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Costs and psychosocial burden of tuberculosis to the treatment supporters in Ghana

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ABSTRACT

Objectives: Tuberculosis treatment supporters contribute crucially to tuberculosis control and prevention without financial compensation. The World Health Organization recommends direct observation of treatment, involving supporters who incurred costs for frequent health facility visits and waiting times, potentially impacting their socio-economic status. This study aims to inform tuberculosis control and prevention policy by determining the costs and psychosocial burden associated with treatment support.

Methods: A cross-sectional cost-of-illness approach, data from 385 supporters were collected through validated questionnaires. Both direct and indirect costs were assessed, with psychosocial burden measured using the Zarit Burden Interview (ZBI) 12-item questionnaire.

Results: Results reveal that, on average, supporters spent GHS 122.4 (US$21.1) monthly, constituting 19 % of their income. A significant 77.1 % experienced a high burden on the ZBI scale, with females facing a greater burden than males. Socio-demographic factors such as education, household size, income, and district of residence influenced both direct and indirect costs.

Conclusion: In conclusion, the study underscores the substantial costs and psychosocial burden on tuberculosis treatment supporters and recommends extending the livelihood empowerment against poverty program in Ghana to cover treatment support costs.

Introduction

Tuberculosis (TB) is an infectious disease caused by Mycobacterium tuberculosis, primarily affecting the lungs but capable of spreading to other organs [1]. It spreads through airborne droplets when an infected person coughs or sneezes. Prevention measures include the Bacillus Calmette-Guérin (BCG) vaccine, early screening, and infection control strategies like proper ventilation and respiratory hygiene [2]. Treatment involves a six-month antibiotic regimen, including rifampicin, isoniazid, pyrazinamide, and ethambutol, under the Directly Observed Treatment, Short-course (DOTS) strategy [2–4]. Different treatment supporters provide patients with informal care. They assist patients in adhering to treatment regimens, provide emotional and physical support, and may help with daily activities depending on the patient's needs. Treatment supporters, may include family, friends, or community members offering support specific to treatment adherence [5].

Tuberculosis remains a significant public health challenge, especially in developing nations like those in Africa and Asia [6,7]. In Ghana, TB is widespread across all regions and districts, with alarming incidence and mortality rates reported in 2020 [8]. The Ministry of Health, in collaboration with the Ghana Health Service, has implemented strategies such as the Directly Observed Therapy Short Course (DOTS) to address these challenges [9].

In 2020, Ghana reported a TB incidence rate of 143 and a mortality rate of 49 per 100,000 populations [8]. This resulted in a concerning one-third of estimated TB cases leading to death, with only one-third of cases reported to health centers [8]. The DOTS strategy, a vital component of Ghana's TB control efforts, involves treatment supporters who observe daily medication intake, ensure treatment completion, and provide social and psychological support [10–13].

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Despite the global success of DOTS, challenges persist, with variations in treatment success rates across regions and income levels [4,10,12,14]. Many low-income countries in Africa and Asia struggle to meet the 85 % treatment success rate target set by the DOTS strategy [15–17]. A systematic review highlighted challenges, including direct and indirect costs for TB patients and treatment supporters [18]. In low-income countries, repeated health facility visits contribute to costs and psychological stress for supporters [4,10,19].

In Ghana, treatment supporters play a crucial role, yet there are no financial incentives to alleviate the costs they incur. This study aims to estimate the direct, indirect, and intangible costs of the DOTS strategy on treatment supporters. The Bono Region is used as a case study to understanding the costs implications for effective policy on tuberculosis control and prevention Figs. 1 and 2.

Methods

Our study employs a cost description, which is a form of partial economic evaluation to investigate the economic burden on adult TB treatment supporters, aged 18 and above. . This approach involves systematically identifying, measuring, and valuing the resources associated with the intervention without comparing them to outcomes or alternative interventions [20]. Cost description is a type of partial economic evaluation of health care programmes that aims at calculating the cost of a given disease or health care service [20]. The cost description was conducted from the societal perspective, as recommended by Drummond et al. [20], to reflect the economic burden of tuberculosis on the Ghanaian society.

Data was collected through structured interviews employing close-ended questionnaires. Direct costs encompassed out-of-pocket expenses for transportation, accommodation, feeding, and communication. The study employed the Zarit Burden Interview 12-item scale [21] to gauge the psychosocial burden.

