Quality of life among pulmonary tuberculosis patients under treatment in Eastern Taiwan

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Objectives: We evaluate the quality of life (QOL) among tuberculosis (TB) patients during different treatment periods. **Methods:** We conducted a population based cohort study in Eastern Taiwan. The short version of the World Health Organization quality of life (WHOQOL) questionnaire was administered to TB patients under treatment at 3 periods: during an initial treatment period, at a 2-month treatment period, and after a 6-month treatment period. **Results:** 140 TB patients were interviewed after approval by institutional review boards and interviewee informed consents. The average age of the patients was 48.9 years (SD=18.9 years) and more than half of them were men. Physical domain scores decreased significantly from the initial treatment to the 2-month anti-TB treatment (12.517 ± 2.832, 11.667 ± 3.179, p<.001), and then increased after a 6-month treatment (12.691 ± 2.903). Social domain scores also significantly decreased from the initial treatment to the 2-month anti-TB treatment (13.618 ± 2.685, 12.899 ± 2.953, p<.05), and then increased after 6 months of treatment (13.900 ± 2.552).While controlling probable factors affecting the 4 domain scores related to QOL, drugs related hepatitis reduced physical (β = 2.3700, p < .001), psychological (β = 2.633, p < .001), social (β = 4.135, p < .001), and environmental domain scores (β = 3.449, p < .001) and blurred vision significantly reduced physical (β = 2.290, p < .001), psychological (β = 2.127, p < .001), social (β = 1.075, p < .05), and environmental domain scores (β = 1.587, p < .01). Physical domain scores significantly decreased as age increased per 10-year (β = 0.39, p < .01). The patients employed exhibited significantly higher scores of physical, social, and environmental domains compared than those who were unemployed (β = 0.959, p < .05, β = 0.815, p < .05, and β = 0.852, p < .05 respectively). The patients with a higher income showed fewer scores of psychological domain (β = 2.029, p < .01) compared than those who having a lower income. **Conclusions:** TB affected individual health and QOL, although patients underwent effective treatment. Healthcare workers should be concerned regarding the adverse reactions of anti-TB drugs. (*Taiwan J Public Health. 2014;***33(1):***23-35*)

Key Words: quality of life, TB patients, adverse reactions

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INTRODUCTIONS

Pulmonary tuberculosis (TB) remains a serious public health, social, and economic problem worldwide. Because considerable attention has focused on preventing transmission and treatment outcome, the effect of TB disease on quality of life (QOL) is seldom considered [1-3]. Despite effective treatment and available cures, TB can cause anatomic and functional change of the lungs.

Prolonged therapy (a minimum of 6 to 9 months) with potentially toxic drugs may lead to adverse reactions that particularly affect elderly patients. Isolation to prevent transmission of *Mycobacterium tuberculosis* may leave the person shunned by his/her friends and make one feel social stigmas [4-6]. TB infects one-third of the global population, and kills approximately 2 million people worldwide annually [7]. TB is one of the most common leading infectious diseases, with 58 cases per 10^5 people in Taiwan, and is also the leading cause of infectious death. The highest incidence of TB, 111 cases per 10^5 people, is located in Eastern Taiwan [8]. The Taiwan government is committed to controlling endemic TB, and has implemented directly observed short-course therapy (DOTS) since 2006. Community health care workers deliver a daily dose of medicine to onsite patients, and watch patients take and swallow the medicine. To enhance medicine adherence, they also provide nutrition for patients with poor economic status.

Exploring the TB effect on QOL includes TB management and outcome measurement. Conventional clinical and biological indicators are intrinsically related to patient QOL, but they fail to represent a person's self-perceived function and daily well-being. QOL involves a person's perceptions of their position in life in the broader culture and in the value systems in which they live, related to their goals, expectations, standards, and concerns [9]. Medical care should narrow the gap between patient expectations and actual events [10]. Health-related QOL (HRQOL) is a complex type of patient-reported outcomes to evaluate health status. HRQOL broadly describes the accuracy of a person's perception of his or her well-being in physical, mental, and social aspects. Self- or interviewer-administered questionnaires can be used to measure HRQOL at a point or longitudinal changes within patients during a period. QOL measurement can be used with generic and disease-specific instruments.

In the Dion study, among 50 participants who completed all study measurements (SF36 and Euro QOL EQ-5D questionnaires), 17 received 2 months of treatment for active TB, 25 were treated for latent TB infection, and 8 had a history of TB [11]. Defining the TB effect on QOL was difficult because of mixed-variable periods in TB treatment and the small sample size in this study. Chamla constructed a 2D model of the SF-36: physical health and psychological health from factor analysis on TB patients [12]. However, the social component may play an important role in infectious TB patients because they may perceive themselves as disease vectors and feel social stigmas [5,6,13]. Pasipanodya and colleagues used the St. George Respiratory Questionnaire (SGRQ), a widely used specific instrument for measuring HRQOL in patients with chronic obstructive pulmonary disease, to assess TB patients under at least 20 weeks of therapy and latent TB infection (LTBI) patients [14]. Although the mean total score of SGRQ for post-TB patients was significantly higher than that for the LTBI score, it did not show the treatment effect on TB. Therefore, no specific instrument currently exists for measuring TB patients' QOL.

