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Development and Validity-Reliability Testing of a Questionnaire on Public Knowledge, Attitudes, and Practices Regarding the Risks of Consuming Illegal Herbal Medicines Sold through E-Commerce in Indonesia

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Abstract

Background: The widespread circulation of illegal herbal medicines through e-commerce platforms has become a significant public health concern in Indonesia. Many consumers remain unaware of the potential risks posed by unregistered or counterfeit herbal products, which may contain harmful substances and lead to adverse health effects. To address this issue, a valid and reliable instrument is needed to assess public knowledge, attitudes, and practices (KAP) related to the consumption of such products.
Purpose: This study aimed to develop and test the validity and reliability of a KAP questionnaire assessing public awareness and behavior regarding the risks of consuming illegal herbal medicines sold through e-commerce in Indonesia.
Methods: The study was conducted at RSUD Siti Fatimah, South Sumatra Province, Indonesia. The questionnaire was developed through literature review, expert consultation, and item validation processes. Data were collected from 50 respondents selected using purposive sampling. Validity testing was performed using the Pearson product–moment correlation, while reliability was assessed using Cronbach's Alpha. An item was considered valid if the correlation coefficient (r-calculated) exceeded the r-table value (0.279) at $p < 0.05$, and reliable if Cronbach's Alpha > 0.60.
Results: The knowledge questionnaire (15 items) demonstrated validity with r-calculated values ranging from 0.325 to 0.582 and a Cronbach's Alpha of 0.794. The attitude questionnaire (10 items) showed valid item correlations between 0.333 and 0.634, with a Cronbach's Alpha of 0.711. The practice questionnaire (12 items) also met validity criteria (r-calculated = 0.291–0.609) and achieved a Cronbach's Alpha of 0.724. All instruments fulfilled the required thresholds for validity and reliability.
Conclusions: The developed KAP questionnaire was proven valid and reliable for assessing public knowledge, attitudes, and practices regarding the consumption of illegal herbal medicines sold through e-commerce in Indonesia. Conducted at RSUD Siti Fatimah, this study provides a useful instrument for future research and public health programs aimed at reducing the risks of illegal herbal product use.

Keywords: Validity, Reliability, Knowledge, Attitudes, Practices

Introduction

The advancement of digital technology and the rapid expansion of e-commerce platforms have transformed consumer behavior globally, including in the health product sector (Ichim et al., 2020). In

Indonesia, online marketplaces have become increasingly popular channels for purchasing traditional and herbal medicines (Rita et al., 2025). Although these platforms offer convenience and accessibility, they have also facilitated the widespread circulation of illegal herbal medicines products that are unregistered, counterfeit, or contain undeclared pharmaceutical ingredients (Ahen et al., 2023). This phenomenon has emerged as a significant public health issue that warrants serious attention.

Reports from the Indonesian National Agency of Drug and Food Control (BPOM) indicate a marked increase in the number of illegal herbal products sold through online platforms in recent years (BPOM, 2024). These products are often marketed with exaggerated claims, such as curing chronic diseases including hypertension, diabetes mellitus, and chronic kidney disease (Ashraf, 2024). However, many contain harmful or undeclared substances such as corticosteroids, sibutramine, or sildenafil analogues, which may lead to severe adverse effects including hepatic toxicity, renal impairment, cardiovascular complications, and even death (Saberi et al., 2018). The misuse and long-term consumption of such products exacerbate the burden of non-communicable diseases and pose additional challenges to public health governance in Indonesia (Suzana, 2025).

National data highlight the strong urgency for public health interventions. According to the 2025 report from BPOM's Cyber Directorate, 79,015 illegal pharmaceutical and food product contents were recorded circulating through e-commerce platforms during the first semester of 2025. Earlier, in the first quarter of 2025, BPOM had already detected 39,642 illegal links related to the online sale of such products. Historically, the number of similar links has reached 347,941, containing promotions of illegal products through e-commerce and social media (BPOM, 2025). These figures indicate the massive and difficult-to-control scale of illegal product distribution if not accompanied by strong public education initiatives (Mahaputra et al., 2024; Mponda et al., 2025).

