ORIGINAL ARTICLE

Psychometric Evaluation of the Indonesia Version of Connor-Davidson Resilience Scale-25 Among Diabetic Foot Ulcer Patients: A Confirmatory Factor Analysis

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ABSTRACT

Introduction: The burden of diabetic foot ulcers (DFU) patients is quite high, such as a more frequent visits to health care services compared with diabetic patients without foot ulcers. Resilience is needed to increase their adaptability. Assessing resilience of DFU patients requires a valid instrument. However, there have been no studies on specific psychometrics test, especially to conduct validity using CFA among DFU Patients. The aim of this study was to evaluate the psychometrics, especially reliability and factor structure of the Indonesia version of the Connor-Davidson Resilience Scale-25 (CD-RISC-25) among DFU patients. **Methods:** A cross-sectional study design was undertaken from April to June 2021 in four hospitals located in South Kalimantan, Indonesia, namely Ulin Hospital in Banjarmasin city, Idaman Hospital in Banjarbaru city, Boeyasin Hospital in Pelaihari city, and Damanhuri Hospital in Barabai city. The inclusion criteria were patients who had a history of DFU of more than 2 years. The total sample in this study was 184 patients. The respondents were selected using purposive sampling. Permission to use the CD-RISC-25 was permitted by the original author. Cronbach's alpha was used to evaluate internal reliability. Confirmatory factor analysis (CFA) was used to evaluate the structural model fit of CD-RISC-25. **Results:** The Cronbach's alpha for CD-RISC-25 Indonesia version was adequate (Cronbach's alpha > 0.89). Confirmatory factor analysis showed good fit with goodness-of-fit index (GFI)=0.93, and adjusted goodness-of-fit index (AGFI)=0.91, Root-Mean-Square Error of Approximation (RMSEA) = 0.08. **Conclusion:** Indonesia version of CD-RISC-25 had adequate reliability and validity.

Keywords: Diabetes Mellitus; Foot Ulcer; Psychometrics; Resilience

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INTRODUCTION

One of the complications of Diabetes mellitus in the long term is Diabetic Foot Ulcer (DFU). DFU patients have to leave their jobs due to their mobility limitations, and activity limitations as well as leave their job. DM patients had potential complications such as diabetic foot ulcers (DFU), the data showed that patients with DFU have a high burden because of the length of stay in the hospital (1). This condition will trigger stress, depression, anxiety, powerlessness, and loss of hope (2, 3) among DFU patients and it can be risk factor that affect resilience (4).

The International Diabetes Federation (IDF) estimates the global number of diabetes patients could reach 783.7 million people by 2045. This number is increased in 2021 (5). There are still limited studies that describe the prevalence of DFU in Indonesia. A previous study has found that the prevalence of DFU in Indonesia was 12% (6). Previous study also mentioned that there was 184 DFU patients in south Kalimantan, Indonesia (7).

Stressors in DFU patients are related to low social support, low health literacy, high-cost hospital care, limited access, complex treatment, and low information from health care provider (8). Some patients with DFU may develop mental illness complications, such as anxiety and depression are associated with delayed wound healing (9). Therefore, strategies are needed to manage the stressors to

obtain good health outcome (10). Resilience, which is defined as the psychosocial ability to face crisis condition and reduce negative emotion, is one of strategies to bounce back with this condition (11). This ability helps individuals persist in the long treatment process and also to stay focused without negative emotion (12).

WHO stated that resilience is a key factor in protecting and promoting health as well as well-being at individual and community levels (13). "Having good resilience will contribute to transition readiness and adherence to therapeutic compliance, which is required in DFU patients undergoing self-treatment in order to achieve controlled glycaemic status (14). Resilience is a predictor of all aspects of the quality of life of diabetic patients and resilience-based training can improve the self-efficacy of these patients (15, 16). Tool is needed to assess the resilience for developing strategy among DFU patients.

