Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2, 526-539
2026
Publisher: Learning Gate
DOI: 10.55214/2576-8484.v10i2.12130

The influence of social support on improving the quality of life and nutritional status of tuberculosis patients

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Abstract: Tuberculosis (TB) remains a major global health challenge, substantially impairing patients' quality of life (QoL) and nutritional status. Although social support is an essential component of TB care, the specific impact of peer support delivered by TB survivors has not been adequately explored. A quasi-experimental study with a non-equivalent control group and pretest–posttest design was conducted among 76 patients with pulmonary TB. Participants were assigned to an intervention group receiving structured mentoring from trained TB survivors or a control group receiving standard care. QoL was assessed using the Short Form-36, while nutritional status was evaluated through body weight and BMI. The intervention group demonstrated significantly greater improvements in overall QoL compared with the control group (mean score 80.72 vs. 71.43; $p<0.001$), particularly in social functioning, vitality, and mental health domains, nutritional outcomes also improved more markedly in the intervention group, with higher mean weight gain (6.33 kg vs. 4.48 kg; $p=0.001$) and a greater increase in BMI (from 19.85 to 22.26). Peer-based social support provided by TB survivors effectively improves both QoL and nutritional status among patients undergoing TB treatment. Integrating survivor-led mentoring into routine TB care may promote a more holistic and patient-centered recovery approach.

Keywords: *Nutritional Status, Quality of life, Social support, TB patients, Tuberculosis.*

1. Introduction

Tuberculosis (TB) remains a serious global health challenge. The Global Tuberculosis Report 2024 reported that in 2023, approximately 8.2 million new TB cases were reported globally, representing the highest number since modern records began. During the same period, TB-related deaths were estimated at 1.25 million, making it the leading cause of death from an infectious disease, surpassing HIV/AIDS [1]. Indonesia, as one of the world's largest contributors to TB cases, faces a double burden in TB treatment. Successful treatment depends on eradicating the bacteria and the patient's overall physical, psychological, and social recovery.

TB patient care often focuses solely on clinical aspects and medication adherence; however, the disease's impact extends to declines in quality of life and nutritional status. Quality of life (QoL) is a vital indicator of healthcare service success, encompassing physical, emotional, and social well-being throughout the illness [2, 3]. TB patients often experience a significant decline in quality of life due to stigma, drug side effects, and economic pressures. Furthermore, TB has a strong bidirectional relationship with nutritional status. Active infection causes catabolism, leading to weight loss and

History: Received: 14 November 2025; Revised: 5 January 2026; Accepted: 9 January 2026; Published: 13 February 2026
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protein-energy malnutrition. Conversely, chronic malnutrition weakens cellular immunity, increasing the risk of disease reactivation and mortality [4, 5]. Malnutrition is even considered a major obstacle to achieving the global TB elimination target by 2035 [6].

To break the vicious cycle of infection, malnutrition, and poor quality of life, biomedical interventions alone are insufficient; strong social support is required. Social support, which includes emotional, instrumental, informational, and esteem support, is positively associated with the physical and mental health of chronically ill patients [7, 8]. To date, the primary source of social support for TB patients has been family members or Drug Supervisors (PMOs) from their immediate environment. However, family support is often limited, either due to a lack of specific knowledge regarding side-effect management or caregiver burnout caused by the prolonged duration of treatment [9].

This is where the role of TB survivors becomes highly strategic yet underutilized. Unlike family members or healthcare professionals, survivors possess unique experiential knowledge. Through peer support, survivors can provide authentic empathy by having endured the same ordeal, thereby reducing anxiety and increasing patient self-efficacy [10, 11]. Studies show that patients are more likely to accept health advice, such as dietary recommendations and medication adherence, when it is delivered by someone they perceive to be "in the same boat" [12]. Survivor support has the potential to reduce psychological stress, which often suppresses appetite in patients, and may thus indirectly contribute to improvements in nutritional status [13].

Although the role of survivors has been recognized in improving medication adherence and recovery rates [14, 15], literature specifically examining the simultaneous influence of survivor support on nutritional status and quality of life remains limited. Most previous studies have focused more on the role of family or the impact of social support in general. Therefore, this study is important to address this gap by analyzing the specific influence of social support provided by TB survivors on improving the quality of life and nutritional status of TB patients. The findings of this study are expected to provide empirical evidence supporting the inclusion of survivors as a key element of holistic TB control programs.

2. Method

This study used a quasi-experimental design with a non-equivalent control group and a pretest-posttest design. The study was conducted in the Surakarta district, which includes 17 community health centers (Puskesmas). The location was selected based on the high prevalence of TB cases, with a total patient population of 264 individuals recorded in the initial study period, April 2023. The intervention and monitoring period lasted 6 months, corresponding to the intensive and continuation phases of TB treatment.