The Zarit Burden Interview (ZBI) 12-Item Scale is a widely used tool designed to assess the level of psychosocial burden experienced by caregivers of individuals with chronic illnesses, disabilities, or aging-related conditions. It measures the psychological, emotional, and physical stress caregivers face when providing care. It consists of 12 questions, each scored on a 5-point Likert scale (never, rarely, sometimes, quite frequently, nearly always).

Indirect costs were estimated using the human capital approach [22], valuing productive time lost during Directly Observed Therapy Short Course (DOTS) center visits. Time spent on drug rations, waiting at the DOTS center, and supporting the TB patient in treatment were quantified in hours and converted to days based on an assumed 8-hour workday. For employed treatment supporters, the 2019 daily minimum wage rate (GHS 10.65 = US$ 1.99) was applied. Informal sector costs used the November 2019 average daily agricultural labor wage rate (GHS 37.5 = US$ 7.03) in the Bono Region. Costs were reported in Ghana Cedis (GHS) and converted to US dollars(2019 values) at an average exchange rate of GHS 5.33 for US$ 1, as per the Bank of Ghana interbank exchange rate, November 2019 (Available from:https://www.bog.gov.gh/economic-data/exchange-rate/), to ensure international comparison with other cost-of-illness studies.

Study setting

The study, conducted in six (6) districts in the Bono Region, categorized them as relatively urban (Berekum, Dormaa, Sunyani) and rural (Jaman North, Jaman South, Tain). These districts, sharing economic and demographic similarities, were chosen due to their high number of active tuberculosis cases.

Inclusion and exclusion criteria

Participants were eligible for inclusion if they were TB treatment supporters aged 18 years or older and had provided treatment support to TB patients for at least two months. Duration of support and clinical were key considerations for inclusion.

Individuals were excluded if they had provided TB treatment support for at least two months but were clinically ill or if they had served as TB treatment supporters for less than two months.

Sampling procedure

For our study, we purposefully selected six hospitals in the Bono Region that had the highest number of TB cases. These districts are likely experiencing high burden of TB which is of public health concern. We identified treatment supporters from TB registers at each hospital and contacted them via phone before their scheduled drug ration date. During a visit to pick up their TB drugs at the hospital, we asked for their informed consent. Respondents who agreed to participate in the study were interviewed till we obtained the necessary sample of 385 respondents. To minimize disruption to their routine care, questionnaires were administered after respondents had completed their treatment schedule and were preparing to leave the hospital.

Data collection

A validated questionnaire on estimating tuberculosis costs adapted from tool to estimate patients' costs - tuberculosis coalition for technical assistance [23], was administered on 385 treatment supporters to collect information on the direct and indirect costs incurred. Using the below formula, we allocated the sample sizes proportional to the TB cases in each district as represented in Table 1.

$$\frac{\text{number of treatment supporters in each district}}{\text{total number of treatment supporters in the six districts}} \times 385$$

Description of costs variables

Table 2 present detailed description of the cost's variables.

Scoring of the Zarit Burden scale

A 12-item survey using a 5-point scale (0 to 4) measured treatment supporter burden. Scores were summed for each item, resulting in a total score (0 to 48), with higher scores indicating greater burden. Based on

Table 1
Number of tuberculosis patients on treatment as of 2018 and sample size allocated.

No	District	No. of TB Cases	Sample Size	%
1	Berekum Municipality	112	$\frac{112}{631}X385 = 68$	18
2	Dormaa Municipality	89	$\frac{89}{631}X385 = 54$	14
3	Jaman North	78	$\frac{78}{631}X385 = 48$	12
4	Jaman South	62	$\frac{62}{631}X385 = 38$	10
5	Sunyani Municipality	170	$\frac{170}{631}X385 = 104$	27
6	Tain	120	$\frac{120}{631}X385 = 73$	19
	TOTAL	631	**385**	**100**

Table 2
Description of Costs.

Cost Type	Cost Categories	Description
Direct Cost	Feeding	Direct out-of-pocket payments for foods and water
	Travel/transportation	Cost associated with travels to and from the health facility for TB medication
	Accommodation	Direct out-of-pocket payments for lodging
	Other: communication	Direct out-of-pocket payments on mobile credit/phone calls
Indirect Cost (productivity losses associate with the providing TB treatment support)	Time spent on travel/ transportation	Productive time spent travels to and from health facility for TB medications
	Time spent with TB patient	Productive time spent with TB patient supervising/serving TB medications.
	Waiting Time	Productive time spent at health facility waiting for TB medications
Zarit Burden Interviews	The psychological pain associated with the provision of TB treatment support	Zarit burden interview scores

Ankri et al.'s suggestion, burden levels were classified: 0 to <10 (no to mild), 10–20 (mild to moderate), and >20 (high) [24].

