FACTOR RELATED TO DEFAULT AMONG TUBERCULOSIS PATIENTS TREATMENT WITH DOTS PROGRAM IN KOTAMOBAGU SUBDISTRICT, NORTH SULAWESI PROVINCE, INDONESIA

SAHARA ALBUGIS

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.....
Mrs.Sahara Albugis
Candidate

.....
Assoc.Prof. Boonyong Keiwkarnka
Dr.P.H.
Major-Advisor

.....
Prof. Santhat Sermsri
Ph.D.
Co-Advisor

.....
Mr. Thaval Poblap
M.D., Ph.D.
Co-Advisor

.....
Assoc.Prof. Rassmidara Hoonsawat
Ph.D.
Dean
Faculty of Graduate Studies

.....
Assoc.Prof. Sirikul Isaranurug
M.D., Dip.Thai Board of Pediatrics
Chair
Master of Primary Health Care Management
ASEAN Institute for Health Development

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on
March 14 , 2005

.....
Mrs.Sahara Albugis
Candidate

.....
Assoc.Prof. Boonyong Keiwkarnka
Dr.P.H.
Chair

.....
Prof. Santhat Sermsri
Ph.D.
Member

.....
Asst.Prof. Junya Pattaraarchachai
Sc.D.
Member

.....
Mr. Thaval Poblap
M.D., Ph.D.
Member

.....
Assoc.Prof. Rassmidara Hoonsawat
Ph.D.
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Mahidol University

.....
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Director
ASEAN Innstitute for Health Development
Mahidol University

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Sahara Albugis

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SAHARA ALBUGIS 4737948 ADPM / M

M.P.H.M. (PRIMARY HEALTH CARE MANAGEMENT)

THESIS ADVISOR: BOONYONG KEIWKARNKA Dr.P.H., SANTHAT SERMSRI Ph.D., THAVAL POBLAP M.D., Ph.D.

ABSTRACT

A cross sectional descriptive study was conducted among two hundred of patients being treated for tuberculosis under the directly observed therapy short course (DOTS) program in Kotamobagu subdistrict, Indonesia. The objective was to identify factors related to default among tuberculosis patients treated in a DOTS program. Data was collected on January 17 to February 4, 2005 by interview questionnaire designed by researcher.

Nearly one half (45.5 %) of respondents were found in the 15 – 34 age group. More than one half (56.0 %) were male, had secondary school and higher and were farmers. Almost two thirds (65.5 %) had a monthly family income less than or equal to 556,553 rupiah.

The result of this study showed that 11 percent of the patients had default behavior with their treatment. There were significant association between marital status (p-value = .001), occupation status (p-value = .042), availability of drugs (p-value = .000) and default of patients tuberculosis treatment. Female, single people, unemployed people, and patients with less access to drugs were more likely to default. There was no significant association between age, gender, family income, knowledge, attitude, availability of health providers, time for traveling, and cost for traveling, family support and default of patients treatment in this study area.

The patients who had completed treatment could be members of the Social Welfare Support Program to set a good example of cured tuberculosis patients. They could act as educators to those patients who are under treatment and encourage them to complete treatment to get cured of the disease.

KEY WORDS: TUBERCULOSIS/DEFAULT/DOTS

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LIST OF ABBREVIATIONS

WHO : World Health Organization

DOTS : Directly Observed Therapy Short course

TB : Tuberculosis

SS^+ : Sputum smears positive

SS^- : Sputum smears negative

HIV : Human Immune Deficiency Viral

AIDS : Acquired Immune Deficiency Syndrome

NTP : National Tuberculosis Program

HBM : Health Belief Model

CHAPTER 1
INTRODUCTION

1.1 Rational and Justification

Tuberculosis is an infection, often of long-term duration, caused by 2 species of Family Mycobacteriaceae, Order Actinomycetales—M.tuberculosis and M.bovis which are transmitted through unpasteurized milk. These mycobacteria can cause disease in virtually every organ system in the body, but prominently occur in the lungs. The disease is characterized histological by a granuloma formation. (1)

Robert Koch (1882) first described the tubercle bacillus. They are slender, rod-shaped, aerobic, non-spore forming and non motile bacteria. One of the most striking features of these bacilli is their acid fastness i.e.: they are difficult to stain. Once stained, they strongly retain the dye, which is not removed even by acid school. They can also be stained with fluorescent dyes. The bacteria are 2-4 mm long and 0, 2-0, 5 mm wide in size. (1)

Tuberculosis is a contagious disease. Like the common cold, it spreads through the air. Only people who are sick with tuberculosis in their lungs are infectious. When infectious people cough, sneeze, talk or spit, they propel tuberculosis germs, known as bacilli, into the air. A person needs only to inhale a small number of these to be infected. Left untreated, each person with the active tuberculosis disease will infect on average between 10 and 15 people every year, but people infected with tuberculosis bacilli will not necessarily become sick with the disease. The immune system “walls off” the TB bacilli which, protected by a thick waxy coat, can lie dormant for years. When someone’s immune system is weakened, the chances of becoming sick are greater. (2)

Tuberculosis is a leading public health problem worldwide and particularly in developing countries. In view of the seriousness of the problem, WHO, in 1993,

declared it to be a Global Emergency. Of the 1.7 billion people estimated to be infected with the TB bacillus, 1.3 billion live in developing countries. At the present time, it is estimated that there are 16-20 million cases worldwide with 8 million new cases every year. Two million of these people die every year. These constitute 26% of eminently avoidable adult deaths worldwide. (3)

The problem of tuberculosis is acute in developing countries which account for about 95% of tuberculosis cases, with the South-East Asia Region, Western Pacific and Africa the worst affected regions. With 25% of the worlds population the S-E-A-R- carries a disproportionate 40% of world's burden of tuberculosis. (4)

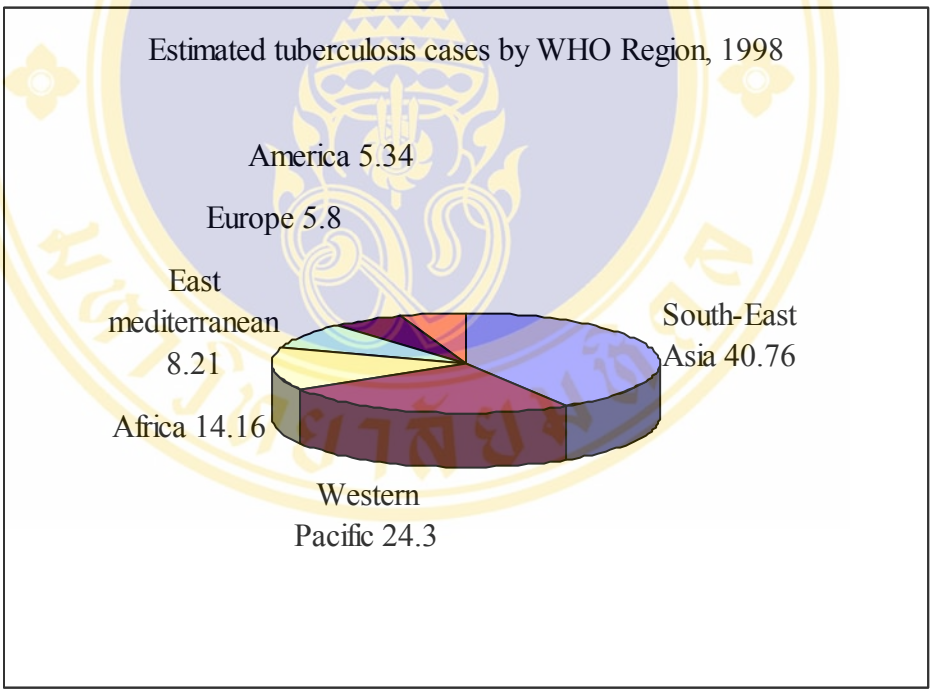

Figure 1 Estimated Tuberculosis Cases by WHO (3)

In the South East Asia region, nearly 3 million cases and 700,000 deaths occur every year, five countries: Bangladesh, India, **Indonesia**, Myanmar and Thailand account for 95% of these deaths. This morbidity and mortality occur, mainly in the economically productive age between 15-60 years, directly affecting each nation's

economy. The situation is likely to be further complicated by the rapidly expanding HIV/AIDS epidemic and the emergence of multi-drug resistant strains of TB.

Many cases remain undiagnosed, primarily due to the failure of health systems to promptly diagnose and properly treat those who seek care. Patients also require information on the progress of TB and the location of the diagnostic facilities. Of patients diagnosed, less than half of those in a program completed treatment. Patients who do not complete treatment may continue to infect others in the community. It is estimated that one infectious patient infects an average of 10-15 people. The Region's persistent problems of poverty, rapid population growth, increasing migration and poor health infrastructure for implementation of National health programs have only added to the grim scenario.

Patients who do not complete their treatment or who take treatment irregularly on account of inadequate prescribing, unreliable drug supplies, poor patient motivation or finances, or other reasons can develop Multidrug Resistant TB. MDR-TB is difficult and very expensive to treat.

HIV is an important risk factor for the development of tuberculosis. As a result, in many areas, a parallel epidemic of TB is following the AIDS pandemic. It is estimated that in the next 3-5 years, 20-250% of TB cases in some parts of the SEA Region could be directly attributed to HIV. HIV associated TB is more difficult to diagnose, although response to short courses of treatment is usually good.

In Indonesia there are at least half a million new cases of TB per year and 175.000 deaths. Tuberculosis is the second killer of adults after cardiovascular disease and the most important killer out of all the communicable diseases. (5)

Tuberculosis (TB) is the third major cause of mortality in Indonesia. This nation of 17,000 islands and 207 million inhabitants (1999) ranks third on WHO's list of high burden countries (2000). According to the 1995 National Health Household Survey on morbidity patterns, TB ranks 7^{th,} with a prevalence rate of 4.2 per 1000

population. The WHO Global Surveillance and Monitoring Project estimated the national TB incidence to be 583,000 (all cases) and 262,000 (new smear positive cases) per year. Based upon the World Bank's DALY (Disability Adjusted Life Year) calculations, TB is responsible for 7.7% of the total disease burden in Indonesia, whereas the average rate for neighboring countries is about 4%.[6]

Table 1 New Case Sputum Smear Positive according to Gender and Province in Indonesia, 2001

No	Province	Male		Female		Total
		No	%	No	%	
1	Aceh	534	64.3	297	35.7	831
2	North Sumatera	616	64.0	347	36.0	963
3	West Sumatera	-	-	-	-	-
4	Riau	-	-	-	-	-
5	Jambi	321	61.3	203	38.7	524
6	South Sumatera	1,319	60.3	867	39.7	2,186
7	Bengkulu	190	54.9	156	45.1	346
8	Lampung	194	55.4	156	44.6	350
9	Bangka Belitung	0	0	3	100.0	3

Table 1 New Case Sputum Smear Positive according to Gender and Province in Indonesia, 2001 (cont.)

