Predictive Indexes of Tuberculosis Case Under Reporting of Hospital in Kudus, Central Java, Indonesia

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ABSTRACT

Under-reporting case of tuberculosis is patients who are not reported to the national TB surveillance system after diagnosis resulting in an inaccurate estimate of TB burden. This study examined some indicators (indexes) leading to tuberculosis under-reporting case in hospital in Kudus city. This study employed Explanatory mixed-methods design. In quantitative study, it assesses nine indicators of under-reporting tuberculosis case to determine how many indicators relating to under-reporting case. Meanwhile in qualitative study it digs the perceptions and information from medical staffs and doctors of hospital regarding the reasons of chosen indicators of under-reporting case. A multilevel logistic regression analysis was conducted for quantitative data, and content analysis for qualitative data. The findings of the quantitative and qualitative parts of study were mixed at the interpretation. This study showed that some indicators relating to under-reporting case of tuberculosis in the multilevel analysis are: 1) doctor's competence (OR=0.09; CI95%= 0.05 to\ 0.17; p<001), 2. Nurse's competence (OR=0.05; CI95%= 0.02 to 0.09; p<001), 3. Nurse's commitment (OR=0.13; CI95%= 0.07 to 0.24; p<001), 4. Smear negative (OR=0.35; CI95%= 0.18 to 0.67; p=0.002), 5. Extra pulmonary TB (OR=15.45; CI95%= 8.08 to 29.51; p<0.001), and 6) hospital management (ICC= 11.24%; CI95%= 2.20% to 41.62%). Meanwhile in qualitative study also supported the finding six indicators relating to under-reporting case of tuberculosis. It can be concluded that there are six indexes relating to tuberculosis under-reporting case in hospital of Kudus.

Keywords: Under-reporting case, tuberculosis, some indexes

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BACKGROUND

TB (Tuberculosis) under-reporting case is patients who are not reported to the national TB surveillance system after diagnosis resulting in an inaccurate estimate of TB burden. This causes delays in starting treatment, thereby prolonging morbidity and increasing the likelihood of subsequent transmission [1].

Study in Kenya (2016) using the inventory study method obtained results about 715 out of 3409 laboratory-registered smear-positive TB cases were not found in the TIBU report in Kenya. The proportion of under-reporting cases of smear-positive TB that were not reported in Kenya was 20.7% (95% CI 18.4-23.0) [2]. Meanwhile, study in Italy (2012) used the record linkage method using TB diagnostic data carried out at the University Hospital in Pisa (UHP) and the Italian Infectious Disease Surveillance system, namely Italian Infectious Diseases Surveillance (IIDS). In the first study of the number of TB patient findings 293 only 80 patients (27%) were not reported 39 of whom were microbiologically confirmed [3].

A study conducted by Garcia et al (2015) stated that of the 592 TB cases or 85 (14.4%) were under-reported cases with the percentage of unreported cases per health service center ranging from 45.2%. Some variables associated with case under-reporting at the multivariate level were smear-negative TB (OR = 1.87; CI: 1.07-3.28), extra

pulmonary disease (OR = 2.07; CI: 1.05-4, 09) and retired patients (OR = 3.04); CI: 1.29-7.18). The percentage of cases reported among smear-positive cases was 9.4% and 19.4% (p = 0.001) among the rest of the study population so that smear-positive TB was not associated with under-reporting cases and the recommendations of the study were assistance from TB case managers can increase the rate of under-reporting [4].

Research conducted in Brazil by Santos et al (2018) stated that TB case under-reporting rate was 29%, and some related indicators were the presence of a clinical form of TB as cavity or pulmonary TB that was not specific or had both types of TB at the time. The proportion of under-reporting found in that study was lower than that observed in other Brazilian studies that accounted for under-reporting of mortality data, so the variables associated with under-reporting of TB were mostly related to the health care system rather than individual characteristics, indicating the need for professional training and health information system properly [5].

A study conducted by *Jetset* (research network) TB Indonesia in 2018 stated that Indonesia in 2017 the incidence of TB cases was 1,020,000, the number of detected cases was 710,000 and TB cases that were notified was 401,130 [6] which can be seen in the following figure.

