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Development of Standard Early Detection Instrument Suspected Pulmonary Tuberculosis in Family With Positive Pulmonary Tuberculosis

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Abstract

Tuberculosis or TB is a contagious infectious disease caused by the Mycobacterium tuberculosa bacillus. Suspect pulmonary tuberculosis is a person who has signs and symptoms of pulmonary TB. The diagnosis of pulmonary TB can be established based on clinical symptoms, physical examination and bacteriologic examination. This study aims to develop a standard instrument of suspected pulmonary TB in families with positive pulmonary tuberculosis. The method used in this research is the development of an instrument that refers to the development of Djemari Mardapi model with 9 steps of development. This research was conducted with 3 stages. The first stage is the preliminary stage, then the development stage and last is the evaluation stage. Instrument review by expert or content validity was analyzed using Aiken V formula, instrument reliability based on agreement of experts analyzed using Two Way Anava and reanalyzed using Hoyt formula. The construct validity was analyzed using Exploratory Factor Analysis (EFA) with the help of SPSS 18.0 software, while instrument reliability based on field results was analyzed using KR-20 formula. The results of the content validity indicate that twenty-six instrument items have values >0.3 which means that all valid instrument items are used. The result of reliability based on expert agreement shows the value of 0.824 which means experts agree in judging. The result of construct validity is Kaiser Meyer Olkin (KMO) 0,816, Measure Sampling Adequacy (MSA) >0,5, and Bartlett's test 0,000 significance test so that instrument item can be analyzed further. There are 5 factors formed from the 26 available instrument items and each item in each factor has a factor loading value> 0.3. Instrument reliability results using KR-20 formula of 0.929, which means reliable instrument used. Based on the evaluation of standard instrument of early detection of pulmonary tuberculosis suspect developed, overall 26 instrument items able to measure indicator of variable to be measured. Further developed instruments can be used by health workers and cadres to perform suspect pulmonary tuberculosis in the community.

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INTRODUCTION

Tuberculosis or TB is an infectious disease caused by Mycobacterium tuberculosa (Depkes RI, 2011:1). Special tuberculosis to attack the lungs is called pulmonary TB. Tuberculosis may also invade other organs such as meningens, kidneys, bones, intestines, pleura, urinary tract and urinary tract and lymph nodes. If tuberculosis has invaded these organs then called extra-pulmonary TB.

Tuberculosis is the leading cause of death after HIV/AIDS and this occurs in developing countries (Raviglione and Uplekar, 2010:2). TB disease can be treated and cured, but TB disease still contributes to death every year. The prevention of TB disease is difficult because of the ineffective and expensive vaccine development and the long process of diagnosing it. The main task that should be done is to provide appropriate care for people infected with TB disease and early detection of TB cases.

Four countries account for 60% of new cases of TB in the world, namely India, China, Indonesia, and Nigeria (WHO, 2016:1). Decrease in global TB cases can be intensified if various countries make efforts to control TB disease optimally. Decrease in TB incidence is expected to decrease by 4-5% by 2020.

TB case findings in Indonesia ranked third in the world (Dewi et al, 2016:2). TB control programs in Indonesia have been started, one of which is the National TB Control Program (PPTN). The program has a national target of early detection of TB cases of >70% and treatment success >85%. Early diagnosis and treatment is considered an important indicator of success in the National TB Control Program and this is a major challenge for the Indonesian state.

Based on the International Standards for Tuberculosis Care (ISTC), it is affirmed that the standard for the diagnosis of pulmonary TB is if the symptoms conform to standard 1 (Fair, Hopewell, and Pai, 2007:61). Standard 1 The ISTC explains that any person who exhibits productive cough symptoms for 2-3 weeks or more of unclear causes should be evaluated as suspected tuberculosis.

