dari 25 item pertanyaan, 19 dinyatakan valid secara statistik ($p < 0,05$) dengan tingkat kekuatan validitas berdasarkan nilai koefisien korelasi (r) bervariasi dari sedang hingga kuat (0.470-0.745). Nilai Cronbach's Alpha untuk pertanyaan yang valid sebesar 0,904 menunjukkan reliabilitas yang sangat baik.

Kesimpulan: Kuesioner yang dikembangkan terbukti valid dan reliabel untuk mengukur tingkat pengetahuan pasien kanker yang menjalani radioterapi. Instrumen ini berpotensi digunakan dalam praktik klinis dan penelitian untuk mendukung intervensi edukasi yang lebih terarah.

Kata kunci: kanker, kuesioner, pengetahuan, radioterapi, reliabilitas, validitas

INTRODUCTION

Cancer is one of the main causes of morbidity and mortality in Indonesia and around the world[1],[2]. Various treatment modalities have been developed, including radiotherapy, which is a key component, along with surgery and chemotherapy. Radiotherapy utilizes high doses of ionizing radiation to selectively kill cancer cells and shrink tumor size, playing a crucial role in healing efforts and improving patients' quality of life[3].

The success of radiotherapy treatment is highly dependent on various factors, including the patient's adequate level of knowledge regarding their condition and the therapy procedure being undertaken[4],[5]. Good knowledge is expected to encourage patient compliance with treatment schedules, thereby achieving optimal therapeutic outcomes, both curative and palliative. Low knowledge, inadequate information, and patient fear of radiotherapy are often identified as the main causes of cancer patients' non-compliance with radiation therapy schedules[6],[7]. A study at Abdul Wahab Sjahranie Regional Hospital in Samarinda found that the relationship between the level of knowledge of radiotherapy and the level of compliance was not statistically significant[8]. These discrepancies in results indicate that there may be factors influencing adherence other than patient knowledge, or that the instruments used to measure knowledge are not sufficiently robust to accurately measure patient knowledge levels in certain populations. Therefore, to accurately understand the role of patient knowledge in the context of radiotherapy, it is crucial to ensure that the measurement instruments used have high psychometric quality. Inaccurate questionnaires have the potential to produce biased data and misleading conclusions regarding the relationship between knowledge and adherence or treatment outcomes.

Instrument validation in a radiotherapy facility serving a large number of cancer patients could produce a measurement tool specifically relevant to the patient population. This not only meets academic needs but also has high practical value, allowing the instrument to have wider application and generalizability potential in similar clinical settings, particularly in Indonesia. Dr. M. Djamil General Hospital is a national referral

hospital for the central Sumatra region. Patients served come not only from West Sumatra, but also from the provinces of Riau, Riau Islands, Jambi, Bengkulu, and surrounding areas. A questionnaire validated at Dr. M. Djamil General Hospital would have strong relevance for use in research or clinical practice at other health facilities in West Sumatra and the surrounding areas that serve cancer patients. This, in turn, could be used for more targeted and effective educational interventions.

Based on the explanation above, a questionnaire instrument with proven psychometric quality is needed. A valid questionnaire means it is able to measure what it is supposed to measure, while a reliable questionnaire means it is able to provide consistent results in repeated measurements. Researchers have developed a specific knowledge level questionnaire for cancer patients undergoing radiotherapy. This developed questionnaire requires rigorous validity and reliability testing to ensure that the data obtained from its use are valid and consistent, so that it can serve as a strong basis for future research or clinical interventions. This study aims to test the validity and reliability of the knowledge level questionnaire instrument for cancer patients undergoing radiotherapy, covering five knowledge domains: cancer, radiotherapy, side effects, self-care, and nutrition.

METHODS

Research Design

This study was a quantitative study with a cross-sectional design to pilot a questionnaire used to measure the level of knowledge of cancer patients undergoing radiotherapy. This study was conducted at the Radiation Oncology Unit of Dr. M. Djamil General Hospital, Padang, in July 2025. The selection of Dr. M. Djamil General Hospital as the research location was based on its role as a type A referral hospital and a center of excellence in oncology in the Central Sumatra region. This indicates that Dr. M. Djamil General Hospital serves a large number of cancer patients undergoing radiotherapy, making it a representative environment for the target population. Validating the questionnaire at the referral center can also increase the credibility and potential application of the instrument in other health facilities that refer patients to Dr. M. Djamil General Hospital or have similar patient characteristics.