No	Province	Male		Female		Total
		No	%	No	%	
10	DKI Jakarta	1,560	58.6	1,101	41.4	2,661
11	West Jawa	175	49.6	178	50.4	353
12	Center Jawa	415	53.1	366	46.9	781
13	DI Yogyakarta	-	-	-	-	-
14	East Jawa	-	-	-	-	-
15	Banten	-	-	-	-	-
16	Bali	-	-	-	-	-
17	NTB	1,052	60.4	690	39.6	1,742
18	NTT	-	-	-	-	-
19	West Kalimantan	314	65.1	168	34.9	482
20	Center Kalimantan	-	-	-	-	-
21	South Kalimantan	-	-	-	-	-
22	East Kalimantan	-	-	-	-	-
23	**North Sulawesi**	**1,014**	**61.3**	**641**	**38.7**	**1,655**
24	Center Sulawesi	-	-	-	-	-
25	South Sulawesi	-	-	-	-	-
26	Southeast Sulawesi	373	57.2	279	42.8	652
27	Gorontalo	-	-	-	-	-
28	Maluku	-	-	-	-	-
29	North Maluku	-	-	-	-	-
30	Papua	179	66.1	92	33.9	271
Indonesia		**8,256**	**59.8**	**5,544**	**40.2**	**13,800**

Source : Ditjen PPM-L, Depkes RI [6]

North Sulawesi is one of the 33 provinces in the Republic of Indonesia, with its capital city being Manado. This region, with an area of 1,533,698 ha, is located at $0^0 30^{'}$-$4^0 3^{'}$ North Latitude and $121^0 127^{'}$ East Longitude. Based on the regional government system, North Sulawesi is subdivided into the Manado Municipality, **Bolaang Mongondow District**, Sangihe Talaud District and Bitung Municipality. To the North this region borders on the Republic of the Philippines, Sulawesi Sea and the Pacific Ocean. The Eastern part is on the Maluku Sea and the on the Southern side is the Tomini Gulf. The western part borders Gorontalo Province, which until the end of 2000 was a part of North Sulawesi and then became its own province. [7, 8, 9] Bolaang Mongondow (usually shortened to Bolmong) is situated between Minahasa and Gorontalo on the Minahasa peninsula. With a total area of 8, 358, 04 km^2 it is one of the largest Districts in North Sulawesi. It comprises 17 sub districts and 267 villages. Seven sub districts are situated along the mountainous north coast, 4 along the less inhabited and less developed southern coast and 4 in the middle irrigated lowland. The district capital, **Kotamobagu** has a population of 2.112,77 (in 2002). Overall Bolmong has a low average population density due to large unpopulated areas which have been given over as a National park. [10]

From data Susenas (2002), has the population of 448,040, consists of 232,935 men (51.99%) and 215,105 women (48.01%). There are 112,384 households with an average of 4 people/household.

Table 2 Cases of Tuberculosis in Bolaang Mongondow District

Years	**Tuberculosis cases**	
	Suspect	**New cases**
2002	4,946	449
2003	6,338	662
2004	6,340	687

Source : Health office Bolaang Mongondow District [11]

Figure 2 Population Distribution according Age and Gender [11]

Of the population over 10 years old, most completed Primary School (29.10%) while 21.13 % had no or not yet completed Primary School had not or not yet completed primary school and others had 49.77%. The illiterate percentage in 1999 was 96%. The total number of poor villages in Bolmong district in 2001 was 100 villages (37.45%) from a total of 267 villages. Number of morbidity cases in the district of Bolmong caused by upper respiratory tract infection, malaria, and tuberculosis was 25.80%, 17.70%, and 13.08% respectively. [11]

During August to December 2004, the data show that positive tuberculosis cases in Kotamobagu subdistrict was 200 patients, of which with 11.0 percent of the patients had default behavior with their treatment.

1.2 Research Questions

What are the factors related to default among tuberculosis patients treated in a (Directly Observed Treatment Short Course) DOTS program in Kotamobagu subdistrict, North Sulawesi province, Indonesia.

1.3 Research Objectives

1.3.1 General Objectives

To identify factors related to default among tuberculosis patients treated in a DOTS program in Kotamobagu subdistrict, North Sulawesi province, Indonesia.

1.3.2 Specific Objectives

1. To examine the default among tuberculosis patients treated in the DOTS program in Kotamobagu subdistrict, North Sulawesi province, Indonesia.
2. To identify the predisposing factors (age, gender, marital status, family income, education, occupation, knowledge, and attitude); enabling factors (availability of drugs, availability of health providers, and time for traveling and cost of traveling); reinforcing factors (family members' support) among tuberculosis patients.
3. To examine the relationship between default tuberculosis patients and predisposing factors, enabling factors and reinforcing factors

1.4 Research Hypothesis

1. There are associations between default of tuberculosis patients' treatment with DOTS and predisposing factors including age, gender, marital status, family income, education, occupation, knowledge, and attitude.
2. There are associations between default of tuberculosis patients' treatment with DOTS and enabling factors including availability of drugs, availability of health providers, time for traveling, and cost of traveling.
3. There is an association between default of tuberculosis patients' treatment with DOTS and reinforcing factors such as family members support.

1.5 Conceptual Framework

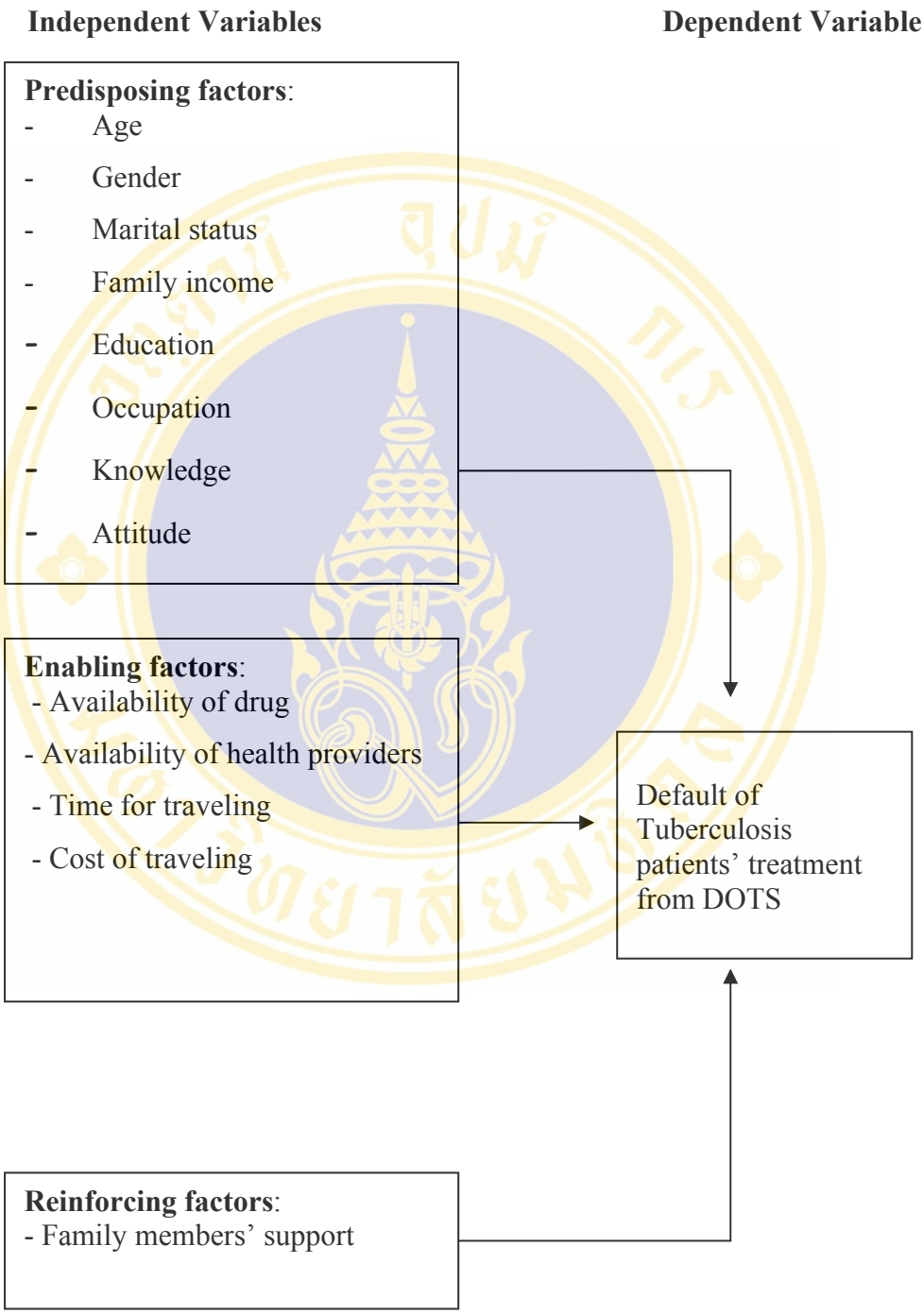

Figure 3 Conceptual Framework

1.6 Operational Definition

Marital status: Refers to marital status of patients, categorized as single, currently married, widowed, divorced or separated (nominal scale).

Family income: Refers to total income per month of the patient's family, categorized as less than or an equal to 556,553 rupiah, or more than 556,553 rupiah (ordinal scale).

Occupation: Refers to occupation of patients, categorized as farmer, business, government official or others including students, unemployed and housewife (nominal scale)

Education: Refers to degree of education such as illiterate, no school but literate, primary school, secondary school and higher. (Nominal scale).

Knowledge: Refers to patients understanding about the name of their disease, causative agents of the disease, duration of treatment, side effects of drugs and importance of regular treatment for complete cure of the disease.

Attitude: Refers to feelings expressed by patients about health service providers intention towards the patients during service delivery, whether positive or negative.

Family members support: Refers to anyone who stays with the TB patient in the same house such as husband, wife, son, who encourages the tuberculosis patient regularly take medicines until they are cured.

Default: Refers to tuberculosis patients receiving treatment from DOTS center who do not collect drugs for 2 months or more at any time after registration.

1.7 Limitations of the study

1. Default of Tuberculosis treatment was not randomly selected. The results of this study may not represent patterns of defaulted treatment from DOTS of the other patient types in DOTS.
2. From the design of the study, the cross sectional study lets us know only the prevalence of the defaulted treatment from DOTS. From the results we cannot know about the incidence of defaulted TB treatment from DOTS.

CHAPTER 2
LITERATURE REVIEW

2.1 Review about tuberculosis

Tuberculosis is a disease caused by bacteria called Mycobacterium tuberculosis. The bacteria can attack any part of your body, but they usually attack the lungs. Tuberculosis disease was once the leading cause of death in the United States. Tuberculosis is spread through the air from one person to another. The bacteria are released into the air when a person with tuberculosis disease of the lungs or throat coughs or sneezes. People nearby may breathe in these bacteria and become infected. When a person breathes in TB bacteria. The bacteria can settle in the lungs and begin to grow. From there, they can move through the blood to other parts of the body, such as the kidney, spine and brain. TB in the lungs or throat can be infectious. This means that the bacteria can be spread to other people. TB in other parts of the body such as the kidney or spine is usually not infectious. People with TB disease are most likely to spread it to people they spend time with every day. This includes family members, friends and coworkers. [12]

What is latent TB infection?