Pulmonary TB suspect is someone who has signs and symptoms of pulmonary TB (Depkes RI, 2011:15). Signs and symptoms of pulmonary tuberculosis are characterized by the main symptoms, cough with phlegm for 2 weeks or more and accompanied by other symptoms. Other symptoms that accompany the main symptoms are coughing up blood (hemoptysis), shortness of breath, chest pain, body weakness, decreased appetite, weight loss, malaise, night sweats without physical activity, fever over a month.

Model method of TBC Partnership Stop (Wahyuni and Artanti, 2013:88). This method is done by empowering the patient and the community so as to reduce the dependence of the community on health workers in solving health problems, including suspected tuberculosis and providing IEC TB services. This requires the role of cadres.

In applications in the field of early detection of TB models is still rare, especially in cases of pulmonary tuberculosis. So far, the discovery of pulmonary tuberculosis cases is limited to guessing without standard guidance such as instruments. Training and counseling of pulmonary TB that has been given is still less effective if not given guidelines that can be used cadres.

The results of document studies at Semarang City Health Office obtained results that the city of Semarang was ranked second highest in Central Java. The coverage of puskesmas with the highest prevalence of TB cases is Puskesmas Bandarharjo. The findings of cases of pulmonary tuberculosis at Puskesmas Bandarharjo Semarang in 2016 amounted to 155 cases.

The results of interviews with health workers at the Puskesmas Bandarharjo Semarang show that, currently there is no standard instrument to find suspected pulmonary TB. During this time, the discovery of suspected pulmonary tuberculosis by cadre refers to leaflets and pocket books provided during cadre training. Based on the problem, it is necessary to develop a standard instrument of early detection of suspect tuberculosis of the lungs is valid and reliable.

METHODS

This research was conducted by research method of instrument development and research design development which was used refers to development research proposed by Mardapi (Mardapi 2016:132).

There are ten steps to be followed in the development of an instrument. In the tenth step in the research development of this instrument is the final product result of a valid and reliable instrument. These ten steps include: 1) determining instrument specifications; 2) writing instruments; 3) determine the scale of the instrument; 4) determine the scoring system; 5) reviewing instruments; 6) conducting field test; 7) analysis of field test results; 8) revisions; 9) assemble and refine the instrument and 10) evaluation of the whole instrument.

Models of Mardapi instrument development modification are carried out through three stages: initial stage, development stage and evaluation stage. Initial preparation of determining instrument, writing instrument to determine specification. The development stage consists of an overview of the instrument by experts, experiments, anis- tics and revisions. The evaluation stage consists of assembling and refining the instrument.

In the preliminary stage, the data sources in this study were obtained from preliminary observations conducted at Bandarharjo Semarang Public Health Center. The observational activities undertaken were combined with interviews with health workers and pulmonary TB cadres about the techniques undertaken in finding suspected pulmonary TB. The next activity is document study which aims to see the number of lung tuberculosis sufferers in Puskesmas Bandarharjo Semarang. At the stage of development of data sources in this study obtained from the results of validation by experts and data field test results

Research subjects in this study were families with positive pulmonary TB patients amounted to 110 people. The sample selection in this research use area technique (cluster) random sampling. According to (Sugiyono, 2015:83), area technique (cluster) random sampling is used if the population does not consist of individuals, but consists of individual groups or clusters. The sampling technique of the area is used to determine the sample in the study.

Techniques and instruments of data collection used are expert validation sheet and structured interview guide sheet. Analysis of data on the process of developing the instrument that is, the initial product developed tested the validity and reliability of the contents by experts and analyzed with the help of SPSS 18.0 software to obtain a valid and reliable instrument. Furthermore, the instruments were tested into the field by interviewing the respondents in the work area of Puskesmas Bandarharjo Semarang. The test results of the early detection instrument of suspected pulmonary tuberculosis were then analyzed the validity of the construct using the Exploratory Factor Analysis formula with the help of SPSS 18 software. Furthermore the reliability test of instrument test result in the field was analyzed using KR-20 formula.