Data analysis

Descriptive statistic, cost estimation, scoring of Zarit Burden interviews was the analysis techniques used. Socio-demographic predictors of the various cost's components were performed using the one-way ANOVA test of equality of mean difference. A two-side P-value<0.05 was considered statistically significant. We conducted our analyses using STATA version 14.0 (StataCorp, 2015, College Station, Texas, USA) and Microsoft Excel.

Results

The study involved 385 respondents (Table 3), primarily treatment supporters with a mean age of 39. Of these supporters, 53 % were male, 47 % were female, and 74 % were married. Additionally, 77.4 % were employed in the informal sector, while 22.6 % worked in the formal sector. In terms of income, 38 % earned between GHS500-GHS750, and 35 % earned less than GHS500. Family members constituted 72 % of the treatment supporters, 20 % were friends and occupation-wise, 56 % were farmers, 17 % were involved in trading, and 6 % worked as government employees. These socio-demographic characteristics provide insights into the diverse profile of the study participants.

Direct and indirect costs of tuberculosis treatment support

Table 4 reveals tuberculosis treatment support costs, totaling GHS35,837 (US$6724) per month. Indirect costs constitute 67 % (GHS23,853.16 or US$4475.26), while direct costs make up 33 % (GHS11,984.00 or US$2248.41). Monthly average cost per treatment supporter is GHS112.4 (US$21.1), with transportation (17 %) and feeding (15 %) as major direct cost components.

Table 3
Socio-demographic characteristics of respondents ($n = 385$).

Characteristics	n(%)
Age group	
18–24	13(3.4)
25–34	90(23.4)
35–44	174(45.2)
45–54	95(24.7)
>54	13(3.4)
Gender	
Male	205(53.3)
Female	180(46.8)
Marital status	
Never Married	66(17.1)
Married	284(73.8)
Widowed	23(6.0)
Divorced/Separated	12(3.1)
Religion	
Christian	303(78.7)
Non-Christian	82(21.3)
Highest level of education	
Primary	69(17.9)
Junior High School	146(37.9)
Senior High School	137(35.6)
Tertiary (University)	33(8.6)
Ethnicity	
Dagaaba/Frafra/Mo	77(20.0)
Akan	233(60.5)
Others	75(19.5)
Household size	
Alone	22(5.7)
<4	166(43.1)
4–5	154(40.0)
6–7	43(11.2)
Type of occupation	
Farming	214(55.6)
Government employee	24(6.2)
Private employee	58(15.0)
Trading	67(17.4)
Students	6(1.6)
Unemployed	16(4.2)
Sector of employment (363)	
Formal sector	82(22.6)
Informal sector	281(77.4)
Monthly income	
No income	22(5.7)
<500	134(34.8)
500–750	148(38.4)
750–999	34(8.8)
>999	47(12.2)
Relationship with patient	
Family member	276(71.7)
Friend	75(19.5)
Health worker	22(5.7)
Spouse	12(3.1)
District of Residence	
Berekum Municipal	68(17.1)
Dormaa Municipal	54(14.0)
Jaman North	48(12.5)
Jaman South	38(9.9)
Sunyani Municipal	104(27.0)
Tain	73(19.0)

Table 4
Direct and Indirect Costs of Tuberculosis Treatment Support to the treatment supporters.

Cost component	N	Cost (GHS)	Cost (US$)	Average cost (GHS)	Average cost (US$)	Cost profile (%)
Direct Cost						
Food	298	5237.0	982.6	17.8	3.3	14.6
Transportation	237	6011.0	1127.8	25.4	4.8	16.8
Others	197	736.0	138.1	3.7	0.7	2.1
Total direct cost		**11,984.0**	**2248.4**	**46.8**	**8.7**	**33.4**
Indirect Cost						
Formal Sector	82	1530.9	287.2	18.7	3.5	4.3
Informal Sector	281	22,322.2	4188.0	79.4	14.9	62.3
Total Indirect Cost	**363**	**23,853.2**	**4475.3**	**65.7**	**12.3**	**66.6**
TOTAL COST		**35,837.2**	**6723.7**	**112.4**	**21.1**	**100**

Table 5
Predictors of Tuberculosis Treatment Support Costs.