Data source and sampling procedure

The population in this study was all cancer patients undergoing radiotherapy at the Radiation Oncology Unit Dr. M. Djamil General Hospital during the study period. Inclusion criteria for this study included cancer patients undergoing radiotherapy at Dr. M. Djamil General Hospital, aged 18 years or older, able to read and write, and willing to participate in the study after being given a complete explanation. Exclusion criteria for this study were patients with cognitive impairment who were deemed unable to understand the questions or complete the questionnaire, as well as patients with medical conditions that prevented them from completing the questionnaire (e.g., critical condition, severe pain).

The sampling technique used was consecutive sampling, meaning all patients who met the inclusion criteria and were willing to participate were recruited sequentially until the minimum required sample size, which was 30, was met. The minimum sample size of 30 respondents was determined based on previous literature[9], [10], [11],[12].

Data Collection

Data were collected directly from cancer patients undergoing radiotherapy at the Radiation Oncology Unit of Dr. M. Djamil Padang General Hospital during the study period in July 2025. Respondents who met the inclusion criteria and were willing to participate in the study were asked to complete a questionnaire prepared by the

researcher. Before completing the questionnaire, the researcher explained the purpose of the study and the procedure for completing the questionnaire to the respondents. Data collection was carried out directly while the patients were undergoing radiotherapy treatment at the unit.

Variables in the study

The variable in this study was the level of knowledge of cancer patients undergoing radiotherapy. This variable was measured through several aspects of knowledge, including general knowledge about cancer, knowledge about radiotherapy, knowledge about side effects of radiotherapy, knowledge about self-care during radiotherapy, and knowledge about nutrition during radiotherapy.

Measurement and Instrument

The instrument used in this study was a questionnaire developed by the researchers to measure the level of knowledge of cancer patients undergoing radiotherapy. The questionnaire consisted of 25 questions divided into five subsections: general knowledge about cancer, general knowledge about radiotherapy, knowledge about side effects of radiotherapy, knowledge about self-care during radiotherapy, and knowledge about nutrition during radiotherapy. Respondents answered the questions using the answer options "True" or "False," which were then scored to assess their level of knowledge. The questionnaire used in this study can be seen in Table 1.

Table 1. Questionnaire Items on Knowledge of Cancer Patients Undergoing Radiotherapy

No	Question	True	False
A	General knowledge about cancer		
1	Cancer is classified as a communicable disease		
2	Parents who have cancer will automatically pass the disease on to their children.		
3	Cancer is an incurable disease.		
4	Smoking can increase the risk of lung and laryngeal cancer.		
5	Obesity and a history of oral contraceptive use can increase the risk of breast cancer.		
B	General knowledge about radiotherapy		
1	Radiotherapy is a method of cancer treatment using radiation.		
2	If patients do not undergo radiotherapy according to schedule (frequently miss treatment sessions), the effectiveness of therapy will decrease.		
3	If the tumor has shrunk or the patient feels better, radiotherapy does not need to be continued.		
4	If the hemoglobin (Hb) level is low (<10 g/dl), the patient will receive a blood transfusion before continuing radiotherapy		
5	After undergoing radiotherapy, the patient's body can emit radiation and therefore should avoid contact with others, especially infants and children.		
C	Knowledge about the side effects of radiotherapy		
1	The side effects of radiotherapy are localized depending on the part of the body being irradiated.		
2	Radiation for breast cancer can cause diarrhea.		
3	Pain during urination is one of the side effects of radiation for cervical cancer.		
4	Itching and darkening of the skin caused by radiotherapy are permanent.		
5	Hair loss after radiotherapy for brain tumors can grow back		
D	Knowledge about self-care during radiotherapy		
1	Patients should not bathe during radiation therapy.		