Figure 1: National data of Tuberculosis case

Figure 1 shows that there are underreporting cases from the number of cases detected with notified cases of 44% or 401,130 cases, so there are around 308,870 cases at the national level that are not reported. Meanwhile, data from the Ministry of Health of the Republic of Indonesia in 2017, Central Java is the region with the 3rd highest coverage of tuberculosis case findings as follows; first West Java with (52,328 cases), second East Java (45,239 cases), and third Central Java with findings of 28,842 cases [7]. In central Java, the number of tuberculosis new cases was on average 76 per 100,000 in all cities and districts meanwhile in

Magelang the number of new cases were at rate of 39.74 per 100,000 being the lowest detection rate among other districts. Kudus district were with 52.87 per 100,000, which means is that this figure is still far below the National SPM where the target is 100% [8]. The results of the DKK Kudus report (2018) on all tuberculosis cases in the sanctuary of the Sunan Kudus Hospital, dr. Loekmono Hadi, Mardirahayu Hospital, Nurussyifa Hospital, Aisyiyah Hospital, Kumalasiwi Hospital, Kartika Hospital, which data for hospitals in Kudus 2018 are as follows:
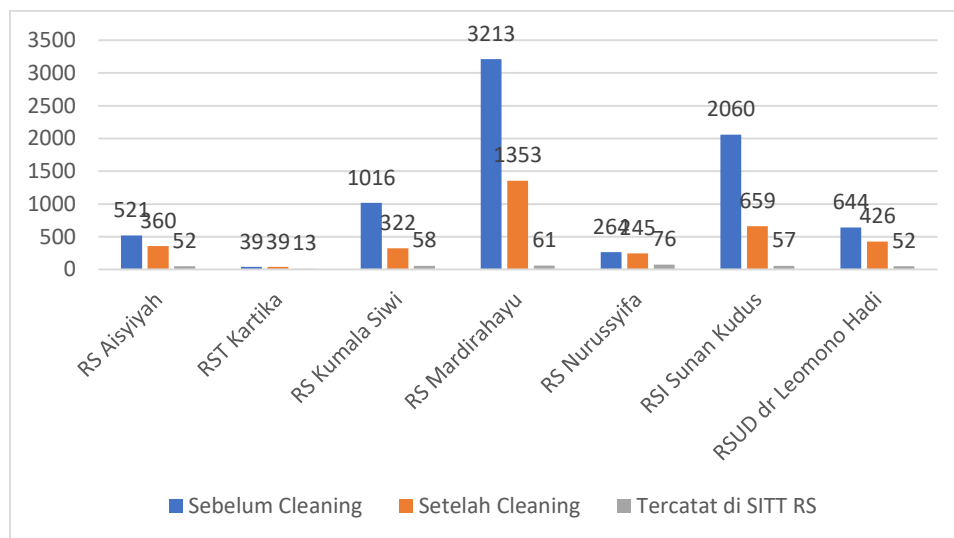

Figure 2: Tuberculosis data in 2018 in Kudus

Based on figure 1, there is difference data between before the cleaning process and after the cleaning process from all medical record data that is in the hospital in Kudus. There are also differences in the medical record data after the cleaning process with the data recorded in the SITT RS where there were cases of tuberculosis that were not reported or under-reported cases of TB at SITT DKK Kudus.

Therefore, this study aims to determine the indicators influencing under-reporting cases of TB at the Hospital in Kudus. This research is expected to help eliminate the 10% level of tuberculosis under-reporting that occurs in the holy from the 44% proportion that occurred nationally based on the 2017 WHO MDGs target and the target of the national TB control program contained in the 2014 National Tuberculosis Control Guidelines.

METHOD
This study used mixed methods sequential explanatory design in the way that this study was combination of quantitative and qualitative research. The mixed methods design in this study was in the form of quantitative research and then continued with qualitative research used to explain quantitative results. In this research design, the data collected at first were quantitative data and analyzed, and then followed by the collection and analysis of qualitative data.

The population for quantitative study were all tuberculosis cases recorded in Kudus, which data were obtained from seven hospitals in Kudus including Kudus Hospital, Kudus Hospital, Mardirahayu Kudus Hospital, Nurussyifa Hospital, Aisyiyah Hospital, Kumalasiwi Hospital, Kartika Hospital, Kudus Health Services (SITT) in

2019. In determining the sample size, the online application www.openepi.com were used by considering the case control calculation based on previous research from Hong et al, 2012 OR = 1.23 and Garcia et al 2015 OR = 2.07 then the average value of the OR is 1.55 therefore the number of samples obtained between 333-350 in each group of cases and controls. In this study, the highest value of the sample range from the openepi formula was 350 so that the case group sample was 350 and the control group sample was 350 and the total sample was 700 tuberculosis data participants. Meanwhile the sample of qualitative study was informants with a purposive sampling technique on criterion-based selection, namely KSM (medical staff group) which includes TB officers who handle TB cases and record TB in health services and doctors who diagnose TB in health services and the total samples were were 35 participants.

In analyzing quantitative data, STATA 6 and Microsoft excel were used for data analysis. Multilevel Logistic regression analysis was done to test the statistical significance of the interaction between data measurement which indicated influence of indicators. *P* value was considered significant at the 95% intervals. Content analysis of the content was done to identify and qualitative data. Moreover, the results of the quantitative and qualitative studies were combined during the interpretation stage in this study. Later on, to elucidate the results of the quantitative study, joint display of quantitative and qualitative findings was done for side-by-side comparisons.