	Total direct cost	Total indirect cost	Total cost	Joint effect
Characteristics	**β [95 % CI]**	**β [95 % CI]**	**β [95 % CI]**	**F-stat; P-value**
Age	−0.1 [−0.2, 0.1]	0.0 [−0.1, 0.2]	0.0 [−0.3, 0.2]	0.4; 0.641
Gender				2.7; 0.100
Male	0.0 (reference)	0.0 (reference)	0.0 (reference)	
Female	4.0 [−0.8, 8.8]	−27.1 [−32.4, −21.8] ***	−23.1 [−30.7, −15.5] ***	
Marital status				
Never married	0.0 (reference)	0.0 (reference)	0.0 (reference)	3.0; 0.029 *
Married	2.8 [−2.9, 8.6]	29.2 [22.9, 35.6] ***	32.1 [23.0, 41.2] ***	
Widowed	26.0 [7.1, 44.8] **	−42.0 [−62.9, −21.0] ***	−16.0 [−46.0, 14.0]	
Divorce	−2.1 [−11.6, 7.3]	38.4 [27.9, 48.9] ***	36.2 [21.2, 51.3] ***	
Highest education				4.7; 0.003 **
Primary	0.0 (reference)	0.0 (reference)	0.0 (reference)	
Junior high	13.1 [−4.8, 30.9]	−8.2 [−28.1, 11.6]	4.8 [−23.5, 33.2]	
Senior high	15.2 [−2.8, 33.1]	−19.6 [−39.6, 0.3]	−4.4 [−33.0, 24.1]	
Tertiary	12.1 [5.2, 19.0] **	−48.6 [−56.3, −40.9] ***	−36.5 [−47.5, −25.6] ***	
Household size	1.1 [0.2, 2.0] *	1.4 [0.4, 2.4] **	2.5 [1.1, 3.9] ***	6.2; 0.002 **
Monthly income (₵100)	0.0 [−1.0, 0.9]	−4.1 [−5.2, −3.0] ***	−4.2 [−5.7, −2.6] ***	28.7; <0.001***
District				7.2; <0.001***
Berekum	0.0 (reference)	0.0 (reference)	0.0 (reference)	
Dormaa	6.3 [2.3, 10.4] **	−1.2 [−5.7, 3.3]	5.1 [−1.3, 11.6]	
Jaman North	4.8 [0.5, 9.1] *	−1.9 [−6.7, 2.8]	2.9 [−3.9, 9.7]	
Jaman South	−4.7 [−9.2, −0.2] *	−4.7 [−9.7, 0.3]	−9.4 [−16.6, −2.2] *	
Sunyani	−1.8 [−5.2, 1.7]	−0.3 [−4.1, 3.6]	−2.0 [−7.5, 3.5]	
Tain	3.1 [−0.6, 6.9]	−0.8 [−5.0, 3.3]	2.3 [−3.6, 8.3]	

β: adjusted coefficient. CI: confidence interval. *: $p < 0.05$. **: $p < 0.01$. ***: $p < 0.001$.