In 1991, the World Health Organization (WHO) initiated a cross-cultural QOL assessment instrument, to include measures of disease and impairment effect on daily activities and behavior, perceived health measures [15], and disability/functional status measures [16]. The WHOQOL research group later simplified the WHOQOL-100 to a short form called the WHOQOL-BREF [17,18], which comprises 26 items measuring four domains: physical health, psychological health, social relationships, and environment. All items are rated on a 5-point Likert scale. This instrument can be widely

used in interventional studies for cross-cultural, population, or intra-disease comparisons.

The WHOQOL-BREF has been validated in the general population, and has been adopted by disease-specific people undergoing hemodialysis and with traumatic spinal-cord injury [19-21]. However, it is currently not applied to TB patients. TB is still prevalent in Taiwan, particularly in Eastern Taiwan, where the incident rate is 120.4 per 10^5, compared to 67.4 per 10^5 at global Taiwan in 2006 [22]. Researches on the QOL changes for TB patients during different treatment periods are limited. We used a longitudinal design to evaulate the association between QOL and TB treatment. The study hypothesis examines differences of QOL during different treatment periods and relationship between QOL and drugs related adverse effects.

MATERIALS AND METHODS

Sample

A population-based prospective study was conducted for TB patients residing in Eastern Taiwan, covering 0.57 million residents. From March 1 to July 31 in 2007, 200 patients were diagnosed with TB by sputum culture or tissue-confirmed, or by a physician. Among these TB patients, 60 were excluded from this study for the following reasons: 22 with disturbed consciousness, 3 with extra-pulmonary TB, 12 dead at diagnosis, 5 confirmed with multidrug-resistant TB, 6 repatriates after diagnosis, and 12 refused to be interviewed because of insufficient time, interest, or relocation. The remaining 140 TB patients agreed to participate in the study.

Procedure

The WHOQOL-BREF questionnaire was administered to TB patients at 3 periods: during the initial treatment period, at a 2-month treatment period, and after a 6-month treatment period. Registered nurses and community healthcare workers were well trained to become interviewers to visit participants and to fill out the WHOQOL-BREF questionnaires. All staff involved in this study signed a letter of agreement to maintain patient confidentiality. The study complied with the guidelines on human participant research and other institutional policies involved in the study. All participants signed an informed consent and received an interview before becoming inpatients. During data collection and analyses, we managed the missing value according to the WHOQOL regulations. Where more than 20% of data was missing from an assessment, the assessment was discarded. Where an item was missing, the mean of other items in the domain was substituted. Where more than two items were missing from the domain, the domain score was not calculated (with the exception of domain 3, social domain, where the domain was calculated if < 1 item was missing) [23].

Instruments

The WHOQOL-BREF questionnaire contains 26 items, each representing one facet. Among the 26 items, 24 are grouped into 4 domains: physical health (7 items), psychological health (6 items), social relation (3 items), and environment (8 items). The other 2 items measure overall QOL and general health. The WHOQOL-BREF domain scores were calculated by multiplying the average scores of all items in each domain by 4, and ranged from 4 to 20. Higher domain scores indicated enhanced QOL [17].

Dependent measurement

Four domain scores of HRQOL were measured by the WHOQOL-BREF.

Independent variables

Demographic variables included age, gender, education levels, ethnicity, employment status, personal monthly income, comorbidities, adverse reactions of anti-TB treatments, different treatment periods, and treatment outcome. Education levels were categorized as more than 9-year education and less than 9-year education. Ethnicity were categorized as aborigines and non-aborigines. Personal income was categorized < 30,000 NTD per month, 30,000- 60,000 NTD per month, and > 60,000 NTD per month. Comorbidities include diabetes, liver diseases, cancer, gastrectomy, pneumoconiosis. Adverse reactions of anti-TB treatment include skin itching, hyperuricemia, gastro-intestinal upset, blurred vision, distal limb numbness, and hepatitis.

Data analysis

Data analyses were conducted using SPSS 17.0 statistical software (SPSS Inc., Chicago, IL, USA). The distribution of categorical demographic characteristics and baseline comorbidities were presented with frequency and proportion. The generalized estimating equation (GEE) [24] was used to evaluate longitudinal repetitive measures of HRQOL while TB patients were interviewed at 3 treatment periods: initial diagnosis (within 2 weeks of anti-TB treatment), at a 2-month intensive treatment, and after 6 months of treatment. The GEE model extends the regression model to accommodate longitudinal and correlated data, and provides a convenient method to model the relationship between the responses and the time-dependent covariates. This model has become a popular statistical tool in biological, epidemiological, educational, and social science studies [25]. *Beta* and 95% confidence intervals (CI) were used to estimate the effects of independent variables on 4 domain scores. A full model to predict factors affecting 4 domain-score changes were performed on the potential predictors with $p < .05$ obtained from univariate analyses. All statistical tests were performed at the two-tailed significance level of .05.