The study population comprised all outpatients with pulmonary TB at Community Health Centers (Puskesmas). A multistage sampling technique was applied. Stage 1 (Cluster Sampling): From 17 Puskesmas, centers with similar demographic characteristics were randomly selected as locations for the intervention and control groups to minimize information contamination between groups. Stage 2 (Purposive Sampling): In each selected cluster, respondents were recruited based on inclusion and exclusion criteria.

The sample size was calculated using the hypothesis-testing for two means formula, with a 95% confidence level ($Z\alpha=1.96$) and 80% test power ($Z\beta=0.84$). Considering a 10% drop-out rate, the minimum sample size was set at 38 respondents per group, totaling 76 respondents for the study.

Inclusion criteria for patient respondents were: (1) diagnosed with pulmonary TB within < 1 month (early phase of treatment); (2) aged > 18 years; (3) permanently domiciled in Surakarta City; and (4) willing to follow the research procedure until completion. Exclusion criteria included: (1) patients with serious disease complications that hinder communication (e.g., severe hearing or speech impairment, stroke); and (2) patients who moved domicile during the study period.

Respondents were divided into two groups. The control group received standard care (SCC) from the Puskesmas, consisting of anti-tuberculosis drugs and standard education through brochures or

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130

leaflets on TB management, without intensive support. The intervention group received standard care plus a social support program from "SEMAR" (Surakarta TB Survivors Community).

The intervention was delivered by TB survivors who had completed communication and counseling training as "Peer Educators." The criteria for companion survivors included: age 25-45 years, a minimum high school education, having been declared fully cured of TB, and possessing a communication device (cell phone). The intervention included four dimensions of social support (emotional, informational, instrumental, and assessment) provided through monthly visits lasting 60 minutes per session (30 minutes of health education and 30 minutes of counseling/experience sharing). Educational materials covered medication side effect management, adherence to a balanced nutritional diet, cough etiquette, and stress coping strategies. Weekly phone monitoring was conducted to track medication adherence, and consultations via WhatsApp were available at any time.

Data collection was conducted at three time points: (T0) baseline before the intervention; (T1) end of the 2nd month (end of the intensive phase); and (T2) end of the 6th month (end of treatment). Quality of life was measured using the Short Form-36 (SF-36) questionnaire, which has been validated in Indonesia. This instrument assesses 8 domains of physical and mental health. Nutritional status was measured using Body Mass Index (BMI). Body weight was measured using a digital scale (accuracy of 0.1 kg), and height was measured using a microtoise (accuracy of 0.1 cm). Nutritional status classification followed the WHO standards for Asian populations. Demographic data were obtained through structured interviews and medical records.

Data were analyzed using SPSS statistical software. Univariate analysis was conducted to describe respondents' characteristics. Bivariate analysis tested the effect of the intervention on the dependent variables (quality of life and nutritional status) using the following tests: Paired t-test or Wilcoxon Signed Rank Test to compare pre-test and post-test scores within one group. An independent t-test or Mann-Whitney U Test compared the difference (gain score) between intervention and control groups. To compare mean outcomes at baseline, the end of the 2nd month, and the end of the 6th month, ANOVA or the Friedman test was used. The significance level was set at $\alpha < 0.05$.

This research protocol received ethical clearance from the Health Research Ethics Committee of the Faculty of Medicine, Public Health, and Nursing, Gadjah Mada University-Dr. Sardjito General Hospital under number KE/FK/0438/EC/2023. All respondents provided written informed consent before participation.

3. Results

3.1. Respondent Characteristics

A total of 76 TB patients were recruited in this study. Overall, the homogeneity test results showed no statistically significant differences between the two groups in all baseline characteristic variables ($p > 0.05$). This indicates that the subject allocation process successfully created two balanced groups before the intervention, thus minimizing selection bias. The majority of respondents were in the productive to pre-elderly age range, with a median age of 51 years in the intervention group (IQR: 33–58) and 48.5 years in the control group (IQR: 37.75–57.25). Males were the dominant gender in both groups (intervention: 36.8%; control: 22.4%); however, this difference was not statistically significant (p=0.726). Detailed respondent characteristics are shown in Table 1.

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Table 1.
Characteristics of the Intervention and Control groups.