RESULT
Quantitative
Characteristic of participants

Tabel 1: Characteristic of participants in general.

Varible	N (700)	% (100%)
Hospital		
Kartika	62	8.86
Kumalasiwi	24	3.43
Mardirahayu	181	25.86
Nurussyifa	31	4.43
RSA	124	17.71
RSI	117	16.71
RSUD	161	23
Retired		
No	325	46.43
Yes	375	53.57
Hospital Facilities		
Complete	342	48.86
Not complete	358	51.14
Hospital Networking		
Good	366	52.29
Poor	334	47.71
Hospital Commitment		
Weak	212	30.29
Strong	488	69.71
Medical Staff Commitment		
Weak	330	47.14
Strong	370	52.86
Doctors' competence		
Poor	353	50.43
Good	347	49.57
Medical staffs' Competence		
Poor	361	51.57
Good	339	48.43
BTA (Smear)		
Negative	487	69.57

Positive	213	30.43
Type of TB		
Pulmonary	340	48.57
Extra Pulmonary	360	51.43

Based on table 1, the highest number of TB case patients was from several service providers including the highest was 181 or 25.86% and the lowest was 24 or 3.43%. Of the seven hospitals in Kudus city, the highest case of tuberculosis patients was in Mardirahayu Hospital and the lowest case was in Kumalasiwi Hospital. Later on, TB patients retired was 375 or 53.57% higher than those who did not retire including 325 or 46.43%.

TB patients treated with complete hospital infrastructure (48.86%) are lower than incomplete facilities (51.14%). Meanwhile, TB patients treated by a hospital with a good hospital network were (52.29%) and the hospital network was lacking (47.71%). Moreover, TB patients treated by the hospital with weak commitment were (30.29%) and strong commitment was (69.71%). Meanwhile, TB patients handled by health workers with weak commitment were (47.14) and strong commitment were (52.86%). TB patients treated by doctors with less competence were less than 50.42%, and good competence were 49.57%. Meanwhile, TB patients handled by health workers with less competence were 51.57% and good competence was 48.43%. Patients with negative smear was 69.57%, positive smear was 30.43%, pulmonary TB was 48.57% and extra pulmonary was 51.43%.

Univariate analysis

Tabel 2: Bivariate analysis using chi-square test about difference percentage of TB case reporting

Variable Group	TB case reporting status						OR	P
	reported		Not reported		Total			
	N	%	N	%	N	%		
Hospital Facilities								
Complete	155	47.70	170	52.30	325	100	0.80	0.20
Not complete	195	52	180	48	375	100		
Hospital Networking								
Good	168	49.13	174	50.87	342	100	0.93	0.65
Poor	182	50.81	176	49.19	358	100		
Hospital Commitment								
Weak	181	49.45	185	50.55	366	100	0.95	0.76
Strong	169	50.60	165	49.40	334	100		
Medical Staff Commitment								
Weak	100	47.17	112	52.83	212	100	0.97	0.32
Strong	250	51.23	238	48.77	488	100		
Doctors' competence								
Poor	82	24.85	248	75.15	330	100	0.12	<0.001
Good	268	72.77	102	27.56	370	100		
Medical staffs' Competence								
Poor	66	18.70	287	81.30	353	100	0.05	<0.001
Good	284	81.84	63	18.16	347	100		
BTA (Smear)								
Negative	55	15.24	306	84.76	361	100	0.02	<0.001
Positive	295	87.03	44	12.97	339	100		
Type of TB								
Pulmonary	201	41.28	286	58.72	487	100	0.30	<0.001
Extra Pulmonary	149	73.71		26.29	213	100		
Hospital Facilities								
Complete	273		67	19.70	340	100	14.9	<0.001
Not complete	77		283	78.61	360	100		

The results of bivariate analysis with Chi Square test according to status of retired patients in the SITT stated that the percentage of unreported TB patients who had retired (48%) was lower than those who had not retired (52.30%) and had no significant effect with a p value of 0.020 (greater than 0.05). It can be interpreted that tuberculosis patients with retirement status have probability of 0.80 times, that their cases will not be reported at SITT. The percentage of TB patients who were not reported if they had complete facilities (49.19%) was

lower if they had incomplete facilities (50.87%) and did not statistically significant with a p value of 0.65 (greater than 0.05). Based on these results, it can be concluded that a hospital with good facilities and infrastructure has a probability of 0.93 times that the cases are not reported at SITT. That the percentage of TB patients not reported with good networks (49.40%) was lower if they had less network (50.60%) and did not have a statistically significant effect. with a p value of 0.76 (greater than 0.05). Based on these results it can be interpreted that a hospital that has a good network has a probability of 0.80 times that the cases will not be reported at SITT.