RESULTS

Demographic characteristics of TB patients

The mean age of the 140 TB patients was 48.9 ± 18.9 years (mean ± SD); 70.7% of the sample comprised men, and more than half of them were aboriginal Taiwanese. More than half of TB patients received fewer than nine years of education, 35.8% of them worked in unskilled occupations, or were unemployed, and 84.8% of their personal monthly incomes were lower than NT$ 30,000. Fifty-seven (40.7%) of them had comorbidities, of which diabetes was the most common (Table 1).

Adverse reactions of anti-TB medicines during different treatment periods

During the 3 rounds of interviews, anti-TB adverse reactions appeared mostly at the 2-month anti-TB treatment interval despite no statistical significance exisited. Common adverse reactions at the 2-month treatment period were skin itching, hyperuricemia, GI upset, blurred vision, distal-limb numbness, and hepatitis (Table 2).

Changes to the four domain scores during different treatment periods

Figure 1 illustrated changes of the four domain scores during three different treatment periods. Physical domain scores decreased significantly from the initial treatment to the

Table 1 Demographic characteristics of 140 patients with tuberculosis

Demographic Variables		n (%)
Age		
	≦ 30 year-old	27 (19.3)
	31 to 50 year-old	52 (37.1)
	51 to 64 year-old	29 (20.7)
	≧ 65 year-old	32 (22.9)
	Mean (SD)	48.9 (18.9)
Gender		
	Male	99 (70.7)
	Female	41 (29.3)
Level of Education		
	≦9 years	105 (76.1)
	≧10 years	33 (23.9)
Race		
	Aborigines	85 (60.7)
	Non-aborigines	55 (39.3)
Employment		
	Yes	77 (64.2)
	No	43 (35.8)
Personal Monthly Income (in NT Dollars)		
	＜30,000	117 (84.8)
	30,000-60,000	18 (13.0)
	>60,000	3 (2.2)
Comorbidities		
	Yes	57 (40.7)
	No	83 (59.3)
Treatment success		
	Yes	97 (69.3)
	No	43 (30.7)

2-month anti-TB treatment (12.517 ± 2.832, 11.667 ± 3.179, $p < .001$), and then increased after a 6-month treatment (12.691 ± 2.903). Social domain scores also significantly decreased from the initial treatment to the 2-month anti-TB treatment (13.618 ± 2.685, 12.899 ± 2.953, $p < .05$), and then increased after 6 months of treatment (13.900 ± 2.552). (data not shown) Although the psychological and environmental domain scores decreased at the 2-month anti-TB treatment, they were not statistically significant (Fig. 1).

Effects of demographic characteristics on the four domain-score changes considering time effect

Table 3 showed univariate analysis of demographic characteristics on effects of the four domain scores considering time effect by a GEE model. The physical domain scores significantly decreased as age increased per 10-year (β = 0.32, 95% CI: -0.56, -0.07). Women exhibited higher social domain scores compared than men did (β = 0.917, 95% CI: 0.110, 1.723) More education levels exhibited

Table 2 Comparisons of adverse reactions of anti-TB treatments during three treatment periods

Adverse reactions of Anti-TB	≦2-Week Treatment(%)	2-Month Treatment(%)	≧6-Month Treatment(%)	p value
No	82 (59.0)	52 (46.8)	51 (55.4)	.153
Yes	57 (41.0)	59 (53.2)	41 (44.6)	
Adverse reactions				
Skin Itching	28 (20.1)	27 (24.3)	22 (23.9)	.684
Hepatitis	3 (2.2)	4 (3.6)	1 (1.1)	.604
GI Upset	17 (12.2)	18 (16.2)	13 (14.1)	.654
Blurred Vision	9 (6.5)	13 (11.7)	11 (12.0)	.275
Distal Limb Numbness	5 (3.6)	8 (7.2)	2 (2.2)	.174
Hyperuricemia	17 (12.2)	25 (22.5)	11 (12.0)	.050