In addition to the high circulation rates, the health impacts of consuming illegal products are also significant. According to the 2024 Analysis of Drug and Food Poisoning Cases published by PUSAKOM BPOM, there were 1,164 verified poisoning cases related to pharmaceuticals, traditional medicines, dietary supplements, cosmetics, food, and mixed products. In 2023, 6,402 poisoning cases were reported in total, with 1,722 cases confirmed as poisoning due to drugs and food. BPOM's third-quarter 2024 report also recorded 3,404 verified cases classified as criminal vulnerabilities related to drugs and food (BPOM, 2024).

Law enforcement efforts against illegal products have been consistently strengthened. In a 2025 joint operation, BPOM seized 44 types of illegal products (including 29 cosmetics, 12 traditional medicines, and 3 processed food products), with a total of 127,281 pieces confiscated from e-commerce and delivery services.

During Ramadan 2025, BPOM also found 376 distribution points selling illegal or expired food products. At the end of 2024, 235 illegal cosmetic products with an estimated value of IDR 8.91 billion were discovered. These facts illustrate that the spread of illegal products is not merely a regulatory issue, but a serious public health threat (Amalia, 2024; Qona & Afianto, 2020; Wensen et al., 2024).

Despite government regulatory measures and public awareness campaigns, the consumption of illegal herbal medicines remains prevalent (Harfiani et al., 2025). Several underlying factors contribute to this persistence. First, there is a general lack of public knowledge regarding the official registration and safety verification processes conducted by BPOM (Mahaputra et al., 2024). Second, cultural beliefs in the naturalness and efficacy of traditional remedies often lead to misconceptions that herbal products are inherently safe (Efferth, 2025). Third, the influence of aggressive digital marketing and the availability of products at low prices foster consumer trust without adequate verification (Charen & Harbord, 2019). Lastly, limited access to professional healthcare advice encourages self-medication practices based on information obtained from social media or online communities (Sembiring et al., 2024).

Public behavior toward the use of herbal medicines is shaped by three interrelated components: knowledge, attitude, and practice (KAP) (Mponda et al., 2025). Knowledge encompasses an individual's understanding of product legality, potential side effects, and safety standards (Cho et al., 2025). Attitude refers to the degree of belief, trust, and perception of risk associated with herbal medicine consumption (Wyk & Prinsloo, 2020). Practice reflects the behavioral tendencies of individuals in purchasing, evaluating, and using herbal medicines, including their habits of checking BPOM registration numbers or consulting healthcare professionals (Aulia & Umami, 2024). Measuring these components is essential for identifying determinants of unsafe consumption patterns and for designing targeted interventions (Boachie et al., 2025)

Although studies on herbal medicine use have been conducted in Indonesia and other Southeast Asian countries, most have focused on general health beliefs or the prevalence of traditional medicine use. Research that specifically examines KAP related to illegal herbal medicines in the context of e-commerce remains scarce. Furthermore, the absence of a standardized and psychometrically validated instrument to assess public knowledge, attitudes, and practices concerning the risks of illegal herbal medicine consumption limits the accuracy of health behavior assessment and policy formulation.

Instrument development and psychometric validation are critical steps in ensuring that data obtained from behavioral studies are both valid and reliable. A well-developed KAP questionnaire can serve as a valuable tool for researchers, public health practitioners, and policymakers to measure public awareness,

evaluate the effectiveness of health education campaigns, and guide policy development related to online herbal medicine regulation.

Therefore, the present study aimed to develop and test the validity and reliability of a Knowledge, Attitude, and Practice (KAP) questionnaire concerning the risks associated with consuming illegal herbal medicines sold through e-commerce in Indonesia. It is expected that the resulting instrument will provide a robust and standardized measurement tool to support future research, public health surveillance, and community education efforts aimed at promoting safer herbal medicine practices in the digital marketplace.