The percentage of TB patients was not reported if the commitment of the hospital was strong (48.77%) was lower if the hospital had a weak commitment (52.83%) and had no effect with statistically significant with a p value of 0.32 (greater than 0.05). Based on these results it can be interpreted that a hospital with a strong commitment has a 0.97 times smaller probability of having cases not being reported at SITT. The percentage of TB patients who did not report strong health care commitment (27.56%) was lower if handled by health workers with weak commitment (75.15%) and had an effect statistically significant with a p value less than 0.001. Based on these results, it can be interpreted that health workers with good commitment are 0.20 times less likely to have cases not being reported at SITT. The percentage of TB patients who were not reported when served by doctors with good SITT competence (18.16%) was lower than if served by doctors with less SITT competence (81.30%) and had a statistically significant effect with a p value of less than 0.001. Based on these results, it can be interpreted that doctors with good competence are 0.05 times less likely to have their cases not reported at SITT.

The percentage of TB patients who did not report the competence of good health workers (12.97%) was lower if handled by health workers with less competence (84.76%) statistically significant with a p value less than 0.001. Based on these results, it can be interpreted that health workers with good competence have 0.02 times less chance of having cases not being reported at SITT. The percentage of unreported TB patients with positive smear (26.29%) was lower with negative AFB (58.72%) and had a statistically significant effect on the value p is less than 0.001. Based on these results it can be interpreted that tuberculosis patients with smear positive have a probability of 0.30 times that their cases will not be reported at SITT. The percentage of unreported TB patients with pulmonary TB patients (19.70%) was lower with extrapulmonary TB (78.61%) and had a statistically significant effect. with a p value less than 0.001. Based on these results, it can be interpreted that the type of extra-pulmonary tuberculosis has 14.90 times the possibility of cases not being reported at SITT.

Multilevel Analysis
Table 3 presents the results of a multilevel analysis of individual factors and institutional contextual factors (RS) that affect the incidence of underreported cases in tuberculosis patients in Kudus. The factors that are located at level 1 (individual) are examined for their effects which are fixed (fixed effect). Various factors at level 2 that are higher, namely the hospital, are examined for their institutional contextual influence in a unit that is random (random effect).

Multilevel analysis was performed on a sample of TB patients of n = 700 who visited the hospital in Kudus. The sample was selected using a fixed disease sampling technique, with a sample size ratio of unreported TB cases: reported TB cases = 350: 350. There were 7 hospitals studied, with the lowest TB patient sample size of 24 patients (lowest) to 181 patients (highest) per hospital, with an average of 100 patients per hospital.

Table 3: Multilevel analysis toward indicators relating to under-reporting case of tuberculosis

Independent variable	Odds Ratio	Confidence Interval 95%		P
		Batas Bawah	Batas Atas	
Fixed Effect (Level 1):				
Doctor's competence (Good)	0.09	0.05	0.17	<0.001
Medical Staff 's competence (Good)	0.05	0.02	0.09	<0.001
Medical staff's commitment (Strong)	0.13	0.07	0.24	<0.001
Smear (Positive)	0.35	0.18	0.67	0.002
TB types(Ekstra-Pulmoner)	15.45	8.08	29.51	<0.001
Constan	13.24	5.54	31.66	<0.001
Random Effect (Level 2):				
Hospital				
Variant (Constanta)	0.42		0.07	2.35
N observation	700			
Groups (RS)	7			
N observation/ Group (RS)	Min= 24			
	Mean= 100			
	Maks= 181			
Log likelihood	-152.87			

LR test vs. logistic regression	p=0.009			
p (all)	<0.001			
Inh8ugtraclass correlation (ICC)	11.24%	2.20%	41.62%	

The Effect of Doctor Competence on the Incidence of Unreported Cases

There is an effect of doctor competence in the tuberculosis integrated information system (SITT) on the incidence of unreported cases. TB patients who were examined by doctors with good competence were less likely to be reported than those examined by doctors with less competence (OR = 0.09; 95% CI = 0.05 to 0.17; p <001).

Effect of Competency of Health Workers on Unreported Cases

There is an effect of the competence of health workers in the tuberculosis integrated information system (SITT) on the incidence of unreported cases. TB patients whose information was recorded by health workers with good competence were less likely to be reported than recorded by health workers with less competence (OR = 0.05; 95% CI = 0.02 to 0.09; p <001).

Effect of Commitment of Health Workers on Unreported Cases

There is an effect of commitment of health workers in the tuberculosis integrated information system (SITT) on the incidence of cases not being reported. TB patients served by highly committed health personnel were less likely to be reported than those served by weakly committed health personnel (OR = 0.13; 95% CI = 0.07 to 0.24; p <001).