RESULT AND DISCUSSION

The standard instrument of early detection of suspected pulmonary tuberculosis developed from two things, namely the factual instrument for the early detection of suspected pulmonary tuberculosis and the standard instrument of early detection of pulmonary tuberculosis suspect was developed.

The result of preliminary study which has been done by the researcher with observation method, interview and document study in September 2017 at Puskesmas Bandarharjo Semarang, obtained the result that in conducting the suspect randomization, pulmonary tuberculosis has not yet used standard instrument. The instruments currently used in Puskesmas Bandarharjo Semarang are in the form of pocket books and leaflets.

The standard instrument of early detection of suspected pulmonary tuberculosis was developed in the form of a structured interview guide sheet with 26 items consisting of 2 items on general symptom indicators, 6 items in respiratory symptoms indicator, 5 items on systemic symptoms indicator, 2

points on mask use indicator, 5 items on home physical environment indicator, 2 points on nutritional status indicator, 2 points on indicator of smoker and 2 items on the indicator spitting.

. The scoring scale used is the guttman scale with the dichotomy score. Next is the result of content validity analysis based on expert judgment. The following expert validation results using the Aiken V formula presented in Table 1.

Table 1. Expert Validation Results Using Formula Aiken V

Item	Rater 1	Rater 2	Rater 3	∑S	Aiken Coefficient	Criteria
1	4	4	4	12	1	Valid
2	3	3	4	10	0.77	Valid
3	4	4	4	12	1	Valid
4	3	3	3	9	0.66	Valid
5	3	4	3	10	0.77	Valid
6	3	3	3	9	0.66	Valid
7	3	3	3	9	0.66	Valid
8	3	3	3	9	0.66	Valid
9	3	3	3	9	0.66	Valid
10	3	3	3	9	0.66	Valid
11	3	4	3	10	0.77	Valid
12	4	3	4	11	0.88	Valid
13	3	3	3	9	0.66	Valid
14	3	3	3	9	0.66	Valid
15	3	3	3	9	0.66	Valid
16	3	3	2	8	0.55	Valid
17	3	3	3	9	0.66	Valid
18	4	4	3	11	0.88	Valid
19	3	3	3	9	0.66	Valid
20	4	4	3	11	0.88	V
21	4	4	4	12	1	V
22	4	4	4	12	1	V
23	3	4	3	10	0.77	V
24	4	4	4	12	1	V
25	3	3	3	9	0.66	V
26	4	4	4	12	1	V

Based on the data in Table 1 it can be concluded that all the standard instrument items of early detection of pulmonary TB dsuspek obtained value >0.30. That means all items are declared adequate/valid. In addition to the value provided, experts also provide suggestions for instrument improvement.

A valid instrument should be assessed first by an expert in accordance with the field. The assessment of experts is expected that the developed instruments can measure what should be measured to obtain results in accordance with the objectives of the instrument.

This is in accordance with the criteria proposed by Azwar (2014:34) on instrument validity. If the validity coefficient ≥0,3 means the grains are said to be adequate (valid), and vice versa if the validity coefficient <0.3 then the item is declared inadequate (not valid).

The results of research supporting this research are Alfinto, Florentinus and Utomo (2015:87). The Alfinto study concluded that to test the validity of the content by using expert judgment by the validator. Validator in this study amounted to 3 people and the average of validation result from third is 4.1. The results show that each item of the instrument is valid on the basis of the content because the value is >0.3.

After performing the content validity of the experts, further analysis is performed to determine reliability based on expert judgment or interrater appraisal. Interrater reliability was analyzed by two way anova test using SPSS 18.0 software. The calculation results using SPSS are presented in Table 2.

Table 2. Results Calculation of Reliability Using SPSS Program 18

Source	Type III Sum of Squares	Df	Mean Square
Corrected Model	19.654[a]	77	.255
Intercept	873.346	1	873.346
P	.308	2	.154
Item	14.321	25	.573
P * Item	5.026	50	.101
Error	.000	0	.

