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Factors Influencing Tuberculosis Directly Observed Treatment Short-Course (Tb Dots) Compliance in Jolo Through the Theoretical Lens of the Health Belief Model

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Abstract

This study set out to explain the treatment compliance among the TB DOTS clients in Jolo, Sulu. It used the six (6) constructs of the Health Belief Model, namely perceived susceptibility and severity of the TB disease, perceived benefits and barriers to the TB DOTS program, cues to action and self-efficacy to determine the health beliefs and behavior of the respondents. There were 141 selected respondents; 111 of whom were classified as compliant to the treatment and 30 as non-compliant. The clients individually completed the survey instrument in a face-to-face interview. Investigation of the summary of responses gathered from the study revealed a complete separation between the compliant and non-compliant respondents in the areas of perceived barrier and self-efficacy, deeming both perfect predictors of treatment compliance. Multivariate logistic regression found cue to action as another significant predictor, with the local health givers having the greatest impact on treatment compliance. Clients who were confident of completing the program were more likely to comply.

Keywords: *Tuberculosis (TB), TB DOTS Compliance, Health Belief Model (HBM), Treatment Adherence, Perceived Barriers, Self-Efficacy, Cues to Action, Logistic Regression, Public Health, Jolo Sulu*

INTRODUCTION

Tuberculosis (TB) is fatal. It kills. It is infectious; caused by a bacterium that spreads through the air when the infected speak, cough, or sneeze. It is the second leading infectious killer after COVID-19, above HIV and AIDS according to the World Health Organization (WHO), causing 1.3 million deaths in 2022 alone.

TB is present in all countries and cuts across all age groups. Globally, the WHO reported an estimated 10.6 million people with TB in 2022 including 5.8 million men, 3.5 million women, and 1.3 million children. In 2022, the largest number of cases occurred in the Southeast Asian Region (46%), the African Region (23%), and the Western Pacific (18%). Of the new TB cases, more than two-thirds of the

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global total occurred in Bangladesh, China, the Democratic Republic of the Congo, India, Indonesia, Nigeria, Pakistan, and the Philippines.

In the Philippines, the Field Health Surveillance Information System of the Department of Health – Epidemiology Bureau identified tuberculosis as the 8th leading cause of morbidity for 2021. The country has one of the highest TB prevalence rates in the world, with about 1 million Filipinos having active TB disease. It is the leading killer among all infectious diseases in the country. More than 70 people lose their lives to TB every day (Weiler, 2019). The WHO has called for urgent action to end TB in the Philippines, one of the high-burden countries for TB (Fukunaga et al. 2021; WHO, 2021).

The Philippines Department of Health (DOH) has implemented the Tuberculosis Directly Observed Treatment Short-Course (TB DOTS) program to reduce the burden of TB incidence and mortality in the country. TB DOTS involves the administration of anti-TB drugs under the supervision of a healthcare worker. However, non-adherence to the treatment remains a challenge for TB prevention and control. Compliance with the DOTS program is essential for successfully treating TB and preventing drug resistance (Fukunaga et al. 2021). According to the DOH, the treatment coverage for TB in the country was 63% in 2019, and the treatment success rate for all forms of TB was 91% in 2017. It reported 311,000 TB cases in 2021, an 18% increase in TB treatment compared to 2020 based on the national TB registry. However, the COVID-19 pandemic and the heightening of restrictions have led to a 37% drop in annual notifications between 2019 and 2020 (DOH, 2022). The DOH has sought to address the problem of paper-based submission of the Self-Assessment Form (SAF) by TB DOTS facilities by implementing an online system for TB DOTS certification in some regions of the Philippines. The WHO's End TB Strategy set ambitious targets for 2020 (compared with 2015 data): a 20% reduction in TB incidence, a 35% reduction in the number of TB deaths, as well as zero TB-affected households facing catastrophic costs.