Effect of BTA Patient Status on the Incidence of Unreported Cases

There is an effect of the patient's AFB status on the incidence of underreported cases. TB patients with smear positive were less likely to be reported than smear negative (OR = 0.35; 95% CI = 0.18 to 0.67; p = 0.002).

Effect of Tuberculosis Type on the Incidence of Unreported Cases

There is an effect of the type of tuberculosis of TB patients on the incidence of underreported cases. Extra-pulmonary TB patients were more likely to go unreported than pulmonary TB (OR = 15.45; 95% CI = 8.08 to 29.51; p <0.001).

Influence of Institutional Contextual on Unreported Cases

There is an influence of hospital institutional contextual factors on the incidence of underreported cases. Intraclass correlation shows that the influence of hospital institutional contextual factors explains 11.24% of the variation in the incidence of unreported TB cases (ICC = 11.24%; 95% CI = 2.20% to 41.62%). ICC = 11.24% exceeds the rule of thumb regarding the contextual influence, which is considered quite large, namely ICC = 8-10%.

Qualitative

The results of the quantitative analysis show that the commitment of health workers, the competence of doctors, the competence of health workers, BTA and type of TB and institutional hospitals have an effect on TB cases not reported in SITT. The results of the quantitative analysis were further studied using in-dept interview to 35 taken by purposive sampling. Indept interviews were conducted to find out in depth about the explanation of unreported TB cases according to influencing variables. The results of the in-depth interview analysis are presented as follows.

Tabel 4: The results of the in-depth interview analysis

variables	Result of interview
Doctor's competence	*…they (doctors) here are based on their expert…(I4)* *I conduct examination based on diagnosis case management… (I2)* *…they (doctors) who met the criteria can report the TB case correctly…(I7)*
Health worker's competence	*… Already done according to the treatment protocol, but there are still obstacles in adjusting the isolation area which is still one with regular hospitalization …(5)* *the nurse listens to the complaints felt by patients both due to side effects of drugs and health conditions…(11)* *… It has been implemented properly, for reporting and recording by nurses . and every month there is also a report to the local DKK …(4)*
Health worker's commitment	*… Already done according to the treatment protocol, but there are still obstacles in adjusting the isolation area which is still one with regular hospitalization . … (2)* *always carry out the implementation in accordance with the results of nursing care that is medical and nursing tuberculosis. … Yes ,, we give access to patients to contact us, related …(26)* *Every intervention is always evaluated in order to improve the performance of nurses … (22)* *Yes using the SITB system (tuberculosis information system… (29)*
Patient's smear	*… There was a case. … (8)* *No, because every patient who is examined at the hospital will always have a history recorded … (10)* *There was a case. … (16)* *There have been negative TB cases…(18)*
Type of Tuberculosis	*… No cases… … No, all medical history must be recorded and reported… … Doctors and the TB case management team at the hospital*

Hospital Management	*Strengthening internal networks with other health facilities in this case PKM and regional village cadres who have TB patients who go to the hospital 1. Patients enrolled through rajal pa ranap 2. If the suspect or TB is suspected, he will carry out sputum support examinations (microscopic or TCM) and chest X-ray radiology 3. If the results of the examination and support lead to TB, TB treatment will be carried out according to the case and through prior education to the patient and family ...(19)*
	3. Through the registration system, validation of symptoms leading to TB, supporting examinations consisting of BTA tests, X-rays, blood etc., diagnosis of TB, intervention of TB patients, implementation and evaluation of TB procedures Patient list.
	...Determine the diagnosis by looking at signs and symptoms for PPE, the officers are fulfilled, but for the patient and the patient's family is sometimes lacking. (16)
	there is a TB dots room, the groove is separate, the sputum / sputum collection room is available I did That's enough Through the Rs website, suggestion box, sms, direct complaints to care solutions etc. (21)
	Through the suggestion box or contact the customer complaint CP Through the RS website, sms, suggestion box or customer complaint CP (29)

Doctors in hospitals in Kudus are in accordance with their expertise, although there are a few who have not. In addition, doctors at the hospital have carried out examinations according to the diagnosis and case management, but there was one respondent who stated that it was not in accordance with the procedure for diagnosis and case management and the doctor at the hospital in Kudus had not carried out the diagnosis according to the results of the examination by 2 respondents. The rest they stated that the doctor had carried out the diagnosis according to the results of the examination and the doctor who had met the criteria above the tuberculosis case handled was reported well at SITT.

Health personnel in the hospital are able to administer and manage sputum specimens properly. In addition, health workers at the hospital always maintain communication and interaction with patients and health workers at the hospital take action according to the doctor's direction. Health workers in hospitals do not experience problems in reporting cases so that health workers who have the competence are mostly tuberculosis cases handled well reported at SITT. nurses have handled TB cases in accordance with the protocol set by the hospital. In addition, the nurse always documents the results of the tuberculosis patient care that has been given and the nurse has carried out a reciprocal response to the patient.

