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Cross-culture adaptation and validation of Indonesian language version of Pittsburgh Sleep Quality Index

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ABSTRACT

Hemodialysis (HD) patients have a high rate of poor sleep. The Pittsburgh Sleep Quality Index (PSQI) is the most popular self-reported instrument to measure sleep quality. No study has tested the psychometric efficiency of the Bahasa (Indonesian language) PSQI in hemodialysis (HD) patients, and no cross-cultural adaptation has been done. The purpose of this research was to translate the PSQI into Bahasa and improve its psychometric properties for use in evaluating HD patients in Indonesia. This study used instrument translation, cultural adaptation, content validation, and equivalence to cross-culturally validate and adapt an instrument. The hemodialysis center at a West Java medical facility served as a source of potential HD patients throughout the period of October 2022 to February 2023. A content validity index (CVI) was calculated for each item and the entire scale. The factor structure of the Bahasa PSQI has been evaluated by confirmatory factor analysis and internal consistency was calculated using Cronbach's alpha. The online survey received a response rate of 62.8% from a total of 220 patient with HD (about ten responders each item). The level of language clarity was 87.8%, and the level of cultural relevance was 84.5%. The CVI varied from 0.92 to 1.00. Each factor had factor loading ranging from 0.51 to 0.62. that Cronbach alpha for total score was 0.803, and the subscale ranged from 0.771 to 0.863. Our research provides preliminary evidence of the validity and reliability of the translated and adapted tool using data from HD patients in Indonesian hospitals.

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1. INTRODUCTION

End-stage renal disease (ESRD) causes serious health issues and is treated mostly through hemodialysis (HD) [1]. HD patients have a high rate of poor sleep (41-85%; [2]). El-Baroudy [2] found that poor sleep quality is a strong predictor of HD patients' quality of life. In addition, the leading causes of death in HD patients are cardiovascular disease and infectious complications, both of which are correlated with sleep disruptions [3]. The term "sleep quality" is commonly used to refer to a variety of different sleep measurements [4], [5], including total sleep duration, sleep onset latency, sleep efficiency, alertness following sleep onset, and daytime drowsiness. Subjective sleep quality is rated differently from objective sleep ratings. Indicators of improved subjective sleep quality include shorter sleep latencies, sufficient total

sleep time, reduced waking after sleep initiation, and daily alertness [6]. Good sleep quality can be objectively determined via polysomnography [5].

Polysomnography (PSG) is the 'gold standard' for objectively measuring sleep duration, depth, and pattern [5]. This paradigm is constrained when applied to public studies, especially in areas with limited PSG access. Due to its low cost and accessibility of use, subjective sleep evaluation may be better for assessing sleep quality in larger groups. Several sleep-rating questionnaires help clinicians and researchers assess subjective estimates of total sleep time, sleep maintenance, waking during the night, mood and physical feelings upon waking, and other factors that may affect sleep quality, such as comorbid conditions and medications [7]. The Pittsburgh Sleep Quality Index (PSQI) is the most popular self-reported instrument to measure sleep quality [8].

The PSQI is a self-report questionnaire consisting of 19 items used to evaluate individual sleep quality over the course of the previous month [9], [10]. In order to differentiate between "good" and "poor" sleepers, the PSQI's 19 questions are aggregated into seven components that assess different elements of sleep, and the sum of these seven components produces a global score [8]. According to Buysse *et al.* [8] the original PSQI has sufficient internal consistency and good test-retest reliability. The indices of sleep quality are consistent and simple to understand for both patients and healthcare practitioners [4], [8]. There has never been a study done to test the psychometric efficiency of the Bahasa (Indonesian language) version of the PSQI in HD patients, and there has been no cross-cultural adaptation of the PSQI into Bahasa [11], [12]. The purpose of this research was to translate the PSQI into Bahasa and improve its psychometric properties (i.e., translation, cultural adaptation, validity, and reliability) for use in evaluating HD patients in Indonesia. By having a validate tool of PSQI for use in patient with hemodialysis, it would provide a basic screening information about sleep quality thus help healthcare provider to design effective intervention.

2. METHOD

2.1. Study design

This study used instrument translation, cultural adaptation, content validation, and equivalence to cross-culturally validate and adapt an instrument [13], [14]. The first step involved translating the instrument into Indonesian and then back into English. The items from Phase II, "cultural adaptation," were assessed for their readability, cultural applicability, and overall appropriateness. Internal consistency and concept validity were evaluated in the final phase.

2.2. Participants

The hemodialysis center at a West Java medical facility served as a source of potential HD patients throughout the period of October 2022 to February 2023. About 650 patients were initially enrolled, all of whom were receiving usual hemodialysis. All willing participants had their eligibility determined by a nephrologist. All patients must be able to speak and understand Bahasa, be on maintenance hemodialysis, (3) be between the ages of 20 and 65, and (4) have been receiving regular hemodialysis therapy (three times per week) for at least six months. Recent history of acute myocardial infarction, unstable angina, uncontrolled arrhythmias, acute stroke, cancer, a diagnosis of malignancy, and a diagnosis of mental disorder were all reasons to exclude a patient from the study.