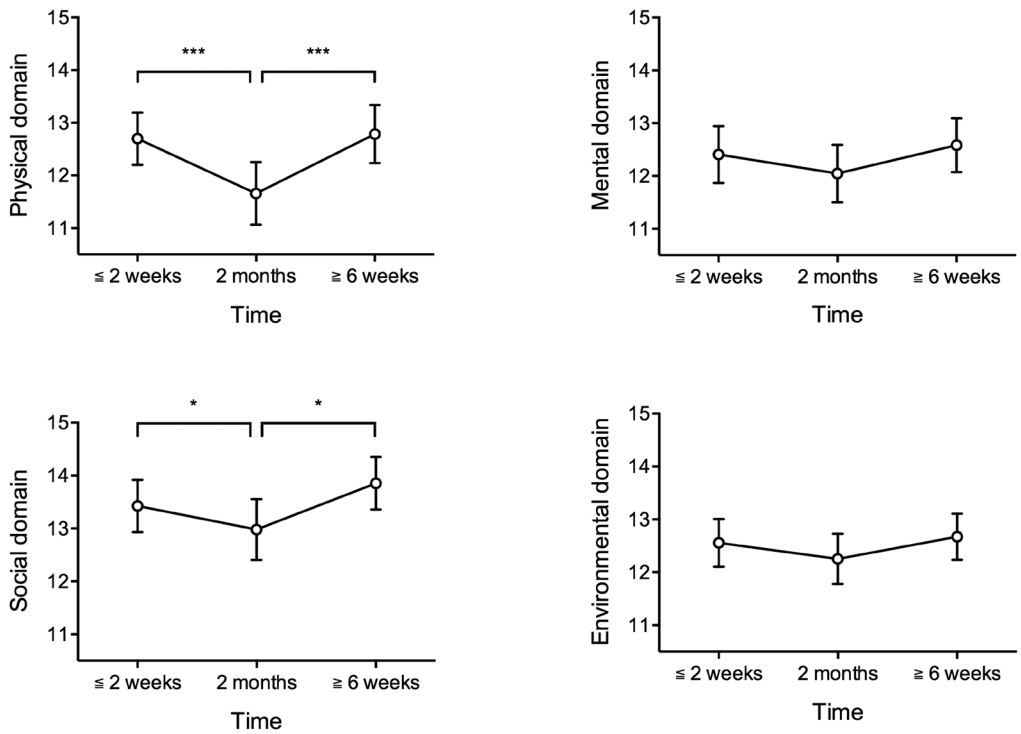

Figure 1. Comparisons of the four domain-score changes during three treatment periods

higher psychological domain scores compared with less education levels (β = 1.249, 95% CI: 0.266, 2.232).Non-aborigines showed higher environmental domain scores than aborigines did (β = 1.223, 95% CI: 0.515, 1.932). The patients employed exhibited significantly higher scores of physical and psychological scores compared than those who were unemployed (β = 0.958, 95% CI: 0.095, 1.821 and β = 0.811, 95% CI: 0. 031, 1.590 respectively). Whereas,

Table 3 Univariate analysis of demographic characteristics on the four domain scores considering time effect

Variables	Reference	Physical Domain		Psychological Domain		Social Domain		Environmental Domain	
		β	95% CI	β	95% CI	β	95% CI	β	95% CI
Age per 10 years		-0.32*	(-0.56, -0.07)	-0.22	(-0.44, 0.01)	-0.03	(-0.24, 0.19)	0.06	(-0.14, 0.25)
Gender									
Female	Male	-0.259	(-1.190, 0.673)	-0.121	(-1.042, 0.800)	0.917*	(0.110, 1.723)	-0.008	(-0.710, 0.694)
Education									
≧10 years	≦9 years	0.842	(-0.093, 1.776)	1.249*	(0.266, 2.232)	0.565	(-0.332, 1.462)	0.481	(-0.348, 1.309)
Race									
Non-aborigines	Aborigines	0.362	(-0.596, 1.292)	0.216	(-0.611, 1.043)	0.208	(-0.555, 0.971)	1.223**	(0.515, 1.932)
Employment									
Yes	No	0.958*	(0.095, 1.821)	0.811*	(0.031, 1.590)	0.660	(-0.064, 1.383)	0.726	(-0.006, 1.458)
Personal income (NTD/month)									
30,000-60,000	<30,000	0.795	(-0.405, 1.995)	1.202	(-0.098, 2.501)	0.447	(-0.494, 1.388)	0.963	(-0.180, 2.105)
>60,000		-1.419**	(-2.588, -0.249)	-3.078***	(-4.283, -1.873)	-0.794	(-3.164, 1.576)	-1.772	(-3.695, 0.151)
Comorbidity									
Yes	No	-0.445	(-1.347, 0.457)	-0.595	(-1.441, 0.251)	0.699	(-0.091, 1.490)	0.373	(-0.368, 1.114)

* denotes $p < .05$; ** denotes $p < .01$; *** denotes $p < .001$

higher personal income had fewer scores of physical domain and psychological domain compared with lower personal income (β = -1.419, 95% CI: -2.588, -0.249 and β = -3.078, 95% CI: -4.283, -1.873 respectively).

Effects of adverse reactions on the four domain-score changes considering time effect

The patients without drug related hepatitis exhibited 2.8 more scores of physical domain (95% CI: 1.579, 4.020), 3.455 more scores of psychological domain (95% CI: 2.296, 4.613), 4.047 more scores of social domain (95% CI: 3.126, 5.688), and 3.713 more scores of environmental domain (95% CI: 2.011, 5.415) compared with those patients with drug related hepatitis. The patients without drug related blurred vision exhibited 2.407 more scores of physical domain (95% CI: 1.538, 3.277), 2.47 more scores of psychological domain (95% CI: 1.641, 3.300), 1.172 more scores of social domain (95% CI: 0.248, 2.096) and 1.702 more scores of environmental domain (95% CI: 0.856, 2.547) compared with those patients with drug related blurred vision. Otherwise, drugs related skin itching, distal limb numbness, and hyperuricemia did not significantly affect 4 domain scores. (Table 4)

