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# Cultural Appropriateness of the Risk Assessment Tool for Diabetic Foot Ulcer and Its Psychometric Properties Among Diabetes Mellitus Patients

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**Abstract:** Diabetic Foot Ulcer (DFU) is an usual impact in DM patients in which early detection is very important. A risk assessment tool for DFU has previously been developed by researchers. This study aimed 1) translate and did cultural appropriateness ; 2) To test some psychometric properties: face validity, intra-rater, inter-rater, and test-retest reliability. The results showed that 1) The expert translator has not have different definition; 2) face validity was acceptable, mostly the nurses agreed with the assessment tool and they said that easy to specialist nurses use the assessment tool, but the general nurses will not understand use the tool; 3) Intra-rater reliability using Intra-class Coefficient Correlation (ICC) for total score was 0.996 with Kappa 1.00 for duration of DM, history of ulceration, history of claudication, neuropathy sensory, abnormal skin, foot care, Kappa 0.93 for foot deformities, Kappa 0.92 for history of amputation, and Kappa 0.89 for peripheral vascular disease; 4) inter-rater reliability using the ICC and alpha cronbach's was 1.00 for the researcher and nurse 1. The researcher and nurse 2, 3 was 0.96 for alpha and ICC. The result of ICC of patient 1 was 0.93 and the patient 2 was 0.3. Patient 1 showed that the ICC was significance but patient 2 showed that the tool was not reliable and 5) test-retest using the alpha cronbach's is 0.991 of total score and ICC is 0.991. The conclusion is the tool of risk assessment tool for DFU was valid and reliable.

***Keywords:*** Psychometric Properties, Cultural Appropriateness, Diabetic Foot Ulcer, Assessment, Tool.

## I. INTRODUCTION

Diabetes Mellitus (DM) is a metabolic disorder which has a lot of causes and is identified by continued presence of fasting plasma glucose numbers of more than 7 mmol/liter related to carbohydrate, fat and protein metabolism (Holt, 2009). DM can be categorized into Type 1 DM, Type 2 DM, Gestational DM, and specific classification based on cause (American Diabetes Association [ADA], 2015). There are approximately 300 million DM patients, and the number is expected to be around 347 million in 2025 worldwide (Rebolledo, Teran, & Jorge, 2011 cited in Goodarz et al., 2011). More than 80% of deaths from DM patients happen in poor and developing countries (Mathers et al., 2007). Indonesia is one middle-income country in which WHO predicted prevalence of DM patients of 8.4 millions in 2000 and rising to 21.3 millions in 2030 (Darmono, 2007 cited in Wild et al., 2004. Hence, controlling or managing health conditions and complications is important for DM patients (Dowshen, 2013).

The impacts of DM are long-term damage to organs (Alberti & Zimmet, 1998). According to Muller et al. (2005) DM patients are at high risk of respiration infection, urinary system infection, mucosa membrane infection and skin bacterial infection. On the other hand, DM can lead to negative blame, discrimination that leads to negative life domain, poor relationship and social identity, emotional and influences behavioral management (Brown, Ventura, & Mosely, 2014). Bringing with it signs and symptoms among DM patients, DFU is one of the effects among DM patients leading to amputation (World Health Organization [WHO], 2013). According to Dubsky et al. (2012). Diabetic Foot Ulcer (DFU) is the most serious complication and the most common causes to be hospitalized which can lead to amputation among DM patients.

DFU is estimated to be at around 15% risk complication in DM (Singh et al., 2005 cited in Reiber, 1996). The most costly and dreaded consequence of the DFU is lower amputation which happens in around 10 to 30 times in DM patients in the general population (Singh et al., 2005 cited in Trautner et al., 1996 cited in Siitonen

et al., 1993). Besides those problems, DFU is related to increased health care costs and mortality rates (Schaper, Apelqvist & Bakker, 2003).

The basic principles of DFU care in clinic and/or home visit are 1) to examine and check swelling, cracks, and numbness of the feet, 2) to teach patients using the self-help method such as using a mirror when doing a foot examination, 3) to do foot care example feet hygiene such as daily washing to include feet drying, 4) to use water at the appropriate temperature before washing the feet, 5) to prevent wounds using the appropriate footwear, 6) choose proper fitting shoes, 7) to cut the toes nails carefully, 8) to prevent foot lesions, 9) to keep the feet moist except between the toes, 10) to ask for help when a visual disorder happens (Aalaa et al., 2012).