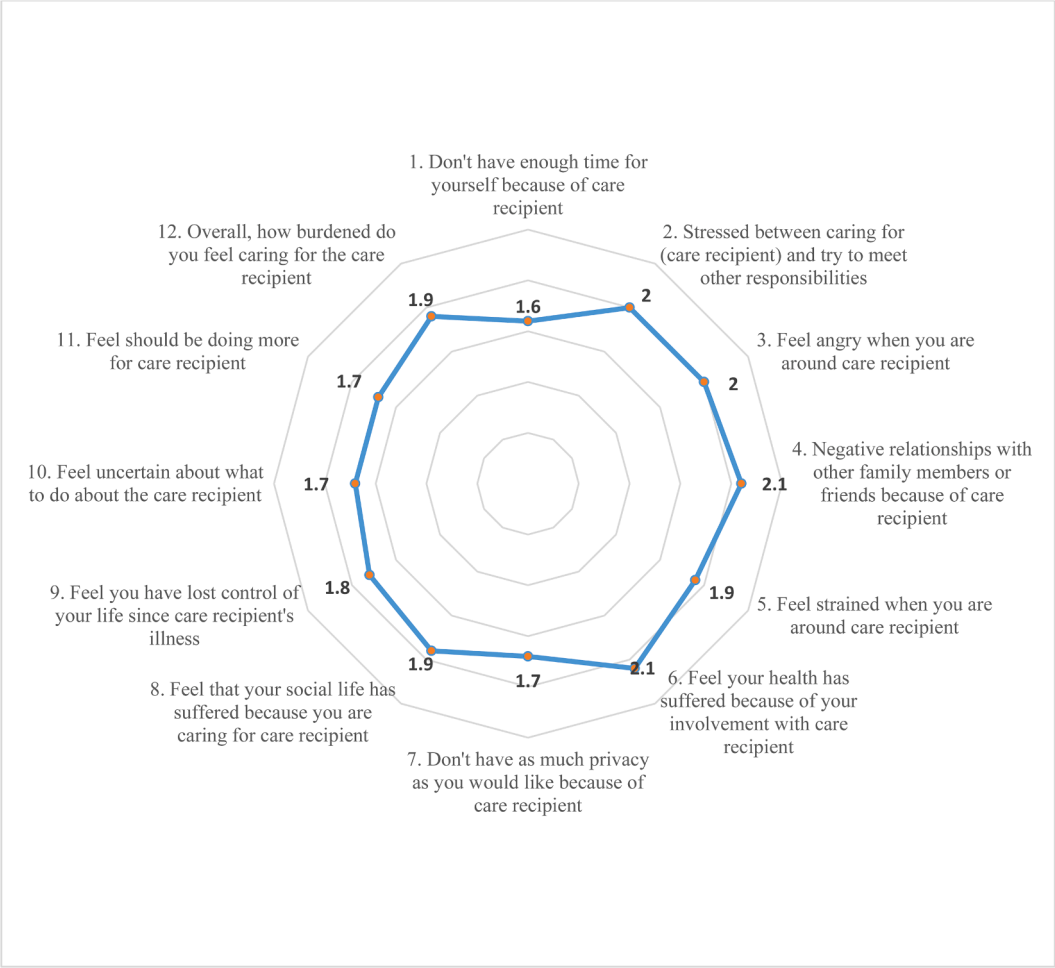

Fig. 1. Mean Zarit Burden Score for each Subscale of the 12 Items

Fig. 1 displays mean scores for Zarit Burden Items. Those lacking personal time had the lowest mean (1.6/4), while respondents with health issues and strained relationships scored highest (2.1/4 each).

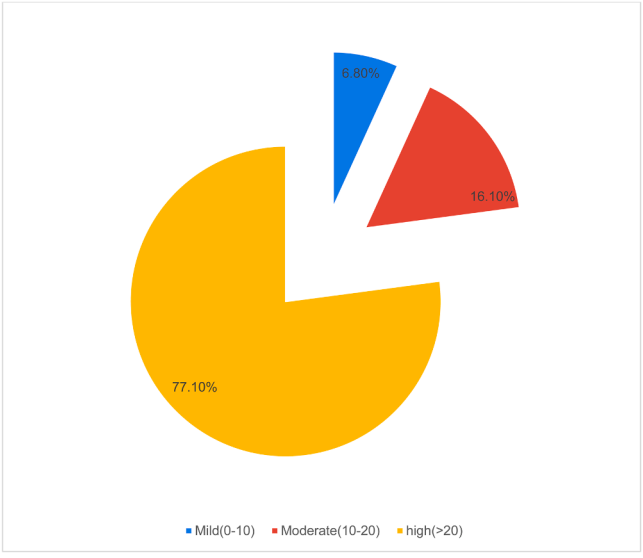

Fig. 2. Distribution of Treatment Supporters' Level of Burden by Zarit Interview ScoreTop of Form

Treatment Supporters' burden levels were assessed using Zarit burden interview scores. Scores 0 to >10 indicated no to mild burden, 10–20 indicated mild to moderate, and >20 indicated high burden25. Findings revealed 16.1 % experiencing moderate burden, while 77.1 % had high burden among treatment supporters, as depicted in Fig. 2.