Full-model to predict factors affecting the four domain-score changes

After controlling probable factors, drug related hepatitis reduced physical (β = 2.3700, 95% CI: 1.094- 3.645), psychological (β = 2.633, 95% CI: 1.085, 4.181), social (β = 4.135, 95% CI: 3.168, 5.102), and environmental domain scores (β = 3.449, 95% CI: 2.182, 4.717) and blurred vision significantly reduced physical (β = 2.290, 95% CI: 1.208, 3.372), psychological (β = 2.127, 95% CI: 0.975,

Table 4 Univariate analysis of adverse reactions on the four domain scores considering time effect

Variables		Physical Domain		Psychological Domain		Social Domain		Environmental Domain	
	Reference	β	95% CI	β	95% CI	β	95% CI	β	95% CI
Skin itching									
No	Yes	0.484	(-0.458, 1.425)	0.530	(-0.430, 1.490)	0.360	(-0.487, 1.208)	0.384	(-0.367, 1.135)
Hepatitis									
No	Yes	2.800***	(1.579, 4.020)	3.455***	(2.296, 4.613)	4.407***	(3.126, 5.688)	3.713***	(2.011, 5.415)
Blurred vision									
No	Yes	2.407***	(1.538, 3.277)	2.470***	(1.641, 3.300)	1.172*	(0.248, 2.096)	1.702***	(0.856, 2.547)
Distal limb numbness									
No	Yes	0.032	(-1.442, 1.506)	0.634	(-1.358, 2.626)	0.7	(-1.091, 2.490)	0.535	(-1.114, 2.184)
Hyperuricemia									
No	Yes	0.311	(-0.617, 1.238)	0.274	(-0.663, 1.210)	-0.418	(-1.126, 0.290)	0.015	(-0.815, 0.845)

*denotes p < .05; **denotes p < .01; ***denotes p < .001

3.279), social (β = 1.075, 95% CI: 0.117, 2.033), and environmental domain scores (β = 1.587, 95% CI: 0.598, 2.576). The patients at a 2-month treatment period significantly decreased physical domain scores compared with those at initial treatment period (β = -0.901, 95% CI: -1.474, -0.327). Physical domain scores significantly decreased as age increased per 10-year (β = -0.39, 95% CI: -0.69, -0.100). Female patients exhibited higher social domain scores compared than males did (β = 0.857, 95% CI: 0.126, 1.587). Non-aboriginal patients showed higher scores of physical domain and environmental domain compared with aboriginal patients (β = 0.92, 95% CI: 0.012, 1.828 and β = 1.23, 95% CI: 0.465, 1.996 respectively). The patients employed exhibited significantly higher scores of physical, social, and environmental domains compared than those who were unemployed (β = 0.959, 95% CI: 0.074, 1.845, β = 0.815, 95% CI: 0.141, 1.489, and β = 0.852, 95% CI: 0.139, 1.565 respectively). The patients with a higher income showed fewer scores of psychological domain (β = -2.029, 95% CI: -3.352, -0.705) compared with those who having a lower income. (Table 5)

DISCUSSIONS

To our best knowledge, this is the first study to investigate QOL using a longitudinal design for TB patients in Taiwan. We conducted a population based cohort study and found that drugs related hepatitis and blurred vision significantly impaired QOL for TB patients. Although TB can be successfully treated, it not only influences a person's health, but also his or her QOL. Long-term TB treatment of at least 6 months and possible anti-TB adverse reactions may result in QOL changes.

We observed male predominance and elderly susceptibility to TB infection,

Table 5 Full-model predictive factors affecting four domain-score changes

Variables	Reference	Physical Domain		Psychological Domain		Social Domain		Environmental Domain	
		β	95% CI	β	95% CI	β	95% CI	β	95% CI
Treatment periods									
2-month	≦2-week	-0.901**	(-1.474, -0.327)	-0.161	(-0.685, 0.362)	-0.163	(-0.751, 0.424)	-0.129	(-0.610, 0.352)
≧6-month		0.373	(-0.172, 0.918)	0.456	(-0.158, 1.071)	0.558*	(0.006, 1.111)	0.318	(-0.152, 0.788)
Age per 10-years		-0.390**	(-0.690, -0.100)	-0.180	(-0.430, 0.070)	-0.030	(-0.210, 0.270)	0.009	(-0.012, 0.031)
Gender									
Female	Male	-0.262	(-1.134, 0.610)	-0.276	(-1.126, 0.574)	0.857*	(0.126, 1.587)	0.083	(-0.606, 0.772)
Race									
Non-aborigine	Aborigine	0.920*	(0.012, 1.828)	0.313	(-0.523, 1.148)	0.289	(-0.454, 1.033)	1.230**	(0.465, 1.996)
Education									
≧10 years	≦9 years	0.100	(-1.103, 1.213)	0.798	(-0.279, 1.874)	0.466	(-0.500, 1.433)	0.514	(-0.398, 1.426)
Personal income (NTD/month)									
30,000-60,000	＜30,000	0.043	(-1.053, 1.140)	0.825	(-0.359, 2.010)	0.194	(-0.641, 1.028)	0.407	(-0.597, 1.410)
>60,000		-0.232	(-0.947, 0.484)	-2.029**	(-3.352,-0.705)	0.533	(-2.303, 3.369)	-0.635	(-1.581, 0.311)
Hepatitis									
No	Yes	2.370***	(1.094, 3.645)	2.633**	(1.085, 4.181)	4.135***	(3.168, 5.102)	3.449***	(2.182, 4.717)
Blurred vision									
No	Yes	2.290***	(1.208, 3.372)	2.127***	(0.975, 3.279)	1.075*	(0.117, 2.033)	1.587**	(0.598, 2.576)
Employment									
Yes	No	0.959*	(0.074, 1.845)	0.622	(-0.155, 1.400)	0.815*	(0.141, 1.489)	0.852*	(0.139, 1.565)