2	Patients are advised to wear loose clothing during radiation therapy.
3	Patients should avoid direct sun exposure during radiation treatment, especially on the irradiated skin area.
4	Patients are prohibited from exercising during radiation therapy.
5	During radiation therapy, patients should get plenty of rest and limit physical activity.
E	Knowledge about nutrition during radiotherapy
1	During radiation treatment, patients are advised to consume more protein, such as milk and side dishes.
2	During radiation treatment, patients should avoid protein from red meat (beef, goat, etc.)
3	Food intake can affect Hb (hemoglobin) levels during irradiation.
4	Patients should reduce their consumption of carbohydrates such as rice, flour, and potatoes during radiation treatment.
5	Patients should limit their consumption of fruits and vegetables during radiation therapy to the head and neck area.

Ethical Considerations

This study was approved by the Ethics Committee of the Faculty of Medicine, Andalas University, under ethics review number 463/UN.16.2/KEP-FK/2024. All participants signed informed consent after being fully explained the study's purpose and procedures. Participation was voluntary, and participants could withdraw at any time without impacting their medical care.

Data analysis

The data were analyzed using the statistical applications Microsoft Excel and SPSS (version 25). In presenting the data, the average (mean) ± Standard deviation (SD) is used to present continuous variables, while frequency and percentage are used to present categorical variables. A questionnaire is considered valid if the validity test calculation using the Pearson Correlation method shows a significance value <0.05. According to the criteria set by Priyanto, a questionnaire is considered reliable if the Cronbach's Alpha value is >0.6.[13]. Items that do not meet the validity criteria will be excluded from the final questionnaire.

RESULTS

Respondent Characteristics

This study included 30 cancer patients undergoing radiotherapy at Dr. M. Djamil General Hospital. The average age of patients undergoing radiotherapy was 52.2 years, indicating that most respondents were in the late adult age group with a balanced gender. Most respondents were from the Minang ethnic group, reflecting the dominant population in the study area. The majority of patients had low socioeconomic status with most respondents having a secondary education level. The most dominant location of cancer was the head and neck area (46.7%). These findings indicate that the demographic and clinical characteristics of respondents are relatively representative of the population of cancer patients undergoing radiotherapy in Indonesia, especially in the central Sumatra region. The characteristics of respondents can be seen in full in Table 2.

Table 2. Respondent Characteristics

Characteristics	Amount (%)	
Age (Mean±SD)	52.2±13.5	
Sex	Male	15 (50.0)
	Female	15 (50.0)
Ethnic group	Minangkabau	23 (76.7)
	Malay	3 (10.0)

Characteristics	Amount (%)
Batak	2 (6.7)
Javanese	1 (3.3)
Madurese	1 (3.3)
Marital status	
Married	27 (90.0)
Widowed	1 (3.3)
Unmarried	2 (6.7)
Number of Children (Mean±SD)	2.9±1.4
Monthly Income	
>IDR 3,500,000	4 (13.3)
>IDR 2,500,000- 3,500,000	5 (16.7)
>IDR 1,500,000- 2,500,000	14 (46.7)
<IDR 1,500,000	7 (23.3)
Education	
Did not complete elementary school	0 (0.0)
Elementary School	5 (16.7)
Junior High School	4 (13.3)
Senior High School	17 (56.7)
Higher education	4 (13.3)
Cancer Location	
Head - Neck	14 (46.7)
Breast - Thorax	8 (26.6)
Abdomen - Pelvis	6 (20.0)
Extremities	2 (6.7)
Cancer Duration (years) Mean±SD	1.8±0.9
Number of Radiotherapy Sessions, Mean ± SD	13.8±9.2

Validity Test

Of the total 25 items in the questionnaire, 19 questions showed a significance value <0.05, which means statistically valid. Two invalid items were A5 (p=0.355), C1 (p=0.658), and items that were not analyzed (B1, B2, E1, E5) because the data were homogeneous. Homogeneous means that all respondents gave the same answer to the question item. According to the criteria set by Priyanto, the level of validity strength based on the correlation coefficient (r) value varies from moderate to strong.[14]. The complete results of the validity test can be seen in Table 3.