Several resilience scales for the adult population have been developed, such as the Resilience Scale for Adults Dispositional Resilience (RSA) (17), the Resilience Scale for Adolescents (READ) (18), the Brief Resilience Scale (19), and the Connor-Davidson Resilience Measure (CD-RISC) (20), these questionnaires are valid and reliable. The results of the previous review stated that the Connor-Davidson Resilience Measure (CD-RISC) have adequate psychometric properties. It can be used to measure resilience among community sample, primary care outpatients, general psychiatric outpatients, clinical trial of generalized anxiety disorder, and two clinical trials of PTSD in North Carolina, and it was using English Language (20). However, there is one study in Indonesia to test the validity and reliability of the Connor-Davidson Resilience Measure (CD-RISC) among adolescents (21) and it was published in poster presentation. The structure of CD-RISC will differ in the context and population in which this scale is used.

CD-RISC was initially used to measure resilience in PTSD patients after long periods of treatment. However, CD-RISC has now been used in the assessment of resilience in patients of various medical conditions, treatments, and diagnosis, and also been used across cultures and languages, as explained by the developers through their official website (22). The use of CD-RISC has been reported in various countries such as DFU in China (23) and diabetes-related lower limb amputation in Hungary (24). There has been no validation study of this CD-RISC among the DFU population in Indonesia. Indonesia is a populous country with diverse ethnicities, religions, perspectives, and cultures therefore the use of a suitable instrument that is adjusted to its population characteristics is of necessity. It can be expected that the source and value of resilience will be different compared to other populations. So, this study aims to evaluate the reliability and factor structure of the Indonesia version of Connor-Davidson Resilience Scale-25 (CD-RISC-25) among Diabetic Foot Ulcer Patients.

MATERIALS AND METHODS

Study design

A cross-sectional study design was undertaken from April to June 2021 in four hospitals, Banjarmasin, Banjarbaru, Pelaihari and Barabai, Kalimantan in Indonesia. We used self-report questionnaire to collect the data for psychometric evaluation of the CD-RISC-25 among DFU patients.

Population, Samples, and Sampling

The total sample is 184 respondents. The respondents were selected using purposive sampling. The sample size required for model testing is based on the parameter estimation and it is recommended to use 5 to 20 observations for each parameter. As there are 7 parameters in this model testing, a minimum of 140 participants was required. The inclusion criteria of this study were patients who had history diabetic foot ulcer (DFU) more than 2 years based on Wagner Scale, aged 18-75 years old.

Patients who have lived with DFU for more than two years already have lots of experiences of treatment, therapy, as well as the impact of injuries physically, emotionally, and spiritually. It is expected that this specific time criterion may reflect on their resilience in facing DFU. Patients who disagreed to join, who are not competent in giving consent such as dementia patients, mental disorders or in unconscious conditions in this study was the exclusion criteria.

Instruments

The original author was granted permission to use CD-RISC-25, which is the newest version of CD-RISC questionnaire (20). When applying for permission to use CD-RISC, the original authors recommended to use the CD-RISC-25 version as it has been translated into Bahasa and has been reported in psychometric tests on adult populations of disaster survivors (21). However, the original authors did not grant to conduct exploratory factor analysis (EFA).

Resilience (CD-RISC-25)

Resilience was measured using the Indonesia version of the Connor-Davidson Resilience Scale-25 (CD-RISC-25). The researcher has obtained permission from the original author. CD-RISC-25 consists of 25 items and 7 domains, namely hardiness (items 5, 10, 11, 12, 22, 23, 24), coping (2, 7, 13, 15, 18),

adaptability/ flexibility (items 1, 4, 8), meaningfulness/ purpose (items 3, 9, 20, 21), optimism (items 6, 16), regulation of emotion and cognition (items 14, 19), and self-efficacy (items 17, 25). The higher score means the more resilient a person, while the lower the score means the person tends to be depressed, anxious, and experience post-traumatic stress disorder. This questionnaire has been tested for convergent validity, which is positively related to Kobasa hardiness in outpatient psychiatric patients and reliability with Cronbach's alpha of 0.89 (20), while in this study Cronbach's alpha was 0.902.