Characteristics	Intervention Group (n=38)	Control Group (n=38)	P value
Age			
Median in years (IQR)	51 (33, 58)	48.5 (37.75, 57.25)	0.963
≤30 Years	9 (23.7%)	7 (18.4%)	0.945
31-40 Years	4 (10.5%)	4 (10.5%)	
41-50 Years	5 (13.2%)	10 (26.3%)	
51-60 Years	14 (36.8%)	11 (28.9%)	
>60 Years	6 (15.8%)	6 (15.8%)	
Gender			
Man	28 (36.8%)	17 (22.4%)	0.726
Woman	10 (13.2%)	21 (27.6%)	
Education			
Junior High School	4 (10.5%)	7 (18.4%)	0.221
Senior High School	23 (60.5%)	19 (50%)	
PT	11 (28.9%)	12 (31.6%)	
Work			
Doesn't work	9 (23.7%)	12 (31.6%)	0.413
Retirement	3 (7.9%)	2 (5.3%)	
Self-employed	12 (31.6%)	13 (34.2%)	
Employee	14 (36.8%)	11 (28.9%)	
Income Perception			
Very less	4 (10.5%)	4 (10.5%)	0.46
Not enough	3 (7.9%)	4 (10.5%)	
Enough	27 (71.1%)	27 (71.1%)	
More than enough	4 (10.5%)	3 (7.9%)	
Marital status			
Marry	28 (73.7%)	27 (71.1%)	0.945
Single	7 (18.4%)	6 (15.8%)	
Widower	2 (2.6%)	1 (2.6%)	
Widow	1 (1.3%)	4 (10.5%)	
Home Environment			
Very Dense	5 (13.2%)	8 (15.8%)	0.784
Quite Dense	18 (23.7%)	21 (55.3%)	
Not Solid	15 (39.5%)	11 28.9%)	

3.2. Analysis of Changes in Quality of Life Scores

During the study period, both groups experienced an increase in quality of life, as shown in Table 2. In the control group, the mean score increased from 56.29±14.97 (at baseline) to 65.81±17.23 at the end of treatment (month 6). This increase was statistically significant ($p<0.001$) with a strong effect size (Kendall's W = 0.86), reflecting the natural positive impact of the standard TB treatment regimen on the patient's physical condition. In contrast, the Intervention group showed a much more dramatic jump in scores, from 52.94±13.56 to 80.72±8.65. A very strong effect size value (Kendall's W=0.99) indicates that the addition of survivor support accelerated quality of life recovery far beyond the effects of standard treatment alone.

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Table 2.
Comparison of Quality of Life Score (SF-36) Dynamics Between Groups.

Measurement Time	Intervention Group (n=38)	Control Group (n=38)	p-value (Between Groups)a
Baseline (T0)	52.94±13.56	56.29±14.97	Δ1(T1-T0)=0.002*
2nd Month (T1)	67.41±18.32	65.81±17.23	Δ2(T2-T0)=<0.001**
6th month (T2)	80.72±8.65	71.43±12.47	
Friedman Test	X^2=75.51; p<0.001	X^2=65.25; p<0.001	
Effect Size (W)	0.99 (Very Strong)	0.86 (Strong)	

Note: Description: aMann-Whitney U Test.

To isolate the pure effect of survivor support, a mean difference analysis was conducted, as shown in Table 3. At the end of the study period, the intervention group recorded a total increase (Δ) of ***+27.78*** points, nearly twice that observed in the control group (Δ) +15.13 points. The Mann-Whitney difference test on the difference in scores (gain score) confirmed that this disparity in improvement was highly significant ($p < 0.001$). These findings demonstrate that social support from survivors has a substantial clinical impact, rather than reflecting a placebo effect or simple physical recovery.

Table 3.
Comparison of Baseline vs. End of Treatment Improvement (Delta) ScoresΔ.

Variables	Intervention Group	Control Group	Mean Difference	p-value
(Δ)T2-T0	+27.78 points	+15.13points	+12.65 points	< 0.001

3.2.1. SF-36 Domain Analysis

A detailed analysis of the eight SF-36 domains revealed distinct recovery patterns between the two groups (Table 4). Overall, both groups showed a significant ($p < 0.001$) increasing trend in scores from baseline to the end of treatment, with the intervention group consistently recording higher final scores and a sharper acceleration of improvement across all domains.

The largest disparity was observed in the psychosocial domain. In the role emotional aspect, the intervention group recorded a score increase of +37.71 points (an increase of 10.7 points, approximately 78% of baseline), far surpassing the control group, which increased by +25.00 points. A similar phenomenon was observed in the vitality domain, where survivor support increased scores by +33.95 points, compared to +13.32 points in the control group.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130

Table 4.
Changes in SF-36 Domain Scores Between Groups.