In most people who breathe in TB bacteria and become infected, the body is able to fight the bacteria to stop it from spreading. The bacteria become inactive, but they remain alive in the body and can become active later. This is called latent TB infection. People are with latent TB infection.

- have no symptoms
- don’t feel sick
- can’t spread TB to others
- usually have a positive skin test reaction
- can develop TB disease later in life if they do not receive treatment for latent TB infection

Many people who have latent TB infection never develop TB disease. In these people, the TB bacteria remain inactive for a lifetime without causing disease. But in other people, especially people who have a weak immune system, the bacteria become active and cause TB disease.

What is TB disease?

TB bacteria become active if the immune system can't stop them from growing. The active bacteria begin to multiply in the body and cause TB disease. Some people develop TB disease soon after becoming infected, before their immune system can fight the TB bacteria. Other people may get sick later, when their immune system becomes weak for some reason.

Babies and young children often have weak immune systems. People infected with HIV, the virus that causes AIDS, have very weak immune systems. Other people can have a weak immune system, too, especially people with any of these conditions:

- substance abuse
- diabetes mellitus
- silicosis
- cancer of the head or neck
- leukemia or Hodgkin's disease
- severe kidney disease
- low body weight
- certain medical treatment (such as corticosteroid treatment or organ transplants)

Symptoms of TB depend on where in the body the TB bacteria are growing. TB bacteria usually grow in the lungs. TB in the lungs may cause:

- a bad cough that lasts longer than 2 weeks
- pain in the chest
- coughing up blood or sputum

Other symptoms of TB disease are:

- weakness or fatigue
- weight loss
- no appetite
- chills
- fever
- sweating at night

Table 3 Difference between Latent TB Infection and TB Disease

Latent TB Infection	TB Disease
- Have no symptoms - Do not feel sick - Cannot spread TB to others - Usually have a positive skin test - Chest x-ray & sputum test normal	- Symptoms include : • a bad cough that lasts longer than 2 weeks • pain in the chest • coughing up blood or sputum • weakness or fatigue • weight loss • no appetite • chills • fever • sweating at night - May spread TB to others - Usually have a positive skin test - May have x-ray, and/or positive sputum smear or culture

Categories of patients for registration on diagnosis:

- New: a patient who has never had treatment for TB or who has taken anti-tuberculosis drugs for less than one month.
- Relapse: a patient previously treated for TB who has been declared cured or treatment completed, and is diagnosed with bacteriological positive (smear/culture) tuberculosis.
- Failure: a patient who, while on treatment, is sputum smear positive at 5 months or later during the course of treatment.
- Return after default: a patient who returns to treatment with positive bacteriology, following interruption of treatment for two months or more.
- Transfer-in: a patient who has been transferred from another tuberculosis register to continue treatment.

How is TB disease treated?

Tuberculosis disease can almost always be cured with medicine, but the medicine must be taken as the doctor or nurse directs. The most common drugs used to fight TB are: isoniazid (INH), rifampicin, pyrazinamide, ethambutol, and streptomycin. (13)

Directly Observed Treatment Short Course (DOTS) is a strategy to ensure cure by providing the most effective medicine and confirming that it is taken. It is the only program based strategy which has been documented to be effective worldwide. In DOTS, during the **intensive phase** of treatment a health worker or other trained person watches as the patient swallows the drug in his presence. During the **continuation phase** the patient is issued medicine for one week in a multiblister comb pack of which the first dose is swallowed by the patient in the presence of health worker or trained person. The consumption of medicine in the continuation phase is also checked by return of the empty multiblister combipack when the patient comes to collect medicine for the next week.

Treatment outcomes for smear positive pulmonary TB patients:

- Cured: a patient who is sputum smear negative in the last month of treatment and on at least one previous occasion.
- Treatment completed: a patient who has completed treatment but who does not meet the criteria to be classified as cured or a failure.
- Treatment failure: a patient who is sputum smear positive at 5 months or later during treatment.
- Died: a patient who dies for any reason during the course of treatment.
- **Defaulter**: a patient who did not collect drugs for 2 months or more at any time after registration.
- Transfer out: a patient who has been transferred to another recording and reporting unit and for whom the treatment outcome is not known.
- Treatment success: the sum of patients cured and those who completed treatment.

The cases are divided into three categories: category I, category II, and category III. Table 1 shows the type of cases included in each kind of category, the treatment regimen and the duration of treatment. [13]

Table 4 Treatment Categories and Sputum Examination Schedule in DOTS

TREATMENT REGIMEN			**SPUTUM EXAMINATION FOR PULMONARY TB**			
Category of treatment	Type of patient	Regimen*	Pre-treatment sputum	Test at month	If result is	-----> Then
Category I	New sputum smear positive	2 $(HRZE)_3$	+	2	-	Start continuation phase, test sputum again at 4 & 6 month#
					+	Continue intensive phase for one more month#
	Seriously ill SS^- Seriously ill extra-pulmonary**	4 $(HR)_3$	-	2	-	Start continuation phase, test sputum again at 6 month#

Table 4 Treatment Categories and Sputum Examination Schedule in DOTS (cont.)

TREATMENT REGIMEN			SPUTUM EXAMINATION FOR PULMONARY TB			
Category of treatment	Type of patient	Regimen*	Pre treatment sputum	Test at month	If result is	-----> Then
Category II	SS^+ Relapse***	$2(HRZES)_3$			-	Start continuation phase, test sputum again at 5 & 6 month#
	SS^+ Failure***	$1(HRZE)_3$	+	3	+	Continue intensive phase for one more month, test sputum again at 4,6,9 month#
	SS^+ treatment after default	$5\ (HRE)_3$				
Category III	SS^-, not seriously ill	$2\ (HRZ)_3$			-	Start continuation phase, test sputum again at 6 month#
	Extra Pulmonary, not seriously ill		-	2		

* The number before the letters refers to the number of months of treatment. The subscript after the letters refers to the number of doses per week. H (Isoniazid) 600 mg, R (Rifampicin) 450 mg, Z (Pyrazinamide) 1500 mg, E (Ethambutol) 1200 mg, S (Streptomycin) 750 mg. Patients who weight >60 kg receive additional rifampicin 150 mg. Patients > 50 yrs old receive streptomycin 500 mg. Patients in categories I and II who have a positive sputum smear at the end of the initial intensive phase receive an additional month of intensive phase treatment.

** Examples of seriously ill extra pulmonary TB cases are meningitis, disseminated TB, tuberculosis pericarditis, peritonitis, bilateral or extensive pleurisy, spinal TB with neurological complications and intestinal and genitor-urinary TB.

*** In rare and exceptional cases, patients who are sputum smear negative or who have extra pulmonary disease can have Relapse or Failure. This diagnosis in all such cases should always be made by an MO and should be support by culture or histological evidence of current, active TB. In this case, the patient should be categorized as Other and given Category II treatment.

Any patient treated with Category I or Category III who has a positive smear at 5,6 or 7 months of treatment should be considered a Failure and started on Category II treatment afresh.

2.2 Theoretical model

This study used a Precede-proceed model. The Precede-proceed model is a framework for the process of systematic development and evaluation of health education programs designed by Lawrence Green and Marshall Kreuter (1998).

- Precede-proceed has nine phases. The first five of which are diagnostic:
- Phase 1 - Social Diagnosis
- Phase 2 - Epidemiological Diagnosis
- Phase 3 - Behavioral and Environmental Diagnosis
- Phase 4 - Educational and Organizational Diagnosis
- Phase 5 - Administrative and Policy Diagnosis

The four remaining phases in Precede-proceed are implementation and evaluation (process, impact, and outcome) with an emphasis on using the later to improve the former. Evaluation of the process begins as soon as implementation does, in order to detect problems early so they can be corrected. As implementation proceeds, the planer starts evaluating in the order in which the program effects are expected.

Theory is most likely to be informative during phase 4 of the planning process suggested by Precede-proceed or the educational and organizational diagnosis. This phase examines those behavioral and environmental conditions linked to health status or quality of life concerns to determine what causes them. The educational and organizational diagnosis identifies factors that must be changed to initiate and sustain the process of behavioral and environmental change. These factors will become the immediate targets or objectives of the program.

According to the precede framework, three categories: the predisposing, reinforcing and enabling factors affect individual or collective behavior.

Predisposing factors are factors antecedent to behavior that provide the rational or motivation for the behavior. They include persons or populations knowledge, attitude, beliefs, values and perceptions that facilitate or hinder motivation for change.

Enabling factors are factors antecedent to behavior that allow a motivation or aspiration to be realized. They include personal skills, resources or barriers that can help or hinder the desired behavior changes, as well as environmental changes. These skills can be viewed as vehicles or barriers, created mainly by society or systems. Antecedents to behavior which enable a motivation to be realized include the availability, accessibility and affordability of health care and community resources which facilitate the performance of an action. Facilities and personal or community resources may be ample or inadequate, as may income or health insurance, and law and status may be supportive or restrictive.

Reinforcing factors are factors subsequent to behavior that provide continuing reward, incentive or punishment for a behavior and contribute to its persistence or extinction, and include social support, praise, reassurance and symptom relief. [14]

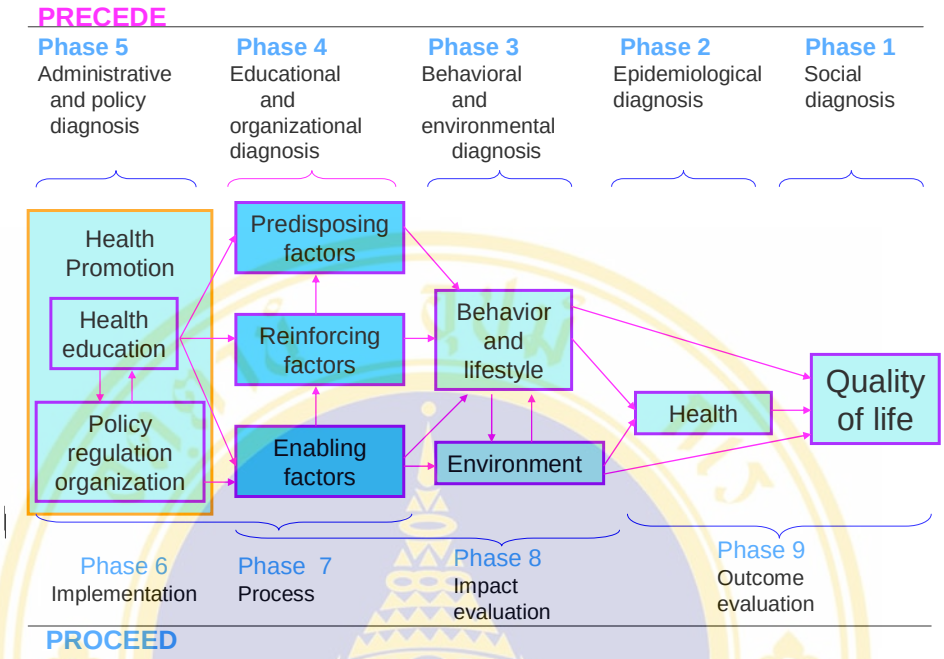

Figure 4 Diagram of Precede Proceed Model [15]

