Original Research

Nursing Students' Clinical Confidence In Caring Tuberculosis: Indonesian Version Of The U.S Tuberculosis Curriculum Consortium Survey Using Rasch Analysis

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ABSTRACT
Background: Nursing students who are prepared in clinical practicums to comprehend the knowledge, reflect their beliefs about tuberculosis instruction, and perceive their abilities in caring for tuberculosis patients are also at risk. Nursing students' clinical confidence in caring for tuberculosis patients is essential to be assessed. Knowledge, beliefs, and clinical confidence, as unidimensional constructs based on Bandura's theory of self-efficacy, had been used in the US National Tuberculosis Curriculum Consortium (NTCC) survey for nursing students. This study's objective was to investigate the Indonesian version of the NTCC survey among nursing students' experiences caring for tuberculosis patients.

Methods: A quantitative study with cross-sectional using an online survey among 250 students 1st to 3rd-yearrd year students in one faculty of nursing in Banten, Indonesia. Prior to data collection, NTCC surveys were translated backward and forward, reviewed by experts, and tested in a pilot project.

Results: Internal consistency using Rasch analysis on each subscale showed good results and gave strong evidence that three subscales are unidimensional. There was an item separation index and reliability score, in that order: knowledge about tuberculosis (8.68 and 0.99), beliefs regarding tuberculosis instructions (6.50 and 0.98), and clinical confidence in caring for tuberculosis patients (6.29 and 0.98).

Conclusion: The Indonesian version of the NTCC survey has excellent internal consistency. This instrument might be improved since the original instrument is 13 years old and there is a cultural gap between the US and Indonesia. Moreover, this instrument might be needed for improving tuberculosis teaching in the nursing curriculum in Indonesia.

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INTRODUCTION

During the period 2016–2020, Indonesia met all three criteria for classification as a high Tuberculosis (TB) burden country: a high TB prevalence, a high number of

multi-drug resistant TB (MDR-TB) cases, and a high prevalence of TB and HIV (World Health Organization [WHO], 2019). Indonesia has a TB incidence of 845,000 in a population of 268 million, and the prevalence reached 1 million in a survey from 2014 to 2015 (Surya et al., 2017). Moreover, MDR-TB cases reached 2.4 % of all new TB cases in 2018 (WHO, 2019).

Nurses and nursing students have the highest prevalence of latent TB infection among health workers due to the long duration and high intensity of their contact with patients (Christopher et al., 2010) (Kinikar et al., 2019). An Indian study also found that nursing students had more days exposed to positive smear TB patients: a mean of 12.4 days per 6 months, with a range of 0 to 126 days (Zwerling et al., 2013). Studies have documented higher exposure among healthcare workers than general populations in Indonesia, Germany, and Japan (Erawati, & Andriany, 2020) (Herzmann et al., 2017) (Nishimura et al., 2018).

Nursing students may lack knowledge about TB transmission, treatment, and prevention. Insufficient understanding of TB can lead to unsafe behaviors while conducting routine procedures for TB patients (Akin et al., 2011) (Carvalho et al., 2019). A study in Turkey showed that students' knowledge about TB was poor, and their attitudes toward caring for TB patients were generally negative, with only 5.9% of the sample reporting they would prefer to care for TB patients (Akin et al., 2011).

Beliefs are all about personal capabilities to use knowledge and skills among nursing students, and they determine the students' self-confidence (Klassen & Klassen, 2018). Belief about TB should be a concern for the nursing student while they do the clinical where they take care of TB patients. Akin et al., (2011) found 41.3% of students stated tuberculosis in their academic programs is not satisfied, 80% of students considered tuberculosis lectures to be a very important part of their education, and only 5.9% of students prefer to work in the units in which patients with tuberculosis were being treated. Students who received tuberculosis lectures or education had higher levels of knowledge and more positive attitudes toward tuberculosis than their peers who did not receive such education.

During clinical practice, TB exposure from patients might highly occur among nursing students whether in a hospital setting or in a community setting since Indonesia is one of the top five TB cases countries in the world. Undergraduate nursing students are preparing to be professionals (Mekgoe et al., 2019) (Chicas et al., 2021). Moreover, an African study found that nursing students have difficulty integrating tuberculosis content from nursing school into clinical practice (Mekgoe et al., 2019).

