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Validity and Reliability of the Pittsburgh Sleep Quality Index Bahasa Indonesian Version among Type 2 Diabetes Mellitus Patients

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Abstract

Background: Poor sleep quality is a prevalent symptom reported by type 2 diabetes mellitus patients, and with impaired glycemic control, decreased quality of life, psychological distress, and an increased risk of diabetes-related complications. Sleep disturbances may also negatively affect treatment adherence and daily functioning. Despite its clinical significance, a culturally adapted and validated instrument for assessing sleep quality in Indonesian patients with type 2 diabetes mellitus remains limited. To address the existing literature gap, this study translated and adapted the Pittsburgh Sleep Quality Index (PSQI) for patients with type 2 diabetes mellitus in Indonesia and evaluated its validity and reliability.

Methods: This study employed a quantitative descriptive design using a cross-sectional approach. The translation and cultural adaptation process followed recommended guidelines, including translation, expert panel review, and pilot testing. Content validity was assessed by a panel of experts. Reliability testing was conducted using Cronbach's alpha to assess internal consistency. A convenience sample of 140 adult patients with type 2 diabetes mellitus completed the instrument.

Results: The item content validity and a Cronbach's alpha coefficient were 1 and 0.712, respectively. The findings demonstrated that the Indonesian version of the PSQI-I had satisfactory validity and reliability. The content validity index indicated good relevance. The overall Cronbach's alpha indicates acceptable internal consistency reliability.

Conclusion: Bahasa Indonesia version of the PSQI (PSQI-I) is a valid and reliable instrument for assessing sleep quality among Indonesian patients with type 2 diabetes mellitus. This instrument may be used in clinical and nursing practice, as well as in future research, to evaluate sleep-related problems in this population.

Keywords: Reliability, Sleep Quality, Validity, Questionnaire

BACKGROUND

Disturbances in sleep quality are prevalent among patients with type 2 Diabetes Mellitus (T2DM) and are closely associated with glycaemic control and the risk of chronic complications. The relationship between sleep and metabolism is bidirectional: sleep disturbances, including insomnia, inadequate sleep duration, fragmented sleep, and sleep-disordered breathing, can worsen glucose regulation and cardiometabolic profiles. Conversely, metabolic dysfunction in T2DM, such as nocturia, neuropathy, and chronic pain, can also disrupt sleep patterns and quality (1). Previous research indicates that 70.5% of participants experience poor sleep quality (2). A recent systematic review and meta-analysis confirmed that the prevalence of poor sleep quality among patients with diabetes is high, establishing sleep problems as a significant public health concern in this population (3). Consequently, sleep quality is a critical component of diabetes management.

A meta-analysis demonstrated that both abnormal sleep duration and poor sleep quality are associated with higher HbA1c levels and greater glucose variability. These effects are likely mediated by decreased insulin sensitivity, hormonal dysregulation (such as alterations in cortisol, leptin, and ghrelin), and chronic inflammation (4). The clinical consequences of sleep disturbances in patients with T2DM extend beyond glycaemic control; poor sleep quality is also linked to increased incidence of microvascular and macrovascular complications, depression, and comorbidities. A systematic review and meta-analysis of 11 studies reported significant associations between poor sleep quality, poor glycaemic control, depression, and comorbidity. Additionally, sleep duration is significantly associated with the occurrence of diabetic retinopathy (DR) (5).

The Pittsburgh Sleep Quality Index (PSQI) is the most widely used instrument in clinical research for systematically assessing sleep quality. The PSQI is a self-report questionnaire that evaluates seven components of sleep: sleep duration, sleep initiation time, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction, culminating in a global score (6). The PSQI has demonstrated robust psychometric properties in both clinical and non-clinical populations. Its advantages include ease of administration, sensitivity in distinguishing between poor and good sleepers, and strong evidence of reliability, such as high Cronbach's alpha and test–retest consistency, across various languagesDespite the widespread use of the PSQI globally, any translated version requires rigorous validity and reliability testing within the target population. The psychometric properties of translated instruments must be reassessed in each cultural context and specific clinical group. In Indonesia, the PSQI has been translated, and previous research has demonstrated good reliability and validity in adolescent populations (12). Additionally, adaptations of the PSQI for hemodialysis populations indicate that cross-cultural adaptation can yield locally applicable instruments (13). However, these findings are insufficient to determine the suitability of the Indonesian PSQI for adult patients with T2DM. The limited evidence in this population underscores the need for focused psychometric research to ensure valid and reliable interpretation of PSQI scores among Indonesian patients with T2DM.

