

Original Article

Characteristics of directly observed treatment short-course workers in Taiwan

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Abstract

Background: Little is known about the characteristics of health workers. The objective of this study was to figure out the characteristics of different types of health workers involved in Directly Observed Treatment Short-course (DOTS) work.

Methods: The study comprised of 444 community health workers and 822 potential DOTS workers; the participants attended the training course and completed structured questionnaires. The questionnaires were then analyzed to investigate the knowledge, stigmatization, and accountability of community health partnerships (ACHPs) in tuberculosis (TB) control.

Results: Our study results found statistically significant differences in TB knowledge scores ($p < 0.001$) and ACHPs scores ($p < 0.001$), but not in stigmatization scores ($p = 0.541$) among the participants. Analysis of variance of stigmatization factors 2 and 3 differed significantly among participants ($p < 0.001$ for both factors). Level of education (Odds ratio, OR = 1.69) and stigmatization factor 3 [avoidance (OR = 1.25)] were found to be negative factors, whereas knowing a patient with TB (OR = 0.75), having TB knowledge (OR = 0.78), and high scores in stigmatization factor 1 [attribution (OR = 0.87)] were found to be positive factors.

Conclusion: The main factor explaining why DOTS workers did not enter into a contract was avoidance, and that main reason why they chose to become employed was sympathy. Potential DOTS workers who know a patient with TB, have high TB knowledge, and have high attribution concerns are more likely to remain under contract.

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Keywords: accountability; community health workers; directly observed therapy; knowledge; tuberculosis

1. Introduction

Inadequate health worker performance is a widespread problem. Directly observed treatment short-course (DOTS) workers are staff drawn from many different sectors of health care, such as community health workers (CHWs), public health workers (PHWs), and lay health workers (LHWs); there are also family-member DOTS workers and self-administered DOTS. Both family-member DOTS and community DOTS strategies can assist in attaining international targets for treatment success under the program conditions.¹ Community

supervisors are an essential component of any DOTS strategy.² Ongoing support of treatment supporters must include recognition that their role is not simply that of treatment observation,³ and the emphasis should shift in practice from medication watching to treatment support.⁴ Clear government policy and support for LHW programs in tuberculosis (TB) control are needed.⁵

Health worker practices are complex behaviors that have great potential influence on patients, and better communication between health professionals, particularly medicine dispensers, and patients is essential for improving treatment adherence in treating TB, even with DOTS.⁶ Nonadherence seems to be related to treatment delivery failures. Running training workshops in TB control are effective for the promotion of knowledge and elimination of stigmatization in first-line caregivers⁷; hence, the health system needs strengthening through intensified

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health-care worker training and supervision.⁸ LHWs are widely used to provide care for a broad range of health issues. However, little is known about the characteristics of LHWs. The theories explored suggest intrinsic and extrinsic motivation factors that lead people to volunteer for health programs. Intrinsic motivation encompasses such feelings as empathy and altruism as well as others such as religious and cultural convictions, and the factors a person believes in are responsible for motivation, and in particular, contextual settings.⁹ This study surveyed multiple factors related to health workers who participated in TB control training workshops before the execution of the DOTS program.

2. Methods

A survey was used to obtain information from health workers participating in nationwide TB training workshops. The training workshops were held in each county, one by one, starting in 2006, and a total of 24 workshops were ran. This was an empirical study, with the participants being health workers who were recruited into the study; we attempted to investigate the characteristics of health workers and attributing factors. Two types of health worker were included in this study, namely, CHWs and potential DOTS workers. The CHWs were on the staff at one health center in the county; lay community members supervising patients with TB during the anti-TB treatment period were defined as DOTS workers. However, before they became DOTS workers, they had received in-depth training, and during that training period, they were defined as potential DOTS workers, who had been recruited from each county to take part in the DOTS program and who would become government-contracted workers if they passed the training course. In order to understand the magnitude and complexity of the various issues faced by the governmental TB control program, participants received the same training course, the contents of which included education about TB, information about the current state of TB epidemiology, the skills needed for DOTS execution, destigmatization, and human rights. A questionnaire survey was conducted during training; all the participants completed two questionnaire surveys, one before and the other after training. Questionnaires were completed to investigate the knowledge, stigmatization, and accountability of community health partnerships (ACHPs) of health workers in TB care. The questionnaire contained three parts of structured sections derived from three original valid questionnaires; the first part of the structured questionnaire used in this study during the DOTS training courses contained nine items on TB knowledge and was derived from a previous TB knowledge questionnaire designed by the Centers for Disease Control (CDC) Taiwan. The second part of the structured questionnaire contained eight items on stigmatization and was derived from the AQ-S8 for Measures of Illness Stigma.¹⁰ The third part of the structured questionnaire contained eight items of ACHP; it was derived from a previous CHP literature and assessed the accountability of the CHPs.¹¹ These questionnaires were adapted and translated into Chinese after validity-checking using Cronbach α ; the critical attribute of our instrument