Clinical confidence is a key component for effective clinical performances during clinical practice and self-efficacy in doing clinical practicum is a mediating between knowledge and skills (Porter, Morphet, Missen, & Raymond, 2013). Clinical practicums serve the dual purposes of developing competency prior to practicing in clinical settings and developing confidence in a safe setting where no harm can come to the student or patient (Porter et al., 2013). A hospital or another clinical setting as a place where students practice the previous knowledge they gained in a classroom or faculty's laboratory is a totally different situation, yet sometimes it creates multiple challenges for students.

Research about TB in Indonesia is mostly focusing on patient-centered care, general healthcare workers, health system programs, and microbiology in diagnosis. Patient–centered research is such as non-adherence to medication, family support, willingness to seek health facilities, and psychological distress (Jauhar, Nursasi, &

Wiarsih, 2018) (Probandari, Mahendradhata, Widjanarko, Alisjahbana, & Tuberculosis Operational Research, 2017) (Ruru et al., 2018). Research general healthcare workers related to TB such as case finding, notification rate, lost to follow-up, managing TB, and LTBI (Rahayu et al., 2015) (Sari, Mertaniasih, Soedarsono, & Maruyama, 2019). Limited studies and instruments focusing on nursing students' clinical confidence in taking care of TB patients are inadequate sources of information for nursing education.

National Tuberculosis Curriculum Consortium NTCC survey, a self-report survey that has been used for eight health disciplines (medicine, nursing, pharmacy, physician assistant, public health, clinical laboratory, respiratory therapy) across 25 academic institutions in the United States (Benkert et al., 2009) (Fair et al., 2006) (Harrity et al., 2007) (Jackson et al., 2007). The survey instruments were designed by the NTCC's contributors using content from the United States Centers for Disease Control and Prevention, the NCC's core curriculum on tuberculosis, and the self-study modules on tuberculosis that form part of the curriculum (Jackson, Harrity, Hoffman, & Catanzaro, 2007). This study aims to evaluate the NTCC survey for Indonesia's undergraduate nursing students. This study's results are expected to be useful for nursing scholars in the nursing education field for evaluating curricula regarding tuberculosis nursing care.

MATERIALS AND METHOD

We conducted an online survey and collected data from 250 nursing students in one nursing faculty located in Banten province, Indonesia. Ethical approval was obtained from the Mochtar Riady Institute of Nanotechnology Ethical Committee (MRIN-EC) Karawaci, Banten, on July 28th 2020 with protocol number 2007020-04. This study's inclusive criteria were those who are students in their first to final year, have internet access, and are at least 17 years old.

This study used a descriptive correlational design and convenience sampling. The online questionnaire did not identify the respondents. The respondents who consented to participate filled out the consent, put their electronic signatures on it, captured the form, and sent it to the cloud. The cloud for the informed consent was provided separately from the questionnaire database, and only the researcher has access to it. Once the respondent clicks on the yes button, it indicates they are agreeing to join this study.

All of the students had to fill out the National TB Curriculum Consortium Survey (NTCC), nursing faculty developed a version of the survey specifically for undergraduate nurses (Benkert et al., 2009). The NTCC survey for the Bachelor of Nursing Science is a 45-item, self-report instrument developed to measure knowledge, beliefs about TB instruction, and clinical confidence in treating TB patients and controlling the spread of TB. The NTCC survey for nursing students consists of five parts.

Part-one records demographic characteristics. Part two measures nursing students' beliefs about TB education. Section three consists of general TB knowledge questions. Section four contains TB knowledge questions specifically for BSN students. Together, parts three and four form the TB knowledge scale. Part five assesses the students' confidence in caring for TB patients.

TB knowledge was measured by general questions about TB (Part 3) and questions about TB specifically for BSN students (Part 4). The questions concentrate on the diagnosis of TB, the assessment of TB patients, and the treatment of adult TB patients. Part three consists of five items. Part four of the NTCC survey has twelve items; in the adapted version used for this study, all but two were included as questions

about TB for nursing students, while items 19 and 20 were treated as demographic characteristics.

The two-part TB knowledge scale has 15 multiple-choice questions, five of them general and 10 specific to nursing students. The TB knowledge items have one right answer out of four options. Every correct answer receives a score of 1, while wrong answers are scored as zero. The original instrument had no cut-off points for the knowledge scale. Possible scores range from 0 to 15. Higher scores indicate greater knowledge about the care of TB or latent TB infection patients.