Methods

This study employed a quantitative descriptive design aimed at developing and testing the psychometric properties of a questionnaire to measure public knowledge, attitudes, and practices (KAP) concerning the risks of consuming illegal herbal medicines sold through e-commerce in Indonesia. The primary goal was to ensure that the instrument was valid and reliable for use in future research and health education interventions.

The study was conducted at RSUD Siti Fatimah, South Sumatra Province, Indonesia, in 2025. The study population consisted of hospital visitors and outpatients who were aware of or had access to information about herbal medicines sold online. A total of 50 respondents were recruited using a purposive sampling technique based on inclusion criteria: adults aged 18 years or older, able to read and understand Indonesian, and willing to participate voluntarily. Respondents who submitted incomplete questionnaires were excluded from the analysis.

The development of the questionnaire followed a systematic process. The first stage involved a comprehensive literature review to identify key indicators and item dimensions based on previous studies and World Health Organization (WHO) guidelines related to the safety and use of herbal medicines. The second stage included expert validation by three specialists in public health, pharmacology, and nursing, who reviewed each item for clarity, content relevance, and cultural appropriateness. Revisions were made based on expert feedback to improve the instrument's validity and readability.

The finalized questionnaire consisted of three domains. The knowledge domain comprised 15 multiple-choice questions, each with four options and one correct answer. The attitude domain contained 10 statements rated on a five-point Likert scale ranging from "strongly disagree" (1) to "strongly agree" (5). The practice domain included 12 statements also measured using a five-point Likert scale, ranging from "never" (1) to "always" (5).

The validity test was performed using the Pearson product–moment correlation to assess the correlation between each item and the total score of its domain. Items were considered valid if the correlation coefficient (r-calculated) exceeded the r-table value (0.279) at a significance level of $p < 0.05$. The reliability test used Cronbach's Alpha, with a minimum acceptable threshold of 0.60 to determine internal consistency within each domain.

Data were collected through self-administered questionnaires distributed to respondents at the outpatient area of RSUD Siti Fatimah. Before data collection, respondents were informed about the purpose of the study and signed written informed consent forms. Each participant completed the questionnaire in approximately 10–15 minutes. Data analysis was conducted using SPSS version 21.0, applying descriptive statistics for demographic data, correlation analysis for validity testing, and Cronbach's Alpha for reliability analysis.

Ethical approval for this study was obtained from the Health Research Ethics Committee of RSUD Siti Fatimah, South Sumatra Province. All participants were assured of confidentiality, and the collected data were used solely for academic and research purposes.

Results

The data analysis was performed to evaluate the validity and reliability of the questionnaire developed to assess public knowledge, attitudes, and practices (KAP) regarding the risks of consuming illegal herbal medicines sold through e-commerce in Indonesia. The validity test aimed to determine whether each item in the instrument accurately measured the intended construct, while the reliability test assessed the internal consistency of the items within each domain.

Table 1. Item Validity Results of the Knowledge Questionnaire

Questionnaire Items	r-Calculated	r-Table	P (Sig.)	Remarks
Q1	0,453	0,279	0,001	Valid
Q2	0,564	0,279	0,000	Valid
Q3	0,483	0,279	0,000	Valid
Q4	0,491	0,279	0,000	Valid
Q5	0,564	0,279	0,000	Valid
Q6	0,582	0,279	0,000	Valid
Q7	0,571	0,279	0,000	Valid
Q8	0,392	0,279	0,005	Valid
Q9	0,491	0,279	0,000	Valid
Q10	0,564	0,279	0,000	Valid
Q11	0,325	0,279	0,021	Valid
Q12	0,521	0,279	0,000	Valid

Questionnaire Items	r-Calculated	r-Table	P (Sig.)	Remarks
Q13	0,557	0,279	0,000	Valid
Q14	0,565	0,279	0,000	Valid
Q15	0,483	0,279	0,000	Valid

Based on the results presented in Table 1, all 15 items of the knowledge questionnaire obtained r-calculated values greater than the r-table value (0.279) and p-values less than 0.05. These results indicate that each item is statistically significant and fulfills the validity criteria. Therefore, all items in the knowledge domain are considered valid and can be used to measure respondents' knowledge regarding the risks of consuming illegal herbal medicines sold through e-commerce.