Performance evaluation of TS case handling by TB officers in hospitals has been implemented properly and the recording and reporting system of TB cases has been implemented properly by nurses at the hospital. There is no diagnosis result of the negative smear status of TB patients who are not reported at the SITT, in other words most of the smear negative cases have been reported, besides that those who have the authority to report TB cases are doctors and the hospital TB case management team. Some hospitals in Kudus Regency have diagnosed TB (Extra Lung) but there are hospitals that do not diagnose Extra Pulmonary TB at all, there are no cases of tuberculosis that have not been reported or in other words all cases have been reported at SITT and doctors and TB officers have the authority to reported TB cases in hospital. Implementation of TB case services in hospitals is in accordance with law number 25 of 2009, besides that the hospital has made several efforts to overcome public service constraints in the implementation of Tuberculosis case services in hospitals. Furthermore, the hospital has implemented appropriate procedures to obtain TB case services (inpatient and outpatient) at the hospital and the

facilities at the hospital are sufficient both in terms of parking lots, medical equipment etc. in serving TB cases.

DISCUSSION
Doctor's Competence and Unreported Cases
Based on the results of quantitative research, it can be concluded that there is an effect of doctor's competence in the tuberculosis integrated information system (SITT) on the incidence of unreported cases where TB patients who are examined by doctors with good competence are 0.09 times less likely to be reported than being examined by doctors with less competence. Meanwhile, the qualitative research results also show that doctors with good competence have a small possibility that cases handled are not reported at the SITT. The results of the indept interview regarding the competence of doctors show that doctors in hospitals in Kudus are in accordance with their expertise, although there are a few who have not. In addition, doctors at the hospital have carried out examinations according to the diagnosis and case management, but there was one respondent who stated that it was not in accordance with the procedure for diagnosis and case management and the doctor at the hospital in Kudus had not carried out the diagnosis according to the results of the examination by 2 respondents. The rest of them stated that the doctor had carried out the diagnosis according to the results of the examination. The indept interview results also stated that the doctors at the hospital in Kudus already knew the process and procedure for reporting cases. From the results of the qualitative research, it states that the procedures for diagnosis and case management are correct and an understanding of the procedure for reporting cases and based on the results of the study also states that doctors with good competence can carry out examination procedures and diagnose cases correctly so that cases are unlikely to be reported at SITT.

The results of this study are reinforced by the results of research conducted by Dzou et al (2019) which states that heavy workloads and bad incentives affect the competence of doctors in being responsible for reporting TB cases. The results of the study were in two Chinese hospitals and contributed to the rate of under-reporting of cases and similar findings have been reported in Namibia, India and Bangladesh where a lack of physician competence contributed to under-reporting [9]. Research conducted by Apkekar et al (2017) states that more than three-quarters of the 8 million registered doctors in India are involved in private medical practice. The results show that

low-income private doctors in big cities in India have poor knowledge of TB diagnosis and treatment and lack of awareness and perception of public health services available for TB control. This study reveals the gaps and weaknesses in the reported practice of private doctors in treating pulmonary TB, the most important and persistent problem of public health problems in India and the need for organized efforts to engage private doctors in disease control programs where their curative function can contribute significantly[10].

The research conducted by Rosma et al (2016) aims to investigate the condition of current TB case reporting in the Babakan Primary Health Center in Surabaya (PHC) by doctors and evaluate several factors that might influence the behavior of private practitioners related to reporting TB cases to PHC. The results of the study found that there were four factors that influenced the reporting of TB cases by PPs to the PHC, including self-awareness, ignorance, lack of time, and poor implementation of recording-reporting at PHC. The level of self-awareness was significantly associated with TB case reporting by doctors (p <0.05). The involvement of the private sector, the increase in follow-up treatment reports, and the use of electronic-based reporting were considered important by participants to establish an established recording-reporting system for TB cases [11].

Competency of Health Workers and Unreported Cases
Based on the results of quantitative research, it can be concluded that there is an effect of the competence of health workers in the Tuberculosis Integrated Information System (SITT) on the incidence of unreported cases where TB patients whose information is recorded by health personnel with good competence are 0.05 times less likely to be reported than recorded by personnel. health with less competence. In other words, health workers who have less competence are likely to have their cases reported at SITT. Meanwhile, the qualitative research results also show that health workers with good competence have a small possibility that cases handled are not reported at SITT. The results of indept interviews regarding the competence of health workers show that health workers in hospitals are able to administer and manage sputum specimens properly. In addition, health workers at the hospital always maintain communication and interaction with patients and health workers at the hospital take action according to the doctor's direction. The results of the indept interview also stated that health workers at the hospital did not experience problems in reporting cases. The qualitative research results also support that nurses who have good competence have a tendency to report TB cases to SITT well. In the qualitative research results, it is stated that competent nurses are shown by the quality of attitudes, motives, insight of nurses, ability to interpret, the ability to accept something new, maturity of mind, and self-assessment in treating tuberculosis cases in the hospital. And the conclusion of the qualitative research carried out with the in-dept interview method stated that health workers with good competence have the ability to report tuberculosis cases well too.