Part two is about beliefs about TB education and consists of five items. Each statement assesses what students believe about the value of TB instruction. The Likert scale for every statement consists of four responses: *strongly disagree, disagree, agree,* and *strongly agree.* There were two reverse items in the adapted survey, numbers 2 and 4. In those questions, the agreement indicates something undesirable or negative. On non-reverse items, *strongly agree is* scored as 4, *agree is* scored as 3, *disagree is scored* as 2, and *strongly disagree is scored* as 1. For reverse items, *strongly disagree is* scored as 4, disagree is scored as 3, *agree is* scored as 2, and *strongly agree is scored* as 1.

Part five of the NTCC survey measures clinical confidence about caring for TB patients. The clinical confidence scale focuses on four competence categories that include 10 items total: assessing, screening, and monitoring TB patients (three items), designing, implementing, and evaluating a patient management plan (two items), communicating effectively with TB patients and their families (three items), and assessing, evaluating, and utilizing community public health resources for TB (two items). On the original survey, answers were assessed on a six-point scale, with A indicating the lowest level of confidence and F indicating the highest level of confidence. The adapted survey scored responses as 1, 2, 3, 4, 5, and 6 instead. On the clinical confidence scale, which is section 5 of the survey, there were no reverse items and no cut-off points.

Rasch analysis was used to analyze the data collected in this study. NTCC tested the U.S. version of the NTCC students' tuberculosis survey's reliability using Rasch analysis with a group of 92 APN/NP students. According to Wright and Mok, (2014) a noble and valid measurement model has to follow five indicators for human science. Those indicators are for producing a linear measure, overwhelming missing data, affording an accurate estimate, determining outliers or misfits, and being a replicable evaluation. The Rasch model accomplishes these compared with other measurement models.

The Rasch model is a subsection of a larger group of measurement models. It is known as item response theory (IRT), which transforms raw ordinal type data using probability and logarithms to equal-interval scale data called logit (log odd unit). According to Bradley et al. (2015), the Rasch model has been used broadly to analyze psychometric data in many areas, such as educational research, language assessment, and health sciences.

RESULTS

The following are tables of research results.

Table 1. Nursing students' sociodemographic characteristics (n=250)

Variable		*N*	%
Year of Study			
	1st year	75	30.0
	2nd year	104	41.6
	3rd year	71	28.4
Age (years)			
	17-18	22	8.8
	19-20	162	64.8
	>20	66	26.4
Gender			
	Female	213	85.2
	Male	37	14.8
GPA			
	2.75-3.0	15	6.0
	3.01-3.5	170	68.0
	3.51-4.0	65	26.0
Place of Origin in Indonesia			
	West	156	62.4
	Central	72	28.8
	East	22	8.8

Table 2. Variable fit statistics of knowledge, beliefs, and clinical confidence among nursing students (N=250)

Variable	Fit Statistics				Item separation	Item reliability
	Infit		Outfit			
	Mean Square	SD	Mean Square	SD		
Knowledge	0.99	-0.1	1.10	0.3	8.68	0.99
Beliefs	0.99	-0.3	1.00	-0.2	6.29	0.98
Clinical confidence	0.99	-0.3	1.00	-0.2	6.50	0.98

Table 3. Rasch analysis fit statistics and item difficulty assessment

Items	Fit Statistics				SE Model	Measure
	Infit		Outfit			
	Mean Square	SD	Mean Square	SD		
Tuberculosis Knowledge Generally, what percentage of people in the United States who have latent TB infection (LTBI) and a normal immune	0.95	-0.1	1.87	1.79	0.33	3.78

Items	Fit Statistics				SE Model	Measure
	Infit		Outfit			
	Mean Square	SD	Mean Square	SD		
system, will go on to develop TB disease at some point in their lives						
Ms. Hardy has been diagnosed with active TB. Which one of the following should be the <u>first</u> priority in developing a teaching plan about her anti-tuberculosis medications	1.10	0.62	1.7	2.43	0.22	2.78
Which of the following is a contraindication to TB skin testing?	1.12	2.54	1.15	2.32	0.14	0.45
What is the currently recommended method for administering tuberculin?	1.03	0.26	1.1	0.6	0.18	-1.67
You are working as the RN in a rural clinic. Mary wants to obtain a food handler's license and is required to show proof that she does not have active tuberculosis disease. She came to your clinic to obtain a skin test (PPD), and now returns for the reading. When it should the skin test reading be done for Mary?	0.95	-0.75	0.95	-0.75	0.15	-0.77
Tuberculosis organisms are most commonly transmitted from person-to-person in which one of the following ways	1.01	0.1	1.06	0.38	0.18	-1.67
Why is BCG <u>NOT PART</u> of the routine vaccination program in the United States?	1.02	0.39	1.06	0.67	0.14	1.13
Which one of the following is <u>NOT</u> appropriate for you to use in working with a patient with active TB	1.02	0.29	0.98	-0.9	0.16	-1.23
Which of the following is <u>NOT</u> a risk factor for progression of TB from infection to disease	1.00	0.04	0.96	-0.56	0.14	-0.2
As a nurse, you should teach patients that the MOST	0.96	-0.4	1.0	0.07	0.17	-1.39