Given the current context, evaluating the psychometric properties of the Indonesian version of the PSQI in adults with T2DM is both timely and clinically significant. Establishing robust evidence of its reliability and validity will enable researchers and healthcare professionals in Indonesia to assess sleep quality in this population with greater confidence. The objective of this study was to translate the PSQI into Bahasa Indonesia and to establish and enhance its psychometric properties, including translation, validity, and reliability, for use in assessing patients with type 2 diabetes in Indonesia. A validated Indonesian version of the PSQI would provide essential screening information on sleep quality, support healthcare providers in designing more effective interventions, and strengthen future research on the interactions between sleep and metabolic outcomes in this context.

METHODS

Study Design

This study employed a quantitative descriptive design using a cross-sectional approach to assess the validity and reliability of the Indonesian version of the Pittsburgh Sleep Quality Index (PSQI-I) in patients with type T2DM.

Setting and Participants

Two groups of volunteers were recruited for this study. The first group consisted of 40 participants who participated in the pretest of the PSQI-I. Their role was to assess the clarity and readability of the questionnaire items (14). Meanwhile, the second group consisted of 100 participants recruited for the scale's reliability evaluation. Cronbach's alpha values become more stable when the sample size is at least four times larger than the number of test items in reliability analysis (15). Eligibility criteria for both groups included adults diagnosed with type 2 diabetes mellitus (T2DM) who were able to communicate in Indonesian, had no communication difficulties or mental health disorders such as depression or other psychiatric conditions, and were willing to participate in the study.

Instrument

The Pittsburgh Sleep Quality Index is a self-report questionnaire that assesses subjective sleep quality over a one-month period. This instrument was developed by Daniel J. Buysse (6) to provide a standard tool for assessing sleep patterns and problems in clinical practice and research. The PSQI consists of 19 questions, which are summarized into seven main components. The main components of the PSQI are subjective sleep quality (item 6), sleep latency (items 2 and 5a), sleep duration (item 4), habitual sleep efficiency (items 1, 3, and 4), sleep disturbances (items 5b-5j), use of sleeping medication (item 7), and daytime dysfunction (items 8 and 9). Each component is scored on a scale of 0–3. The scores from the seven components are summed to form a global PSQI score ranging from 0 to 21. In the original validation study, the PSQI demonstrated strong internal consistency (Cronbach's alpha = 0.83) and good test–retest reliability (r = 0.85). The instrument also demonstrated high diagnostic accuracy, with a sensitivity of 89.6% and specificity of 86.5% in distinguishing good sleepers from poor sleepers, using a global cut-off score of>5.

The translation of the Bahasa Indonesia version of PSQI (PSQI-I) was performed by Mapi Research Trust, and permission to use was granted by them as the official distributor as well. Five experts consisted of two academic nursing lecturers, two endocrine consultant doctors, and one nurse with more than 5 years of clinical experience. These expert panels separately assessed the cultural appropriateness and relevance of each item using a 4-point Likert scale (1 = not relevant at all; 4 = very relevant).

Data Collection

This study consisted of two phases: first, a pre-testing of the instrument. The prefinal version of the instrument underwent pilot testing with 40 patients with type 2 diabetes from the Endocrine Clinic at Panti Rapih Hospital, who completed the PSQI-I and provided feedback on item clarity and readability. The second phase was reliability testing of PSQI. The adapted PSQI was piloted on 100 participants to evaluate internal consistency and item-total correlations, confirming its reliability. The researcher recruited two research assistants (RAs) to assist with data collection.

Content Validity

Expert ratings informed the content validity evaluation of the Bahasa Indonesia PSQI (PSQI-I). Each expert who participated in a content validity panel was asked to rate each questionnaire item independently using a 4-point Likert scale (score 1=not relevant, score 2=somewhat relevant, score 3=relevant, and score 4=very relevant). Accordingly, any item scored 1 or 2 was considered not relevant, while items scored 3 or 4 were considered relevant. Item-level content validity indices (I-CVI) were calculated as the proportion of experts rating items as 3 or 4, while the scale-level CVI (S-CVI) was derived by averaging all I-CVI scores. Thresholds for acceptability were set at I-CVI 1 and S-CVI > 0.90, denoting excellent content validity (16).

