Hilla University College Journal For Medical Science

Volume 4 | Issue 1 Article 6

3-14-2026

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How to Cite This Article

Abbas, Amat Aljabar Faisal and Alridha, Ali Mohammed Abd (2026) "Validity and Reliability of a Survey Questionnaire Assessing Pharmacists' Knowledge, Attitudes, and Practices About Potential Drug Interactions Among Cancer Patients," *Hilla University College Journal For Medical Science*: Vol. 4: Iss. 1, Article 6.
DOI: https://doi.org/10.62445/2958-4515.1097

ORIGINAL STUDY

Hilla Univ Coll J Med Sci

Validity and Reliability of a Survey Questionnaire Assessing Pharmacists' Knowledge, Attitudes, and Practices About Potential Drug Interactions Among Cancer Patients

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Abstract

Background: Cancer patients often undergo complicated treatment plans that involve numerous medications throughout therapy. Pharmacists' knowledge about the potential drug interactions in cancer patients and their practices is essential to reduce avoidable drug-related problems and increase the efficacy and compliance of chemotherapy. A validated knowledge, attitudes, and practices (KAP) questionnaire regarding pharmacists' knowledge, attitudes, and practices related to potential drug interactions among cancer patients isn't available.

Objectives: The purpose of this study was to develop a reliable and valid questionnaire to assess pharmacists' knowledge of possible medication interactions with cancer patients.

Materials and Methods: This cross-sectional study was conducted among pharmacists working in oncology departments in the Babylon Governorate. After 100 individuals finished the questionnaire, 50 of them retook it two weeks later. Using Cronbach's α and interclass correlation coefficients, respectively, internal and test-retest reliability were evaluated. Exploratory factor analysis was used to evaluate construct validity.

Results: The questionnaire was completed by 100 individuals, with a mean age of 28.32 ± 2.59 years, and 77% of them were female. The Knowledge, Attitude, and Practice parts, and the overall questionnaire, have Cronbach's α values of 0.719, 0.782, 0.803, and 0.795, respectively. According to the interclass correlation coefficient, the test-retest reliability results for knowledge, attitudes, and practices were 0.816, 0.783, and 0.839, respectively. Seven factors involving (30) items were obtained in the exploratory factor analysis, with a cumulative initial eigenvalue contribution rate of 71.39%. Conclusion: The questionnaire's criteria for assessing pharmacists' knowledge of possible medication interactions with cancer patients were effective.

Keywords: Attitude, Knowledge, Practice, Reliability, Survey development, Validity

1. Introduction

Although cancer is a significant global public health concern for both men and women, new therapeutic options are being developed. There is a higher probability of interactions when anticancer medications are used in conjunction with additional drugs to minimize or prevent their adverse side effects. Additionally, the cancer itself makes extra medications important [1]. Cancer patients are susceptible to complex therapy protocols that include many different kinds of drugs, such as cytotoxic and molecularly targeted treatments, comorbidity medications, and cancer supportive care pharmaceuticals. This increases the risk of potential drug-drug interactions (PDDI) in cancer patients [2]. Supportive medicines for cancer patients may also have several significant PDDIs, as well as medications used to treat

Received 24 September 2025; revised 17 November 2025; accepted 19 November 2025.
Available online 14 March 2026

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https://doi.org/10.62445/2958-4515.1097

comorbidities, for example, cardio-oncology agents, which must be carefully taken into consideration [3]. Pharmacists' knowledge regarding PDDIs in cancer patients and their practices is essential in minimizing preventable drug-related issues and improving chemotherapy's effectiveness and adherence [4].

As far as we currently know, no questionnaire assesses the KAP of pharmacists regarding PDDIs among cancer patients.

This study aimed to develop a reliable and valid questionnaire to assess pharmacists' knowledge of potential medication interactions with cancer patients.

2. Materials and methods

2.1. Phase 1: Questionnaire development

After reviewing the literature and consulting with partners, the questionnaire was created. To develop KAP questionnaire items about PDDIs among cancer patients, we thoroughly reviewed relevant government documents and existing research. Following eight discussion sessions between authors, the final questionnaire included 51 items divided into four sections. Since nine of them are demographic, they cannot be tested for validity and reliability.