The results of this study were covered by research by Hong et al. (2012) which stated in their research that work stress and nurse fatigue were higher than doctors and the level of nurse empowerment was lower than doctors in the TB department in Korean public health institutions, thus affecting the performance and competence of nurses in carrying out task in handling and reporting TB cases [12]. Previous studies have shown that registered nurses

working in acute care hospitals in Sweden have lower job satisfaction in larger hospitals and have an effect on the performance and competence of the nurses. In our study, the job satisfaction of TB management nurses at the National Medical Center, the largest participating hospital was the lowest among public health institutions. Also, our study found that the burnout score of nurses in the TB department at the National Medical Center was significantly higher than the score for physicians. These results can be explained by the heavy workload and concerns about TB infection due to the National Medical Center's selection of priority inpatients for severe and highly contagious TB patients such as MDR-TB patients. This study shows that the number of co-workers is associated with job satisfaction among TB management nurses. In a previous study in private hospitals in Korea, the job satisfaction of nurses in institutions with more than two TB control nurses was higher than nurses in institutions with only one TB control nurse. In an environment with more than two TB management nurses, it is estimated that division of tasks, cooperation, participation in external training during shifts, and effective communication results in increased job satisfaction related to performance [13].

Commitment of Health Workers and Unreported Cases
Based on the results of this study, it shows that there is an effect of commitment of health workers in the integrated tuberculosis information system (SITT) on the incidence of unreported cases where TB patients who are served by health workers with a strong commitment have 0.13 times less chance of not being reported than being served by health workers weak commitment. Meanwhile, the qualitative research results also show that health workers with strong commitment have a small possibility that cases handled are not reported at SITT. The results of the indept interview regarding the commitment of health workers (nurses) that nurses have handled TB cases according to the protocol set by the hospital. In addition, the nurse always documents the results of the tuberculosis patient care that has been given and the nurse has carried out a reciprocal response to the patient. Furthermore, the results of the indept interview stated that the performance evaluation of TS case handling by TB officers in the hospital had been carried out properly and the recording and reporting system of TB cases had been carried out properly by nurses at the hospital.

In qualitative research, it was found that the commitment of TB laboratory staff with good categories with competency in tuberculosis cases was correctly reported to SITT. The results of qualitative research also support that TB cases handled by officers with good commitment will be properly reported to the SITT. While the qualitative research results also show that health workers with good competence have a small possibility that cases handled are not reported at SITT.

The results of the study by Melosini et al (2012) stated that several reasons can be considered to explain the under-reporting rate due to the lack of commitment by health personnel in handling tuberculosis cases in the first case, some Units have not informed their TB cases and, in general, there are poor communication between different UHP units and Cleaning Office as shown by incomplete overlap between two different registers. The second reason that can explain why the data is incomplete is the extreme spread of TB cases in too many different Units (nearly 16) in our Hospital. Another point may be the inaccuracy of the TB code reported in HDR. We were able,

indeed, to confirm a diagnosis of active TB (by direct CRF examination) in 93% of cases coded for TB in the first HDR position, compared to only 56% of cases coded for TB in second or following the HDR position, with positive predictive values. height only for the TB code in the first position. This represents a limit to the accuracy of this evaluation and suggests that other, more accurate methods of defining active TB should be considered[3].

Smears against and Unreported Cases

The results of the quantitative study of this study stated that there was an effect of the patient's AFB smear status on the incidence of unreported cases where TB patients with smear positive were 0.35 times less likely to be reported than negative AFB. The results of the qualitative study also stated that it was easier for patients with positive smear to report their cases at SITT because of the complete data starting from examination to diagnosis. So it can be concluded from the results of the indept interview that there was no diagnosis of the negative smear status of TB patients that were not reported at the SITT, in other words most cases of negative smear had been reported but unlike positive smear, which was 100%, other than that who had the authority to report TB cases are doctors and the hospital TB case management team. So that tuberculosis patients with positive smear will be greater reported than negative smear.