2.3 Related study

2.3.1 Predisposing factors

The data indicate that a high proportion of infectious cases occur among young adults, aged 15-34 years. The high risk of infectious tuberculosis in young adults all confirm that a cycle of transmission still exists in many first nation communities. Many people in this population are infected with tuberculosis bacteria and problems such as substance abuse, diabetes and HIV can increase the risk of disease following infection. Young adults at high risk for infectious tuberculosis are often highly mobile, moving from community to community, on and off reserves. Overcrowded housing increases the likelihood that infectious cases will spread tuberculosis to other [16]

The case rates for 1987 and 1995 indicate that the rates among older Canadians are falling, whereas the rates among younger Canadians are increasing. In addition, it

may be inferred from the increase in case rates among children under 5 years of age that there has been an increase in recent transmission of tuberculosis infection in all age groups. In Canada, tuberculosis is more common among males. In 1995 the case numbers and rates were higher for males than for females. (17)

A majority of the defaulters were in the age group 35-54 years. A significantly higher proportion of defaulters (57.6%) had per capita income of > Rs.633. Analysis of marital status showed a higher proportion of defaulted patients were among those married. Though all patients in the study group were well informed about treatment duration and its regularity, most of them did not have any knowledge regarding the disease. However, the difference between those who defaulted and those who completed was significant only among category II patients wherein > 90% of the defaulted did not have any knowledge about the disease. Very few patients received Direct observed treatment (DOT) by a DOT provider rather than the centre staff. The majority approached the centre for direct observed treatment (DOT). (18)

Young and middle aged males with lower education levels, unemployed, poor and laborers are most susceptible to progressive pulmonary tuberculosis. The most severe forms of the disease are more common in single persons. The factors that promote its progression are as follows: poor living conditions, migration, and chronic alcoholism (19).

Indian Council of Medical Research, reports that 610 of tuberculosis patients, was 54 percent of males and 57 percent of females were aged between 15 and 45. Literacy was significantly lower among females as completed to males. About 40% of the patients were below the poverty line. Knowledge of tuberculosis was poor, only 12 % of males and 16 % of female patients were aware of the infectious etiology of the disease. Perception of health was similar in different age groups. Likewise, perceived good health status was similar in different occupational groups. The resistance of both males and females to visit friends before treatment was observed in 38 % of males, many men felt inhibited from revealing their diagnosis to friends (43%) and even to their spouse (16%). This proportion did not change significantly

even after treatment. The sociodemographic factors such as age, literacy, occupation and income had no significant correlation with physical, social or mental well being. The initial reaction to diagnosis of tuberculosis was quite distressing, this included worry (50%), depression (10%) and suicidal thoughts. The reasons for these emotions may be physical debilitation, illiteracy, lack of knowledge of tuberculosis or fear of loss of income on account of long duration of treatment. (20)

The majority of the increases in incidences were in elderly patients 70 years of age or higher. In individuals group less than 30 years old, a reduction in the incidence of tuberculosis was shown until 1996. (21)

There is a marked female to male preponderance with a male: female ratio of 1: 2.1. This finding may not be in accordance with global data, where males have a greater prevalence rate for pulmonary tuberculosis. The majority of patients were in the low income group, with a monthly income less than Rs.3000 per month. The majority of patients (> 65%) also belonged to the poor socioeconomic group with a mean monthly income of less than Rs.3000. This group is further predisposed to malnutrition of several types and perhaps has a poor immunity allowing re-emergence of previous infections or even new infections of tuberculosis. Low income also tends to affect the treatment regimen, in so far as drug availability and duration of therapy in concerned. (22)

The overall male: female ratio was 1.2: 1, although this ratio was reversed in the younger age groups. (23)

The male: female ratio was approximately 2: 1. Most patients (> 70%) presented with pulmonary tuberculosis and most of these (70%) were within the age group 15-44 years. (24)

The main risk factors for tuberculosis were marital status other than married, educational level less than higher, low income, having been in prison, not having own

place of residence, current unemployment, current smoking, alcohol consumption, shortage of food and contact with tuberculosis patients.[25]

A case control study done by Une et al in Chikuho, Japan shown significantly more of the male cases had long term employment in coal mining. Exposure to dust is likely to be associated with the high tuberculosis incidence in males aged 50 or over. The cases showed significantly higher unemployment levels and lower education levels. Among females, more of the cases were unmarried/divorced and a significantly higher proportion was receiving welfare benefits. The high incidence of tuberculosis is probably related to a low socioeconomic level resulting from closure of coalmines. No difference was observed in working hours, night shifts, smoking rate and drinking habits. These factors are unlikely to be singly related to the onset of tuberculosis. [26]

There were marked differences in tuberculosis incidences between occupation groups. Incidence rates among unemployed persons were consistently three fold higher than average. In addition, farmers engaged in animal husbandry and sweater sellers, their helpers and students had a higher than average. Incidence rate housewives, monks/nuns living in settlements and the military had lower than average rates. There was no apparent association of tuberculosis incidence with education attainment. In addition, there were no substantial differences in tuberculosis incidence according to marital status, expect single parents had considerably higher rates in 1994 (31.8/1000) and divorces had higher rates in 1995 (15.9/1000). [27]

The prevalence rates for males were from 20 % to 70 % higher than for females. A number of factors may contribute to women having poorer access than man to tuberculosis diagnostic services and to effective treatment. Among these are lack of time and resources and lack of decision making power, which affect women access to health services in general. More specific to care seeking for tuberculosis, are poor knowledge of the disease and poor interpretation of its sign and symptoms by the women themselves as well as by the health workers, the social stigma associated with

being diagnosed with tuberculosis and the financial and time costs of the prolonged course of tuberculosis treatment. [28]

A poor level of knowledge about tuberculosis among the female and literate population and a significantly higher proportion of individuals aged more than 40 years were aware of the correct mode of transmission of tuberculosis. The age, education and severity of illness were not significantly associated with an increase in the knowledge about tuberculosis. [29] The similar study done by Purohit, shown poor knowledge about tuberculosis among the illiterate. [30]

TB patients could have continued sharing a room with an infected person, because of lack of accommodation, high rental costs and inadequate knowledge about TB transmission. Over 70% of TB patients easily mentioned the symptoms which included sweating at night, loss of weight, loss of appetite and prolonged coughing, which at times was accompanied by sign of blood in the sputum. [31]

2.3.2 Enabling factors

Adjusting for sex, the cure rate was higher when treatment was provided by tuberculosis control staff in the main health centers rather than by a nurse or village health worker at the peripheral level. [32]

Default appears to be significantly linked to transportation time, the sex of the patients, patient information and the quality of communication between patients and health workers. [33]

A study from Thailand, reports that most patients (86 %) were supervised by family members, 24 patients were supervised by health center staff and 34 patients were supervised by community members. While the cure rate was highest among patients supervised by health center staff (79 %) results under 2 supervised options. There was no statistically significant association (74%) for patients supervised by community members, (77 %) for patients supervised by family members). [34]

2.3.3 Reinforcing factors

Eighty five point six percent of females TB patients had problems in their relationship with their spouse (61.0 %) and family members (58.0 %) after being diagnosed with tuberculosis. The results of the tuberculosis service factors found that 39% of females were not satisfied with their providers' behavior which was significantly associated with treatment seeking behavior. [35]

CHAPTER 3
RESEARCH METHODOLOGY

3.1 Research design

The research was cross-sectional study of patients who defaulted treatment under DOTS in Kotamobagu subdistrict, North Sulawesi, Indonesia. The data was collected through structured questions by interviewing, and covered general information about tuberculosis patients and predisposing factors including knowledge about tuberculosis and treatment received from health providers, enabling factors including availability of drugs, availability of health providers, time for traveling and cost of traveling and reinforcing factors.

3.2 Study area

Bolaang Mongondow (usually shortened to Bolmong) is situated between Minahasa and Gorontalo on the Minahasa peninsula. With a total area of 8, 358, 04 km^2 it is one of the largest Districts in North Sulawesi. It comprises 17 sub districts and 267 villages. Seven sub districts are situated along the mountainous north coast, 4 along the less inhabited and less developed southern coast and 4 in the middle irrigated lowland. The district capital, **Kotamobagu** has a population of 2.112,77 (in 2002). Overall Bolmong has a low average population density due to large unpopulated areas which have been given over as a National park. From data Susenas (2002), has the population of 448,040, consists of 232,935 men (51.99%) and 215,105 women (48.01%). There are 112,384 households with an average of 4 people/household. (10)

3.3 Study population

The target population of the study was all of the tuberculosis patients receiving treatment under DOTS during August to December 2004 from specific health centers. The following criteria were used in this study aged above 15 years and under treatment from DOTS in Kotamobagu subdistrict, North Sulawesi Province, Indonesia.

3.4 Sample size

A total of 200 tuberculosis out-patients were included in this study. The sample was from all tuberculosis patients under treatment from 2 health centers in the Kotamobagu subdistrict and came to collect drugs were non-randomly selected for interview in this study.

3.5 Research instruments for data collection

Data was collected by interview questionnaire designated by the researcher. Almost all of the questions in the questionnaire were closed but some were open ended. Initially the questionnaire was prepared in English and then translated into Indonesian.

The questionnaire was composed of 5 parts as follows:

Part 1: General information of tuberculosis patients

Information from medical cards and treatment records about their confirmed diagnosis was recorded.

Part 2: Predisposing factors

Age, gender, marital status, family income, education, occupation was recorded. Concerning about knowledge, the respondents were interviewed about their knowledge and this means their understanding about the name of their disease, causative agent of the disease, duration of treatment, side effects of drugs and importance of regular treatment for complete cure of the disease.

Knowledge was assessed by 11 multiple choice questions. All items were converted to scores; each correct answer was given a score with a minimum and maximum score of 13 and 48 respectively. Knowledge level was classified into 3 groups based on a cut off point for knowledge, in which the cut off point was determined by mean +/- SD of full marks. Those who got:

> Mean ± SD = good level

Mean ± SD = moderate level

< Mean ± SD = poor level

After which the number and frequency of each level was obtained.

To measure attitude toward tuberculosis treatment the respondents were asked their opinion on their tuberculosis disease and treatment. This part contained 16 questions with 9 positive and 7 negatively designed questions. The questions were prepared on a basic 3 level Likert Scale. The respondents' scores for each question were ranted lowest "1" to highest "3" depending on either whether the question was positive or negative.