Procedure

This study used online self-report questionnaire using Google Form. In data collection, subjects selected according to the characteristics of the sample were asked to fill out a questionnaire on Google Form. The researchers received help from research assistants (enumerators) which are clinical nurses at the hospital that have been trained regarding sample selection. The enumerators also provided assistance for the patients when they filled out the questionnaire using the Google Form. Respondents who agreed to join this study must sign the online informed consent. They took 20 minutes to fill the questionnaire and they were allowed to withdraw after reading informed consent as well as the questionnaire.

The process of translation and adaptation of the questionnaire followed the previous study (25, 26). The first process was translating the original questionnaire from English to Indonesia (forward translation) by the clinical nurses that familiar with the terminology and worked more than 5 years. Then two experts in the field of advance health nursing and community nursing reviewed the results of the translation (expert panel). Then the results of the Indonesia translation were re-translated into English by a professional translator (back translation). Then we conducted a pilot study with 10 respondents to test whether the questionnaire could be understood (pilot study). The final version of the questionnaire was distributed to respondents for psychometric testing (final version). (25, 26).

Data analysis

All data were analyzed using IBM SPSS statistic 23, $p < 0.05$ was considered statistically significant. Descriptive statistics were used to calculate the minimum and maximum values, average, standard deviation (SD), skewness, and curtosis on the Connor-Davidson Resilience Scale-25 (CD-RISC-25) questionnaire. The internal consistency reliability was measured using Cronbach's alpha: previous studies suggest that Cronbach's alpha >0.5 is considered acceptable reliability (27). Cronbach's alpha of original CD-RISC 25 was 0.89 (20). Inter-item correlation and item-total correlation were calculated using the pearson correlation; a correlation of more than 0.2 indicates that it is satisfactory (28). The questionnaire was tested for reliability with internal consistency. The validity test was construct validity using confirmatory factor analysis (CFA). It was carried out to evaluate construct validity (29) and evaluated using , goodness of fit index (GFI), adjusted goodness-of-fit index (AGFI) and it should be greater than 0.90 (29), root-mean- square error of approximation (RMSEA) $\leq$ 0.10 (30).

Ethical Clearance

The procedure of this study was granted by the ethics committee of Ulin Hospital, Banjarmasin, Indonesia. Number: 13/III-Reg Riset/RSUDU/21.

RESULTS

Demographic characteristic of respondents

Table I showed that the majority of respondents were between 51-60 years old (41.3%) and most predominantly by women (59.8%). Based on religion, the majority of respondents were Muslim (98.4%) and the majority of education background was elementary school (58%) and more than a half of respondents (66.3%) did not have any job and had income below IDR 3,000,000 (64.7%). 94.6% of respondents had health insurance. 58.7% respondents had been suffering diabetes for 1-5 years and 49.5% of respondents received oral diabetes medication.

Reliability

To validate CD-RISC-25, all seven factors of the 25-item version were correlated with total score resilience variables (Table II). Cronbach's alpha for internal consistency CD-RISC-25 was 0.899 with delete item between 0.894-0.902. The CD-RISC-25, as well as its subscales, correlated significantly and positively with the hardiness ranging from (α= 0.894 to 0.896), coping (ranging from α= 0.894 to 0.899), adaptability ranging from α= 0.895 to 0.897), meaningful (ranging from α= 0.895 to 0.902), optimism (ranging from α= 0.894), regulation emotion (ranging from α= 0.896 to 0.897), and self-efficacy (ranging from α= 0.894 to 0.895).

Confirmatory factor analysis

Figure 1 presents the goodness of fit for the model structure. with goodness-of-fit index (GFI)=0.93, and adjusted goodness-of-fit index (AGFI)=0.91, Root-Mean-Square Error of Approximation (RMSEA) = 0.08.