Predictors of tuberculosis treatment support costs

The study reveals disparities in TB treatment costs based on demographics and location (Table 5). Widows face significantly higher average direct costs (GHS 26.0, 95 % CI: GHS [7.1, 44.8]) than unmarried individuals. Those with tertiary education experience elevated costs (GHS 12.1, 95 % CI: GHS [5.2, 19.0]) compared to primary education. An increase in household member's correlates with a GHS 1.1 rise in total direct costs (95 % CI: GHS [0.2, 2.0]). Regionally, Dormaa and Jaman North incur higher costs (GHS 6.3, 95 % CI: GHS [2.3, 10.4]; GHS 4.8, 95 % CI: GHS [0.5, 9.1]) compared to Berekum District, while Jaman South sees lower costs (GHS 4.7, 95 % CI: GHS [−9.2, −0.2]). Multivariate regression emphasizes the significant impact of marital status, education level, household size, income, and district on TB treatment support costs among respondents'

Predictors of Zarit Burden interview scores

Table 6 presents one-way ANOVA and Welch's *t*-test results for sociodemographic characteristics of TB treatment support recipients. Significant differences in mean Zarit Burden scores were found by sex ($T=-4.9$, $p < 0.001$), marital status ($F = 16.1$, $p < 0.001$), education ($F = 31.2$, $p < 0.001$), and income ($F = 12.7$, $p < 0.001$). In the multiple linear regression model, females had an average score 3.0 points higher than males (95 % CI: [2.2, 3.7]). Widowed (−6.5, 95 % CI: [−9.0, −4.0]) and divorced (−7.8, 95 % CI: [−9.1, −6.6]) individuals had significantly

lower burden scores. Differences were observed by education and household size. Increasing direct cost by GHS100 led to a 3.1-point increase (95 % CI: [1.7, 4.4]) in Zarit Burden score, and a GHS100 increase in indirect cost led to a 13.7-point increase (95 % CI: [11.1, 16.3]) in Zarit Burden score.

Discussion

Supporting tuberculosis patients with treatment costs averages GHS 122.4 (US$21.1) monthly, covering travel, feeding, and indirect expenses. Travel costs vary based on factors like frequency, transportation mode, and proximity to health facilities, imposing costs. Direct costs, particularly feeding, are noteworthy, while indirect costs, tied to time loss, constitute the highest burden. Socio-demographic factors such as marital status, education, household size, income, and district contribute to support costs. Dormaa and Jaman North residents face higher costs (GHS6.3 and GHS4.8, respectively), potentially due to distant travel for tuberculosis treatment. This aligns with studies in Ethiopia [1] and Zambia [25] linking rural residency to increased tuberculosis treatment expenses.

Within Ghana, regional disparities in economic opportunities, healthcare infrastructure, and social support systems may influence the extent and nature of costs incurred by treatment supporters. For treatment supporters in rural regions, the costs of accompanying patients to health facilities can be substantial. Costs may include transportation expenses, lost earnings due to time away from work if treatment centres are far from home. In contrast, urban settings may offer shorter travel distances and better access to public transportation, reducing some of these costs. However, urban areas may present other challenges, such as high out-of-pocket costs for services and congestion-related delays.

Findings from the Bono Region can be applied to other regions by identifying common public health challenges, health system structures, and socio-cultural factors influencing access to health care. While specific contextual differences exist, broader themes such as access to healthcare, health-seeking behaviors, community engagement, and the effectiveness of interventions can inform strategies in similar settings. However, adjustments may be necessary to account for variations in infrastructure, population demographics, and policy implementation across regions.

Education independently predicts total direct costs, with tertiary-educated individuals incurring GHS12.1 (95 % CI: GHS [5.2, 19.0]) more than those with primary education, consistent with findings in Nigeria [26] and Benin [27]. Larger household sizes independently contribute to higher treatment-related expenses, corroborating a systematic review anticipating elevated healthcare costs in developing countries [28].

Regarding psychosocial burden, assessed via the Zarit burden scale, significant burdens were observed, indicating notable social and psychological challenges leading to supporter fatigue. This aligns with global and Ghanaian research, emphasizing caregiver strain in chronic diseases like TB [19,29]. In Ghana, 72 % of family caregivers faced substantial burden, consistent with cultural expectations [29]. Predictors of intangible costs included gender, marital status, religion, education, ethnicity, income, and the relationship with TB patients. Females exhibited a significantly higher burden (3.0 [95 % CI: 2.2, 3.7]) than male supporters, consistent with Ghana and Nigeria's findings [30, 31].

The regression model revealed a significant association between increased direct and indirect costs of assisting TB patients and higher Zarit Burden scores. A GHS100 rise in direct costs led to a 3.1 (95 % CI: [1.7, 4.4]) increase, while a similar increase in indirect costs resulted in a 13.7 (95 % CI: [11.1, 16.3]) rise in Zarit Burden scores. Consistent with past studies, economic burdens on family caregivers in Canada [32] were linked to higher caregiving burden.