was its moderate to high internal consistency (Cronbach α for TB knowledge: 0.72; AQ-S8: 0.68; ACHP: 0.94). The questionnaires required the participants to rate the importance of indicators of TB knowledge, stigmatization, and ACHP; the questionnaire items were rated using a 5-point Likert scale, from extremely unimportant to extremely important; the higher the score, the higher the knowledge, the stigmatization, and the ACHP. This project was evaluated and proofed by the Project Review Board of the CDC; informed consent was given by the participants of this project before their questionnaires were completed.

The participants were placed into classes according to the classes' geographical distance from their homes. The participants of this study from the TB training course comprised of 444 CHWs and 822 potential DOTS workers ($n = 1266$ in total). Standardized procedures were followed and the participants completed the structured questionnaire during training. The questionnaires were collected immediately after completion. To assess the related factors of the participants, we analyzed the scores of the participants, and the differences in scores were compared by analysis of variance. In addition, factor analysis and logistic regression were used to analyze the attribution of related characteristic factors.

3. Results

3.1. Comparison of the three groups of participants

The workshop participants comprised of CHWs and potential DOTS workers, and the latter were either contracted ($n = 392$) or noncontracted ($n = 430$) with the government after the training workshop. These three groups of participants were compared in terms of TB knowledge scores, ACHP scores, and stigmatization scores. We found that there were statistically significant differences in the TB knowledge scores ($p < 0.001$) and ACHP scores ($p < 0.001$); however, we did not find any statistically significant differences in the stigmatization scores ($p = 0.541$) among the participants. The highest TB knowledge scores were obtained by the CHWs, while the highest ACHP scores were measured in the potential DOTS workers (contracted) (Table 1).

3.2. Factor analysis for stigmatization

Extraction using the principal component analysis method was performed, and factor analysis for the eight items of stigmatization revealed that three components explained 63.83% of the total variance after rotation (component 1: 26.22%; component 2: 21.78%; component 3: 15.83%). To define, the terminology of components 1, 2, and 3 were generalized from the questions in the questionnaire: component 1 contained responsibility, anger, segregation, and danger factors; the question was the questions were "I would think that it was Tb case own fault", "How angry would you feel at Tb case?", "I think it would be best for Tb case to put away in a hospital.", "How dangerous would you feel Tb case is?", and we imputed component 1 as stigmatization factor 1,

Table 1
Comparison of TB knowledge, ACHP, and stigmatization scores among workshop participants.

Workshop participants	TB knowledge scores	ACHP scores	Stigmatization scores
	Mean \pm SD	Mean \pm SD	Mean \pm SD
Community health workers ($n = 444$)	7.52 \pm 0.79	31.20 \pm 5.67	37.61 \pm 8.35
Potential DOTS workers (noncontracted) ($n = 430$)	6.87 \pm 1.41	33.42 \pm 5.54	37.17 \pm 8.68
Potential DOTS workers (contracted) ($n = 392$)	7.27 \pm 1.10	34.44 \pm 5.12	36.97 \pm 8.93
p for ANOVA	<0.001	<0.001	0.541

ACHPs = accountability of community health partnerships; ANOVA = analysis of variance; DOTS = Directly Observed Treatment Short-course; TB = tuberculosis.

attribution. Component 2 contained fear, pity, and help factors; the question was “How scared (pity, likely to help) of the TB case did you feel?”, and we imputed component 2 as stigmatization factor 2, sympathy; component 3 contained the avoidance factor; the question was “I would try to stay away from the TB case” and we imputed component 3 as stigmatization factor 3, avoidance (Table 2).

Stigmatization factors 1–3 were analyzed to estimate the distribution of stigmatization factor scores among the workshop participants. Analysis of variance of stigmatization factors 2 and 3 differed significantly among the workshop participants ($p < 0.001$ for both factors), but stigmatization factor 1 revealed no significant difference ($p = 0.080$). The highest scores for stigmatization factor 2 (sympathy) were found in the contracted potential DOTS workers, i.e., the contracted potential DOTS workers were found to be the most sympathetic, more so than noncontracted potential DOTS workers, while noncontracted potential DOTS workers were in turn found to be more sympathetic than CHWs. The highest scores for stigmatization factor 3 (avoidance) were measured in CHWs, who were found to be the most avoidant workers, more so than noncontracted potential DOTS workers, who were in turn more avoidant than contracted potential DOTS workers. Comparing the three groups of participants, there was a linear trend in both stigmatization factor 2 [sympathy ($p < 0.001$)] and stigmatization factor 3 [avoidance ($p < 0.001$)] (Table 3).