An assessment tool is important to assess risk factors related to DFU. A study of systematic review supporting the instrument or a reliably assessment is needed for international clinical guidelines to assess risk of DFU among DM (Crawford et al., 2013). The tools for assessment are important as part of the nursing process in the assessment phase before diagnosing the main problem, planning and intervention in patients. The function of the assessment tool is to make a framework that helps nurses in decision making and comprehensive care of specific components (Royal College Nursing, 2004). Based on Alavi et al. (2014) the early identification of high risk for DFU is crucial to decrease the number of morbidity and mortality and also nurses as part of an inter-professional approach which is often needed to support patients' needs.

The researcher has already developed a risk assessment tool for DFU (Parliani, Phutthikhamin, & Sangchart, 2019). The researcher have not test validity and reliability of assessment tool where this study will test face validity, intra-rater, inter-rater, and test-retest reliability and also will do cultural appropriateness.

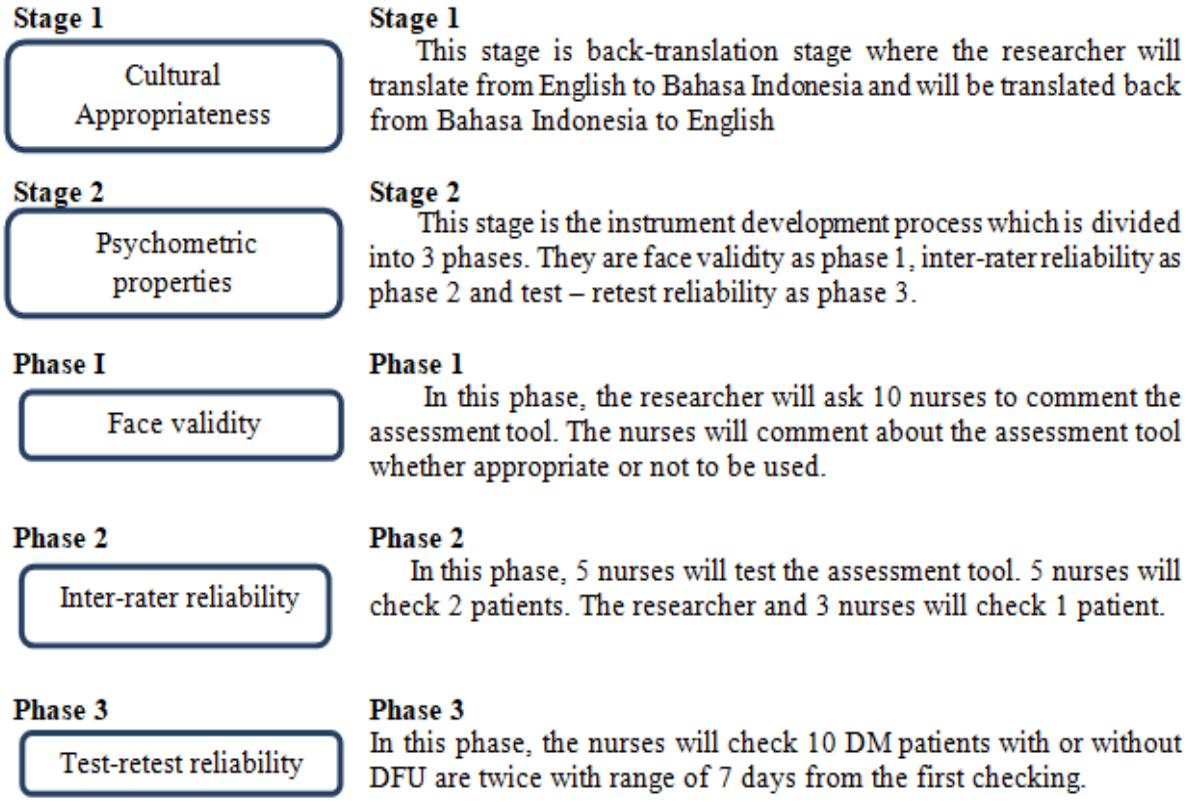
## II. METHOD

**Study design, Population, and setting**

The type of methodology in this study is descriptive study which aims to do cultural appropriateness and some test of validities and reliabilities. The population in the study is nurses who work in specialist wound clinic, West Borneo, Indonesia. The research instrument in this study will be the risk assessment tool for DFU as developed by the researcher (Parliani, Phuttkhikhamin, Sangchart, 2019). It can be seen on attachment 1