Studies of the association between unreported cases and extrapulmonary TB and smear-negative TB where diagnosis may be delayed or without histology or microbiological culture. This is explained in many other studies and may be due to the fact that providers think that transmission is lower among these cases and that reporting TB cases to public health departments is important to identify affected patients immediately so as to reduce transmission, to calculate accurate incidence. and also to identify TB index cases, Smear-positive TB patients are more contagious so case reporting and contact tracing are very important and easy to implement. In that study it was found that 9.4% of smear-positive cases were underreported and lower than rates described in other studies. Most of the cases diagnosed and reported were from the emergency department and specialty clinics in our study as well as from other published studies and half were diagnosed in the emergency department and case detection in the primary care setting is essential for early diagnosis and eventual disease control.

The results of the study on the under-reporting of TB cases in Kenya were largest in areas with high TB burden with one in three smear positive cases unknown to the NTLD Program in some areas where high patient burden at these facilities could affect the quality of recording and accuracy. health service time, so as to lower reporting rates. The TB surveillance evaluation in Kenya highlighted that health centers and hospitals have challenges in maintaining complete TB records for patients and the underreported rate is also significantly higher among patients with few smears perhaps because clinics can focus on contacting the most contagious patients, while those with the slightest smear are left to seek treatment on their own. Nonetheless, hundreds of highly contagious smear positive patients were diagnosed but not reported at TIBU, raising concerns about continued disease transmission [2].

Types of Tuberculosis and Incidence of Unreported Cases

The results of this quantitative study indicate that there is an effect of the type of tuberculosis of TB patients on the incidence of unreported cases where extra-pulmonary TB patients are 15.45 times more likely to be unreported than pulmonary TB. Meanwhile, the qualitative research results also confirmed that extrapulmonary tuberculosis cases were less reported than pulmonary tuberculosis. The results of the indept interview show that some hospitals in Kudus Regency have diagnosed TB (Extra Lung) but there are hospitals that do not diagnose Extra pulmonary TB at all, there are no tuberculosis cases that are not reported or in other words all cases are reported at SITT and doctors and TB officers who has the authority to report TB cases in the hospital. We also found an association between unreported cases and extrapulmonary TB and smear-negative TB, in which diagnosis may be delayed or without histology or microbiological culture. Nonetheless, reporting TB cases to the public health department is important to identify affected patients immediately so as to reduce transmission, to calculate the incidence accurately, and also to identify TB index cases.

Institutional Contextual and Unreported Cases

There is an influence of hospital institutional contextual factors on the incidence of unreported cases where the intraclass correlation shows that the influence of hospital institutional contextual factors explains as much as 11.24% (greater than 8-10%) the variation in the incidence of unreported TB cases. The results of the qualitative study also confirmed that hospital management would determine whether or not the tuberculosis cases were reported at SITT. The results of the indept interview stated that the implementation of TB case services in hospitals was in accordance with law number 25 of 2009, besides that the hospital had made several efforts to overcome public service constraints in the implementation of TB case services in hospitals. Furthermore, the hospital has implemented appropriate procedures to obtain TB case services (inpatient and outpatient) at the hospital and the facilities at the hospital are sufficient both in terms of parking lots, medical equipment etc. in serving TB cases. The indept interview results also state the mechanism for complaints / complaints from patients due to dissatisfaction with TB case services at home.

Research conducted by Hong et al (2018) states that the second main factor associated with under-reporting is the hospital health information management system. This study found that Chinese hospitals use different operating systems to record patient information and transfer the information to different TB reporting systems. Using different reporting systems, organizations collect different information about TB patients and cases, making uniform data difficult to collect at the national level. Like China, health information management systems in many low- and middle-income countries are fragmented and often include multiple vertical systems designed to meet the requirements of national governments or international organizations / donors. As a result, the same problems occur in other low- and middle-income countries. For example, in Indonesia, the reporting forms for each health center are different, which results in missing data and hinders the data standardization process [14].

CONCLUSION

TB cases are less likely to go unreported if: (a) Doctor competence in SITT is good (OR = 0.09; 95% CI = 0.05 to 0.17; p <001); (b) Competence of health workers in SITT is good (OR = 0.05; 95% CI = 0.02 to 0.09; p <001); (c) Commitment of health workers in SITT was strong (OR = 0.13; 95% CI = 0.07 to 0.24; p <001), and (d) The patient's status was smear positive (OR = 0.35; 95% CI = 0.18 to 0.67; p = 0.002).

TB cases were more likely to go unreported if the type of tuberculosis was extra-pulmonary (OR = 15.45; 95% CI = 8.08 to 29.51; p <0.001). There is an influence of hospital institutional contextual factors on the incidence of underreported cases (ICC = 11.24%). In other words, there is a variation in the incidence of unreported TB cases between hospitals that are related to hospital organizational-institutional factors. There is no influence of pension factors, facilities and infrastructure, hospital networks and hospital commitment to the incidence of TB cases not reported in the SITT.

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