

Social Support, Quality of Care, and Patient Adherence to Tuberculosis Treatment in Peru: The Mediating Role of Nurse Health Education

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Background: Peru is one of the countries with the highest burden of tuberculosis (TB) and multidrug-resistant tuberculosis (MDR-TB) in the Latin American region and globally. Health education provided by nurses reinforces social support and the quality of patient care allows a greater impact on adherence to TB treatment.

Purpose: This study evaluated the mediating effect of treatment education between social support, quality of care, and treatment adherence in TB patients.

Methods: A cross-sectional study was carried out considering 162 adult TB patients from four health centers of the public sector located in the center of the city of Lima, Peru. Data were collected on variables, such as social support, quality of care, health education, and adherence to TB treatment. SmartPLS was used for data analysis.

Results: The results showed that social support and quality of care significantly influence health education. Likewise, health education mediates social support and quality of care for better adherence to treatment.

Conclusion: It is recommended that hospitals take initiatives to provide better health education on TB treatment to ensure better adherence to treatment.

Keywords: social support, quality of care, education, adherence to treatment, tuberculosis

Introduction

Tuberculosis (TB) is one of the major global public health problems. According to recent data from the World Health Organization (WHO), this disease affects 9.9 million people, including 5.5 million men, 3.3 million women, and 1.1 million children.¹ It is an infectious-contagious disease caused by bacillus *Mycobacterium tuberculosis* that is present in all countries and age groups.¹ In Latin America, the largest proportion of cases are in countries such as Brazil and Mexico, including Peru.² In fact, Peru is among the 40 countries with the highest burden of tuberculosis and multidrug-resistant tuberculosis globally.³ Recently, an increase from 2.5% to 7.3% of MDR-TB cases has been reported in the last two decades.⁴

TB affects people's physical health. In fact, TB patients suffer a number of debilitating effects that affect physical well-being and impair quality of life from a physical standpoint.⁵ Moreover, TB negatively affects the psychological, emotional, and social status of patients, probably because it generates hopelessness, stigma in the community, social isolation, and discrimination due to its infectious nature⁶ and by the beliefs and prejudices that have been nurtured over the years.⁷ Such unfounded perceptions become a constant challenge to what TB patients have to deal with, as they face

social situations, such as loss of employment after diagnosis, financial constraints, reduced marriage prospects, and lack of social support.^{7,8} This further contributes to social exclusion and isolation, which, in turn, impacts adherence to treatment.⁹ TB patients who are not cured or do not adhere to treatment pose a serious risk not only to individuals but also to the community.¹⁰ Therefore, it is important to assess the social support and quality of care and health education provided by nursing and to identify adherence to treatment.

Social Support

Despite the condition in which TB patients find themselves, they report almost nonexistent social support from families and community members.⁵ Social support refers to the resources provided to an individual from institutional centers, community centers, and economic benefits;¹¹ where they are made to believe that they are loved, cared for, esteemed, and members of a network of mutual obligations.¹² Previous studies have suggested that social support promotes adherence to TB treatment and a better psychological state by changing affective states, buffering stress, increasing self-efficacy, and promoting positive behaviors.^{7,13,14} A study conducted in China found that social support is an effective strategy for improving treatment outcomes for TB patients.¹³ Furthermore, another study showed that nurses' social support influenced nonadherence.⁷ However, there is evidence that social support contributes to nonadherence due to negative emotional experiences, such as feelings of guilt and competing interests between the patient and the source of support.¹⁵

Quality of Care

Quality of care is another factor associated with adherence to TB treatment. In fact, the quality of care of health professionals plays an important role not only in adherence to TB treatment but also in the control and completion of treatment.¹⁶ Improving treatment outcomes for TB patients depends on accessible and effective care that is responsive to patient needs. One study found that lack of availability of daily TB medical care in health facilities was associated with missed daily doses in patients.¹⁷ TB patients often discontinue and drop out of treatment when they do not receive adequate supervised care.^{17,18} Activities such as monitoring adherence to treatment, pill counting, and patient follow-up, providing accurate information could impact adherence to treatment.¹⁷