2.2. Phase 2: Questionnaire validation

In accordance with [5], exploratory factor analysis (EFA) required a sample size of at least 100 participants, and 50 of them underwent test-retest reliability testing.

The inclusion criteria included pharmacists working in the oncology department who were interested in participating in the study. The researcher provided the participants with a paper questionnaire to complete on-site, and two weeks later, they administered a second test. The survey results can be used to evaluate the validity and reliability of the questionnaire.

2.3. Statistical analysis

Statistical analysis performed by the author using Statistical Package for the Social Sciences (SPSS) software version 23. Interclass correlation coefficients were used to test stability and reliability. Exploratory factor analysis using the principal axis factoring method and Oblimin with Kaiser Normalization rotation determined the construct validity.

Table 1. Participant characteristics.

Variables	Mean ± SD	N (%)
Age	28.32 ± 2.59	
Sex		
Male		23(23%)
Female		77(77%)
The institution		
First Oncology Center		62(62%)
Second Oncology Center		38(38%)
Degree		
Bachelor's degree		94(94%)
Master degree		2(2%)
PhD		0
Other		4(4%)
Years of experience		4.15 ± 2.84
Educational event attendance		
Yes		21(21%)
No		79(79%)
No. of educational events (N = 21)	1.62 ± 0.80	
Patient no.	32.44 ± 9.49	
No. PDDIs	24.34 ± 12.20	

2.4. Ethical approval

The study was approved by the Scientific Committee of Researches of Health Directorate (in October 2024 – no:79) and ethical committee for clinical studies (in November 2024 – reference#:MEC-86), Also, participants' verbal consent had been obtained after informing them of the study.

3. Results

3.1. Demographic characteristics profile of study participants

A total of 100 participating pharmacists had demographic characteristics that were demonstrated in Table 1. Most pharmacists were females 77% while males 23% with a mean age of 28.32 ± 2.59. Most participants constituted of pharmacists work at the first oncology center, 62%. Approximately all the participants had bachelor's degree 94% and most of them had never enrolled in an educational event before (79%). The mean number of educational events in pharmacists who had enrolled was 1.62±0.80. The mean number of patients was 32.44±9.49, and the mean number of monthly PDDIs was 29.76±8.49. Table 1 summarizes the participants' characteristics.

3.2. Reliability of the questionnaire

Questionnaire reliability was determined using Cronbach's α. The Cronbach's α coefficients of the total questionnaire and Knowledge, Attitude and Practice dimensions, respectively, were 0.719, 0.782, 0.803, and 0.795. Intraclass Correlation Coefficient

Table 2. Variance explained.

	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.044	20.145	20.145	5.206	17.353	17.353
2	3.862	12.873	33.018	4.071	13.569	30.921
3	3.431	11.437	44.456	3.460	11.535	42.456
4	3.124	10.412	54.868	2.855	9.516	51.972
5	1.899	6.329	61.197	2.462	8.208	60.179
6	1.733	5.776	66.973	1.690	5.632	65.811
7	1.324	4.413	71.386	1.672	5.575	71.386

(ICC) was used to determine test-retest reliability. The results showed good reliability for the knowledge domain (ICC = 0.816; 95% CI: 0.698–0.891), as well as good reliability for both the attitude domain (ICC = 0.871; 95% CI: 0.783–0.924) and the practices domain (ICC = 0.839; 95% CI: 0.733–0.905).

3.3. Validity of the questionnaire

The questionnaire had been tested for validity by five academic specialists with experience, including a clinical pharmacy specialist, two pharmacology specialists, and two biostatistics specialists. The revised questionnaire was sent to (100) pharmacists to perform a pilot study for exploratory factor analysis EFA which is used to establish validity. The KMO test (0.672) and the Bartlett test of sphericity (Chi-squared, df= 435; P < 0.001) indicate that the data met the criteria required for factor analysis.