The findings on the costs and psychosocial burden of TB to treatment supporters in the Bono Region have significant policy implications.

Table 6
Predictors of Zarit Burden Interview Scores.

Characteristics	Zarit score		Linear regression of Zarit score
	Mean ± SD	F-stat; P-value	aβ [95 % CI]
Age group		1.2; 0.332	
18–24	23.5 ± 3.4		0.0 [reference]
25–34	22.7 ± 2.7		0.0 [−0.8, 0.9]
35–44	22.3 ± 3.3		0.2 [−0.6, 1.0]s
45–54	22.7 ± 2.8		0.3 [−0.5, 1.2]
>54	21.4 ± 2.8		−0.6 [−1.7, 0.5]
Sex		−4.9; <0.001 ***	
Male	21.8 ± 2.4		0.0 [reference]
Female	23.3 ± 3.5		3.0 [2.2, 3.7] ***
Marital status		16.1; <0.001 ***	
Never married	22.0 ± 2.9		0.0 [reference]
Married	23.0 ± 3.0		0.7 [−0.3, 1.8]
Widowed	19.0 ± 1.6		−6.5 [−9.0, −4.0] ***
Divorce	21.0 ± 0.0		−7.8 [−9.1, −6.6] ***
Highest education		31.2; <0.001 ***	
Primary	20.7 ± 2.7		0.0 [reference]
Junior high	21.7 ± 2.8		−8.7 [−10.9, −6.4] ***
Senior high	24.0 ± 3.0		−5.7 [−8.0, −3.4] ***
Tertiary	23.9 ± 0.3		−6.1 [−7.7, −4.6] ***
Household size		2.1; 0.094	
Alone	24.0 ± 0.0		0.0 [reference]
<4	22.5 ± 3.0		−8.3 [−11.6, −5.0] ***
4–5	22.4 ± 3.2		−8.3 [−11.6, −5.0] ***
6–7	22.1 ± 3.1		−8.8 [−12.1, −5.5] ***
Monthly income		12.7; <0.001 ***	
No income	24.0 ± 0.0		0.0 [reference]
<500	21.2 ± 3.0		−4.8 [−5.8, −3.9] ***
500–750	23.3 ± 3.3		−0.5 [−1.3, 0.3]
750–999	21.8 ± 3.1		−0.2 [−1.5, 1.1]
>999	23.5 ± 0.5		
District		0.3; 0.890	
Berekum	22.8 ± 3.3		0.0 [reference]
Derma	22.5 ± 2.9		0.1 [−0.4, 0.6]
Jaman North	22.2 ± 3.5		−0.5 [−1.1, 0.0]
Jaman South	22.8 ± 2.4		0.3 [−0.2, 0.9]
Sunyani	22.6 ± 2.9		0.2 [−0.3, 0.6]
Tain	22.3 ± 3.2		−0.2 [−0.7, 0.3]

(continued on next page)

Table 6 (*continued*)

Characteristics	Zarit score		Linear regression of Zarit score aβ [95 % CI]
	Mean ± SD	F-stat; P-value	
Total direct cost (₵100)			3.1 [1.7, 4.4] ***
Total indirect cost (₵100)			13.7 [11.1, 16.3] ***

SD: standard deviation. aβ: adjusted coefficient. CI: confidence interval. *: $p < 0.05$. **: $p < 0.01$. ***: $p < 0.001$.

Costs, including transportation costs, loss of income, and out-of-pocket expenses, highlight the need for economic support mechanisms such as subsidies, financial incentives, and reimbursement programs [33]. Integrating TB-related financial support into broader social protection initiatives could provide a safety net for caregivers facing economic hardships.

The study also underscores the psychosocial burdens, such as emotional distress and disruptions to personal life. These findings suggest that psychosocial support interventions, such as counselling services and peer support networks through community engagement can enhance treatment adherence and improve the overall well-being of both patients and their treatment supporters.

Addressing the Costs and psychosocial burden of TB to treatment supporters requires targeted policy interventions that provide financial relief, psychosocial support, and systemic improvements in healthcare delivery [34]. These measures will not only reduce the burden on treatment supporters but also contribute to better treatment outcomes and overall TB control efforts.

Despite valuable insight into the economic and psychosocial burden borne by treatment supporters the generalizability of these findings beyond the Bono Region requires careful consideration, particularly when extrapolating to other countries or regions with different socioeconomic contexts.