SF36 Domain	Kel	Baseline (T0) (mean ± SD)	2nd month (T1) (mean ± SD)	6th month (T2) (mean ± SD)	Δ(T2-T0)	X2 (Friedman Test)
Physical Functioning	I	52.37 ± 18.77	63.32 ± 21.46	77.26 ± 12.17	24.89	66.229 p=0.0001
	K	54.21 ± 27.69	65.13 ± 32.56	78.16 ± 17.26	23.95	25.52
Physical Role	I	53.29 ± 34.47	68.42 ± 36.15	84.87 ± 18.87	31.58	39.519 *p=0.0001*
	K	56.58 ± 34.23	65.79 ± 35.08	73.68 ± 26.60	17.10	19.47
Bodily Pain	I	68.09 ± 21.36	77.11 ± 25.87	84.21 ± 17.40	16.12	43.070 p=0.0001
	K	66.71 ± 19.26	70.92 ± 23.30	73.75 ± 19.28	7.04	7.89 p=0.019
General Health	I	42.11 ± 15.01	56.71 ± 22.16	66.58 ± 16.03	24.47	71.021 p=0.0001
	K	46.97 ± 17.65	50.92 ± 18.81	54.74 ± 16.44	7.77	10.36 p=0.006
Vitality	I	50.79 ± 17.03	69.87 ± 23.32	84.74 ± 10.06	33.95	68.599 p=0.0001
	K	57.07 ± 17.22	67.20 ± 20.03	70.39 ± 17.68	13.32	22.41 p< 0.001
Social Functioning	I	56.58 ± 20.08	78.29 ± 26.59	89.14 ± 13.37	32.56	52.231 p=0.0001
	K	62.30 ± 19.88	72.17 ± 24.73	64.93 ± 19.51	2.45	6.23 p=0.044
Emotional Role	I	48.25 ± 39.29	69.30 ± 42.72	85.96 ± 24.05	37.71	40.430 p=0.0001
	K	53.95 ± 35.39	75.00 ± 35.46	78.95 ± 28.39	25.00	28.76 p< 0.001
Mental Health	I	64.63 ± 20.30	78.42 ± 25.85	90.74 ± 11.24	26.11	60.992 p=0.0001
	K	67.79 ± 18.78	75.58 ± 23.00	76.42 ± 21.94	8.63	16.18 p< 0.001

Note: Description: I = Intervention Group; K = Control Group.

Table 5.
Changes in quality of life scores (gain scores) per SF-36 between groups (pre-test vs post-final test).

SF Domain-36	ΔMean Intervention Group	ΔMean of Control Group	Mean difference	p-values
Physical function	24.89	23.95	0.95	0.54
Physical role	31.58	17.11	14.47	0.019
Body aches	16.12	7.04	9.08	0.002
General health	24.67	7.68	17.00	0.002
Vitality	33.95	13.32	20.63	0.000
Social function	32.57	2.63	29.93	0.000
Emotional role	37.71	25.00	12.72	0.151^{ns}
Mental health	26.22	8.63	17.47	0.000

Note: Information: ΔMean = post score-test (month to-6) minus the pre score-test; Mann–Whitney U on gain score; ns = not significant.

The intervention group showed greater improvements in quality-of-life scores than the control group across all SF-36 domains (Table 5). Statistically significant differences were found in physical function, bodily pain, general health, vitality, social functioning, and mental health, while no significant differences were observed in physical and emotional function.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130

3.3. Analysis of Changes in Nutritional Status
3.3.1. Body Weight Comparison

Table 6.
Comparison of Body Weight Between Groups.

	Measurement Time	BW in Kg (Mean±SD)	P Value ANOVA	Post Hoc Tuckey
Intervention	Baseline (T0)	52.35±8.39	0.03	*Δ1(T1-T0)*:1.69; p=0.639
	2nd Month (T1)	54.04±8.36		*Δ2(T2-T0)*:6.34; p=0.003*
	6th month (T2)	58.69±7.72		*Δ3(T2-T1)*:4.65; p=0.039*
Control	Baseline (T0)	50.65±12.48	0.25	*Δ1(T1-T0)*:1.12; p=0.916
	2nd Month (T1)	51.77±12.40		*Δ2(T2-T0)*:4.48; p=0.252
	6th month (T2)	55.13±11.85		*Δ3(T2-T1)*:3.36; p=0.458

Table 6 shows a significant difference in body weight in the intervention group during the observation period. The mean body weight in the intervention group increased from 52.35 ± 8.39 kg at baseline to 54.04 ± 8.36 kg at month 2 and 58.69 ± 7.72 kg at month 6. Tukey's post hoc test showed a significant increase in body weight between baseline and month 6 and between month 2 and month 6, while the difference between baseline and month 2 was not significant. In contrast, the control group showed no significant differences in body weight across measurement times, although an increasing trend up to month 6 was observed. The intervention group experienced greater weight gain than the control group at months 2 and 6 (Table 7), with the proportion of weight gain in the intervention group consistently higher than the control group at months 2 and 6 (Table 8).