Participant background data were analyzed using SPSS for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA). Categorical variables were summarized as frequencies and percentages, while continuous variables were reported as means and standard deviations (SD). Cronbach's alpha was calculated to assess the internal consistency of the scale, with values 0.70-0.79 considered acceptable, 0.80–0.89 indicating good reliability, and ≥0.9 denoting excellent consistency (17).

Ethical Considerations

This study received final ethical approval from the Ethics Committee of Panti Rapih Hospital in Indonesia (approval number: No. 036/SKEPK-KKE/VII/2020). Participants were compensated for their time with a tumbler and provided with details on the study's objectives and procedures, the voluntary nature of participation, and the confidentiality of their responses.

RESULT AND DISCUSSION

RESULT

Participants' Characteristic

In the first phase, 40 patients with type 2 diabetes mellitus were enrolled. The mean age was 58.58 years (SD = 9.59), and the mean duration of diagnosis was 8.32 years (SD = 6.25). A majority of participants were male (52.5%) and did not have diabetes-related complications (55%). In the second phase, 100 respondents were recruited. Of these, 54% were female, with a mean age of 60.03 years (SD = 8.22), a mean illness duration of 8.52 years (SD = 7.45), and 42% did not have complications (Table 1).

Table 1. Characteristic of the Participants

Characteristic	Phase I	Phase II
	f (%)	f (%)
Sex		
Male	21 (52.5)	46 (46)
Female	19 (47.5)	54 (54)
Number of Complication		
None	22 (55)	42 (42)
1	11 (27.5)	32 (32)
2	4 (10)	15 (15)
3	1 (2,5)	7 (7)
4	2 (5)	4 (4)
Characteristic	Mean (SD)	Mean (SD)
Age	58.58 ± 9.59	60.03 ± 8.22
Illness duration (years)	8.32 ± 6.25	8.52 ± 7.45

Content Validity

In content validity, experts assess whether each item in the instrument is relevant to the construct or variable being measured. The value of I-CVI: 1, S-CVI/Ave: 1, and S-CVI/UA: 1 (Table 2). This suggested that a CVI value is acceptable for the content validity of the PSQI-I (18).

Table 2. Rating of PSQI-I items by 5 experts

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Expert in agreements	I-CVI	UA
Item								
Q1	1	1	1	1	1	5	1	1
Q2	1	1	1	1	1	5	1	1
Q3	1	1	1	1	1	5	1	1
Q4	1	1	1	1	1	5	1	1
Q5a	1	1	1	1	1	5	1	1
Q5b	1	1	1	1	1	5	1	1
Q5c	1	1	1	1	1	5	1	1
Q5d	1	1	1	1	1	5	1	1
Q5e	1	1	1	1	1	5	1	1
Q5f	1	1	1	1	1	5	1	1
Q5g	1	1	1	1	1	5	1	1
Q5h	1	1	1	1	1	5	1	1
Q5i	1	1	1	1	1	5	1	1
Q5j	1	1	1	1	1	5	1	1
Q6	1	1	1	1	1	5	1	1
Q7	1	1	1	1	1	5	1	1
Q8	1	1	1	1	1	5	1	1
Q9	1	1	1	1	1	5	1	1
Proportion relevance	1	1	1	1	1	S-CVI/Ave	1	
						S-CVI/UA		1

Reliability Testing

The PSQI-I's Cronbach alpha with 7 components was 0.712, indicating acceptable internal consistency. The corrected item-total correlation analysis showed that one component, the sleep medication use component, had a corrected item-total correlation below 0.30 because only a few respondents used sleep medication. Meanwhile, the other six components showed corrected item-total correlation values above 0.30, with the smallest (0.308) for the habitual sleep efficiency component and the largest (0.607) for the subjective sleep quality component. These six components met acceptable item discrimination values because they had values >0.3. (Table 3).