Tables 2 and 3 demonstrate that 71.386% of the variation was explained by the seven variables identified, which included 30 items. Factor 1 contained eight items on the knowledge of potential drug-drug interactions (PDDIs) among cancer patients; Factor 2 had six items on practices in drug interaction investigations; Factor 3 had four items on the pharmacists' attitudes regarding improving the PDDIs information; Factors 4 and 5 included four items on pharmacists' knowledge regarding anticancer compatibility and the order of administration and four items on general pharmacists' knowledge regarding PDDIs, respectively. Factors 6 and 7 both contained two items related to pharmacists' attitudes toward reasons for not checking drug interactions and pharmacists' practices upon identifying drug interactions, respectively.

Questionnaire's final form The knowledge, attitude, and practices (KAP) questionnaire had 39 items in its final form, divided into four main sections: (9 items) for demographic characteristics, (16 items) for knowledge, (6 items) for attitudes, and (8 items) for practices (Table 4).

4. Discussion

To our knowledge, there is no validated KAP questionnaire about pharmacists' knowledge, attitude, and practice regarding potential drug interactions among cancer patients. Therefore, to fill this gap, we established and validated a questionnaire to evaluate the KAP of pharmacists about PDDIs. This questionnaire is designed for researchers interested in evaluating these aspects among pharmacists. It is easy to administer and only takes 15 to 20 minutes to complete. The final questionnaire comprised three domains: KAP and 39 items. Participants (N = 100) had worked in contact with cancer patients. Fifty participants, who had completed the questionnaire twice, were used to assess Cronbach's alpha and test-retest reliability. Internal consistency and reliability were adequate and acceptable for the selected knowledge, attitudes, and practices scales. Reliability can be defined as the degree of consistency that yields the same results when the same tools are used to measure the same thing at other times. The consistency of the questionnaire was evaluated using the interclass correlation coefficient for test-retest reliability and Cronbach's α values for internal consistency. Cronbach's α coefficient is commonly used in validation studies to assess the internal consistency of questionnaires [6]. According to [7], A Cronbach's α score of more than 0.7 is often considered acceptable.

Results with Cronbach's $\alpha > 0.80$ are regarded as good studies, such as [8], or as excellent by others, such as [9]. In our study, Cronbach's alpha for all seven factors was above 0.7. The parts of the whole questionnaire had a good level and a sufficient confidence interval, as indicated by the Cronbach's α coefficients of 0.719, 0.782, 0.803, and 0.795 for the Knowledge, Attitude, and Practice aspects, and the overall questionnaire, respectively. It was superior to a survey assessing the knowledge, educational needs, and obstacles of community pharmacy employees on cancer patient counseling [10]. For the KAP questionnaire concerning "knowledge, attitudes, and practices regarding PDDIs," CCI, and a 95% confidence interval ranging from 0.698 to 0.924, our results seemed to be

Table 3. Question distribution across seven factors.

Pattern Matrix							
	Component						
	1	2	3	4	5	6	7
Metronidazole interacts with	0.877						
Epirubicin interacts with	0.864						
Vinblastine interacts with	0.838						
Dexamethasone interacts with	0.815						
Goserelin interacts with	0.795						
Cisplatin interacts with	0.785						
Abiraterone interacts with	0.758						
Methotrexate interacts with	0.558						
Interaction between non-anticancer & non-anticancer drugs prescribed in the oncology department?		0.904					
Interaction between non-anticancer drugs prescribed in the oncology department and comorbidities drugs chronically used by patients?		0.891					
Interaction between anticancer & non-anticancer drugs prescribed in the oncology department?		0.874					
Interaction between anticancer & comorbidities drugs, chronically used by patients?		0.806					
Compatibility of I.V. administered medications?		0.680					
Order of medication administration?		0.644					
In the CAG protocol, carboplatin should be administered before gemcitabine			0.930				
Irinotecan and 5-fluorouracil are compatible in Y Y-site I.V. tubing			0.918				
In the AC protocol of breast cancer doxorubicin should be administered before cyclophosphamide			0.868				
Trastuzumab and paclitaxel are compatible in Y Y-site I.V. tubing			0.856				
It is important for pharmacists to update their knowledge about drug interactions.				0.891			
I think information is important for my practice.				0.830			
I am willing to learn more about PDDIs.				0.792			
Drug interactions must be given more time and attention during undergraduate pharmacy studies.				0.735			
Older patients may have a low probability of developing drug interactions					0.792		
Drug interaction is the effect of one medication being altered when it is taken with another					0.763		
The result may be a life-threatening event or have a permanent detrimental effect in severe drug interactions					0.761		
Patients at increased risk from drug interactions include those with impaired renal or hepatic function.					0.727		
The doctor refused my intervention						0.856	
Inadequate knowledge						0.852	
The doctor accepts your intervention							0.865
The doctor refuses your intervention, and you dispense drugs as it is, without having a discussion or patient education.							0.858

among the best documented in the literature. These results validated the temporal stability of the KAP questionnaire.