Table I : Demographic characteristics of the participants (n = 184)

Characteristic	Mean (SD)	N	%
Age (years)	54.81		
20-30		1	1.1
31-40		11	6.0
41-50		41	22.3
51-60		76	41.3
61-70		44	23.9
>71		10	5.4
Gender			
Male		74	40.2
Female		110	59.8
Religion			
Islam		181	98.4
Non-Islam		3	1.6
Education			
Not school		10	5.4
Elementary school		58	31.5
High school		92	50
Bachelor degree		24	13
Occupational status			
Work		62	33.7
Not work		122	66.3
Income per month			
< Rp 3,000,000		119	64.7
> Rp 3,000,000		65	35.3
Health insurance			
Yes		174	94.6
No		10	5.4
Long suffer diabetes (year)			
< 1		25	13.6
1-5		108	58.7
5-10		32	17.4
>10		19	10.3
Treatment of diabetes			
Insulin injection therapy		40	11.4
Oral diabetes medication		91	49.5
Insulin injection and oral diabetes medication		38	20.7
Not using Insulin injection or oral diabetes medication		15	8.2
Hospital			
Anshari Shaleh Banjarmasin hospital		38	20.7
Ulin Banjarmasin hospital		101	54.9
Damanhuri Barabai hospital		21	11.4
Nirwana hospital		10	5.4
Boeyasin Peaihari hospital		14	7.6

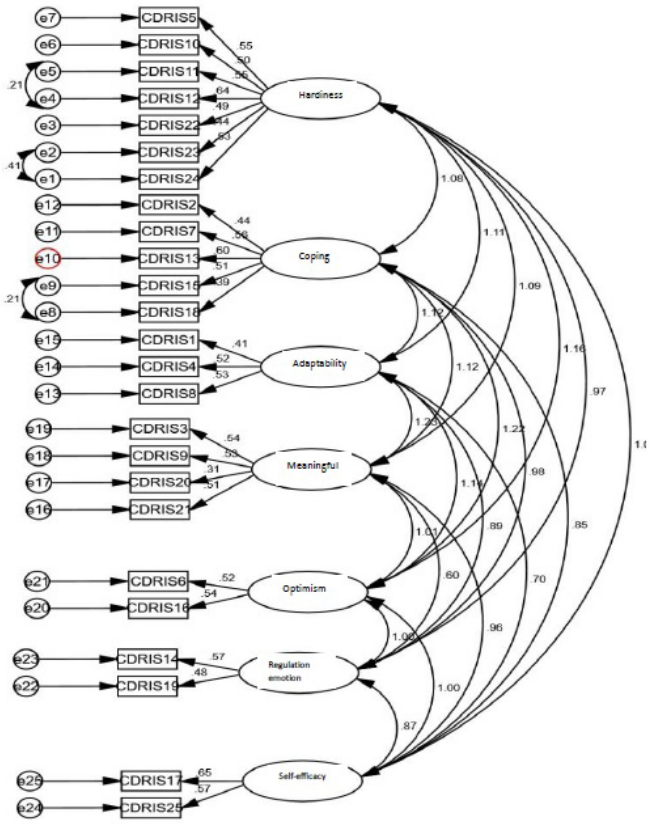

Figure 1 : Factor structure of CDRIS 25, goodness-of-fit index (GFI)=0.93, and adjusted goodness-of-fit index (AGFI)=0.91, Root-Mean-Square Error of Approximation (RMSEA) = 0.08.

Table II : Correlation coefficient item, Cronbach's alpha CD RISC-25, and average scores