It is dangerous to discontinue treatment programs for TB early. This can allow TB that is still alive to become resistant to the drugs that will consequently require more toxic interventions using different medicines. Despite TB DOTS, compliance remains a challenge in many settings. While several interventions have been proposed to improve medication adherence, more research is needed to identify effective strategies for promoting compliance with the DOTS program.

In the province of Sulu, there is no known research on the current status of the TB DOTS program to identify and address specific challenges in its implementation and consequently how it may be improved. Hence, this research was conducted to assess and explain, through the lens of the Health Belief Model (HBM), the compliance status of the enrolled clients of the DOH TB DOTS program in Sulu, specifically in Jolo where no specific information is available on its implementation in the area.

METHODOLOGY

Research Design

The study made use of a descriptive correlational research design. This design allowed the researcher to describe compliance with the program and identify the factors that affected compliance. The study utilized both qualitative and quantitative data collection methods to gather relevant information from respondents who were purposively selected from registered TB DOTS clients. The analysis of the data collected went beyond the descriptive domain. The study employed advanced statistical methods, namely logistic regression and exploratory factor analysis. This research design was appropriate for the study as it provided a comprehensive understanding of the treatment compliance of enrolled clients in the DOH TB DOTS program in Jolo, Sulu.

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Research Locale

The study was conducted at the DOTS center in the Municipality of Jolo, a 1st class municipality and the capital of the province of Sulu. Sulu is one of the five provinces that make up the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM). The Municipality of Jolo has a land area of 126.4 square kilometers, comprising 7.90% of Sulu's total area. According to the 2020 Census, the population of Jolo was 137,266 people, with an estimated population density of 1,086 inhabitants per square kilometer. This figure represented 13.73% of the total population of the province. Once considered one of the most prosperous areas in Southern Philippines, Sulu's economy had significantly declined due to a history of violent conflict and instability. As of 2015 data from the Philippine Statistics Authority (PSA), Sulu was identified as the second poorest province in the country.

The study aimed to provide insights into the compliance behavior of enrolled clients in the TB DOTS program within this specific setting and to help develop evidence-based strategies to improve treatment adherence.

Respondents of the Study

The research respondents were enrolled clients of the TB DOTS program. They were selected purposively from the eight barangays of Jolo, Sulu. This information was summarized in table 1 shown below.

Table 1. Distribution of Respondents according to specific Barangay in Jolo

No.	Locale	Number of Respondents
1.	Alat	17
2.	Asturias	17
3.	Bus-Bus	18
4.	Chinese pier	18
5.	Takut-Takut	18
6.	Tulay	18
7.	Walled City	17
8.	San Raymundo	18
	TOTAL:	**141**

Sampling Design

The study selected 141 participants from the eight barangays of Jolo. They were purposively selected from the enrolled clients registered in the Rural Health Unit. This approach was a sampling technique that involved selecting participants based on specific characteristics or criteria. The inclusion criteria for the participants were as follows:

1. enrolled clients of the TB DOTS Program in Jolo, Sulu, and

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2. those who have completed the TB DOTS program and those who have not.

Data Gathering Procedure

Before the actual data gathering, the researcher scheduled visits to the TB DOTS program site in Jolo, Sulu to coordinate with the program staff and gain access to the enrolled clients. With approval from the program staff, written consent was secured from the selected respondents. The researcher-made survey questionnaire was administered to the respondents in their homes, with data collectors strictly instructed to follow the established procedures and guidelines. Compliance or non-compliance of the respondents with the program was obtained from the TB DOTS compliance records kept at the community health centers. Data collection was completed within a week of approval. Overall, the data-gathering process involved visiting the TB DOTS program sites in Jolo, administering the survey questionnaire to the respondents through face-to-face interviews, and analyzing the data collected using quantitative analysis.