Items	Fit Statistics				SE Model	Measure
	Infit		Outfit			
	Mean Square	SD	Mean Square	SD		
common route of transmitting tubercle bacilli from person-to-person is through contaminated						
What do you tell Mary's employer?	0.97	-0.72	0.95	-0.79	0.14	0.37
Which of the following describes best practice for directly observed therapy (DOT)	0.96	-0.39	0.85	-0.92	0.17	-1.42
What additional tests should be done on all specimens regardless of AFB smear results	0.95	-1.01	0.91	-1.25	0.14	0.9
Your patient asks what her positive PPD test means. Your BEST response is:	0.94	-1.06	0.95	-0.5	0.14	-0.56
Mary returned to the clinic within the correct time frame and her PPD reading is 20 mm induration. What would be the next step in diagnosis and treatment for Mary?	0.95	-0.86	0.93	-0.77	0.14	-0.5
Beliefs						
The career path I have chosen will not require me to know much about TB.	1.43	3.70	1.38	3.36	0.12	-0.11
There is only minimal need for more education on tuberculosis because it is not likely that I will need it in my chosen career.	1.23	2.11	1.23	2.18	0.12	-0.31
In my future plans as a health professional, I am confident that the level of TB knowledge I have attained is adequate to prepare me for my career needs.	1	0.05	1	0.05	0.1	1.15
The current emphasis on TB in my academic program is adequate.	0.71	-3.08	0.77	-2.44	0.11	0.54

Items	Fit Statistics				SE Model	Measure
	Infit		Outfit			
	Mean Square	SD	Mean Square	SD		
TB education is very important to my academic program.	0.75	-3.09	0.70	-3.05	0.14	-1.28
Clinical confidence						
Assess signs and symptoms of medication toxicity in patients who are being treated for LTBI or active TB	1.49	4.90	1.54	5.3	0.07	0.83
Assess a patient's risk for TB exposure	1.32	3.33	1.29	3.02	0.07	0.48
Implement to patient with latent TB infection (LTBI)	1.05	0.6	1.12	1.36	0.07	0.43
Report cases of TB to the appropriate public health authority according to state and local reporting requirements	1.1	1.09	1.09	1.05	0.08	-0.37
Asses patient-reported symptoms suggestive of active TB	1.02	0.22	1.00	0.08	0.07	0.53
Implement to patient with latent TB infection (LTBI)	0.89	-1.22	0.94	-0.68	0.08	0.18
Educate patients and families about issues related to TB, using language that is understandable and reflects cultural awareness	0.79	-2.51	0.75	-2.94	0.08	-0.73
Access community resources available for the low- cost treatment, monitoring (e.g., DOT programs) and follow-up of patients with LTBI	0.76	-2.90	0.78	-2.63	0.08	-0.26
Use of effective verbal and non-verbal skills to elicit the patient's perspective about his/her illness	0.74	-3.12	0.77	-2.73	0.08	-0.42
Identify and describe patient behavior patterns, cultural beliefs and values, that may pose difficulties for adherence to the recommended treatment regimen	0.73	-3.34	0.70	-3.68	0.08	-0.67

DISCUSSION

The NTCC survey for BSN students is originally an English-language instrument developed for US nursing students in 2003 and was translated into Indonesian for this study using the WHO-recommended process for translation. Three translators participated in the translation process. The first and second translators did the forward translation into Indonesian.

The first translator was an Indonesian Ph.D. student in nursing from the University of Texas who was the principal investigator on several projects. The second translator was Indonesian, an English lecturer in the Faculty of Nursing at Universitas Pelita Harapan who graduated from the University of Bristol, United Kingdom. The two translators worked separately and independently.

The researcher reviewed the two forward translations and discussed them with the two translators, combining them to form one forward translation. A third translator did the backward translation. The third translator is an Indonesian, an English lecturer at Universitas Pelita Harapan's Faculty of Nursing who earned a master's degree in English language studies at Sanata Dharma University Yogyakarta. A professional English editor and translator reviewed the original English version and the backward translation to confirm the identity of the meaning.