For the positive attitude question, the scoring was given as follows:

Agree = 3 scores

Not sure = 2 scores

Disagree = 1 scores

For the negative attitude question, the scoring was given as follows:

Disagree = 3 scores

Not sure = 2 score

Agree = 1 scores

Thus, total highest score was being "33" for 16 questions. The levels of attitude were classified into 2 levels based on total score:

> Mean ± SD = good level

< Mean + SD = poor level

Part 3: Enabling factors

In this part, the questions focused on availability of treatment. It refers to the situations under which tuberculosis patients can get anti tuberculosis treatment. It included the availability of drugs and availability of health providers. Accessibility to health centers which included time and cost of traveling. Questions were both open and closed.

Part 4: Reinforcing factors

In this part, the questions focused on family members support for the tuberculosis patients' to regularly take the drugs.

Part 5: Default of tuberculosis patients treatment with DOTS

The information about dependent variable included the time default to regularly collect the drugs.

3.6 Pre test

To test the reliability of the questionnaire and validity of results, pre-testing was conducted with 30 tuberculosis patients in Moadayag subdistrict. The interview questionnaire was distributed to tuberculosis patients and they were allowed answer freely. After that, all the questions were reviewed and revised to adjust the understandability to allow all patients to answer. The pre test results were analyzed for reliability by using Cronbach's Alpha Coefficient (0.587 and 0.631).

3.7 Data collection

Data was collection was by interview using structured questionnaire with patients' tuberculosis under treatment in health center in Kotamobagu subdistrict by the trained Indonesia interviewers.

Data collection was done from January 17 to February 4 2005 by 8 nurses, who had received one day training beforehand. These 8 nurses had a similar educational

background and came from the 2 health centers in Kotamobagu subdistrict. These 8 nurses understood the questionnaire and objective of the study and collected the data from all the tuberculosis patients' who met the criteria.

3.7 Data analysis procedure and statistics used

The study population was interviewed in their houses by nurse interviewers from 17 January to 4 February 2005. The study results were divided into two main categories:

Part 1: Descriptive analysis, which described the percentage and frequency of each independent and dependent variable. In this part, the results were divided into 5 main categories as follows:

1. Predisposing factors were used to describe respondents' age, marital status, education status, occupation status and economic status.
2. Knowledge factors were used to describe tuberculosis causes and treatment.
3. Attitude factors were used to describe tuberculosis disease and the DOTS program.
4. Enabling factors were divided into four categories: availability of drugs; availability of health providers; and time for traveling and cost of traveling.
5. Reinforcing factors were used to describe family members support for the patients 'with tuberculosis.

Part 2: Association analysis, which was done by chi-square test, studied the association between each independent variable and dependent variable. In this part, the results were divided into 5 categories as follows:

1. Association between predisposing factors (age, gender, marital status, education, occupation, family income and default of patients' tuberculosis treatment with DOTS.
2. Association between knowledge and default of patients' tuberculosis treatment with DOTS.

3. Association between attitude and default of patients' tuberculosis treatment with DOTS.
4. Association between enabling factors (availability of drugs, availability of health providers, time for traveling, cost of traveling) and default of patients' tuberculosis treatment with DOTS.
5. Association between reinforcing factors (family members support) and default of patients' tuberculosis treatment with DOTS.

The data was evaluated using SPSS version 11.5. The frequency and proportion of patient's tuberculosis that could be related to each independent variable was analyzed by descriptive statistics such as percent, maximum, mean, minimum and standard deviation. The association of dependent variables (default with treatment) and independent variables were computed by chi-square test. The critical significant level was set at 0.05. The results were then interpreted and presented in the form of tabulated description.

CHAPTER 4
RESULTS

This study was a cross-sectional study of patients' default of treatment with DOTS in Kotamobagu subdistrict, North Sulawesi, Indonesia. The sample size was 200 patients under treatment by a DOTS program and came for collection of drugs to health centers. The findings showed an 11 percent default rate among respondents.

4.1 Descriptive Analysis

4.1.1 Predisposing factors

The predisposing factors considered in this study were age, gender, marital status, education status, occupation status and monthly family income of the tuberculosis patients. Frequency distribution and cross tabulation was performed to check the homogeneity of the background factors between completed and defaulted patients treated under the DOTS program.

The age of the respondents ranged from 15 to 89 years, with an average age of 38.50 years. Ages of respondents were classified into three groups and are shown in table 5 nearly one half (45.5 %) of the respondents were found to be in the 15-34 year age group.

The gender distribution of the respondents indicated that more than one half (56.0 %) were male and 44.0 percent were female.

Regarding marital status, the result showed than slightly over two thirds of cases were married (67.5 %), one fourth (25 %) of cases were single and 7.5 percent were found to be either divorced/separated or widowed.

The result showed that more than one half of respondents (57 %) had up to 4 family members and 43.0 percent had five to ten family members.

Regarding education status of the respondents the education status was divided into 3 groups: no school but literate, primary school, and secondary school and higher. The education status showed that slightly over two third had secondary school and higher education status (68.5 %), more than one fourth (28.0 %) had primary school level education and 3.5 percent had no schooling but were literate.

Regarding the occupation status, it was shown that most of the respondents were farmers (36.5 %), 35.0 percent were housewives, students, unemployed, nearly one fourth (23.0 %) worked as government officials and 5.5 percent of respondents had business.

Monthly family income, as mentioned by the respondents, was divided into two groups. The first group was those with an income less than or equal to 556,553 rupiah, the second group received more than or equal to 556,553 rupiah. Almost two thirds of the respondents (65.5 %) had a monthly family income less than or equal to 556,553 rupiah, and 34.5 percent had more than or equal to 556,553 rupiah. Average monthly family income was 556,553.50 rupiah and income ranged from 100,000 to 2,500,000.

Table 5 Number and Percentage of Respondents Classified by Predisposing Factors

Factors	Frequency	
	Number	**Percent (%)**
Age		
15 – 34	91	45.5
35 – 54	69	34.5
> 55	40	20.0
Mean = 38.5; SD = 16.485; Minimum = 15; Maximum = 89		
Gender		
Male	112	56.0
Female	88	44.0
Marital status		
Single	50	25.0
Married	135	67.5
Others (widowed, separated)	15	7.5
Family members		
One	2	1.0
Two	7	3.5
Three	39	19.5
Fourth	66	33.0
Five	43	21.5
Six	25	12.5
Seven	15	7.5
Eight	2	1.0
Ten	1	0.5

Table 5 Number and Percentage of Respondents Classified by Predisposing Factors (cont.)

Factors	Frequency	
	Number 200	**Percent (%)**
Education		
No school but literate	7	3.5
Primary school	56	28.0
Secondary school and higher	137	68.5
Occupation		
Farmer	73	36.5
Business	11	5.5
Government employee	46	23.0
Others (housewife, student,unemp)	70	35.0
Income (Rupiah per month)		
≤ 556,553	131	65.5
≥ 556,553	69	34.5

4.1.2 Knowledge about tuberculosis disease

There were eleven multiple choice questions concerning knowledge of the respondents on tuberculosis and its treatment, with each correct answer given a score with a total minimum to maximum score of 13 and 48 respectively. Results showed that 29.5 percent said tuberculosis is easily spread, 37.0 percent knew the cause of tuberculosis is bacilli. The respondents knew that tuberculosis is spread by air (86.5 %), and the majority of them (78.5 %) said a cough was a sign of tuberculosis. The table also shows that slightly over two thirds (69.0 %) of the respondents knew the diagnose is of tuberculosis was by sputum examination and preventing the spread of tuberculosis can be done by covering the mouth with a tissue when coughing (33.5 %). The great majority of the respondents knew tuberculosis can be cured with medicine (97.0 %). Concerning the duration of treatment, 81.5 percent of the respondents said six months were required. Many respondents said symptoms after

taking anti tuberculosis drugs include nausea and vomiting (54.0 %), 81.0 percent said they knew tuberculosis would not be cured if they did not complete the drug regimen. Slightly over one fourth (27.5 %) of the respondents knew about the DOTS program.

From table 7 we can see that more than one half (59.0 %) of the respondents had low knowledge about tuberculosis disease and the DOTS program with ranging from scores 13 to 23.

Table 6 Knowledge about Tuberculosis and DOTS Program Classified by items

Items	Correct answer	
	Number	%
1. What are the dangers of tuberculosis?	59	29.5
2. What is the cause of tuberculosis?	74	37.0
3. How is tuberculosis spread?	173	86.5
4. What are the signs/symptoms of tuberculosis?	157	78.5
5. How is tuberculosis diagnosed?	138	69.0
6. How can you prevent the spread of tuberculosis?	67	33.5
7. How is the tuberculosis disease treated?	194	97.0
8. How long do tuberculosis patients need to take drugs?	163	81.5
9. What are the symptoms after starting to take anti tuberculosis drugs?	108	54.0
10. What will happen if the person takes irregularly does drugs/not complete the full course?	162	81.0
11. What is the DOTS program?	55	27.5

Table 7 Number and Percentage of Respondents Classified by Level of Knowledge about Tuberculosis Disease and DOTS Program

	Frequency	
Level	**Number (200)**	**Percent (%)**
High	82	41.0
Low	118	59.0
Mean = 23.05, SD = 4.846		

Low (score 13-23) High (score 24-48)

4.1.3 Attitude about tuberculosis disease and DOTS program

There were sixteen questions about attitude and table 8 shows that in question one, 42.5 percent of the respondents said not sure. In question two and three, 40.0 percent of the respondents said agree. In the fourth question over one half (53.5 %) of the respondents said not sure. The respondents said agree (47.0 %) for question five, 50.5 percent and a majority (72.0 %) of the respondents also said agree for question six and seven respectively. Thirty eight point five percent of them said not sure for question eight. Nearly one half (47.5 %) of the respondents said disagree for question nine, fourthly eight point five percent and fourthly four point five percent said agree for questions ten and eleven. They also said not sure (44.5 %) for question twelve. Majority (81.5 %) of the respondents said disagree in the question thirteen. Eighty four percent of them said agree in the question fourteen. Nearly two thirds (63.0 %) said disagree for question fifteen and over one half (53.5 %) said not sure for question sixteen.

Table 9 shows that 58.5 percent of the respondents had a low level attitude concerning tuberculosis disease and the DOTS program with scores from 27 to 37.

Table 8 Attitude toward Tuberculosis Disease and DOTS Program Classified by items

Items	Agree		Not sure		Disagree	
	No	%	No	%	No	%
You are not re-infected with TB, when you get close contact with other TB patients.	46	23.0	85	42.5	68	34.0
It is easy to be infected with TB disease when eating food together with TB patients.	80	40.0	71	35.5	47	23.5
If any family members are infected with TB, other members will develop the TB disease.	80	40.0	71	35.5	47	23.5
Strong people and weak people have equal risk of infection of the TB disease.	28	14.0	107	53.5	63	31.5
It is easy to get a TB infection when you live with TB patients in a crowed environment.	94	47.0	70	35	34	27.0
You can lose much of your working time when feeling sick with TB.	101	50.5	47	23.5	49	24.5
TB is a serious disease, you may have a fatal outcome if untreated.	144	72.0	38	19.0	16	8.0
You can work to earn income as usual while having TB sickness.	49	24.5	77	38.5	72	36.0
TB patients are disliked/hated by community members.	32	16.0	71	35.5	95	47.5
It is your bad luck to be infected with TB disease.	97	48.5	40	20.0	60	30.0

Table 8 Attitude toward Tuberculosis Disease and DOTS Program Classified by items (cont.)