Research Instrument

The research instrument was a self-made survey questionnaire utilizing a five-point Likert scale. Its construction was based on the six (6) components of the Health Belief Model (HBM). The questionnaire consisted of two (2) parts. The first part included short demographic variables of the respondents using single items such as age, gender, marital status, educational status, occupation, and number of children. The second part contained statements representing indicators of the respective HBM constructs. Each statement was followed by a series of response categories ranging from "Strongly Disagree = 1" to "Strongly Agree = 5," with a midpoint of "Neutral = 3." This instrument was used to collect data to measure the respondents' health beliefs. To ensure the internal consistency or reliability of each questionnaire item, Cronbach's alpha was computed for each scale of the HBM constructs. A Cronbach's alpha value between 0.6 and 0.8 was considered acceptable (Shih J. et al., 2012).

Validity And Reliability

Three experts assessed the instrument's face and construct validity. They evaluated each questionnaire item according to whether or not it was relevant to the HBM factor being assessed. Ten respondents were randomly selected to answer the questionnaire on a specified date. The same questionnaire was administered to the same respondents after two weeks. Their responses to each item were assessed for consistency to test external reliability. For internal reliability, Cronbach's alpha was used to determine whether questions designed to measure the same construct yielded similar responses.

Statistical Treatment of Data

Data collected were analyzed by determining the mean and standard deviation of each Likert scale question. The distribution of responses for each question was tabulated to identify patterns or trends in the data, such as questions receiving consistently high or low scores. Frequency counts and means were used to summarize the data, while Chi-square tests and correlation analyses were employed to determine relationships between the respondents' socio-demographic characteristics, HBM factors, and treatment compliance. Univariate and multivariate logistic regression analyses were conducted to identify significant

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predictors of treatment compliance with the TB DOTS program. The Statistical Package for the Social Sciences (SPSS) was used for all statistical analyses.

The information drawn from the data analysis included reasons for treatment compliance, experiences with the program, and perceptions of the program's effectiveness. Thematic analysis was used to identify common themes and patterns in the data, which informed recommendations for improving compliance with the program (Jamal et al., 2022).

RESULT AND DISCUSSION

The analysis and interpretation of data gathered from the answers to the questionnaires given during face-to-face interview with 141 TB-DOTS clients. The data are herein presented in tabular form ordered in accordance with the specific questions as presented in the statement of the problem.

Demographic Profile of the Respondents

The 141 respondents were clients of the TB-DOTS program who were selected from a list of enrollees in a purposive manner – 111 respondents were classified as compliant and 30 others as non-compliant. As can be gleaned from the data summarized in Table 2, the mean age of the respondents was 36.47 years. This served as basis to categorize the respondents into two groups – those who were 36 years and below, and those over 36 years. Majority of the respondents were male (60.3%), married (59.6%) and most were Muslims (89.4%) as expected. The mean number of children was 2.69. Only 19.1% had no formal education which indicated a relatively educated group of respondents with 55.3% having at least a secondary education.

Table 2. Socio-demographic characteristics of TB-DOTS clients, Jolo, Sulu, 2025 (n=141).

Variable	Response category	Frequency	Percent
Age (m = 36.47, SD = 16.78)	≤ 36	80	56.7
	> 36	61	43.3
Sex	Male	85	60.3
	Female	56	39.7
Marital status	Single	34	24.1
	Married	84	59.6
	Widowed	23	34.7
Education	No formal education	27	19.1
	Elementary	22	15.6
	Secondary	39	27.7
	College	53	37.6
Religious Affiliation	Islam	126	89.4
	Christianity	15	10.6
Number of children (m = 2.69, SD = 2.64)	≤ 2	78	55.3
	> 2	63	44.7

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Health beliefs of respondents concerning TB and TB DOTS viewed through the HBM