Table 7.
Changes in Body Weight Between Groups.

Measurement Time	Changes in BWin the Intervention Group (Mean (Min.-Max.))	Changes in the BW of the Control Group (Mean (Min-Max))	P-Values
2nd Month	1.69 (0.30-3.40)	1.12 (0.20-2.10)	0.001
6th month	6.33 (3.00-9.60)	4.48 (1.4-6.20)	0.001

Note: Information: a= Mann test–Whitney Utest.

Table 8.
Proportion of Weight Gain Between Groups.

Measurement Time	Proportion of Weight Gain in the Intervention Group (%Mean (Min-Max))	Proportion of Weight Gain in the Control Group (%Mean (Min-Max))	P-Values
2nd Month	3.31 (0.71-6.72)	2.37 (0.24-6.77)	0.001
6th month	12.62 (4.62-20.10)	9.66 (1.69-19.35)	0.002

3.3.2. Body Mass Index Comparison

Table 9.
Comparison of Body Mass Index (BMI) Between Groups.

	Measurement Time	BMI (Mean (Min-Max))	P Value ANOVA
Intervention	Baseline (T0)	19.85 (14.99-26.37)	0.0001*
	2nd Month (T1)	20.48 (15.41-26.37)	
	6th month (T2)	22.26 (17.78-27.69)	
Control	Baseline (T0)	19.58 (13.07-29.30)	0.152
	2nd Month (T1)	20.01 (13.82-29.37)	
	6th month (T2)	21.33 (14.88-29.80)	

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130

Repeated measures ANOVA analysis showed a statistically significant change in Body Mass Index (BMI) in the intervention group during the observation period (p = 0.0001). The mean BMI in the intervention group increased from 19.85 (14.99–26.37) at baseline to 20.48 (15.41–26.37) at month 2 and 22.26 (17.78–27.69) at month 6. In contrast, the control group showed no significant change in BMI across measurement times (p = 0.152), although an increasing trend in the mean BMI up to month 6 was observed.

Table 10.
Nutritional Status Between Groups.

Nutritional status Based on BMI		*Baseline (f (%))*			*2nd Month (f (%))*			*6th Month (f (%))*		
		M	**F**	**Total**	**M**	**F**	**Total**	**M**	**F**	**Total**
Intervention	Not enough (<18.5)	10 (26.3)	4 (10.5)	14 (36.8)	7 (18.4)	3 (7.9)	10 (26.3)	2 (5.3)	1 (2.6)	3 (7.9)
	Normal (18.5-24.99)	17 (44.7)	5 (13.2)	22 (57.9)	20 (52.6)	6 (15.8)	26 (68.4)	20 (52.6)	8 (21.1)	28 (73.7)
	Pre-Obesity(25.00 -29.99)	1 (2.6)	1 (2.6)	2 (5.3)	1 (2.6)	1 (2.6)	2 (5.3)	6 (15.8)	1 (2.6)	7 (18.4)
	P Value	***0.68***			***0.67***			***0.71***		
Control	Not enough (<18.5)	7 (18.4)	12 (31.6)	19 (50)	5 (13.2)	9 (23.7)	14 (36.8)	5 (13.2)	4 (10.5)	9 (23.7)
	Normal (18.5-24.99)	9 (23.7)	7 (18.4)	16 (42.1)	11 (29.9)	9 (23.7)	20 (52.6)	9 (23.7)	14 (36.8)	23 (60.5)
	Pre-Obesity (25.00 -29.99)	1 (2.6)	2 (5.3)	3 (7.9)	1 (2.6)	3 (7.9)	4 (10.5)	3 (7.9)	3 (7.9)	6 (15.8)
	P Value	***0.47***			***0.37***			***0.67***		

In the intervention group, a clear improvement in nutritional status was observed during the study period. The proportion of subjects with malnutrition decreased gradually from 36.8% at baseline to 26.3% at month 2 and decreased significantly to 7.9% at month 6. Conversely, the proportion of subjects with normal nutritional status increased from 57.9% at baseline to 68.4% at month 2 and reached 73.7% at month 6. At the same time, the proportion of pre-obese subjects increased at month 6 (18.4%) compared to baseline and month 2 (5.3% each). In the control group, changes in nutritional status distribution were also observed, but tended to be more fluctuating. The proportion of malnutrition status decreased from 50.0% at baseline to 36.8% at month 2 and 23.7% at month 6. The proportion of subjects with normal nutritional status increased from 42.1% at baseline to 52.6% at month 2 and 60.5% at month 6. The proportion of pre-obese in the control group showed a gradual increase from 7.9% at baseline to 10.5% at month 2 and 15.8% at month 6. Statistical tests showed no significant difference in nutritional status distribution between men and women at each measurement time in either the intervention or control groups (all p > 0.05). However, descriptively, the intervention group showed a more consistent improvement in nutritional status compared to the control group until the sixth month of observation.