The Costs and psychosocial burden of TB treatment support are likely to differ in low, middle, and high-income country settings. In low-income countries with weak health systems, the economic costs on treatment supporters may be exacerbated by higher out-of-pocket costs, unreliable healthcare services, and limited social protection measures. For example, in some sub-Saharan African countries, long distances to healthcare facilities and high transportation costs may further strain household finances [3]. Additionally, cultural norms regarding caregiving responsibilities could shape the experience of treatment supporters differently across various societies [35].

In middle-income countries, while social protection schemes may exist, they may not fully cover the indirect costs associated with caregiving, such as lost income and psychological distress [36,37]. The structure of healthcare financing, whether through out-of-pocket payments, national insurance, or donor-funded programs can significantly affect the costs borne by treatment supporters [38]. In high-income countries, where healthcare systems are more robust and social welfare programs more extensive, the costs on treatment supporters may be lower.

This study is the first to estimate direct, indirect, and psychosocial burden of tuberculosis treatment support in Ghana, offering valuable insights for policy and the goal to eradicate tuberculosis by 2035. However, limitations include a cross-sectional approach and reliance on the human capital method, neglecting individual earnings variations. Longitudinal methods could reflect better costs incurred by treatment supporters.

Though the valuable insights generated by this study on the costs and psychosocial burden costs of assisting with TB treatment, some limitations must be acknowledged.

The study collected cross-sectional data, capturing a snapshot of costs at a particular time. However, the costs and psychosocial burden of TB treatment supporters may fluctuate over time due to changes in economic conditions

Also, the study used a purposive sampling approach for the health facility selection, potentially limiting the representativeness of the findings. Given the diverse socioeconomic backgrounds of TB treatment supporters, the study sample may not fully capture variations in costs and experiences across different demographic groups. Additionally, the study was conducted in the Bono Region of Ghana, and the findings may not be directly applicable to other countries or regions where contextual factors such as healthcare infrastructure, economic conditions, and cultural practices may differ.

Finally, the study relied on self-reported data to estimate the costs and psychosocial burden. Respondents may have experienced recall bias, particularly when recalling expenses or emotional burdens associated with supporting TB patients. This may have led to underestimation or overestimation of costs associated with TB treatment support. These limitations may impact the generalizability of the findings and should be considered in the interpretation and application of the results.

Based on the findings and limitations of this study, several directions for future research are recommended.

Future research should focus on longitudinal studies that will enable track the costs and psychosocial burden over the full course of treatment to provide more clearer picture of the economic burden associated tuberculosis treatment support.

Given that socioeconomic conditions and health system structures vary across regions, comparative studies between urban and rural regions, or across different administrative regions, would provide insights into the contextual factors influencing TB treatment support costs for region specific interventions.

While this study highlights psychosocial costs of assisting TB patients with treatment, future research should employ qualitative methodologies such as in-depth interviews and focus group discussions to explore the live experiences of TB treatment supporters.

Future studies should explore the cost-effectiveness of potential support mechanisms, such as cash transfers, transportation subsidies, or mental health counselling, to mitigate the economic and psychological burden on TB treatment supporters.

To mitigate the costs and psychosocial burden of supporting TB treatment, Ghana Likelihood Empowerment against Poverty program (LEAP), has shown positive impacts on household access to health care, though its direct effects on caregiving require further study [39]. Integrating treatment supporters into the LEAP program could help reduce the economic burden of support for TB treatment and improve treatment adherence. Also, transport and service vouchers, effective in Kenya and Bangladesh [40,41], could be adapted to the Ghanaian context. The National Health Insurance Scheme (NHIS) reduces direct service costs but inadequately addresses indirect costs like transport. Therefore, this study recommends Ghana Health Service and Ministry of Health, Ghana should advocate for integration of LEAP or transport voucher programs in the tuberculosis control program.

Conclusion

The study underscores the substantial financial burden on tuberculosis treatment supporters and recommends extending the livelihood empowerment against poverty program in Ghana to cover treatment support costs.

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Competing interests

The authors declare that they have no competing interests.

Ethical approval

All ethical standards and procedures involving human subjects was followed in conducting the study. Before taking part in the study, each participant signed the informed consent form to provide their informed consent for inclusion. The protocol for this study was reviewed and approved by Ghana Health Service Ethics Review Committee with reference number GHS-ERC 003/03/2019.

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