This section presents the Health Belief Model identifies several key dimensions influencing a patient's compliance with TB DOTS therapy. Under perceived susceptibility, individuals express an awareness of their potential to infect household members with TB, with some acknowledging the high likelihood of their family developing the disease and expressing concern for their spouse and children, while others minimize the risk of small exposures. In terms of perceived severity, many feel deeply concerned about infecting loved ones, recognize the risk TB poses to their livelihood, and believe in its potential to cause premature death and long-term health problems, although some do not perceive permanent health changes. Regarding perceived benefits, there is a strong belief that using and completing the TB DOTS program is beneficial, as it helps prevent further health issues and reduces the risk of transmission to others, providing peace of mind regarding their family's safety. However, perceived barriers include the lengthy duration of therapy, associated expenses, social stigma, and the inconvenience of the treatment process, despite health center support. Cues to action such as observing others in the program, encouragement from healthcare providers, personal losses due to TB, reminders from significant others, and ongoing health education all motivate patients to remain compliant. Finally, self-efficacy is reflected in the confidence of patients in their ability to follow the treatment regimen, obtain the necessary care, and protect themselves and their families from TB through strict adherence to the TB DOTS therapy.

The summary of responses of the respondents to the variable indicators for each construct of the HBM. First, the mean results show that for perceived susceptibility, the respondents, in general, "worry about my spouse and children getting infected" (m = 4.77, H) and that "I know that I could infect the members of my household with TB" (m = 4.74, H).

The respondents who were compliant had higher perceived severity (m = 3. 87, H) than those who were non-compliant (m = 3.43, L). The respondents were deeply concerned about infecting their family (m = 4.86, H) as TB could lead to premature death (m = 3.57, H).

Overall, the respondents recognized the benefits that the DOTS program offers. Highest perceived benefit is that "DOTS helps prevent TB from spreading to others" (m = 4.83, H). Completing it will "prevent future health problems" related to TB (m = 4.48, H).

The non-compliant respondents had higher perceived barriers to the program. They believed that people important to them will avoid them if they learn that "I am enrolled in the TB DOTS program" (m = 4.63, H). The compliant respondents had a lower perceived barrier score (m = 2.86, L). The non-compliant highly perceived that "TB DOTS entails unwelcomed expenses" (m = 4.63, H) and that "it takes a long time to complete" (4.43, H) while those who complied had significant lower scores for these two indicator variables, (m = 2.74, L) and (m = 2.52, L), respectively.

Although both the non-compliant (m = 4.00, H) and the compliant (m = 4.83, H) respondents were always reminded by people close to them about their compliance to the treatment, they differed in their responses concerning the local health providers. Compliant respondents acknowledged that the health providers checked on them to improve treatment compliance (m = 4.28, H) and gave updates on the importance of the program and on completing it (m = 4.22, H). The non-compliant gave consistently relatively low scores for these two items.

Finally, it can be gleaned from the table that there is complete separation in the perceived barrier and self-efficacy constructs. For perceived barrier, the response verbal interpretations (VI) were high (H) for the non-compliant and low (L) for the compliant respondents. Conversely, the verbal interpretations for the self-efficacy indicator variables were low (L) for the non-compliant and high (H) for the compliant.

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This makes perceived barrier and self-efficacy constructs as perfect predictors of TB DOTS compliance in this study. This would have implications in the logistic regression analysis that was run to determine predictors of compliance to the TB-DOTS. Consequently, as perfect predictors, perceived barrier and self-efficacy were omitted for further inclusion in the logistic regression analysis (Field, 2009). Because of this, self-efficacy and perceived barrier were deemed predictors of TB DOTS treatment compliance.

Demographics in relation to HBM constructs

In the health belief model, demographic variables are modifying factors in its conceptual framework of health behavior (McKeller and Silence, 2020). Pearson's chi-square test was used to determine relationship between the demographic variables used in this study and the six constructs of the HBM. The results were summarized in Table 4 where it can be gathered that:

1. Education was significantly associated with perceived severity (18.35, $p < .01$), perceived barrier (58.07, $p < .01$), cue to action (33.89, $p < .01$), and self-efficacy (61.29, $p < .01$). This suggests that educated respondents were more likely to perceive the severity of the disease. They were also more likely to see no barrier with respect to the TB DOTS treatment compliance and respond positively to cues from the local health providers. Moreover, these respondents were self-motivated in their treatment compliance.