There were significant gaps between the content and context of the U.S. and Indonesian undergraduate nursing surveys. The original instrument was developed in 2003, 17 years before the Indonesian students took the survey. Several items in the knowledge section regarding TB and nursing education used with US nursing students were different due to differences in the curriculum, nursing students' competencies, and the use of technology in teaching. The language referring to the United States was changed to refer to Indonesia. Items in the instrument that referred to the United States were adapted to Indonesian data without any further changes.

The reliability and validity scores for TB knowledge, beliefs about TB education, and clinical confidence were tested by Rasch analysis using the Winstep statistical program (Linacre & Wright, 2010) (Benkert et al., 2019). Infit and outfit statistics are considered acceptable if they range from 0.6 to 1.4 (Smith & Smith, 2004) (Benkert et al., 2007). Infit statistics are less sensitive to surprising responses to items far from a person's level of ability, and outfit statistics are sensitive to atypical responses to items far from a person's level of ability. An item or outfit value lower than 0.6 indicates the item is not affordable. This study's fit statistics and descriptive data are presented in Table 2.

Rasch's analysis indicated quite good internal consistency for each of the subscales in this pilot study. The reliability score was 0.99, and the item separation index was 8.68 for 15 items on the TB knowledge subscale. Beliefs about TB instruction had an item separation index and reliability of 6.29 and 0.98, respectively. Clinical confidence in taking care of TB patients under this subsection had an item separation index and reliability of 6.50 and 0.98, respectively.

The TB knowledge scale has all items within the range of acceptable attire and outfits except item 3, which has 0.51. Item 3 is the question about the contraindications of skin testing. The item with a score less than 0.6 indicates that the item cannot be answered by pilot study participants. Beliefs about the TB education scale had one of the five items where both the infit and outfit statistics were lower than 0.6. Belief item 3 is about the adequacy of the current emphasis on TB in the student's academic program: 0.48 as an infit and 0.46 as an outfit.

Moreover, the clinical confidence scale has two of the ten items with both infit and outfit lower than 0.6. Those items are item 8 (0.55 as an infit and 0.55 as an outfit) and item 9 (0.28 as an infit and 0.29 as an outfit). Clinical confidence item 8 is about identifying and explaining the patient's behavior and culture related to TB issues. while Item 9 is about confidence in accessing community resources for low-cost TB treatment.

As far as seeking all literature, the authors could state that this current study is one most recent that used the NTCC questionnaires in an Indonesian setting. The previous original instrument was done on nurse practitioner students in the United States by Benkert et al., (2007) by distributing a self-report survey during the final clinical course. The number of respondents was 92 NP students from four universities in the United States, 70 students (61%) reported having attended at least one lecture on TB, and 53 students indicated that they had cared for at least one LTBI or TB patient.

This study used Bandura's self-efficacy theory as the conceptual framework in Benkert and colleagues' study showed that there was a positive relationship between exposure to TB content and perceived self-efficacy for TB care. The result showed a trend toward significance, but there was not a statistically significant positive relationship between TB content in lecture exposure and perceived TB self-efficacy ($r = 0.20$, $p = 0.06$). However, the result revealed a statistically significant positive relationship between self-directed exploration of TB content outside of the classroom and perceived TB self-efficacy ($r = 0.29$, $p = 0.01$).

Besides, there was a positive relationship between past experiences with the care of patients with LTBI or TB, knowledge of TB, and perceived self-efficacy for TB care. A statistically significant relationship between TB knowledge and perceived TB self-efficacy ($r= -0.32$, $p \leq 0.01$) was found. Nonetheless, this was a negative correlation, suggesting the lower the students' knowledge of TB, the more confident they were in their ability to take care of these patients. A statistically significant positive relationship between the number of TB patients cared for in the past and TB self-efficacy ($r = 0.324$, $p = 0.002$) was found (Benkert et al., 2009).

CONCLUSION

The Indonesian version of the NTCC survey has excellent internal consistency. This instrument might be improved since the original instrument is 13 years old and has a cultural gap between the US and Indonesia. It is suggested that future studies might be conducted using an experimental or larger number of undergraduate students. As a result, it is also suggested that future research use more precise and up-to-date methods established by Indonesia's Ministry of Health. So, this instrument might be needed for improving tuberculosis teaching in the nursing curriculum in Indonesia.

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