Table 3. Validity Test

No Question	Pearson Correlation	Sig. Value	Conclusion	Interpretation
A1	0.489	0.006	Valid	Currently
A2	0.523	0.003	Valid	Currently
A3	0.688	<0.001	Valid	Strong
A4	0.705	<0.001	Valid	Strong
A5	0.175	0.355	Invalid	Invalid
B1	and	and	and	
B2	and	and	and	
B3	0.583	<0.001	Valid	Currently
B4	0.665	<0.001	Valid	Strong
B5	0.759	<0.001	Valid	Strong
C1	-0.084	0.658	Invalid	Invalid
C2	0.614	<0.001	Valid	Strong
C3	0.470	0.009	Valid	Currently
C4	0.561	0.001	Valid	Currently
C5	0.685	<0.001	Valid	Strong
D1	0.569	0.001	Valid	Currently
D2	0.513	0.004	Valid	Currently
D3	0.537	0.002	Valid	Currently

No Question	Pearson Correlation	Sig. Value	Conclusion	Interpretation
D4	0.614	<0.001	Valid	Strong
D5	0.563	0.001	Valid	Currently
E1	and	and	and	
E2	0.613	<0.001	Valid	Strong
E3	0.745	<0.001	Valid	Strong
E4	0.734	<0.001	Valid	Strong
E5	and	and	and	and

Reliability Test

The Cronbach's Alpha reliability test for the 19 items yielded a value of 0.904, indicating excellent reliability. This indicates that the questionnaire has excellent internal consistency and is suitable for use in similar research contexts. The complete reliability test results can be seen in Table 4.

Table 4. Reliability Test

Cronbach's alpha

0.904

DISCUSSION

KnowledgeLow n in cancer patients undergoing radiotherapy is still a problem both in the world and in Indonesia.[8], [15], [16]This study aims to test the validity and reliability of the knowledge level questionnaire in cancer patients undergoing radiotherapy.especially in Indonesia. The results of the study indicate that the developed questionnaire instrument has good psychometric qualities and is suitable for use in measuring the level of knowledge of cancer patients undergoing radiotherapy.

Based on the respondent characteristics, we obtained a general overview of cancer patients in Indonesia. Cancer incidence increases from late adulthood to old age. Education level and socioeconomic status can influence patients' ability to understand medical information, including information about radiotherapy and its side effects. Furthermore, the most common cancer sites are the head and neck and breast, consistent with national epidemiological data showing these two types of cancer as the most common indications for radiotherapy. These characteristics are important to understand because they reflect the population context in which the instrument was tested. Given the varied educational and socioeconomic backgrounds, the successful validity and reliability tests indicate that the developed questionnaire is easily understood by various patient groups and has the potential for widespread use in similar clinical populations in Indonesia. We will develop this questionnaire as an instrument to measure the effectiveness of patient education regarding cancer, radiotherapy, side effects, self-care, and nutrition.

Of the 25 question items tested, 19 items were declared statistically valid.. According to Sugiono, the Pearson correlation coefficient shows a value (0.470-0.745) with variations from moderate ($0.40 < r < 0.59$) to strong ($0.60 < r < 0.79$), which indicates that these items consistently measure the level of knowledge of cancer patients undergoing radiotherapy.[14]The higher the Pearson correlation coefficient value, the better the measurement results can show the characteristics to be measured.However, there are two invalid question items, namely A5 (obesity and a history of birth control pill use can increase the risk of breast cancer)and C1 (The side effects of radiation are local depending on the location/part of the body that is irradiated., with significance values of 0.355 and 0.658, respectively. This could be due to several factors, such as the ambiguity of the questions, respondents' lack of specific understanding of the topics, or the fact that these topics may not be the primary focus of the information patients

receive. Questions that do not meet the validity and reliability tests will be removed and not included in further data analysis.

Four question items, namely B1 (Radiotherapy is a method of treating cancer using radiation.), B2 (If the patient does not undergo radiation therapy according to schedule (often misses radiation), the success of the therapy will decrease), E1 (during radiation treatment, patients are advised to consume lots of protein such as milk and side dishes), and E5 (Patients should limit their consumption of fruits and vegetables while undergoing radiation treatment to the head and neck area. The validity of the questionnaire could not be analyzed due to homogeneous data. This condition occurs when all respondents gave the same answer to a question. This homogeneity of data may indicate that the questions were too easy or that the information was already so common knowledge among respondents that it was unable to differentiate between patients' levels of knowledge. This is an important consideration in interpreting validity results and can be used as a consideration for future questionnaire revisions.