2. Religious affiliation was significantly associated with perceived barrier (4.73, $p < .05$) and self-efficacy ($p < .01$). The Christian respondents were more likely to be self-motivated in their treatment compliance while the Muslim respondents were more likely to perceive barriers to their treatment compliance.

3. The respondent's number of children was significantly associated with perceived barrier (20.79, $p < .01$), cue to action (11.10, $p < .01$) and self-efficacy (23.03, $p < .01$). Respondents with more than two (2) children were more likely to perceive barriers to the treatment compliance. Respondents with at most two (2) children were more likely to positively respond to cues from the health providers with respect to their treatment compliance. In addition, they are more self-motivated to comply with the treatment program.

Table 4. Chi-square test results for relationship between respondent socio-demographic characteristics and health belief model constructs.

Socio-demographic characteristics	**HBM variables**					
	Perceived Susceptibility	**Perceived Severity**	**Perceived Benefit**	**Perceived Barrier**	**Cues to action**	**Self-Efficacy**
Age	1.55	0.312	-	0.29	3.62	1.58
Sex	3.08	0.17	-	1.25	0.02	0.77
Marital status	0.92	2.82	-	4.72	2.04	4.25
Educational status	3.05	**18.35, *p*<.01**	-	**58.07, *p*<.01**	**33.89, *p*<.01**	**61.29, *p*<.01**
Religion	0.24	0.21	-	**4.73, *p*<.05**	2.30	**4.54, *p*<.01**

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Number of children	1.64	1.11	-	**20.79, *p*<.01**	**11.10, *p*<-01**	**23.03, *p*<.01**

TB DOTS program compliance in relation to HBM constructs

This section presents the correlation between TB DOTS treatment compliance and the HBM construct variables. The results were summarized in table 5 below. It is easy to see that the TB DOTS treatment compliance of the respondents of Jolo, Sulu were significantly correlated to the HBM constructs. Except for perceived barrier, the HBM constructs had positive correlations with treatment compliance. The results suggest that compliant respondents were more likely to perceive the susceptibility and severity of the TB disease. They see the benefits of the program and respond positively to the encouragement of people important to them besides the health providers. The more confident and efficacious they were, the more likely that they complied with the treatment regimen. As perception of barriers decreases, the more likely the respondents tended to complete the treatment.

Table 5. Pearson correlation between treatment compliance and the HBM variables.

	HBM variables					
TB DOTS treatment compliance	**Perceived Susceptibility**	**Perceived Severity**	**Perceived Benefit**	**Perceived Barrier**	**Cues to action**	**Self-Efficacy**
	.505	.343	.883	-.938	.825	.881
	.000	.000	.000	.000	.000	.000

Predictors of TB-DOTS program compliance

In the determination of factors that may significantly influence compliance with the TB-DOTS program, logistic regression was used since the outcome variable compliance is dichotomous. The variables that were considered for inclusion in the model as predictors were the four constructs of the health belief model. As noted previously, there was virtually complete separation between two HBM constructs and compliance. These were perceived benefits and efficacy and were excluded for further analysis using logistic regression. Univariate and multivariate analysis were done to find a model that best fits the data.

The results of the univariate and multivariate analyses are shown in table 5 shown below.

For the multivariate analysis, to find the model that best fits the data, forward: LR (likelihood ratio) method of logistic regression was used. Only cue to action (Exp(B) = 18972, $p < .05$) was found to be a significant predictor of treatment compliance.

The results of both univariate and multivariate logistic regression coefficients and their corresponding significance values were also herein summarized and presented in Table 6.

Table 6. Association of TB-DOTS compliance and the health belief model constructs for the respondent of Jolo, Sulu.