Total	893.000	78
Corrected Total	19.654	77

Based on Table 2 it can be concluded that the reliability test results using SPSS 18.0 shows the magnitude of interrater variance expressed with Mean Square Item is $S^2s = 0.573$, while the variance error is expressed by Mean Square P* Item is $S^2r = 0.101$. The results of two-way anova calculation, then recalculated with the formula Hoyt and got the result 0.824. This result states that the reliability coefficient obtained is high because >0.7.

This result is also in line with research conducted by Budiono, Susilaningsih and Fatmasari (2016:54). The results of inter rater reliability analysis on research conducted by Budiono showed a value of 0.85. The results of reliability s analysis obtained> 0.7, so it can be concluded that the average assessment of rater agreement has met the criteria value. From the results of the study, Budiono stated that the reliability of the contents of the instrument was analyzed to see if the experts were consistent in assessing the contents of the instrument.

The result of the validation test of the instrument standard instrument of early detection of suspect pulmonary tuberculosis in the second field test can be seen in Table 3.

Table 3. Results of Validity of Instrument Constructs on Second Field Test

Source		Score
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.816
Bartlett's Test of Sphericity	Approx. Chi-Square	3262.158
	Df	325
	Sig.	.000

Based on the results of field trial analysis in Table 3 shows that the KMO and Barlett numbers are 0.816 with a significance of 0.000, then the indicators and samples have met the criteria and can be analyzed further. The next step is to see first the results of anti-correlation analysis, total explained variance explained, Scree Plot and Rotation Component Matrix results. In the result of analysis of Anti image correlation obtained result that number of number which make diagonal (MSA) marked "a" (diagonal direction from top left to right bottom) found no correlation indicator below 0,5.

After the exploratory factor analysis with SPSS 18.0 software is generated also the total variance explained described in Table 4

Table 4. Results Analysis Total Variance Explained Factor Analysis

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	10,943	42.087	42.087	10.943	42.087	42.087	7.255	27.905	27.905
2	3.909	15.034	57.122	3.909	15.034	57.122	3.919	15.072	42.976
3	2.694	10.360	67.481	2.694	10.360	67.481	3.714	14.315	57.491
4	1.835	7.059	74.541	1.835	7.059	74.541	3.714	14.367	71.859
5	1.120	4.309	78.850	1.120	4.309	78.850	1.869	7.181	78.850

Furthermore from the total variance explained result can be concluded that there are 5 factors formed and can represent number of indicator. It can be seen from the 26 items that have been analyzed there are 5 factors that have initial eigenvalues above 1 and the overall result of the explained variance total described in the scree plot in Figure 1.

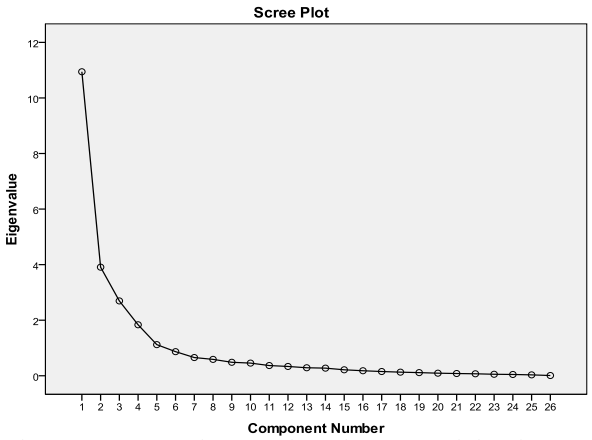

Figure 1. Scree Plot Total Variance Explained Results

Based on Figure 1 it can be seen that the scree plot above appears from factor 1 to 2 decline quite sharply, then from factor 2 to 3 and so also factor 3 to factor 5 but with a smaller slope. On factor 6 and so on the value eigenvalues below 1 so that the number of factors formed from 26 items is 5 factors.

Once it is known there are 5 factors that are formed, then see the rotation component matrix table. In the rotation component matrix table it is concluded that 26 items have a high loading factor on one factor and the loading factor is small enough on other factors. The value of loading factor found in 26 items is >0.3 so items are included in the factors that exist.