The questionnaire's reliability test showed excellent results, with a Cronbach's Alpha value of 0.904. This value is well above the threshold recommended by Priyanto, which is >0.6 , indicating high internal consistency. According to Paiva, a Cronbach's Alpha value >0.80 is considered good reliability, and according to Castro, a Cronbach's Alpha value >0.80 is considered excellent.[17],[18] This strong reliability ensures that the questionnaire can provide consistent results when used on different subjects from the same population or at different points in time. These findings provide confidence that the questionnaire can be relied upon as a stable and accurate measurement tool for further research or clinical interventions.

In Indonesia, the existing Indonesian language questionnaire instrument has never been specifically reported to have been tested for validity and reliability in cancer patients undergoing radiotherapy in Indonesia. The questionnaire validation efforts in this study become even more meaningful when placed in a global context. In comparison, research by Hakleet et al. successfully developed two psychometric instruments in English, which have been proven to have high internal validity and temporal reliability in measuring the concerns and information needs of breast cancer patients during radiotherapy in the Australian population with good reliability[19]. Research by Li et al. on the development and validity of the Information Needs Questionnaire for breast cancer patients undergoing radiotherapy in China demonstrated very high validity (content validity index = 0.980) and reliability (Cronbach's $\alpha = 0.959$) with a sample size of more than 200 respondents.[20]. The questionnaire validation instrument in this study could be strengthened with additional factor analysis and sample expansion to achieve a strong level of generalizability and methodological contribution internationally. However, this study is expected to fill a gap in the context of developing countries, where patient information needs and educational barriers vary significantly, so that it can help other researchers to use it as a measurement tool for patient knowledge levels that has been proven valid and consistent. Validation of the instrument at Dr. M. Djamil General Hospital, as a radiotherapy referral center in Central Sumatra can increase the potential for generalization of this questionnaire for use in other health facilities with similar patient characteristics in Central Sumatra and the surrounding area. This questionnaire can also be used to determine the need for educational materials for cancer patients undergoing radiotherapy. Validation of this questionnaire is an important step in providing a tested measurement tool to understand the role of patient knowledge in the success of radiotherapy, which in turn can inform the development of more effective and targeted educational interventions.

Although the results of this study indicate that the developed questionnaire has good validity and reliability, there are several limitations that need to be considered. First, the relatively small sample size may limit the power of statistical analysis and the generalizability of the results to a broader population. Second, the consecutive sampling design without randomization increases the potential for selection bias, as the recruited participants may not represent the entire population of cancer patients undergoing radiation therapy. Heterogeneous demographic characteristics may influence the questionnaire response patterns. Third, the validity test was limited to content validity and construct validity using Pearson correlation, without further construct validity testing, such as exploratory or confirmatory factor analysis. Furthermore, reliability was only measured at a single point in time, thus reducing the temporal stability of the instrument. Therefore, further research is recommended involving a larger number of respondents and conducted at various radiotherapy service centers to increase generalizability.

This study has several strengths. First, it successfully developed an Indonesian-language knowledge questionnaire for cancer patients undergoing radiotherapy, filling a gap in the previously unavailable instruments in Indonesia. Second, the instrument covers five important domains in radiotherapy patient management, providing a comprehensive overview of patient knowledge levels. Third, our questionnaire is practical and can be used by healthcare professionals to identify gaps in patient knowledge, assess patient needs, and design more targeted and personalized patient interventions.

CONCLUSION

From the results of the validity and reliability test of this questionnaire instrument, 19 questions met the validity and reliability criteria as a research instrument to measure the level of knowledge of cancer patients undergoing radiotherapy in 5 domains, namely, knowledge about cancer, radiotherapy, side effects of radiotherapy, self-care, and nutrition during radiotherapy. This validated questionnaire is recommended for use as an initial screening tool in clinical practice for cancer patients undergoing RT to identify patient knowledge levels and gaps and design more targeted educational interventions. Multi-center validation at other radiotherapy facilities is also needed for the broader generalizability of this instrument to the Indonesian cancer patient population.

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