Variables	Univariate		Multivariate	
	OR (95% CI)	*p*-value	OR (95% CI)	*p*-value

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	Perceived susceptibility			
I know I could infect the members of my household with TB.	28.60 (7.60 – 108.25)	.000	.308 (0.16-5.84)	.43
My spouse and children are at risk for TB.				
I believe that the chances of my family developing TB are great.				
Small exposures to TB patients won't lead to the illness.				
I worry about my spouse and children getting infected with TB.				
	Perceived severity			
The thought of infecting my family with TB deeply concerns me.	6.96 (2.58-18.80)	.000	8.75 (.02-5.84)	.11
My work would be in jeopardy because of TB.				
I believe that developing TB could lead to premature death.				
TB will lead to permanent changes in my health.				
Problems I would experience from this TB illness will last a long time.				
	Perceived benefit			
I benefit by using the TB DOTS package.	-	-	-	-
Completing the TB DOTS program will prevent future health problems for me.				
DOTS helps prevent TB from spreading to others.				
I don't worry about my family getting the illness when I strictly comply with the TB DOTS program				
	Perceived barrier			
The TB DOTS therapy takes a long time to complete.				
People important to me would avoid me if they know I'm				

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enrolled in the TB DOTS program.	-	-	-	-
TB DOTS entails unwelcomed expenses				
The health center is not aware of my compliance with the TB DOTS program.				
The TB DOTS program in inconvenient for me.				
Cue to action				
I see that others in the TB DOTS program are complying with the treatment.	3292.87 (54.00 – 200785.58)	.001	18972 (28.59 – 12391658)	.003
TB DOTS providers check up on me to improve my compliance to the regimen.				
A person known to me died of TB.				
People important to me always remind me of my compliance to the TB DOTS treatment.				
I receive regular and frequent education on the importance of TB DOTS from the providers.				
Efficacy				
I am confident that compliance with the TB DOTS treatment will cure me of the illness.	-	-	-	-
I am confident that I can comply with the requirements of the TB DOTS therapy.				
I am confident that compliance with the TB DOTS therapy will prevent my family from getting the illness.				
I am confident I can obtain the proper treatment with the TB DOTS therapy.				
I am confident that I will remember the daily regimen required by the TB DOTS therapy.				

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Conclusions

According to the findings of this research that were generated from the responses to the research questionnaire in a face-to-face interview with selected clients of the TB DOTS program in Jolo, Sulu, the HBM constructs namely cue to action, perceived barrier and self-efficacy were found to be significant factors influencing TB DOTS treatment compliance. Most important is the cue to action coming from the health workers of the Barangay Health Centers of Jolo, Sulu. Official acknowledgment should be given to these health providers, who, together with people close to the respondents, were the sources of encouragement towards developing the desired behavior in relation to TB DOTS treatment compliance. Nonetheless, the local government of Jolo must also acknowledge the cost the respondents think the program entailed, both in money and time.

Recommendations

The researcher suggests the following recommendations:

To the Community

Motivation of the community to support TB DOTS clients is necessary to help them comply with requirements of the therapy.

To the Department of Health

The health workers of the community may continue with health education about TB and the TB DOTS program including TB drugs and their side effects.

To Future Researcher

Further research is also recommended. Due to limitations in both time and resources, the sample size was small compared to the requirements of the statistical tests employed in this research. Therefore, the researcher does not and cannot claim that the results can be generalized to other communities in Sulu. A similar study may be undertaken with the appropriate sample size.

To the Health Sector

The health workers may identify clients with financial problems and refer them to appropriate agencies, like the DSWD. They may be encouraged to attend skills development programs in the community if there are any.

Completers of the TB DOTS program may be officially rewarded to motivate others to do the same.

Additional staff is essential in the community health centers. Staff shortage could cause limited time for health education.

To TB Patient

TB Patients may take steps to boost self-efficacy by attending any meetings called by the local health units.

Patients are encouraged to reach out to family, friends, or support groups for emotional support and motivation to combat stigma that may arise from the disease.

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