2.3. Instrument

The PSQI was developed by Buysse *et al.* [8]. The PSQI evaluates how well and how often a person slept throughout the previous month based on their own reports. There are a total of 19 questions on the test, and divide into seven categories: i) sleep quality (with one question), ii) sleep latency (with two questions), iii) sleep duration (with one question), iv) sleep efficiency (with three questions), v) sleep disruption (with nine questions), vi) sleep medication (with one question), and vii) daily dysfunction (with two questions). A lower total score (5) indicates better sleep quality, with scores on the lower end of the scale (1) indicating poor sleep. The internal consistency of the PSQI is satisfactory (Cronbach alpha=0.73; [8]).

2.4. Ethical considerations

This research was given final permission by the ethics committee at STIKes Abdi Nusantara, which is located in Indonesia (approval number: 056/ETIK/XII/2022). In exchange for their time, the participants were given a gift card in the amount of $5, as well as information describing the objectives and methodology of the study, the fact that their participation was voluntary, and the anonymity of their responses.

2.5. Cross culture-validation and adaptation process

- Phase 1. Translation

Three Indonesian nursing scholars who are also bilingual, as well as a hospital nurse who is also bilingual, worked together to translate this tool. All four of them had experience studying abroad as well as in Indonesia, so they were comfortable navigating between the two cultures. To begin, we had each expert translate PSQI on their own. The group of experts evaluated the four translated versions that dealt with ambiguities and inconsistencies before settling on the final Bahasa version of the PSQI, which followed independent translation. Conceptual meaning, as opposed to a literal "word-for-word" translation, was the goal of the reverse-translation process [15]. The Indonesian to American English translation of the synthetic instrument was performed first by a third party who is fluent in both languages. The lead investigator and a panel of health experts then compared the two versions of the instrument. There was a considerable discrepancy in the inverse translation, but it turned out to be due to verb choices that were virtually identical to the original. There are three places in the sentences where extra care is needed to provide the same meaning as in English when read in Indonesia.

- Phase II. Culture-Adaptation

Ten HD patients were interviewed cognitively to evaluate cultural adaptation by evaluating how well the translated items, response categories, and questionnaire directions made sense to them [16]. All participants were asked to offer improvements to any sections they found confusing. In addition, five professionals from academic and clinical settings assessed the questionnaire to ensure its accuracy. Each item's cultural acceptability and relevance was evaluated by a separate panel of experts using a 4-point scale ranging from 1 (not relevant at all) to 4 (very relevant). Expert panel evaluations were used to draw judgments on the content validity of the PSQI in Bahasa. A content validity index (CVI) was calculated for each item and the entire scale. The scale-CVI (S-CVI) was calculated by averaging the I-CVI scores, and the CVI values for individual items were derived from the proportion of experts who ranked those items as 3s or 4s. Acceptable I-CVI values are over 0.80, while S-CVI values above 0.90 being considered outstanding [17].

- Phase III. Construct validity and reliability testing

Determining the sample size for a confirmatory factor analysis (CFA) is challenging due to the influence of the total number of factors and indicators as well as the magnitude of factor loadings [18]. While Furr [19] suggests 50 participants for simple CFA models, other studies have suggested sample sizes, between 5 and 20 participants per item.

2.6. Data analysis

Descriptive statistics were used to summarize the data and provide a summary of the study's participants. For the purposes of the statistics, all items with negative wording were switched around. The factor structure of the Bahasa PSQI has been evaluated by CFA, and the best possible estimation has been made. According to Kline suggestions, the following fit indices for measurements have been analyzed [20]: Standardized root-mean-square residual (SRMR), root-mean-square approximation error (RMSEA), and fit comparison (CFI) [21]. Values of RMSEA and SRMR below 0.06 and 0.08, respectively, indicate a satisfactory model of fit. Fits with CFI scores above 0.9 are considered excellent, while those below 0.8 are considered adequate [22]. Relationships among the seven sleep quality dimensions were examined using Pearson correlation analyses. If the correlation coefficients between the two sets of measurements were above 0.7, it would indicate that the two sets of measurements were measuring the same concept, and the two sets of measurements could be combined with some items removed [22]. Internal consistency was calculated using Cronbach's alphas, with a value of 0.7 being considered minimally acceptable for reliability [23]. Statistical tests were run in SPSS version 23 and LISREL 8.80 (student), and a p-value of 0.05 was used to indicate statistical significance.