Item	Agree		Not sure		Disagree	
	No	%	No	%	No	%
TB disease is the one disease which can be cured easily.	89	44.5	69	34.5	39	19.5
After getting TB treatment you can make contact with friends and neighbors as usual.	82	41.0	89	44.5	26	13.0
When your symptoms are relieved, you can reduce drug doses or stop taking the drugs.	13	6.5	21	10.5	163	81.5
Even though you are busy, you can collect the drugs from the health worker at the appointed time.	168	84.0	24	12.0	5	2.5
Due to the drugs, your TB illness is worse than previous times.	5	2.5	65	32.5	126	63.0
Administering the drugs for long times causes dependent on the drugs.	45	22.5	107	53.5	44	22.0

Table 9 Level of Attitude

Level	Frequency	
	Number (n=196)	Percent (%)
High	69	34.5
Low	131	65.5
Mean = 38.7 SD = 11.398		

Low (score 27-38) High (score 39-144)

4.1.4 Enabling factors

Enabling factors were divided into four main groups: first availability of drugs; second, availability of health providers; third, time for traveling; and fourth, cost of traveling.

Table 10 shows that a large majority (86.5 %) of the respondents said they always got drugs in a health center and a great majority (99.5 %) of the respondents got information about tuberculosis disease and treatment from health providers when they came to a health center.

The results also show the traveling time from patient's house to the health center, slightly over two thirds of the respondents had less than or equal to fifteen minutes traveling time (69.0 %) with an average of 14.72 minutes, ranging from five minutes to sixty minutes.

Concerning traveling cost, the average cost was 2030 rupiah. An majority of the respondents (75.5 %) had spent less than or equal to 2000 rupiah, and nearly one fourth (24.5 %) had spent more than 2000 rupiah.

Table 10 Number and Percentage of Respondents Classified by Enabling Factors

Enabling factors	Number	Percent (%)
1. Availability of drugs (n = 193)	167	86.5
2. Health providers (n = 193)	192	99.5
3. Traveling time		
≤ 15 minutes	138	69.0
> 15 minutes	62	31.0
4. Traveling cost (rupiah)		
≤ 2000	151	75.5
> 2000	49	24.5

4.1.5 Reinforcing factors

Reinforcing factors included family member support and table 11 shows that a great majority (95.8 %) of the respondents got support from their family members.

Table 11 Number and Percentage of Respondents Classified by Reinforcing Factors

Reinforcing factors	Number (n = 192)	Percent (%)
Family members support		
- Yes	184	95.8
- No	8	4.2

4.2 Association analysis

Non defaulted and defaulted treatment from a health center were cross tabulated with each of the predisposing factors, enabling factors, and reinforcing factors and any significant association was investigated.

4.2.1 Predisposing factors

The results show that the default of patients from treatment had no significant association with age groups (χ^2 = 3.003, p-value = .223). This means that the age of respondents had no impact on the default of patients from treatment.

When analyzing gender group we can see results show that there was a significant association between gender groups (χ^2 = 3.868, p-value = .049) and the default of patients from treatments, which means that being female (15.9 %) has an impact on default behavior.

Results show that marital status was significantly associated with default of patients from treatments (χ^2 = 14.535, p-value = .001). The respondents not yet married had a higher default of treatment (24.0 %) than respondents who had married and others (divorced/separated or widowed).

There was no significant association between number of family members and default of patients from treatment (χ^2 = 1.344, p-value = .262).

The results show that education had no significant association with the default action of patients from treatment (χ^2 = 3.123, p-value = .210).

There was a significant association between occupation groups and the default of patients from treatment (χ^2 = 4.151, p-value = .042) which means that the respondents such as housewives; and students had higher (17.1 %) default rates than other respondents.

The monthly family income of the respondents showed no significant association with the default of patients from treatment (χ^2 = 0.079, p-value = .779). This means that family income of the respondents had no impact on the default of patients from treatment.

Knowledge of the respondents about tuberculosis disease and treatment under the DOTS program was not significantly associated with the default of patients from treatment (χ^2 = 0.828, p-value = .369). This indicates no impact of knowledge on the default of patients from treatment under a DOTS program.

Regarding attitude of the respondents about tuberculosis disease and treatment under a DOTS program it is shown there is no significant association between attitude group and default of patients from treatment (χ^2 = 1.313, p-value = .341); this mean no impact from attitude on the default of patients from treatment under DOTS program was recorded.

Table 12 Number and Percentage of Default Patients Classified by Predisposing Factors

Predisposing factors	Non default		Default		χ^2	P-value
	No	(%)	No	(%)		
Age						
15 - 34	78	85.7	13	14.3	3.003	.223
35 - 54	65	94.2	4	5.8		
> 55	35	87.5	5	12.5		
Gender						
Male	104	92.9	8	7.1	3.868	.049
Female	74	84.1	14	15.9		
Marital status						
Single	38	76.0	12	24.0	14.535	.001
Married	128	94.8	7	5.2		
Others (widowed, separated)	12	80.0	3	20.0		
Family members						
1 - 4	104	91.2	10	8.8	1.344	.262
5 - 10	74	86.0	12	14.0		
Education						
No school but literate	5	71.4	2	28.6	3.123	.210
Primary school	52	92.9	4	7.1		
Secondary school and higher	121	88.3	16	11.7		

Table 12 Number and Percentage of Default Patients Classified by Predisposing Factors (cont.)

Predisposing factors	Non default		Default		X^2	P-value
	No	%	No	%		
Occupation						
Employee	120	92.3	10	7.7	4.151	.042
Unemployed	58	82.9	12	17.1		
Income (rupiah/month)						
≤ 556,553	116	88.5	15	11.5	0.079	.779
> 556,553	62	89.9	7	10.1		

Table 13 Number and Percentage of Default Patients Classified by Level of Knowledge

Level of Knowledge	Non default		Default		χ^2	P-value
	n	%	n	%		
Knowledge						
Low (score 13-23)	107	90.7	11	9.3	0.828	.369
High (score 24-48)	71	86.6	11	13.4		

Table 14 Number and Percentage of Default Patients Classified by Level of Attitude

Level of Attitude	Non default		Default		χ^2	P-value
	n	%	n	%		
Low (score 27-38)	119	90.8	12	9.2	1.313	.341
High (score 39-144)	59	85.5	10	14.5		

4.2.2 Enabling factors

Enabling factors were divided into four main groups: first availability of drugs; second availability of health providers; third time for traveling; and fourth, cost of traveling.

Availability of the respondents was significantly associated to default of patients from treatment (χ^2 = 22.170, p-value = .000). Respondents not getting drugs by them selves from health centers was highest (30.8 %) associated with default behavior than respondents who always got drugs from health centers. The results also show there was no significant association between the respondents who got service from health providers when they came to health centers and the default of patients under the treatment (χ^2 = 0.085, p-value = .771).

The results showed there was no significant association between traveling time (χ^2 = 1.135, p-value = .330) and default of patients' tuberculosis treatment with DOTS. Concerning traveling cost, the results showed no significant association with default of patients from treatment (χ^2 = 1.881, p-value = .191).

Table 15 Number and Percentage of Default Patients Classified by Enabling Factors

Enabling factors	Non default		Default			P-value
	No	(%)	No	(%)	χ^2	
1. Availability of drugs						
Availability	160	95.8	7	4.2	22.170	.000
No availability	18	69.2	8	30.8		
2. Health providers						
Availability	177	92.2	15	7.8	0.085	.771
No availability	1	100.0	0	.0		
3. Traveling time						
≤ 15 minutes	125	90.6	13	9.4	1.135	.330
> 15 minutes	53	85.5	9	14.5		
4. Traveling cost (rupiah)						
≤ 2000	137	90.7	14	9.3	1.881	.191
> 2000	41	83.7	8	16.3		

4.2.3 Reinforcing factors

Regarding reinforcing factors, we can see that there is no significant association between reinforcing groups and default of patients from treatment (χ^2 = 0.335, p-value = .461).

Table 16 Number and Percentage of Default Patients Classified by Reinforcing Factors (n = 192)

Reinforcing factors	Non default		Default		χ^2	P-value
	No	(%)	No	(%)		
Family members support						
- Yes	171	92.9	13	7.1	0.335	.461
- No	7	87.5	1	12.5		

CHAPTER 5
DISCUSSION

The study was a cross sectional study with the main objective of identifying factors related to default among tuberculosis patients treated in a DOTS program and the specific objectives were first, to examine the default among tuberculosis patients treated in a DOTS program; second to identify the predisposing factors (age, gender, marital status, family income, education, occupation, knowledge, attitude); enabling factors (availability of drugs, availability of health providers, time for traveling, cost of traveling); and reinforcing factor (family members support) among tuberculosis patients and; third, to examine the relationship between default of tuberculosis patients and predisposing factors, enabling factors and reinforcing factors. Two hundred patients were interviewed using a structured questionnaire distributed by 8 nurses from 2 local health centers who had been trained to collect the data. The results showed an 11.0 percent rate of default in tuberculosis patients receiving treatment in Kotamobagu subdistrict.

5.1 Predisposing factors

The predisposing characteristic of the respondent was found to be homogenous in both default and non default groups. The youngest age of respondents was 15 years and the oldest was 89 years. 45.5 percent of the respondents were in the young working age group (15 – 34 year). Among them, 14.3 percent belonged to the default category. This suggests that in the age distribution similar to the study sample tuberculosis affects mostly a younger age group in the rural communities of Indonesia.

Similar findings were also found in several other studies in Canada, India, Bangladesh, and the U.S.A which have shown that a high proportion of infectious cases occur among young adults, aged 15-34 years.

The possible reasons for young adults being at high risk for infectious TB maybe they are highly mobile, moving from community to community, on and off reserves. Overcrowded housing may also increase the likelihood that infectious TB cases will spread.

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Concerning the gender, more than one half of the respondents (56.0 %) was male. The increasing trend of tuberculosis among males is thought to be linked with the increasing male population in Indonesia. This is similar to findings in Australia, where the overall male: female ratio is 1.2:1, although this ratio is reversed in the younger age groups in Canada. [23] Where TB is still more common among males. In 1995 case numbers and rates were higher for males than for females [17]; also in India, males have a greater prevalence rate for pulmonary tuberculosis [22]

There was a significant association between gender and default of patients from treatment (χ^2 = 3.868, p-value = .049), females had a significant higher default rate than males. A possible reason may be the stigma attached to tuberculosis that facilitates women to hide or ignore symptoms and avoid being labeled as a tuberculosis patient for fear of avoidance and separation from the community or their family.