Table 3. Corrected item-total statistics correlation dan Cronbach's alpha Score

Component	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted	Cronbach's alpha
Subjective Sleep Quality	0.607	0.631	
Sleep Latency	0.511	0.655	
Sleep Duration	0.414	0.689	
Habitual Sleep Efficiency	0.308	0.712	0.712
Sleep Disturbances	0.662	0.625	
Use of Sleeping Medication	0.197	0.721	
Daytime Dysfunction	0.316	0.703	

DISCUSSION

The results of this study indicate that all items on the PSQI-I instrument have an Item-Level Content Validity Index (I-CVI) of 1.00, indicating that all experts rated each item as relevant to the construct of sleep quality. Furthermore, a Scale-Level Content Validity Index (S-CVI/Ave) of 1.00 indicates very high agreement among experts regarding the item's relevance. In health instrument validation studies, an I-CVI value of ≥0.78 is considered adequate when the expert panel size ranges from five to ten, while an S-CVI/Ave value of ≥0.90 indicates excellent content validity (18). These results are consistent with various PSQI validation studies that report high content validity. A validation study of the PSQI in healthcare professionals showed that most items had an I-CVI ≥0.78 and an S-CVI/Ave of 0.905, indicating excellent expert agreement on the items' relevance for assessing sleep quality (19). Another study from India evaluating the psychometric properties of the PSQI in clinical populations also reported that the instrument has excellent content validity, as it covers several important dimensions of sleep quality, including subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. The I-CVI values for each item of PSQI Gujarati were 1, suggesting that each item of PSQI Gujarati was appropriate (20). This demonstrates that the PSQI has a robust conceptual framework for assessing sleep quality across diverse patient populations.

In this study, the reliability of instruments used to assess sleep quality among patients with type 2 diabetes mellitus was assessed. Internal consistency reliability is commonly evaluated using Cronbach's alpha in health and social sciences (21). Reliability analysis showed that the Cronbach's alpha value for the PSQI-I instrument in this study was 0.712, indicating acceptable internal consistency. A Cronbach's alpha value ≥0.70 is generally considered to indicate an adequate and reliable instrument (22). A previous study exploring the psychometric properties of the PSQI in a cancer patient population reported a Cronbach's alpha of 0.79, which is slightly higher than that reported in this study (23). A study conducted in Hong Kong Chinese childhood cancer survivors found the Chinese version of the PSQI had a Cronbach alpha of 0.71 (24). The evidence indicates that this PSQI has good internal reliability for assessing sleep quality in clinical populations. The corrected item-total correlation analysis in the present study showed that most PSQI components had correlation values ≥0.30. Previous psychometric evaluations of the PSQI in Korean breast cancer survivors have shown that corrected item–total correlations for its components typically exceed the suggested threshold of 0.30, indicating that the items are adequately associated with the overall scale and contribute meaningfully to the total score (9).

The highest correlation values were found for the sleep disturbances (0.662) and subjective sleep quality (0.607) components, indicating a strong relationship with overall sleep quality. Conversely, the use of the sleeping medication component showed a lower correlation value (0.197). This finding has also been reported in various PSQI validation studies, in which the sleep medication use component often showed a lower correlation than other components (9,25). This may be due to the low prevalence of sleep medication use in Asian populations, leading to less variability in responses and lower correlation with the total score. Research evaluating the factor structure of the PSQI in patients with chronic conditions has shown that the sleep medication use component often contributes less to the total score, yet it is retained because it is an important part of the instrument's conceptual structure. Furthermore, previous studies have shown that deleting certain components increases Cronbach's alpha only minimally, so these components were retained to maintain the instrument's structural integrity (26). In this study, Cronbach's alpha values for item deletion indicated that deleting certain components only marginally increased reliability. Therefore, all PSQI components were retained in the analysis to maintain the instrument's original structure.

CONCLUSION

This study provides compelling validity and reliability evidence for the PSQI in patients with Indonesian type diabetes mellitus. The results of this study indicate that the PSQI-I has excellent content validity and acceptable internal consistency, making it appropriate for assessing sleep quality in clinical populations, especially in patients with type 2 diabetes mellitus. A nurse can confidently use this instrument to identify sleep disturbances in patients, particularly in patients with type 2 diabetes mellitus. Accurate assessment enables nurses to detect sleep problems early, incorporate sleep evaluation into routine nursing assessments, and provide tailored interventions to improve patients' sleep quality.

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AUTHOR'S CONTRIBUTION STATEMENT

DHF was responsible for study design, data collection, data analysis and manuscript drafting. AP was responsible for data collection and data analysis.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

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