3.3. Related factors in contracted versus noncontracted workers

Contracted and noncontracted potential DOTS workers were compared by logistic regression of related factors, and

Table 2
Factor analysis for the eight items of stigmatization.

	Component		
	1	2	3
Responsibility		−0.003	−0.002
Anger		−0.059	0.176
Segregation		0.358	−0.029
Danger	0.581		−0.020
Fear	−0.071		0.030
Pity	0.147		−0.040
Help	0.112		−0.814
Avoidance	0.246	0.194	
% of variance after rotation	26.22	21.78	15.83

Extraction method: principal component analysis.

Rotation method: varimax with kaiser normalization.

controlling for age and gender, level of education (Odd's ratio, OR = 1.69), and stigmatization factor 3 (avoidance) (OR = 1.25) were found to be factors that influenced potential DOTS workers to not accept a contract with the government; in contrast, knowing a patient with TB (OR = 0.75), having a high knowledge of TB (OR = 0.78), and high scores for stigmatization factor 1 (attribution) (OR = 0.87) influence potential DOTS workers to accept a contract with the government for the execution of DOTS work. No significant differences were found for the other factors (Table 4).

4. Discussion

The results of our survey showed that potential DOTS workers could be distinguished from CHWs by their TB knowledge scores and ACHP scores, regardless of gender, identity, or age. Analysis of the TB knowledge scores revealed a trend in the three groups of participants: the scores of CHWs were higher than those of potential DOTS workers (contracted) and the scores of potential DOTS workers (contracted) were higher than those of potential DOTS workers (noncontracted). In contrast, analysis of ACHP scores revealed a different trend: the scores of potential DOTS workers (contracted) were higher than those of potential DOTS workers (noncontracted), and the scores of potential DOTS workers (noncontracted) were higher than those of CHWs. According to the distribution of stigmatization scores, a trend similar to that for the ACHP scores was observed but was not statistically significant ($p = 0.541$).

Policy discussions need to focus on worker employment and deployment, as we know that stigmatizing attitudes may be related to dangerousness and personal responsibility and may undermine the opportunities of people with TB. This study set out to examine and explain how these attitudes lead to discriminatory behavior. The findings of this research are discussed under three headings: components of stigmatization, distribution of stigmatization factors, and characteristics of DOTS workers. It is interesting to explore the eight items of stigmatization by factor analysis and to assess the impact of programs on the components of stigmatization models. There are only eight items in the stigmatization score, in order to simplify the factors for the screening and selection of employees by hiring organizations, and factor analysis was performed; after extraction and rotation, the eight items of stigmatization were imputed into the three stigmatization factors, and analysis of variance of these three stigmatization

Table 3
Distribution of stigmatization factor scores among workshop participants.

	Factor scores				
	No.	Mean	SD	<i>p</i> for ANOVA	<i>p</i> for trend analysis
Stigmatization factor 1: attribution					
Community health workers	444	−0.014	0.985	0.080	0.140
Potential DOTS workers (noncontracted)	430	−0.066	0.961		
Potential DOTS workers (contracted)	392	0.088	1.053		
Stigmatization factor 2: sympathy					
Community health workers	444	−0.170	0.902	<0.001	<0.001
Potential DOTS workers (noncontracted)	430	0.087	0.983		
Potential DOTS workers (contracted)	392	0.097	1.097		
Stigmatization factor 3: avoidance					
Community health workers	444	0.182	0.942	<0.001	<0.001
Potential DOTS workers (noncontracted)	430	0.041	1.068		
Potential DOTS workers (contracted)	392	−0.251	0.935		

ANOVA = analysis of variance; DOTS = Directly Observed Treatment Short-course.

factors uncovered significant differences, the results of which reveal that potential DOTS workers (contracted) were the most sympathetic, CHWs were the most avoidant, and potential DOTS workers (contracted) showed the highest sympathy and the lowest avoidance characteristics.