*denotes $p < .05$; **denotes $p < .01$; ***denotes $p < .001$

consistent with findings from prior published studies [2,22]. Physical and social domain scores significantly decreased from the initial treatment to the 2-month anti-TB treatment, and then increased after 6 months of treatment. A possible explanation is that adverse reactions seemed prominent at the 2-month anti-TB period in our research. Another reason may be that TB patients were associated with unemployment [26], and may have felt ostracized by their families and society when they could not eat meals with them and/or were isolated [5,6]. In our study, the TB patients with a job exhibited higher scores of physical and social domains compared with those without a job after adjusting for covariates (Table 5). However, physical and social domain scores increased after 6 months of TB treatment.

Psychologicaland environmental domain scores did not show a significant change during different treatment periods, which might be associated with healthcare workers providing drugs and incentives to TB patients through the DOTS policy, easy medical care access, and free medical care. The patients having jobs exhibited significantly higher scores of physical, social, and environmental domains compared than those who did not have jobs. The findings were consistent with previous studies [27,28]. However, psychological domain scores were significantly lower among TB patients with a higher income than for those with a lower income. The probable explanation may be that these patients worry regarding being contagious to their families and are unable to maintain their work, depression, and anger [29].

More than 50% of the TB patients in this study were aboriginal Taiwanese. Being a minority in Taiwan, aboriginal Taiwanese often face economic disadvantage and discrimination [30]. That maybe explain why the non-aboriginal TB patients exhibited higher scores of physical and environmental domain compared with aboriginal TB patients.

Although adverse reactions associated with anti-TB drugs were common at different treatment periods, drug-induced hepatitis and blurred vision significantly reduced physical, mental, social, and environmental domain scores in our study. According to the Taiwan guidelines for TB diagnosis and treatment, physicians should discontinue anti-TB medicine on symptomatic hepatitis patients with an increase in aspartate aminotransferase (AST) of more than thrice the upper limit of normal or on asymptomatic drug-induced hepatitis patients with AST 5 times the upper limit of normal [31]. Among our study participants, no patient needed to discontinue anti-TB medicine. However, drug-induced hepatitis significantly affected QOL, although the patient remained asymptomatic [32]. We suggest examining HBsAg, Anti-HCV Ab, and liver function before prescribing anti-TB treatment, and regularly following the liver function at the second, fourth, and eighth treatment weeks. Once an abnormal liver function is detected during treatment, liver function should be followed every week until it returns to the reference range [31]. When we detected a liver function abnormality for patients taking anti-TB medicine as early as possible, we took action according to treatment guideline might improve QOL and increase adherence.

Impaired vision is associated with increased risk for depression and reduced functional status and QOL [33]. Although the incidence of ethambutol induced optic neuritis to 1%-2%, isoniazid, elderly, and renal-impairment comorbidity may aggravate impaired vision. Vision acuity and color vision should be evaluated every 2 to 4 weeks during treatment [31].

Although TB remains one of the leading communicable diseases causing mortality and

morbidity, little attention has been paid to the impact of its therapy on the QOL of TB patients. Atif et al indicated that the importance of health related to QOL, adequate management of adverse reactions associated with anti-TB drugs, and treatment outcomes must be addressed in forthcoming WHO guidelines for TB treatment [34]. The strength of this study lies in using a prospective longitudinal design to evaluate health-related QOL changes among TB patients during different treatment periods. Our study shows that health care workers should be more concerned regarding anti-TB drugs associated with hepatitis or blurred vision. Our study shows that health care workers should be more concerned regarding anti-TB drugs associated with hepatitis or blurred vision.

The relatively small sample size may be the major limitation in this study. Most of the study participants were aborigines and at productive of age in eastern Taiwan, which are rather different from the TB population in Taiwan [35]. Therefore, the study results can not be generalized to the entire population of Taiwan. In conclusion, TB affected not only individual health, but also QOL, despite effective treatments. Healthcare workers should give considerable attention to anti-TB associated with adverse reactions.

Competing interests

The authors declare that we have no competing interests.