4. Discussion

The findings of this study indicate that social support provided by TB survivors has a significant and clinically meaningful effect on improving the quality of life and nutritional status among patients receiving TB treatment. The consistent increase in total quality of life scores in the treatment group from the beginning of treatment until the sixth month indicates that the support intervention by TB survivors has a progressive and sustainable effect. Quality of life has a positive correlation with social support received. These results align with the stress-buffering theory, which states that social support mitigates the negative impact of stress due to chronic illness, thereby improving an individual's physical

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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DOI: 10.55214/2576-8484.v10i2.12130

and psychological well-being [16]. In the context of TB, the disease causes physical symptoms and psychosocial distress, including stigma, anxiety, fear of transmission, and uncertainty about the future. The presence of a survivor as a companion enables patients to receive empathetic, experientially relevant, and continuous support. Recent studies have shown that TB patients with strong social support have a better quality of life, lower levels of depression, and higher treatment adherence than patients with low social support [17, 18]. Thus, the results of this study strengthen the empirical evidence that social support is an important determinant of quality of life among TB patients.

The main findings indicate that social support from TB survivors has a significant impact on improving patients' quality of life. This effectiveness should be understood more deeply through comparison with conventional forms of social support, which are typically provided by health workers, cadres, or volunteers without direct experience as disease survivors. Support from non-survivors is generally limited to informational and instrumental components, such as health education, medication adherence monitoring, and symptoms monitoring. Although essential, this approach often fails to fully address patients' emotional and existential needs, particularly in the context of a highly stigmatized disease such as TB [19].

Although the control group also showed improvements in quality of life throughout the treatment, the magnitude of these improvements was significantly smaller than that of the treatment group. This suggests that standard treatment alone is insufficient to optimize the quality of life among TB patients without adequate psychosocial support.

The difference in quality of life scores at the end of the measurement period between the treatment and control groups confirms that social support from survivors plays an additional role in improving patients' quality of life. This finding aligns with studies from various countries showing that social support-based interventions provide significant benefits to the quality of life of TB patients compared to standard treatment alone [20, 21].

Support provided by survivors integrates lived experience, enabling the formation of a more equal relationship (emotional support based on horizontal experience) between the companion and the patient. This relationship fosters higher levels of trust, openness, and acceptance, allowing health messages to be more easily accepted and internalized by the patient. One of the main advantages of survivor companions is their ability to provide empathy based on real experience (experiential empathy). Unlike the cognitive empathy possessed by non-survivor companions, survivors can deeply understand the physical suffering, fear, fatigue, and psychosocial stress experienced by patients because they have been in the same situation. Experiential empathy has a stronger impact on building a therapeutic relationship because patients feel better understood [22]. This is particularly relevant for TB patients, who are often reluctant to express their feelings due to stigma and shame. Participatory studies indicate that community-based psychosocial interventions incorporating peer support delivered by tuberculosis survivors are considered appropriate and have the potential to reduce stigma and depressive symptoms [23].

Survivor advocates can provide more authentic emotional validation of the patient's experience. When survivors communicate that feelings of fear, despair, or fatigue are normal and have been experienced, the patient gains emotional legitimacy, which reduces psychological burden. This process, known as normalization of the illness experience, has been shown to effectively reduce anxiety and depression in chronic illnesses [24]. Non-survivor caregivers often find it difficult to provide this kind of validation convincingly because they lack comparable personal experience.

Survivor companions also serve as living role models, representing the possibility of recovery and restored quality of life. The presence of recovered survivors provides concrete evidence that the disease can be overcome, thus building realistic and sustainable hope. In this study, significant improvements in the mental health, vitality, and role emotional domains indicate that patients not only improved physically but also experienced profound psychological transformation. This is difficult to achieve through normative, instruction-based support from non-survivor companions. Hope based on real experience has a stronger effect on quality of life than abstract verbal motivation [25].

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130

Support from survivors directly contributes to reducing internalized and social stigma. Survivors help patients reconstruct their identity from a "sick person" to a "recovering person." Survivor-based interventions are among the most effective strategies for addressing TB stigma, as they shift the disease narrative from shame to a manageable and shared experience [26].