Validity assesses the extent to which the accurate assessment system reflects the objectives and demands. It refers to the extent to which a measuring instrument can determine if a characteristic is accurate. The better the assessment findings can reflect the qualities it is meant to evaluate, the higher the validity. The more accurately the measurement's outcomes reflect the characteristics it is designed to assess. Seven common factors, comprising 30 items with a cumulative contribution rate of 71.38%, were identified through exploratory factor analysis. This value is similar to those reported in previous studies [11, 12]. This questionnaire was comprehensive and covered knowledge of general concepts, compatibility, order, and examples of interaction pairs. Additionally, it addressed attitudes regarding improving the PDDIs' information and the reasons behind poor practices. This compensated for the lack of a comprehensive KAP survey on PDDIs among cancer patients [13–17].

This study has several strengths. First, the questionnaire was created after multiple rounds of group discussions and guidance from experts. Second, a thorough questionnaire covering several aspects of the knowledge aspect was provided. Knowledge items and prior research serve as the foundation for

Table 4. Final questionnaire questions distribution and types.

Domains	No.	Measurements	Response choices
Demographic characteristics	9	Age, sex, degree, place of work, years of experience, educational event related to drug interaction, number of educational events, number of patients, and number of drug interactions.	Open-ended, closed-ended, multiple-choice
Knowledge	4	General knowledge regarding PDDIs	Yes, no, not sure.
	4	Knowledge regarding anticancer compatibility and the order of administrations	Yes, no, not sure.
	8	Examples of PDDIs among cancer patients	Multiple choice questions
Attitudes	4	Attitudes regarding improving the PDDIs information	1 = Strongly disagree, 2 = Disagree, 3 = Not sure, 4 = Agree, 5 = Strongly agree
	2	Attitudes toward the reasons for bad practices	1 = never, 2 = rarely, 3 = sometime, 4 = often, 5 = always
Practices	6	Practices in PDDIs investigations	1 = never, 2 = rarely, 3 = sometime, 4 = often, 5 = always
	2	Practices upon PDDIs detection	1 = never, 2 = rarely, 3 = sometime,4 = often, 5 = always

the attitude and practice elements. However, there are limitations to the research design. One of the study's drawbacks is the small sample size; a majority suggest that 300 or larger sample sizes are required for the development and validation of questionnaires [18]. The sample size for this study was considered insufficient; however, it was enough to perform all the statistical tests required for the questionnaire's validation. Future studies assessing pharmacists' understanding of PPDIs in Babylon Governorate or other Iraqi governorates might use this questionnaire.

However, further research is needed to determine the usefulness of the questionnaire. To verify applicability, more test validations and adjustments are therefore required**.**

5. Conclusion

A newly developed, reliable, and validated survey was created to assess pharmacists' knowledge, attitudes, and practices regarding potential medication interactions with cancer patients. It was demonstrated to have appropriate reliability and validity. As a result, the questionnaire is valid for evaluating pharmacists' KAP levels regarding PDDIs in cancer patients**.**

Conflict of interest

The authors of this work declare that they have no perceived, actual, or possible conflicts of interest.

Funding

No funding resource.

Authors' contributions

The authors contributed to this work as follows: Contributor 1 did the literature search, conducted the experimental studies, and was actively involved in data acquisition, data analysis, and statistical evaluation. Additionally, Contributor 1 prepared and edited the initial manuscript draft and served as the guarantor of the work. Contributor 2 was responsible for developing the study concept, designing the research framework, and defining the intellectual content. They also conducted the final review of the manuscript. Both contributors participated in the literature search, data acquisition, statistical analysis, and manuscript editing, reflecting a collaborative and complementary effort throughout the research process.

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