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REFERENCES

1. Chung WS, Chang RE, Guo HR. Variations of care quality for infectious pulmonary tuberculosis in Taiwan: a population based cohort study. BMC Public Health 2007;**7**:107. doi:10.1186/1471-2458-7-107.
2. Chung WS, Chang YC, Yang MC. Factors influencing the successful treatment of infectious pulmonary tuberculosis. Int J Tuberc Lung Dis 2007;**11**:59-64.
3. Lee JJ, Wu RL, Lee YS, Wu YC, Chiang CY. Treatment outcome of pulmonary tuberculosis in eastern Taiwan - experience at a medical center. J Formos Med Assoc 2007;**106**:25-30. doi:10.1016/S0929-6646(09)60212-6.
4. Long NH, Johansson E, Diwan VK, Winkvist A. Fear and social isolation as consequences of tuberculosis in VietNam: a gender analysis. Health Policy 2001;**58**:69-81. doi:10.1016/S0168-8510(01)00143-9.
5. Abioye IA, Omotayo MO, Alakija W. Socio-demographic determinants of stigma among patients with pulmonary tuberculosis in Lagos, Nigeria. Afr Health Sci 2011;**11(Suppl 1)**:S100-4. doi:10.4314/ahs.v11i3.70078.
6. Christodoulou M. The stigma of tuberculosis. Lancet Infect Dis 2011;**11**:663-4. doi:10.1016/S1473-3099(11)70228-6.
7. WHO. World stop tb day fact sheet for the media. Available at: http://www.wpro.who.int/media_centre/fact_sheet/whol05. Accessed March 23, 2012.
8. Chang FY. Statistics of Communicable Diseases and Surveillance Report. Taipei, Taiwan: Centers for Disease Control, Ministry of Health and Welfare, R.O.C. (Taiwan), 2011.
9. Szabo S. The World Health Organization Quality of Life (WHOQOL) assessment instrument. In: Spilker B ed. Quality of Life and Pharmacoeconomics in Clinical Trials. 2nd ed. Philadelphia: Lippincott-Raven,1996.
10. Calman KC. Quality of life in cancer patients -- an hypothesis. J Med Ethics 1984;**10**:124-7. doi:10.1136/jme.10.3.124.
11. Dion MJ, Tousigant P, Bourbeau J, Menzies D, Schwartzman K. Feasibility and reliability of health-related quality of life measurements among tuberculosis patients. Qual Life Res 2004;**13**:653-65. doi:10.1023/B:QURE.0000021320.89524.64.
12. Chamla D. The assessment of patients' health-related quality of life during tuberculosis treatment in Wuhan, China. Int J Tuberc Lung Dis 2004;**8**:1100-6.
13. Kelly P. Isolation and stigma: the experience of