The effectiveness of social support by survivors found in this study is consistent with findings for a variety of other chronic and stigmatized diseases. Peer support by HIV survivors has long been recognized as a key component of global HIV programs. Studies indicate that HIV patients who receive peer support demonstrate better quality of life, higher ART adherence, and lower levels of depression than those who receive support only from healthcare workers [27]. The main similarities with TB include stigma, prolonged treatment duration, and the need for long-term emotional support.

In the context of cancer, survivor mentoring programs have been shown to improve quality of life, psychological coping, and disease acceptance. Cancer survivors provide more meaningful support because they can share strategies for managing therapy side effects and the uncertainty of prognosis [28]. This parallels the findings of this study, where TB survivor companions helped patients manage medication side effects and fears of treatment failure. In chronic mental disorders such as schizophrenia and major depression, peer support workers (survivors) have been shown to improve recovery-oriented outcomes, including quality of life and social functioning, compared to non-survivor professional companions [29]. This emphasizes that lived illness experience can serve as a source of therapeutic strength, not weakness, in the context of support.

Recent literature on TB champions and peer support suggests that mentoring by tuberculosis survivors can provide a significant bridge between the formal health system and the community [30]. TB champions not only provide counseling but also facilitate access to nutritional and emotional support tailored to local needs and cultural contexts. The study reported that among 1,042 tuberculosis patients with severe malnutrition, TB champions successfully facilitated the provision of nutritional supplements for at least 3 months to 238 (61%) by mobilizing local resources, including panchayat leaders, local philanthropists, and community organizations.

The program's effectiveness is enhanced by the TB champions' unique ability to use their personal experiences of recovery from tuberculosis as a motivational tool for other patients. Evidence from the Kerala health system shows that companion support involving those who have recovered from tuberculosis leads to earlier diagnosis, improved treatment adherence, reduced patient inconvenience, reduced stigma, and prevented out-of-pocket expenditure [31].

TB patients who received support from tuberculosis survivors experienced greater weight gain than those in the control group. Proportional weight gain at months 2 and 6 was also higher in the support group. Weight gain during the intensive phase of TB treatment is an important prognostic indicator; each one-unit increase in body mass index (BMI) is associated with a 22% reduction in mortality (95% CI: 10%–32%), while lack of weight gain is associated with treatment failure, relapse, and mortality [32].

These findings indicate that support from TB survivors not only increases weight gain in absolute terms but also results in a more consistent and meaningful percentage gain. A recent systematic review of 8 studies with 1,467 participants found that 5 of the 8 studies showed that nutritional support significantly improved TB treatment adherence [33]. The proposed mechanisms included improved food security, enhanced immune response to TB, limited drug toxicity, and improved adherence to TB medications. Furthermore, a retrospective cohort study in West Bengal, India, showed that TB patients living below the poverty line who received nutritional support (monthly rice and lentils) had a 50% lower risk of unsuccessful treatment outcomes (RR 0.51; 95% CI 0.30–0.86) compared to those who did not receive support [34]. The results of Body Mass Index (BMI) measurements, a more stable and accurate anthropometric measure, showed a statistically significant increase in the group receiving TB survivor support at the 6th month. This pattern suggests that the effects of mentoring on improving nutritional status based on BMI require a relatively long duration, of at least 6 months, to produce statistically significant changes. A recent longitudinal study in Lao PDR, involving 297 drug-

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130

susceptible TB patients, of whom 39.4% had a BMI < 18.5 kg/m² at diagnosis, showed that participants receiving nutritional counseling and support with ready-to-use therapeutic food and therapeutic milk products tailored to nutritional status experienced early nutritional recovery, especially during the intensive phase of TB treatment [32]. By the end of treatment, 84.3% participants improved their nutritional status to a BMI ≥ 18.5 kg/m².

In the context of the WHO 2025 roadmap for the integration of nutritional assessment, counseling, and support into TB care [35], a comprehensive approach to the nutritional status of TB patients, including regular BMI monitoring and tailored interventions, has been identified as an essential component of modern TB care. The INSTITUT (Impact of Nutritional Support for Tuberculosis on Intermediate and Terminal Undernutrition and Treatment Outcomes) protocol currently underway in Benin and Togo hypothesizes that the risk of remaining undernourished after TB treatment (defined as BMI < 18.5 kg/m²) is 50% lower among patients receiving nutritional support compared with those who do not [36].