Logistic regression analysis revealed the association that there were three positive predictors and two negative predictors for potential DOTS workers. Whether they were employed or deployed (contracted or noncontracted), those with a high level of education and high scores for stigmatization factor 3 (avoidance) chose not to be contracted with the government in DOTS work, whereas high TB knowledge scores, knowing a patient with TB, and high scores for stigmatization factor 1 (attribution) were three factors that were found to influence potential DOTS workers to choose to continue to be employed (contracted) by the government for the execution of DOTS work. Although labor intensive, a team approach with well-defined roles for outreach workers is efficient and effective, and the use of incentives and enablers makes DOTS more attractive to patients, rendering the program more successful.¹² LHWs and their intervention work support the concept that carefully selected CHWs who are to

varying degrees representatives of their local population can act successfully as intermediaries in preventive health-care strategies.¹³

In our study of potential DOTS workers, knowing patients with TB and having a high TB knowledge score were found to be major variables that contributed to higher ACHP scores before training. Potential DOTS workers were found to be more accountable than CHWs before and after training, and older age groups tended to be more accountable than younger age groups. After controlling for other factors, the level of ACHP did not correlate significantly with level of education, i.e., a higher level of education did not equal a higher ACHP score.

Lack of knowledge of TB was found to be strongly associated with negative attitudes toward TB and a poorer experience with the disease. Health education can be accomplished in collaboration with lay people, particularly those who have recovered from active TB, their family members, and health workers from the community.¹⁴ Responsibility increases with knowledge.¹⁵ Our survey showed that increasing knowledge increased accountability, and this was true even after training.

Table 4
Logistic regression of related factors for noncontracted versus contracted DOTS workers.

	<i>p</i>	Odd's ratio (OR)	95% Confidence interval for OR	
			Lower	Upper
Age (y)	0.917	1.00	0.98	1.02
Gender (female vs. male)	0.115	0.75	0.53	1.07
Level of education (above senior high school vs. senior high school and below)	0.003	1.69	1.20	2.37
Knew TB patient (yes vs. no)	0.050	0.75	0.56	1.00
TB knowledge (scores)	<0.001	0.78	0.69	0.89
Awareness of social responsibility (scores)	0.530	0.99	0.96	1.02
Stigmatization (factor scores)				
Factor 1: attribution	0.055	0.87	0.75	1.00
Factor 2: sympathy	0.900	0.99	0.86	1.14
Factor 3: avoidance	0.005	1.25	1.07	1.45

DOTS = Directly Observed Treatment Short-course; TB = tuberculosis.

The results of our study revealed that ACHPs scores increase as the level of stigmatization decreases, and that the need to reduce the level of stigmatization was more strongly expressed by CHWs than by potential DOTS workers. Interventions to reduce stigma and promote social support at the patient, household, community, and health-care system levels should be part of future efforts in the control of TB.¹⁶

Even though all the participants in this study passed the training course, relevant information was not collected in this study, which is a major limitation of this study. Are there “external factors,” for example, family issues or life events of a participant, and possible government policy changes in different years, career plan, health status, salary, or income issues that may influence a potential DOTS worker to become a contracted DOTS worker? In addition, there were limitations in terms of the noncomparability between CHWs and potential DOTS workers, such as the fact that CHWs were professional workers, while potential DOTS workers were lay people; the former were formal, government employees with 9–5 working hours, the latter were temporary, contracted employees with nonfixed working hours; and the former found it easier to find an office job than the latter. The latter usually were members of a disadvantaged minority in their community.

The major finding of this study was that high TB knowledge scores, knowing a patient with TB, and high scores for stigmatization factor 1 (attribution) were three factors that at the time of training were the most consistent and significant predictors of becoming employed. Those participants with high levels of education and those with high scores for stigmatization factor 3 (avoidance) were more likely to leave the job. Avoidance was the first factor in those DOTS workers that did not accept a contract, and sympathy was the first factor in those who chose to become employed. Other factors related to accepting a contract were high TB knowledge and high ACHP concerns.

It is also important to note that sympathy and avoidance are two factors with opposite influences on whether or not the potential DOTS worker becomes contracted. It is suggested that the findings put forward in this article may lead to an improved understanding of the dynamics behind employee innovation behavior. The results of our study suggest that the participants understood their accountability in community health, especially after the TB control training workshops. Pre-job and in-service education of health workers not only promotes knowledge, but also increases community accountability, as well as reduces the stigma surrounding TB.

Planners need to be able to predict manpower requirements and define selection criteria, and it is therefore useful to know that potential DOTS workers with a high level of education and high avoidance are more likely to drop out from DOTS work, while those who know a patient with TB, have high TB knowledge, and have high attribution concerns are more likely to remain contracted.

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