patients with active tuberculosis. J Community Health Nurs 1999;**16**:233-41. doi:10.1207/S15327655JCHN1604_3.
14. Pasipanodya JG, Miller TL, Vecino M, et al. Using the St. George respiratory questionnaire to ascertain health quality in persons with treated pulmonary tuberculosis. Chest 2007;**132**:1591-8. doi:10.1378/chest.07-0755.
15. Hunt SM, McKenna SP, McEwan J. The Nottingham Health Profile. Users Manual. Rev ed., Manchester: Galen Research and Consultancy, 1989.
16. McHorney CA, Ware JE Jr, Raczek AE. The MOS 36-Item Short-Form Health Survey (SF-36): II. Psychometric and clinical tests of validity in measuring physical and mental health constructs. Med Care 1993;**31**:247-63. doi:10.1097/00005650-199303000-00006.
17. Anonymous. Development of the World Health Organization WHOQOL-BREF quality of life assessment. The WHOQOL Group. Psychol Med 1998;**28**:551-8. doi:10.1017/S0033291798006667.
18. WHO. The World Health Organization Quality of Life Assessment (WHOQOL): development and general psychometric properties. Soc Sci Med 1998;**46**:1569-85. doi:10.1016/S0277-9536(98)00009-4.
19. Yao G, Chung CW, Yu CF, Wang JD. Development and verification of validity and reliability of the WHOQOL-BREF Taiwan version. J Formos Med Assoc 2002;**101**:342-51.
20. Jang Y, Hsieh CL, Wang YH, Wu YH. A validity study of the WHOQOL-BREF assessment in persons with traumatic spinal cord injury. Arch Phys Med Rehabil 2004;**85**:1890-5. doi:10.1016/j.apmr.2004.02.032.
21. Yang SC, Kuo PW, Wang JD, Lin MI, Su S. Quality of life and its determinants of hemodialysis patients in Taiwan measured with WHOQOL-BREF (TW). Am J Kidney Dis 2005;**46**:635-41. doi:10.1053/j.ajkd.2005.06.015.
22. Centers for Disease Control, Ministry of Health and Welfare, R.O.C. (Taiwan). Taiwan Tuberculosis Control Report. Taipei, Taiwan: CDC Taiwan, 2007.
23. Harper A, Power M, Kuyken W, Sartorius N, Bullinger M, Orley J. WHOQOL-BREF Introduction, Administration, Scoring, and Generic Version of the Assessment. Geneva: WHO, 1996.
24. Zeger SL, Liang KY, Albert PS. Models for longitudinal data: a generalized estimating equation approach. Biometrics 1988;**44**:1049-60. doi:10.2307/2531734.
25. Ghisletta P, Spini D. An introduction to generalized estimating equations and an application to assess selectivity effects in a longitudinal study on very old individuals. J Educ Behav Stat 2004;**29**:421-37. doi:10.3102/10769986029004421.
26. Munch Z, van Lill SW, Booysen CN, Zietsman HL, Enarson DA, Beyers N. Tuberculosis transmission patterns in a high-incidence area: a spatial analysis. Int J Tuberc Lung Dis 2003;**7**:271-7.
27. Aggarwal AN, Gupta D, Janmeja AK, Jindal SK. Assessment of health-related quality of life in patients with pulmonary tuberculosis under programme conditions. Int J Tuberc Lung Dis 2013;**17**:947-53. doi:10.5588/ijtld.12.0299.
28. Deribew A, Deribe K, Reda AA, et al. Change in quality of life: a follow up study among patients with HIV infection with and without TB in Ethiopia. BMC Public Health 2013;**13**:408. doi:10.1186/1471-2458-13-408.
29. Marra CA, Marra F, Cox VC, Palepu A, Fitzgerald JM. Factors influencing quality of life in patients with active tuberculosis. Health Qual Life Outcomes 2004;**2**:58. doi:10.1186/1477-7525-2-58.
30. Chang LL. The research of indigenous tribe developing tour: an example of Kele tribal community [Dissertation]. Hualien: Department of Indigenous Development, National Dong Hwa University, 2004. [In Chinese: English abstract]
31. Luh KT. Taiwan Guidelines for TB Diagnosis and Treatment. Taipei: CDC Taiwan, 2011. [In Chinese]
32. Helbling B, Overbeck K, Gonvers JJ, et al. Host- rather than virus-related factors reduce health-related quality of life in hepatitis C virus infection. Gut 2008;**57**:1597-603. doi:10.1136/gut.2007.142844.
33. Kempen GI, Ballemans J, Ranchor AV, van Rens GH, Zijlstra GA. The impact of low vision on activities of daily living, symptoms of depression, feelings of anxiety and social support in community-living older adults seeking vision rehabilitation services. Qual Life Res 2011;**21**:1405-11. doi:10.1007/s11136-011-0061-y.
34. Atif M, Sulaiman SA, Shafie AA, Ali I, Hassali MA, Saleem F. WHO guidelines for treatment of tuberculosis: the missing links. Int J Clin Pharm 2012;**34**:506-9. doi:10.1007/s11096-012-9657-8.
35. Liao CM, Hsieh NH, Huang TL, et al. Assessing trends and predictors of tuberculosis in Taiwan. BMC Public Health 2012;**12**:29. doi:10.1186/1471-2458-12-29.

台灣東部肺結核病患治療期間生活品質的變化

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目標：評估肺結核病患在不同治療時期的生活品質。**方法：**本研究以台灣東部民眾為基礎的世代研究。採用世界衛生組織健康相關生活品質簡明版問卷，針對台灣東部地區初診斷的肺結核病患進行研究，研究分三階段追蹤研究，第一階段是開始治療時，第二階段是治療二個月治療時，及第三階段是治療六個月時，分別進行面對面問卷調查。**結果：**本研究經人體試驗委員會通過，並取得病人知情同意後進行。共有140位肺結核病患，男性為多，平均年齡為48±18.9歲。整體生理範疇從第一階段開始治療時至第二階段下降到最低(12.517 ± 2.832分, 11.667 ± 3.179分, p＜.001)，到第三階段治療六個月時才回升(12.691 ± 2.903分)。社會範疇也是從第一階段開始治療時至第二階段下降到最低(13.618 ± 2.685分, 12.899 ± 2.953分, p <.05)，到第三階段治療六個月時才回升(13.900 ± 2.552分)。當控制可能干擾變項，病患因藥物引起的肝炎比起沒有肝炎者顯著降低生理範疇(β = 2.370, p < .001)、心理範疇(β = 2.633, p < .001)、社會範疇(β = 4.135, p < .001)及環境範疇(β =3.449, p < .001)。病患因藥物引起的視力模糊比起沒有視力模糊者顯著降低生理範疇(β = 2.290, p < .001)、心理範疇(β = 2.127, p < .001)、社會範疇(β = 1.075, p < .05)及環境範疇(β = 1.587, p < .01)。生理範疇隨著年齡每增加10歲顯著下降0.39分(β = 0.39, p < .01)。有工作的病人比起沒有工作的病人有顯著較高的生理範疇、社會範疇及環境範疇(分別為β = 0.959, p < .05, β = 0.815, p < .05, β = 0.852, p < .05)。每月高收入的病患比起收入低的病患有比較低的心理範疇分數(β = 2.029, p < .01)。**結論：**肺結核病不僅影響個人健康，而且影響生活品質。健康照護者除了關心病患服藥的順從性，更應謹慎注意及處理藥物的副作用。(台灣衛誌 2014；**33**(**1**)：23-35)

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