Regarding marital status, there was a significant association between marital status and default of tuberculosis patients from treatment (χ^2 = 14.535, p-value = .001). Among defaulters a single status was significantly more common than any other status (24.0 %). This is similar to results found in several other studies in Rusia and Japan, which showed that a main risk factor for tuberculosis is being single. Possible reasons may be low support from family members and also enhanced poverty or malnutrition. [19, 25]

There was not a significant association between number of family members, family income and default of tuberculosis patients from treatment. More than one half (57.0 %) of respondents had a small number of family members and almost two thirds

(65.5 %) had a lower income. Family member distribution and family income of the study sample suggests that tuberculosis affects mostly small family households and low income groups particularly in this study area which reports that every household has an average of 4 family members. (11)

This is similar to a study in Nigeria, which showed that most of the respondents had a family monthly income of less than Rs.2000, and 102 of the patients had a family size of 1-4 members.(23)

Concerning education status, results showed that slightly over two thirds (68.5 %) of the respondents had secondary school and higher level education and this was not significantly associated with default of tuberculosis patients under treatment. This suggests that tuberculosis affects mostly high education levels and a possible reason may be no variation in social mixing patterns.

Occupation status showed significant association with default of patients treatment under DOTS ($\chi^2 = 4.151$, p-value = .042), the unemployed had higher default levels than employed. A possible reason for a high number of tuberculosis patients being unemployed may be poverty and malnutrition, these results are similar to the study by S. Bhatia et al that reports unemployed persons were consistently at a three fold higher risk than employed persons. (27)

Concerning knowledge and attitude level, table 7 and 8 show that more than one half (59.0 %) and almost two thirds (65.5 %) of the respondents had low knowledge and attitude. A possible reasons for poor knowledge and attitude on tuberculosis, is low family income (low socio-economic status). Similar findings can also be found in several others studies from India, Bangladesh and Estonia which have shown that poor knowledge, attitude and low socio-economic status come with a higher risk of tuberculosis. (28, 29, 30, 31)

Over 70% of TB patients mentioned symptoms which included sweating at night, loss of weight, loss of appetite and prolonged coughing, which at times was accompanied by signs of blood in the sputum. [31]

There was no significant association between knowledge and attitude level and default behavior of tuberculosis patients. Concerning these results we must first consider a low statistical number and second a possible misunderstanding by patients concerning tuberculosis.

5.2 Enabling Factors

There was a significant association between availability of drugs and default of patients tuberculosis from treatment (χ^2 = 22.170, p-value = .000). A possible reason is availability of drugs can make patients come regularly to health services to collect drugs. This is similar to the Sophia report where a majority of the study group received DOTS at a treatment center [18]

There was no significant association between traveling time, traveling cost and default of tuberculosis patients from treatment. This may be because patients have care seeking behavior. This result is like a study done by Sophia, where distance traveled to the health centre was not a hindrance in a city with adequate transport facilities. [18]

5.3 Reinforcing Factor

The results showed that a great majority (95.8 %) of respondents had support from family members. This may be because the family members of patients have an awareness of the importance of supporting tuberculosis patients in regularly taking drugs. This result is different from a study done by Sophia, which reports that 85.6 percent of tuberculosis patients had problems in relationships with their family members after being diagnosed with tuberculosis. [18]

CHAPTER 6
CONCLUSION AND RECOMMENDATION

6.1 Conclusion

The study was conducted in Kotamobagu subdistrict, North Sulawesi, Indonesia. Results may not be true representative of the situation for default of tuberculosis patients' treatment with DOTS program in other areas.

The prepared questionnaire for the interview was limited to information supplied by patients; therefore further necessary information could not be obtained. The face to face interview using a questionnaire and the clinical report were the main sources of information.

In conclusion, the study on default of tuberculosis patients under treatment by DOTS program was conducted with the main objective of identifing factors related to the default behavior. Nearly one half (45.5 %) of respondents were found in the 15-34 age group. More than one half (56.0 %) were male, slightly over two thirds of cases were married (67.5 %), slightly over two thirds (68.5 %) of respondents had a high level of education, 36.5 percent were farmer and almost two thirds (65.5 %) had a monthly family income less than or equal to 556,553 rupiah.

More than one half of respondents (59.0 %) had poor knowledge about tuberculosis disease and DOTS program. 58.5 percent of respondents had poor attitude about tuberculosis disease and DOTS program.

Large majority of respondents got drugs in health center and great majority got information about tuberculosis disease and treatment from health providers when came in health center. Slightly over two thirds of respondents had less than or equal to fifteen with average 14.72 minutes. Majority of respondents had spent less than or

equal to 2000 rupiah for traveling cost. Great majority of respondents got support from their family members.

The default of patient tuberculosis treatment with DOTS was no found to have a significant association with different age, family incomes, education, knowledge, attitude, availability of health providers, time for traveling, and cost for traveling, family support and default of patients treatment in this study area.

There was a significant associations between gender (p-value = .049), marital status (p-value = .001), occupation status (p-value = .042) and availability of drugs (p-value = .000) and default of tuberculosis patients from treatment. Female, single people, unemployed people and patients with less access to drugs were more likely to default.

6.2 Recommendations

6.2.1 Implementation

On the basis of the results of the study, the following are recommendations for a better default rate of tuberculosis patients' treatment with DOTS program.

1. From the study, female, single people, unemployed people and patients with less access to drugs were more likely to default. For solving this problem, must be early recognition of tuberculosis symptoms and regular visits to health care services is recommended for every tuberculosis patients with an emphasis on those more likely to default, also strong family member support and health provider support are needed to encourage tuberculosis patients to regularly visit health care services.
2. It is recommended that health personal at the subdistrict level set a program to encourage tuberculosis patients to complete their treatment, such as inviting those who have completed tuberculosis treatment to share their experiences.
3. It is recommended that more frequent health education about tuberculosis and the risks of defaulting tuberculosis treatment be provided.

4. It recommended health providers ensure the availability of tuberculosis drugs in order to decrease the default rate.

6.2.2 For Future Study

The following recommendation is given for better further study:

1. To make determination on factors affecting on default among tuberculosis patients treatment with directly observed treatment short course (DOTS), either case control study should be more suitable for the future study.
2. In this study, data only was collected in one subdistrict, in the future research should be in bigger population, to give the picture about factor related to default among tuberculosis patients treatment with DOTS program.

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APPENDIX

APPENDIX A
QUESTIONNAIRES

I.D Number……

Factor Related to Default among TB Patients Treated in DOTS Program in Kotamobagu Subdistrict, North Sulawesi Province, Indonesia.

Address of the interviewee:

House No. : ……..…….. Village No.: ……

Name of village: ……

Sub district : ……

District : ……

Province : …….

Name of Interviewer : …….

Date : ……

The interview started : …….. Ended: ……..

Total minutes of or time: ……

Interview result: ☐ Good ☐ Average ☐ Poor

Sampling editing: ☐ Yes ☐ No

Name of editor: ……

Part I
PERSONAL FACTORS

Please check (√) only one answer according to your understanding and please completed answer in the blank.

1. Age…… Years
2. Gender ☐ 1. Male ☐ 2. Female
3. How many family members living with you in the household?..……members
4. What is your marital status?
   - ☐ 1.Single
   - ☐ 2.Married
   - ☐ 3.Divorced/Separated
   - ☐ 4.Widowed
5. What is your education status?
   - ☐ 1.Illiterate
   - ☐ 2.No school but literate
   - ☐ 3.Secondary School
   - ☐ 4.College/University
   - ☐ 5.Primary school
   - ☐ 6.Other, specify……
6. What is your main occupation?
   - ☐ 1.Farmer
   - ☐ 2.Business
   - ☐ 3.Government official
   - ☐ 4.Other, specify……
7. How much is yours monthly family income, approximately?
   Please indicate ……Rupiah/month

Part II

KNOWLEDGE ABOUT DISEASE

Please make the answer with check (√) according to your understanding.

8. What are the dangers of tuberculosis?

☐ 1.Damage the lung tissue

☐ 2.Easily to spread

☐ 3.Cause death

☐ 4.Difficult to bread

9. What is the cause of tuberculosis?

☐ 1.Heredity

☐ 2.Bacilli

☐ 3.Hard work

☐ 4.Viral

10. How is tuberculosis spread?

☐1.By airway

☐2.By food

☐3.Sharing towels

☐4.Mosquito biting

11. What are the signs/symptoms of tuberculosis?

☐ 1.Cough with expectoration

☐ 2.Fever

☐ 3.Loss of appetite

☐ 4.Loss of weight

12. How is tuberculosis diagnosed?

☐ 1.Sputum examination

☐ 2.Blood examination

☐ 3. Chest X-ray

☐ 4. Stool and Urine examination

13. How can you prevent the spread of tuberculosis?

☐ 1. Health environment

☐ 2. Always cover your mouth with a tissue when you cough

☐ 3. Not share a towel

☐ 4. Do not eat food together

14. How is the tuberculosis disease treated?

☐ 1.Cured with medicine

☐ 2. With traditional medicine

☐ 3. Recover by self

☐ 4. With spiritual magic

15. How long do tuberculosis patients need to take drugs?

☐ 1. 4 months

☐ 2. 8 months

☐ 3. 6 months

☐ 4. 12 months

16. What are the symptoms after starting to take anti TB drugs?

☐ 1.Jaundice

☐ 2.Nausea & vomiting

☐ 3.Dizziness

☐ 4.Itching of skin

17. What will happen if the person takes drugs irregularly does or not complete the full course?

☐ 1.Disease will be cured

☐ 2.Disease will be not cured

☐ 3. TB drugs can't work

☐ 4. The person can die

18. What is the DOTS program?

☐ 1. The strategy for TB control adapted by WHO

☐ 2. The name of the drugs

☐ 3. The effect of the drugs

☐ 4. The name of infection disease

Part III

ATTITUDE ABOUT TB DISEASE AND DOTS PROGRAM

Please mark (√) under the number with your opinion on the following statements (3 = agree, 2 = not sure, 1 = disagree).

	Statement	Agree	Not sure	Disagree
19.	You are not re-infected with TB, when you get close contact with other TB patients			
20.	It is easy to be infected with TB disease when eating food together with TB patients			
21.	If any family members are infected with TB, other members will develop the TB disease			
22.	Strong people and weak people have equal risks of infection of the TB disease			
23.	It is easy to get a TB infection when you live with TB patients in a crowed environment			
24.	You can lose much of your working time when feeling sick with TB			
25.	TB is a serious disease, you may have a fatal outcome if untreated			
26.	You can work to earn income as usual while having TB sickness			
27.	TB patients are disliked/hated by community members			
28.	It is your bad luck to be infected with TB disease			

	Statement	Agree	Not sure	Disagree
29	TB disease is the one disease which can be cured easily			
30	After getting TB treatment you can make contact with friends and neighbors as usual			
31	When your symptoms are relieved, you can reduce drug doses or stop taking the drugs			
32	Even though you are busy, you can collect the drugs from the health worker at the appointed time			
33	Due to the drugs, your TB illness is worse than previous times			
34	Administering the drugs for long times causes dependent on the drugs			

Part IV

ENABLING FACTORS

Please make the answer with check (√) according to your understanding and please complete answer in the blank.