Table 2. Results of the Reliability Test for the Knowledge Questionnaire

Number of Items	Cronbach's Alpha	Criteria	Reliability
15	0,794	> 0,60	Reliable

Based on the results shown in Table 2, the knowledge questionnaire achieved a Cronbach's Alpha value of 0.794, which exceeds the minimum reliability criterion of 0.60. This indicates that the 15 items in the knowledge domain demonstrate good internal consistency and are considered reliable for measuring respondents' knowledge regarding the risks associated with consuming illegal herbal medicines sold through e-commerce.

Table 3. Results of the Validity Test for the Attitude Questionnaire

Questionnaire Items	r-Calculated	r-Table	P (Sig.)	Remarks
Q1	0,634	0,279	0,000	Valid
Q2	0,333	0,279	0,018	Valid
Q3	0,633	0,279	0,000	Valid
Q4	0,634	0,279	0,000	Valid
Q5	0,612	0,279	0,000	Valid
Q6	0,492	0,279	0,000	Valid
Q7	0,417	0,279	0,003	Valid
Q8	0,539	0,279	0,000	Valid
Q9	0,570	0,279	0,000	Valid
Q10	0,402	0,279	0,004	Valid

Based on the results of the validity test for the attitude questionnaire, all ten items demonstrated r-calculated values greater than the r-table value (0.279) with significance levels ($p < 0.05$). This indicates that each statement item in the attitude questionnaire is statistically valid and has a strong correlation with the overall

construct being measured. Therefore, all items are considered appropriate for inclusion in the final instrument.

Table 4. Results of the Reliability Test for the Attitude Questionnaire

Number of Items	Cronbach's Alpha	Criteria	Reliability
10	0,711	> 0,60	Reliable

The results of the reliability test for the attitude questionnaire show that the Cronbach's Alpha value is 0.711, which exceeds the minimum acceptable threshold of 0.60. This indicates that the questionnaire has good internal consistency and reliability, meaning that the items consistently measure the intended construct. Therefore, the attitude questionnaire can be considered a reliable instrument for data collection.

Table 5. Results of the Validity Test for the Practice Questionnaire

Questionnaire Items	r-Calculated	r-Table	P (Sig.)	Remarks
Q1	0,579	0,279	0,000	Valid
Q2	0,318	0,279	0,024	Valid
Q3	0,595	0,279	0,000	Valid
Q4	0,579	0,279	0,000	Valid
Q5	0,567	0,279	0,000	Valid
Q6	0,442	0,279	0,001	Valid
Q7	0,366	0,279	0,009	Valid
Q8	0,518	0,279	0,000	Valid
Q9	0,609	0,279	0,000	Valid
Q10	0,539	0,279	0,000	Valid
Q11	0,291	0,279	0,040	Valid
Q12	0,539	0,279	0,000	Valid

The results of the validity test for the practice questionnaire indicate that all twelve items have r-calculated values higher than the r-table value (0.279) with significance levels ($p < 0.05$). This demonstrates that each item is significantly correlated with the total score, confirming its construct validity. Therefore, all items in the practice questionnaire are considered valid and suitable for further use in assessing respondents' practices.

Table 6. Results of the Reliability Test for the Practice Questionnaire

Number of Items	Cronbach's Alpha	Criteria	Reliability
10	0,724	> 0,60	Reliable

The reliability test results for the practice questionnaire show a Cronbach's Alpha value of 0.724, which exceeds the minimum reliability criterion of 0.60. This finding indicates that the questionnaire possesses good internal consistency, meaning that the items reliably measure the same construct. Hence, the practice questionnaire is deemed reliable for use in this study.