Analysis of the distribution of nutritional status categories (underweight, normal, pre-obese, obese) found that the group with TB survivor assistance experienced a marked reduction in malnutrition prevalence, from 36.8% to 7.9% in 6 months, along with an increase in the proportion of respondents with optimal normal nutritional status from 57.9% to 73.7%. Although the group without assistance also experienced improvements, the assistance group achieved faster and more significant improvements. Specifically, the decrease in malnutrition prevalence in the assistance group was 29% (from 36.8% to 7.9%) in 6 months, compared with a 26% point reduction (from 50% to 23.7%) in the control group. This indicates that assistance from TB survivors provides an additional accelerating effect on nutritional recovery beyond the effects of standard TB treatment alone.

Social support from TB survivors (TB champions or peer supporters) operates through several interrelated mechanisms that improve patients' nutritional status. Peer support from TB survivors provides unique and credible motivation that healthcare professionals cannot offer. Literature shows that companion support involving those who have recovered from TB results in increased rates of early diagnosis, better treatment adherence, reduced patient inconveniences, stigma reduction, and prevention of out-of-pocket expenditure [31]. Stigma reduction is crucial because stigma can reduce patients' motivation for self-care, including maintaining adequate nutritional intake. Therefore, peer support from those with TB experience can increase patient engagement in positive nutritional behaviors.

A study conducted in India showed that TB champions facilitated the provision of nutritional supplements to 60% of patients with severe malnutrition (238 out of 402 patients with severe/moderate malnutrition) by mobilizing local resources, including local administrative leaders (panchayat leaders), local philanthropists, and community organizations [30]. This shows that peer supporters not only provide counseling but also act as advocates and facilitators in accessing resources needed for nutritional recovery. This is reinforced by the results of studies showing that patients who received assistance from former TB patients had a higher level of adherence to treatment [37].

TB champions, due to their personal experience with TB, can translate medical nutrition recommendations into a locally and culturally relevant context. They understand the practical challenges faced by patients, including local food preferences, limited access to certain foods, and financial constraints, and can therefore provide feasible and sustainable nutrition advice. In this context, a systematic review found that three types of nutritional interventions (food baskets, nutritional advice or guidance, and food purchase incentives) had varying effectiveness, with food baskets enriched with macro- and micronutrients showing the most consistent impact on improving medication adherence [33].

TB survivors can increase TB patients' resilience against internal stigma by sharing experiences [38]. When survivors share their experiences through illness narratives, it can enhance social support and serve as a credible source of information grounded in lived experience [12]. Research studies show that individuals are more likely to hear, personalize messages, and act upon health messages when they perceive the messenger as similar to themselves and facing comparable challenges and concerns [11].

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130

The findings of this study support the WHO 2025 recommendation that nutritional assessment, counseling, and support should be integral components of TB care at all levels [35]. Nutritional status not only influences the TB prognosis of individual TB patients but also has population-level implications for TB elimination strategies. Epidemiological studies indicate that each unit increase in baseline BMI is associated with a 22% reduction in mortality, and failure to gain weight during the intensive phase of therapy is a marker for treatment failure, relapse, and mortality [36].

This research also underscores the potential role of peer support in strengthening health systems, especially in resource-constrained settings. TB champions or peer supporters are cost-effective; they require minimal training and can work as volunteers or for minimal compensation while being culturally appropriate and accessible to the communities they serve. This model, which has proven effective in improving TB outcomes through better adherence and reduced stigma, can be readily expanded to incorporate a structured nutritional component.

This study also provides insights into the importance of targeting interventions at the most vulnerable groups. Baseline data showed that the prevalence of initial malnutrition was higher in the control group (50%) than in the intervention group (36.8%), possibly due to randomization or residual differences in baseline characteristics that were not fully balanced. However, regardless of baseline status, the results showed that mentoring was effective in improving nutritional status across different subgroups, with consistent effectiveness across gender. This suggests that peer support programs for nutritional recovery can be implemented equitably.

5. Conclusion

In summary, social support provided by tuberculosis (TB) survivors was associated with improved quality of life and nutritional status among patients receiving TB treatment. Survivor-led support represents a feasible and cost-effective strategy to strengthen patient-centered TB care.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

Acknowledgements:

The authors would like to express their sincere gratitude to the lecturers of the Doctoral Program in Medical & Health Sciences, Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada Yogyakarta, for their valuable insights and continuous support throughout the research process. Special thanks are due to the participants (TB survivors, TB patients, etc.) whose involvement and input during the research significantly contributed to the findings. The authors also acknowledge the financial and technical support provided by the university's Research and Innovation Unit, which made this research possible.

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Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 10, No. 2: 526-539, 2026
DOI: 10.55214/2576-8484.v10i2.12130