This result is in accordance with the pre-existing criteria of acceptable loading factor is >0.3. If each item has a factor loading value> 0.3 then the item is declared to have a validation strong enough to explain the latent konsktruk (Purwanto, 2012:137).

The research is relevant to research conducted by researchers is research Gaol, Khumaedi and Masrukan (2017:68). the resulting Gaol research from the Rotation Component Matrix shows the grouping of 31 items into 8 factors that can be used for the assessment of confident characters and each item has a loading factor >0.3. The results of this study illustrates that factor grouping factors seen from the value of loading factors obtained from each item.

Based on the above description can be concluded that the analysis of the validity of the construct of standard instrument of early detection of pulmonary tuberculosis suspect developed is the formation of 5 factors from 26 items of question. The naming of these factors is respiratory symptoms, environmental sanitation, clean and healthy living behavior, systemic symptoms and nutritional status.

Once the validity of the construct is known, the next step is to test the reliability of the test result instrument in the field. The reliability result obtained in the field test is 0.929. These results indicate that the reliability coefficient obtained is high because the value obtained >0.7 indicates a reliable instrument for use.

This result is in accordance with the existing theory that an instrument is said to have a high reliability if the reliability value obtained >0.7. Measurements that have high reliability are measurements that can produce reliable data (Khumaedi, 2012:29).

The results of research supporting this research are Novitasari, Ridlo and Kristina (2017:88). The Novitasari study concluded that the self-assessment instrument reliability test using Alpha Cronbach was 0.949. This shows that the self-assessment instrument of clinical competency for medical students can be said to be reliable because > 0.7. From the results of the study, Novitasari states that the instrument is said to be reliable if one's response to a consistent or stable statement over time refers to the degree of stability, consistency, predictability, and accuracy.

Other research results that support the research Nugroho, Djunaidi and Rusilowati (2016:6) concluded that based on reliability analysis in the second test conducted through Alpha Cronbach coefficient shows the value of 0.77. These results show the reliability analysis of the reliability

coefficients in the second trial obtained evidence that the performance appraisal instrument illustrates the developed technique developed with a high degree of confidence.

Based on the description of the reliability of the instrument can be concluded that the results of the reliability analysis of standard instruments of early detection of pulmonary tuberculosis suspect developed reliably based on the results of instrument tests in the field. The value obtained is 0.93, indicating that the instrument tested spaciousness has a high reliability coefficient because the results obtained >0.7.

CONCLUSION

Based on the results of research and discussion that has been done, we have obtained the instrument of early detection of suspect tuberculosis lung is valid and reliable. The standard instrument of early detection of suspected pulmonary tuberculosis in families with positive pulmonary tuberculosis patients developed in the form of structured interview structures consists of 26 questions consisting of 10 indocators. These indicators are a common symptom consisting of 2 items, respiratory symptoms consisting of 6 grains, systemic symptoms consisting of 4 grains, the use of a mask consists of 2 items, the physical environment of the house consists of 5 items, nutritional status consists of 2 items, consists of 2 items and spits consisting of 2 items.

Twenty-six instruments of early detection of pulmonary tuberculosis developed and analyzed were considered valid based on expert judgment. Each item gets a value >0.3.

The result of instrument reliability based on expert judgment through two way anova test using SPSS 18.0 software and recalculated with formula Hoyt obtained value of reliability coefficient 0,824. This means that three experts are consistent in assessing the instrument because the reliability coefficient Is >0.7.

Factors formed based on construct validity analysis using Exploratory Factor Analysis (EFA) analyzed by SPSS 18.0 software are 5 factors. Factors formed are respiratory symptoms, environmental sanitation, clean and healthy life behavior, systemic symptoms and nutritional status.

Based on the results of field tests, obtained reliability results are analyzed using the formula KR-20 of 0.93. This result is stated to have a high reliability coefficient because the value obtained >0.7

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