Discussion

The results of the validity and reliability tests indicate that the Knowledge, Attitude, and Practice (KAP) questionnaires developed in this study are both statistically valid and reliable for measuring public perceptions regarding the risks of consuming illegal herbal medicines sold through e-commerce in Indonesia. These findings confirm that the instrument can be used to collect consistent and meaningful data for public health research and education.

Validity testing aims to ensure that each questionnaire item accurately measures the construct it is intended to assess. In this study, all items across the three domains knowledge, attitude, and practice had r-calculated values greater than the r-table value (0.279) and significance levels ($p < 0.05$). This demonstrates that all items have significant correlations with their respective total scores, confirming their construct validity.

For the knowledge domain, all 15 items were found valid, with r-calculated values ranging from 0.325 to 0.582. This suggests that each statement effectively reflects respondents' understanding of the risks associated with consuming unregistered or counterfeit herbal medicines purchased online. A valid knowledge instrument is crucial for assessing public awareness, as misinformation about "natural" or "herbal" products remains widespread in Indonesia, often leading to misuse and potential health hazards.

Similarly, the attitude questionnaire demonstrated strong validity, with all ten items achieving significant correlation values (r-calculated = 0.333–0.634, $p < 0.05$). This indicates that each item appropriately captures respondents' beliefs, perceptions, and emotional responses regarding the safety, regulation, and ethical aspects of using illegal herbal medicines. Attitudinal measures are important because they reflect cognitive and affective predispositions that influence behavioral intentions, particularly in health-related decision-making.

The practice domain also met validity criteria, with twelve valid items (r-calculated = 0.291–0.609, $p < 0.05$). This finding indicates that respondents' self-reported behaviors such as checking product registration, verifying online sellers, and consulting healthcare professionals are well represented in the instrument. Valid practice items are essential for identifying real-world behaviors that contribute to the risk of illegal herbal medicine consumption.

Reliability testing, measured using Cronbach's Alpha, assesses the internal consistency of the items within each domain. A value above 0.60 is generally considered acceptable for research instruments. The knowledge questionnaire achieved a Cronbach's Alpha of 0.794, indicating good reliability and consistent responses among participants. This suggests that the 15 items are cohesively related in measuring the same

construct public knowledge about illegal herbal medicine risks. The attitude questionnaire demonstrated a Cronbach's Alpha of 0.711, reflecting satisfactory internal consistency. This reliability level indicates that participants' attitudes were measured consistently across different items, reinforcing the stability of their attitudinal responses. The practice questionnaire showed a Cronbach's Alpha of 0.724, also exceeding the minimum threshold. This value confirms that the instrument provides reliable measurements of respondents' habitual behaviors and preventive actions related to herbal medicine consumption.

These findings align with prior research emphasizing the importance of rigorous validation in developing KAP instruments. For example, studies on public perception toward traditional medicine and self-medication practices in developing countries often report Cronbach's Alpha values between 0.70 and 0.80, indicating comparable reliability levels. The consistency of the present results supports the robustness of the questionnaire design and the adequacy of item selection (Zavitra et al., 2025).

Furthermore, the observed reliability across domains suggests that respondents demonstrated stable patterns in knowledge, attitudes, and practices, reflecting coherent cognitive and behavioral frameworks concerning herbal medicine use. This coherence strengthens the questionnaire's applicability for larger-scale health promotion and policy studies (Sholikhati et al., 2025).

Conclusions

Overall, the results demonstrate that the developed questionnaire possesses strong psychometric properties in terms of validity and reliability. All items were found statistically valid, and each domain achieved acceptable internal consistency. Therefore, this KAP instrument can be confidently utilized in future studies to evaluate public understanding, attitudes, and practices regarding the use of illegal herbal medicines sold through e-commerce in Indonesia.

Declaration of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The data are not publicly available due to participant confidentiality and ethical considerations.

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