Dimension CD RIS 25	Cronbach alpha	Min	Max	SD	Skewness	Kurtosis
Hardiness						
CDRIS 5	0.895	0	4	0.678	-1.302	5.032
CDRIS 10	0.896	0	4	0.757	-1.890	6.628
CDRIS 11	0.894	0	4	0.654	-1.275	0.258
CDRIS 12	0.894	2	4	0.535	0.115	-0.654
CDRIS 22	0.895	0	4	0.722	-1.273	3.623
CDRIS 23	0.896	0	4	1.104	-0.338	-0.731
CDRIS 24	0.894	0	4	0.934	-1.198	1.164
Coping						
CDRIS 2	0.899	0	4	0.814	-1.567	3.814
CDRIS 7	0.895	0	4	0.542	-0.377	2.464
CDRIS 13	0.894	1	4	0.680	-0.737	1.492
CDRIS 15	0.895	0	4	0.869	-0.788	0.732
CDRIS 18	0.894	0	4	1.009	-0.739	0.171
Adaptability						
CDRIS 1	0.897	0	4	0.840	-1.675	4.572
CDRIS 4	0.895	0	4	0.814	-1.700	4.201
CDRIS 8	0.895	0	4	0.875	-1.550	3.459
Meaningful						
CDRIS 3	0.896	1	4	0.537	-0.321	2.470
CDRIS 9	0.895	0	4	0.798	-1.618	4.146
CDRIS 20	0.902	0	4	1.129	-0.570	-0.686
CDRIS 21	0.895	1	4	0.531	-0.305	2.648
Optimism						
CDRIS 6	0.894	1	4	0.816	-0.859	1.129
CDRIS 16	0.894	0	4	0.739	-1.305	3.771
Regulation emotion						
CDRIS 14	0.896	0	4	0.833	-1.044	1.438
CDRIS 19	0.897	0	4	0.916	-1.149	1.226
Self-efficacy						
CDRIS 17	0.894	0	4	0.803	-1.385	3.391
CDRIS 25	0.895	0	4	0.728	-1.427	4.437
Total Score	0.902	45	99	9.596	0.056	0.716

Table III : Correlation coefficient item of CD RISC 25

Dimension CD RISC 25	Correlation coefficient item	*p* value
Hardiness		
CDRIS 5	0.573	< 0.05
CDRIS 10	0.530	< 0.05
CDRIS 11	0.606	< 0.05
CDRIS 12	0.644	< 0.05
CDRIS 22	0.537	< 0.05
CDRIS 23	0.557	< 0.05
CDRIS 24	0.606	< 0.05
Coping		
CDRIS 2	0.388	< 0.05
CDRIS 7	0.567	< 0.05
CDRIS 13	0.620	< 0.05
CDRIS 15	0.592	< 0.05
CDRIS 18	0.627	< 0.05
Adaptability		
CDRIS 1	0.455	< 0.05
CDRIS 4	0.571	< 0.05
CDRIS 8	0.542	< 0.05
Meaningful		
CDRIS 3	0.536	< 0.05
CDRIS 9	0.563	< 0.05
CDRIS 20	0.384	< 0.05
CDRIS 21	0.567	< 0.05
Optimism		
CDRIS 6	0.588	< 0.05
CDRIS 16	0.602	< 0.05
Regulation emotion		
CDRIS 14	0.513	< 0.05
CDRIS 19	0.477	< 0.05
Self-efficacy		
CDRIS 17	0.607	< 0.05
CDRIS 25	0.561	< 0.05
Total Score	1	

DISCUSSION

In this study, we tested that Indonesia version of Connor-Davidson Resilience Scale-25 (CD-RISC-25) showed high reliability and acceptable construct validity by conducting confirmatory factor analysis (CFA). It can be used to measure resilience among diabetic foot ulcer patients in Indonesia like original questionnaire (20).

The results of internal consistency exhibited that Cronbach alpha of the Indonesia version of CD RISC-25 has excellent reliability. This result is considered acceptable (27, 31). Cronbach alpha in this study is similar with the original CD-RISC-25 (20); and also previous studies in Korean version (α = 0.75) (32); Chinese version (α = 0.97) (33) and Spanish version (α =0.86) (34).

We also applied confirmatory factor analysis (CFA) to evaluate construct validity of Indonesia version of CD RISC-25. To test the structure, we evaluated using RMSEA because it is the most sensitive index (35). Based on previous study (30), the RMSEA in current study was acceptable.

Indonesia version of CD-RISC-25 consist of 7 dimensions with 25 items. Dimension one is hardiness (item 5, 10 ,11, 12, 22, 23, 24) with factor loading more than 0.32 (36). Hardiness is important personality to face stress on health and negative responses when dealing with chronic illness (37, 38). Hardiness is needed for facing diabetic foot ulcer. It is basic psychological to against difficulties and pressure (39) and psychological well-being among patients with type 2 diabetes (40).