3. RESULTS

3.1. Characteristics of respondent

The online survey received a response rate of 62.8% from a total of 220 patient with HD (about ten responders each item). Therefore, we believe that our sample size is sufficient to provide a reliable factor analysis of the PSQI translated into Bahasa. The mean age was 55.76 (SD=10.45), most of them (65.9%) were male, 70% married, and 52.7% had education below senior high school. The average duration of HD among participants was 8.87 years (SD=1.34) as shwon in Table 1.

Table 1. Demographic characteristics (n=220)

Characteristic	n (%)
Age, Mean ± SD	55.76 ± 10.45
Gender	
Male	145 (65.9)
Female	75 (34.1)
Education level	
Below senior high school	116 (52.7)
Above senior high school	104 (47.3)
Marital status	
Married	154 (70.0)
Single	66 (30.0)
Duration of hemodialysis (year), Mean ± SD	8.87± 1.34

3.2. Cross-culture adaptation

According to the findings of the cognitive test, the level of language clarity was 87.8%, and the level of cultural relevance was 84.5%. Each item passed the test for cultural appropriateness, readability, and comprehension according to the panel of experts. Feedback from the interviews resulted in some minor adjustments. Specifically, the concerns with cultural definitions were the most problematic. For instance, a bad dream is equivalent to a nightmare in Bahasa.

3.3. Content validity

Out of the six experts that were invited to take part in the evaluation of the item's content, only five experts were able to complete the process in its entirety. The CVI ranged from 0.92 to 1.00 for a total items. Then, S-CVI of 0.92 for clarity and an S-CVI of 1.00 for relevance depending on the context. The results indicated that the content of the PSQI is valid based on the expert review.

3.4. Confirmatory factor analysis

Each factor had factor loading ranging from 0.51 to 0.62, as shown in Figure 1. The fit indices indicated that the 7-factor model provided an acceptable fit to the data: RMSEA=0.063, SRMR=0.067, and CFI=0.952 as shown in Table 2. Table 3 displays the Pearson correlation coefficients between the 10 subscales, which show that they are sufficiently independent of one another (r=0.396 to r=0.533, p<0.05). The results showed that the factors were fit to data and show a significant correlation between domains.

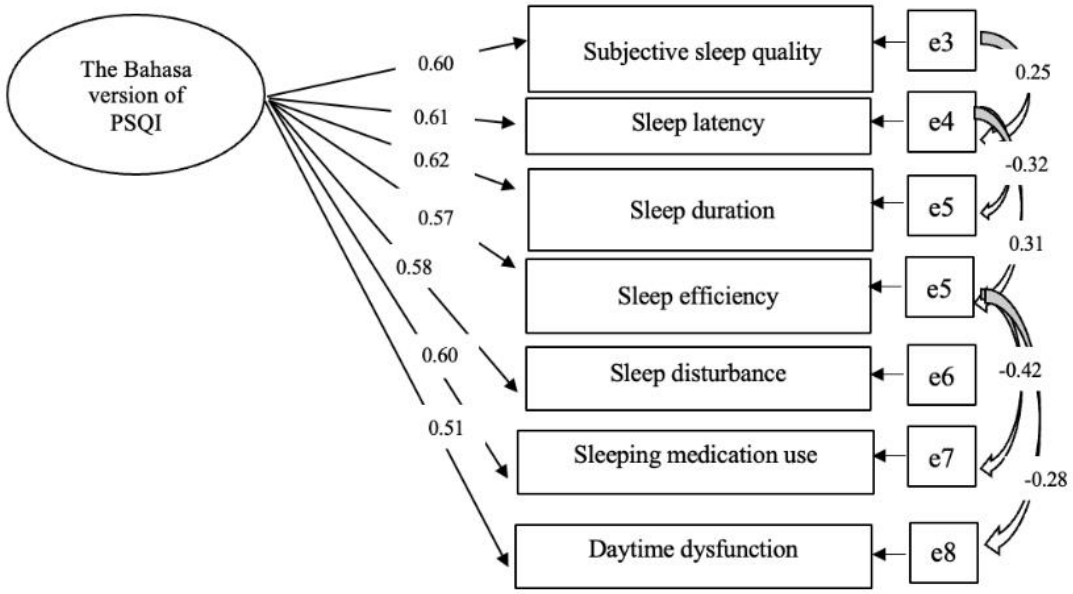

Figure 1. Confirmatory factors analysis

Table 2. Confirmatory factors analysis of the Bahasa version of PSQI (n=220)

Scale	X2	X2/df	RMSEA	SRMR	CFI	NNFI	GFI
Total score	37.132	1.352	0.063	0.067	0.952	0.922	0.953
Subjective sleep quality	38.165	1.874	0.062	0.066	0.931	0.935	0.946
Sleep latency	36.373	1.845	0.057	0.068	0.946	0.927	0.925
Sleep duration	37.522	1.767	0.051	0.065	0.924	0.934	0.933
Sleep efficiency	35.351	1.845	0.064	0.063	0.931	0.943	0.927
Sleep disturbance	34.218	1.883	0.066	0.065	0.944	0.916	0.946
Sleeping medication use	36.147	1.952	0.073	0.062	0.961	0.922	0.957
Daytime dysfunction	36.721	1.917	0.070	0.061	0.957	0.936	0.943

Note: RMSEA (root mean square error of approximation), SMRR (standardized root mean square residual), CFI (comparative fit index), NNFI (non-normalized fit index), and GFI (goodness of fit index).