In this study, the researcher will develop risk assessment tool for DFU among DM patients. Then, psychometric properties of the risk assessment tool will be examined. The stages of tool development are:

**Figure 1: Stages of back-translation and instrument testing**



## III. RESULTS AND DISCUSSION

**Stage I**

This stage is back-translation stage where the researcher has translated from English to Bahasa Indonesia and has translated back from Bahasa Indonesia to English by 2 experts. This stage translated tool version II. The translation agreed by expert to expert. The expert translator has not have different definition and translation from the term of words that the researcher used. This assessment tool version 2 has translated by expert 1 then translated back by expert 2, there did not have different translation.

**Stage 2**

**1. Phase 1 (Face Validity)**

In this phase, the researcher asked 10 nurses to comment the assessment tool version 2. The comments or suggestion from clinician nurses are:

a. The item ulceration and amputation have to be specific, means the term of ulceration or amputation are the location on the foot not the ulceration or amputation on the other location such as hand and fingers.

b. The item foot care are appropriate to be part of the assessment tool, but the questioner of foot care is not appropriate as questions to indicate the bad foot care of DM patients because DM patients have different condition of feet such as easy to burn if we use warm water for foot care then using socks everyday will influence to be moist then easy to be wound or ulcer then the indicator of yes or no on questioner can be misunderstanding when the nurse asked to the patients

c. The nurse suggested the researcher to develop a foot care indicator by herself such as add foot examination (practice) and foot knowledge of foot care.

d. Mostly the nurses agreed with the assessment tool and they said that easy to specialist nurses use the assessment tool, but the general nurses will not understand use the tool. The tool included specific term of items such as claudication, neuropathy sensory, ABI check and foot deformities. If the general nurses have not have capacity and skill to identify those items, they will wrong understanding.

Face validity is defined as form and performance measurement by the subjects (Siregar, 2013). Based on Devon et al. (2007) face validity means that the instrument looks, on the face of it as if it measures the construct of interest. It is a subjective assessment where it is the weakest form of validity (Devon et al., 2007 cited in Trochim, 2001).

**Phase 2 (Inter-rater reliability)**

In this phase, 3 nurses assess same patient with the researcher. The results are:

Table

| | Item1 | Item2 | Item3 | Item4 | Item5 | Item6 | Item7 | Item8 | Item9 | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| Researcher | 2 | 1 | 0 | 1 | 2 | 0 | 2 | 0 | 1 | 9 |
| Nurse 1 | 2 | 1 | 0 | 1 | 2 | 0 | 2 | 0 | 1 | 9 |
| Nurse 2 | 2 | 1 | 0 | 1 | 2 | 0 | 1 | 0 | 1 | 8 |
| Nurse 3 | 2 | 1 | 0 | 1 | 2 | 0 | 1 | 0 | 1 | 8 |

From this table, we can analyze that item 7 from researcher and nurse 2 and nurse 3 are different result. Item 7 is about abnormal skin that included callus, fissures, erythema and dryness. It can be different because the dryness can be subjective based on observer. The ICC and alpha cronbach's was 1.00 for the researcher and nurse 1. The researcher and nurse 2, 3 was 0.96 for alpha and ICC. This value showed that the level of reliable the tool is high.

In this phase, the 5 nurses also assessed 2 same patients. The result of ICC of patient 1 was 0.93 and the patient 2 was 0.3. Patient 1 showed that the ICC was significance or reliable but patient 2 showed that the tool was not reliable. This case can be different because the patient 1 was stable condition whereas patient 2 was not stable condition and the nurses assessed patient with different time because some morning shift and some afternoon shift.