Hardiness was measured by challenge, commitment, and control. Challenge means we see the stressful as opportunity to develop our capability. Commitment means endured what happening in life. Control means trying to face the stressor (41). Commitment will affect the patient care management. Previous study mentioned that intervention of acceptance and commitment therapy is effective to increase adherence among patients with type 2 diabetes (42).

Dimension two and three were coping and adaptability, respectively. These dimensions were construct of Indonesia version of CD-RISC-25 and the items have factor loading more than 0.32. Dimension two is coping (item 2, 7, 13, 15, 18). Coping strategies is required to deal with stressor in life (43). Diabetic foot ulcer patients need to cope with regular treatment. Coping is skill to get resilience (44). Further, dimension three is adaptability (item 1,4,8). Adaptability is ability to respond to external stressor (45). Previous study mentioned that

adaptability can develop resilience in the chronic illness (46). Also another study mentioned that social adaptability index in type 2 diabetes has a significant correlation with quality of life (47).

Dimension four was meaningfulness or purpose (item 3,9,20,21). Meaningful related with positive health outcome, people with great meaningful in life will have great resilience. Otherwise, people with low meaningful in their life will have poor resilience (48). This dimension focused on belief in God, most things happened for a reason, and everything happened had purpose in life. This dimension was also developed resilience. Meaningfulness was needed to deal with chronic illness and to get positive health outcome (49). Assessing the meaning of the disease in diabetic patients is important to improve the physical and mental components of the quality of life, because they often feelings fear, discomfort, frustration, dependence and helplessness are commonly experienced in chronic injury patients (47).

Dimension five was optimism (item 6 and 16). This dimension focused on courage to deal with the s tressor or problem in life. Optimism is predictor of resilience. Optimism as a protective factor to deal with trauma (50). The assessment of the optimism is important for nurses. The internal factor optimism needs to be considered in diabetes related self-care activity. In addition, optimism also had positive significant correlations with sense of responsibility for health in diabetic patients (51).

Dimension six was regulation of emotion and cognition (Item 14 and 19). Regulation of emotion is required to build resilience to bounce back from negative circumstances (52). This dimension focused on ability to handle negative feeling. If it cannot handle, it has effect on distress. Good emotional regulation had effect on the level of psychological well-being (53).

Dimension seven was self-efficacy (item 17 and 25). Self-efficacy as individual beliefs to mobilize their capability to reach the goal. Self-efficacy affects individual's ability to deal with difficult situation. Self-efficacy had important role in resilience (54). It is necessary to conduct a self-efficacy assessment. Increasing self-efficacy related to confidence levels among diabetic patients, and it can improve the skill for glycemic control. Diabetic patients who have a high efficacy will have good management in diet, exercise and glycemic control (54) .

Nurse needs to assess patient's resilience to manage proper intervention. Indonesia version of CD-RISC-25 was tool that can be used to measure resilience among DFU patients. Assessing resilience among DFU patients requires valid measurement to increase their positive adaptability. Some limitations in this study were considered. This study only focused on construct validity by using CFA. We did not conduct exploratory factor analysis (EFA). We also need to compare this instrument with another tool to develop cut off score. However, Indonesia CD-RISC-25 was suitable tool to detect resilience among patient with chronic illness.

CONCLUSION

The Cronbach's alpha for CD-RISC-25 Indonesia version was adequate (Cronbach's alpha > 0.70). Confirmatory factor analysis showed good fit with goodness-of-fit index (GFI)=0.93, and adjusted goodness-of-fit index (AGFI)=0.91, Root-Mean-Square Error of Approximation (RMSEA) = 0.08. Indonesia version of CD-RISC-25 had good reliability and validity. It was approved with 25 items in 7 structures. The adaptation of this questionnaire into Bahasa and psychometric evaluation are needed. This questionnaire can be used as tool to measure and rapid screen the resilience on a large scale to provide reliable data. It can be used in all clinical areas both in the hospital and in the first level of health service. The total score was obtained by sum the score for each item in the questionnaire. The higher score means the more resilient a person, while the lower the score means the person tends to be depressed, anxious, and experience post-traumatic stress disorder.

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