35. Do you always get the drugs when you came in health center?

☐ 1.Yes

☐ 2. No

36. Did the staff give you information (health education) about your disease and treatment?

☐ 1. Yes

☐ 2. No

37. Do you have to collect drug your self?

☐ 1. Yes

☐ 2. No

38. Do you meet your observer in every visit?

☐ 1.Yes

☐ 2.No

39.How long does it take to come in health center from your house……....minutes

40.How much do you spend for traveling (two ways) / visit? Specify……Rp

Part V

REINFORCING FACTORS

Please make the answer with check (√) according to your understanding

41. Did you family members know you are (he/she) taking anti tuberculosis treatment?

□1.Yes

□2.No

□3.Don't know

42. Did you family members support you to take the drug regularly?

□1.Yes

□2.No

□3.Don't know

43. Are you getting better care from family members since diagnosis?

□1.Yes

□2.No

□3.Don't know

Part IV

DEFAULT OF TB PATIENTS TREATMENT WITH DOTS

Please make the answer with check (√) according to your understanding.

44. Do you regularly TB treatment in health center?

☐ 1.Yes

☐ 2.No

☐ 3.Don't know

45. If yes, do you go to TB treatment consent 2 month or more?

☐ 1.Yes

☐ 2.No

☐ 3.Don't know

46. Do you ever take TB drugs before?

☐ 1.Yes

☐ 2.No

☐ 3.Don't know

47. Do you continually when take TB drugs?

☐ 1.Yes

☐ 2.No

☐ 3.Don't know

48. If no, how many times do you miss the drug?

☐ 1.Once time

☐ 2.Twice

☐ 3. Three time

☐ 4.More than three times

49. How long have you been missing the drugs?

☐ 1. 1-2 week's

☐ 2.Two weeks-one month

☐ 3. One month-two month

☐ 4. More than 2 months

APPENDIX B

Indonesia

Figure 5 Map of Indonesia

Sulawesi (**sū'läwā'sē**) , formerly Celebes (**sĕl'əbēz**) , island (1990 pop. 12,511,163), c.73,000 sq mi (189,070 sq km), largest island in E Indonesia, E of

Borneo, from which it is separated by the Makasar Strait. Ujung Pandang (Makasar) is its chief city and port; other important towns are Manado, Gorontalo, and Palopo. Extremely irregular in shape, it comprises four large peninsulas separated by three gulfs—Tomini on the northeast, Tolo on the southeast, and Bone on the south. The terrain is almost wholly mountainous, with many active volcanoes. Mt. Rantemario (11,286 ft/3,440 m) and Mt. Rantekombola (11,335 ft/3,455 m) are the highest peaks. There are numerous lakes; Towuti is the largest and Tondano, with its waterfall, the most beautiful. Asian and Australian elements are comingled in the fauna, which includes the babirusa (resembling swine), the anoa, a small wild ox found only in Sulawesi, the baboon, some rare species of parrot, and many crocodiles. Valuable stands of timber cover much of the island; many forest products are exported. Mineral resources include nickel, gold, diamonds, sulfur, and low-grade iron ore. The mountainous terrain, with only a few narrow coastal plains, limits agriculture; many inhabitants seek their livelihood from the sea, and there are trepang (sea cucumber) and mother-of-pearl industries. Sulawesi is, however, a major source of copra, and corn, rice, cassava, yams, tobacco, and spices are grown. Tourism was developed in the 1990s, and Sulawesi has become especially attractive to divers. The inhabitants are Malayan, except for some indigenous ethnic groups in the interior. The largest ethnic group is the Makasarese-Bugis, who are renowned as seafaring traders; they are Muslim. In the north are the Minahassa, who are Christian. The Portuguese first visited the island in 1512. The Dutch expelled the Portuguese in the 1600s and conquered the natives in the Makasar War (1666–69). In 1950, it became one of 10 provinces of newly created Indonesia; it has since been divided into 4 provinces. Since 1998 the island has been the site of violence between Muslims and Christians. The Univ. of North and Central Sulawesi is in Manado, and private universities are in Manado, Gorontalo, and Ujung Pandang. The Celebes Sea is north of the island, between it and the Philippines

Sulawesi

Figure 6 Map of Sulawesi

Sulawesi (or **Celebes**) is a large Indonesian island. It is the world's 11th largest island covering an areal of 174,600 km².

To the west is Borneo. To the north are the Philippines. To the south is Flores. To the southeast is Timor. To the east are the Moluccas.

Sulawesi contains the following Indonesian provinces:

- Gorontalo
- Sulawesi Barat (West Sulawesi)
- Sulawesi Selatan (South Sulawesi)
- Sulawesi Tengah (Central Sulawesi)
- Sulawesi Tenggara (South East Sulawesi)
- Sulawesi Utara (North Sulawesi

North Sulawesi is one of the 32 provinces in the Republic of Indonesia, with its capital city being Manado (formely also called "Menado"). This region with an area of 1,533,698 ha is located at 0º30"- 4º 3" North Latitude and 121º127" East Longitude.

Based on the regional government system, North Sulawesi is subdivided into the Manado Municipality, Bolaang Mongondow District, Sangihe Talaud District and Bitung Municipality. To the North this region borders on the Republic of the Philippines, Sulawesi Sea and the Pacific Ocean. The Eastern part is on the Maluku Sea and the Southern side is the Tomini Gulf. The western part borders Gorontalo Province which until the end of 2000 was a part of North Sulawesi and then became an own province.

The terrain is extremely mountainous and hilly, stretching from Lembean - Wulur Mahatus mountain chain (in Minahasa) continuing to Mount Ambang- Mount Gambuta (in Bolaang Mongondow). In Sangihe Talaud there are both active and extinct volcanoes, some towering 1,800 - 2,000 meters. Rich volcanic ash has blessed North Sulawesi with fertile lands; the highlands and lowlands producing rice, coconut, clove, nutmeg, vanilla and vegetables. The plains produce rice and corn in Dumoga, Ayong and Sangkub (Bolaang Mongondow). Plateaus in Tondano (Minahasa) also produce rice and corn, while Modoinding is know for its vegetables.

Sangihe Talaud is recognized for its high quality nutmeg and Rumbia Trees (Sago Palm the source of special flour for traditional cookies/snack).

North Sulawesi is also endowed with many lakes like Lake Tondano and Lake Moat. The rivers like Ongkag Mongondow, Ongkag Dumoga, Sungai Sangkub, Randangan, Bulia and others are utilized mostly for irrigation of the ricefields. The Tondano River is used to generate electrical power for Manado and Minahasa regions.

North Sulawesi

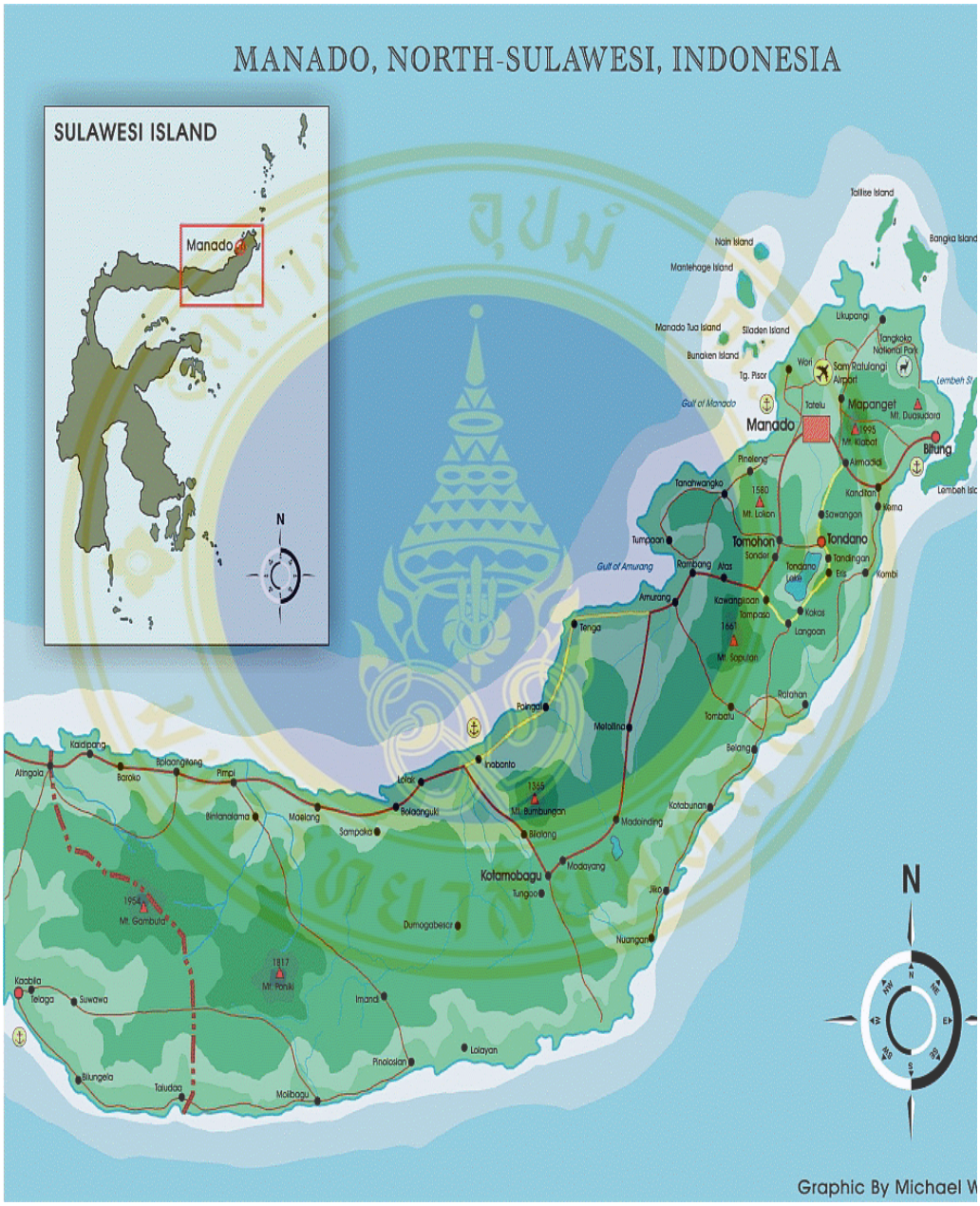

Figure 7 Map of North Sulawesi

BIOGRAPHY

NAME	Sahara Albugis
DATE OF BIRTH	December 26, 1972
PLACE OF BIRTH	Manado
INSTITUTION ATTENDED	Faculty of Medicine, University of Samratulangi Manado, North Sulawesi Province, Indonesia
	ASEAN Institute for Health Development, Mahidol University 2004-2005
	Master of Primary Health Care Management (MPHM)
FELLOWSHIP / RESEARCH GRANT	I.C.C (International Community Culture)
PRESENT POSITION	Medical Doctor (Officer on Integrated Servicing Unit Gogagoman, Kotamobagu subdistrict, Bolaang Mongondow District, North Sulawesi Province, Indonesia)