Inter-rater reliability means that more than one rater evaluates the object using the instrument then reliability of their evaluation of internal consistency is assessed (Drost, 2012 cited in Rosenthal & Rosnoe, 1991). The explanation of item 7 is because the abnormal skin can be change fast or the nurses have different definition of the items. Another explanation is because the patients have done to do wound care that influenced of the skin color or skin condition.

**2. Phase 3 (Test retest)**

In this phase, the nurses checked 10 patients twice with range around 7 days. This phase is test retest. The alpha cronbach's is 0.991 of total score and ICC is 0.991 that indicate the assessment tool version 2 is reliable when tested twice per patient.

The part of the care plan which should be considered first is follow up at specific intervals for DM patients (Aalaa et al., 2012). Accordingly, DM patients should come to a DM clinic to do diagnostic test and foot care comprehensively every year (ADA, 2010; Aalaa et al., 2012). Routine foot care for DM patients, especially patients with limited vision due to DM and other chronic diseases are difficult because they are unable to check their feet (Aalaa et al., 2012).

Test-retest reliability is testing temporal consistency from one instrument phase to another (Drost, 2012). This process has the function to manage the test in a group of objects then manage the same test to the same objects with the correlation between scores on the identical test at different times when doing the test (Drost, 2012).

The results from test re-test were high reliable. One possible explanation is the instrument tool was simple and familiar to use as well as the manual was provided. The test re-test also based on the good standardization (Scholtes, Caroline, & Rudolf, 2010) and the manual can be followed by burses (Drost, 2012). Another possible analyze is the risk factors were objective which influenced reliable score or outcomes. This step also have short time that was 7 days and the patients have not change the condition yet especially the patients who has worse wound and still in hospitalization during study. It can make the tool reliable during the research.

## IV. CONCLUSSION

This study was translated the assessment tool in Indonesian version. It can be used in Indonesia. The assessment tool was valid and reliable to be used in DM patients to identify how risk the patients become DFU. This study have to review more and add some items that nurse clinician suggested, but have to research the item first before including in assessment tool.

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**Attachment 1**

| **The Risk Assessment Tool for Diabetic Foot Ulcer** | | |
|---|---|---|
| **No** | **Component of Assessment** | **Score** |
| **Research Code:** | | |
| 1 | Duration of DM<br>[ 1 ] <10 years<br>[ 2 ] >10 years | |
| 2 | History of ulceration<br>[ 0 ] No<br>[ 1 ] Yes | |
| 3 | History of amputation<br>[ 0 ] No<br>[ 1 ] Yes | |
| 4 | History of intermittent claudication<br>[ 0 ] No | |

| | | |
|---|---|---|
| | [ 1 ] Yes | |
| 5 | Neuropathy sensory<br>[ 0 ] if 9 points can be felt<br>[ 1 ] if 1 – 2 points cannot be felt<br>[ 2 ] if > 2 points cannot be felt | |
| 6 | Peripheral Vascular Disease<br>[ 0 ] 1.00 ≤ ABI≤ 0.90 or 0.91 ≤ABI≤0.90<br>[ 1 ] 0.4 ≤ABI≤ 0.90<br>[ 2 ] ABI ≤ 0.4 or ABI ≥ 1.30<br>Or<br>[ 0 ] if no absent pulse of dorsalis pedis and posterior tibial<br>[ 1 ] if absent pulse of dorsalis pedis or posterior tibial<br>[ 2 ] if absent pulse of dorsalis pedis or posterior tibial | |
| 7 | Abnormal skin<br>(such as: callus, fissure, erythema and dryness)<br>[ 0 ] if no kind of abnormal skin<br>[ 1 ] if has 1 kind of abnormal skin<br>[ 2 ] if has > 1 kind of abnormal skin | |
| 8 | Foot deformities<br>(such as: hammer toe, claw toe, hallux valgus, charcot foot, hallux rigidus, pes capus, and/or pes planus)<br>[ 0 ] if no kind of foot deformities<br>[ 1 ] if has 1 kind of foot deformities<br>[ 2 ] if has > 1 kind of foot deformities | |
| 9 | Foot care (using foot care questioner)<br>[ 0 ] if the score > 9<br>[ 1 ] if the score ≤ 9 | |
| Total Score ( 1 – 14 ) | | |