Table 3. Item correlation of each subscale of the Bahasa version of PSQI

Characteristic	1	2	3	4	5	6	7
Subjective sleep quality	0.421**						
Sleep latency	0.434**	0.431**					
Sleep duration	0.428*	0.452**	0.533**				
Sleep efficiency	0.511**	0.435*	0.432*	0.431*			
Sleep disturbance	0.423**	0.441**	0.415*	0.435**	0.425**		
Sleeping medication use	0.415**	0.512**	0.433*	0.454**	0.454*	0.414**	
Daytime dysfunction	0.396*	0.452*	0.435**	0.435**	0.425**	0.403*	0.401**

Note: * p<0.05; **p<0.001

3.5. Reliability testing results

Table 4 shows that Cronbach alpha for total score was 0.803, indicating that the questionnaire was reliable. The Cronbach alpha for each domans ranged from 0.771 to 0.863. The lowest score was for the daytime dysfunction domain and the higher score for the domain of subjective sleep quality.

Table 4. Internal consistency using alpha Cronbach for the total scale and sub-scale

Characteristic	Total item	Cronbach Alpha
Total score	19	0.803
Subjective sleep quality	1	0.863
Sleep latency	2	0.736
Sleep duration	1	0.860
Sleep efficiency	3	0.882
Sleep disturbance	9	0.767
Sleeping medication use	1	0.773
Daytime dysfunction	2	0.771

4. DISCUSSION

In this study, the psychometric properties of the PSQI were evaluated after its translation and adaptation to the Indonesian context. The study concluded that the PSQI had strong internal consistency, content validity, and construct validity for assessing sleep quality in Indonesian HD patients. The PSQI in Bahasa version has seven-factor structure, as supported by the confirmatory factor analysis results for the 19 items of the translated tool [24]–[26]. The construct validity of the total scales was shown by the fact that all items contributed to the predicted subscale. In addition, as predicted, correlations between subscale scores and sleep quality level were found, providing additional evidence for the construct validity of the PSQI in its Bahasa version. The questionnaire has been translated into and validated for a number of languages, including French, Japanese, German, Spanish, Hebrew, Nigerian, Chinese, and Arabic [4], and has seen extensive use in a variety of age groups and clinical and non-clinical samples (i.e., control participants with no medical conditions). Moreover, a number of variables appear to be consistent across countries in optimal factor models.

Two distinct categories of translational issues have been identified by the item analysis [13]. This includes words that do not retain their meaning when translated from English into Indonesian, as well as phrases or idiomatic expressions that were unfamiliar to respondents after being translated from English into Indonesian due to differences in cultural context or national boundaries. Cognitive interviews, however, helped participants categorize these issues into the four subdomains of reading incorrectly, not

understanding, and appearing odd. The fourth item draws attention to problems with the tool's structure and flow, although it is not reflected in the literature. At last, respondents realized that a survey question on sleep disturbance was intended for them to fill out [27], [28].

Finally, this investigation has three limitations. Health professionals with an excellent understanding of the English language were required for the cognitive interviews [29], [30]. As a result, it's possible that these experts know more about the importance of quality sleep than the general public. The cognitive interviews could only accept a subset of potential participants because of the criteria for native English speakers. Second, this research approaches cross-cultural inquiry with an adherence to ethics. It was hypothesized that Indonesia may translate general principles and the strong associations with sleep quality. The study approach, on the other hand, was a strong point that proved the transferability of recognizing and understanding the underlying assumptions and framework. Finally, at the expert meetings, the translators who worked on both the forward and backward translations were consulted as language experts. For this reason, the "pureness" of the forward and backward translation cannot be considered to have been preserved. Fourth, this study was limited by its single-site design, thus its findings may not apply to all HD patients in Indonesia.

5. CONCLUSION

This is the first investigation of the PSQI psychometric properties among Indonesian HD patients. Our research provides preliminary evidence of the validity and reliability of the translated and adapted tool using data from HD patients in Indonesian hospitals. In addition, our CFA results validate the use of the 19-item, 7-factor Bahasa PSQI version. However, more research is needed to examine its psychometric properties within the context of more comprehensive validation and in multi-site scenario of various locations/hospitals in Indonesia in order to strengthen generalizability.

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