Health Education

Several studies show that treatment education facilitates adherence to TB treatment,¹⁹ this is because there is a greater understanding of the side effects and duration of treatment, and it facilitates the procedures for receiving treatment.²⁰ Education strengthens social support and enables improved TB cure rates and improves treatment sustainability.²¹ Likewise, the quality of education allows to build trust between client-provider and to achieve the success of the treatment. The level of knowledge and beliefs in the treatment allow detection strategies and medical provision, this effective communication adapts to traditions and gives meaning to values, social relations guaranteeing more information, diagnosis and better adherence.²² Therefore, understanding health information allows for proper treatment follow-up.²³ Health education about treatment by nurses is essential for both social support and quality of care, which in turn promotes better adherence.

Adherence to Treatment

By definition, adherence is the collaborative acceptance by the TB patient of the treatment given by the health professional.¹⁹ Patients not adherent to treatment are at risk of experiencing the increased clinical complexity characterized by resistance to tuberculostatic drugs.¹⁹ Likewise, it generates an epidemiological impact with the persistence of foci of disease transmission. Several aspects can lead to non-adherence to TB treatment, including economic factors such as poverty. In fact, people affected by TB are often those who are homeless, malnourished, or migrant.^{14,24} On the other hand, there are other worrying aspects related to the economic costs that the disease can generate for individuals, households, and state entities; these are closely related to the cost of the disease, which, in turn, leads to social and health consequences, such as lack of adherence and increased spread of the disease.²⁵

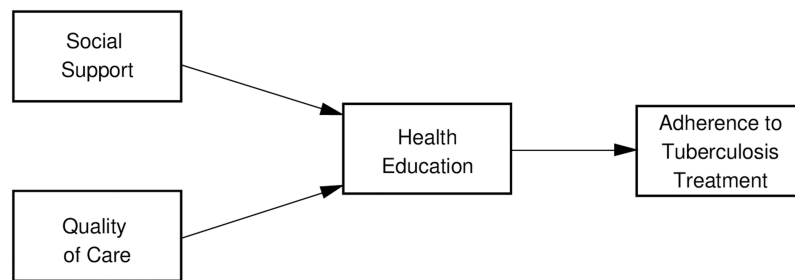


Figure 1 Development framework model.

Study Hypothesis

Based on the literature review and considering a transmission approach,²⁶ it is required to establish a hypothesis where the mediating variable mediates the relationship between the dependent and independent variable (See Figure 1).

H1: Social support and quality of care positively influences health education.

H2: Health education positively influences adherence to TB treatment.

H3: Nurse health education mediates the relationship between social support and TB treatment adherence.

Materials and Methods

Study Design and Participants

A cross-sectional study was carried out to evaluate patients attending four health centers located in the center of Lima, Peru. Data collection began on January 3 and ended on October 23, 2021. The survey was applied considering patients who were diagnosed with drug-sensitive tuberculosis and who have progressed to stage 2 (this stage comprises infected patients who develop the disease). On the other hand, all patients in the second stage (those exposed to contagion and infected), those with extensively drug-resistant tuberculosis (XDR TB), and MDR TB were excluded. G*Power software was used to determine the minimum sample size required. The following parameters were considered: 0.95 for the power test and 0.15 for the effect size (f^2). The results indicated that the minimum sample size was 119 cases. The questionnaire was administered by the interviewer to 162 participants and was acceptable for the SmartPLS partial least squares structural equation modeling (PLS-SEM) technique.²⁷

Ethical Approval

Before starting data collection, consent was requested and obtained from all participants. The study was approved by the Research Ethics Committee of the Universidad Peruana Unión (approval reference number: 2021-CE-FCS-UPeU -00182). In addition, all procedures contributing to the study were performed in accordance with the ethical criteria of the 1975 Declaration of Helsinki and its subsequent modifications.²⁸

Variable Measurements

Quality of Nursing Care

6 items were used to assess patients' perception of the nurse's quality of care. It was based on a previous Study²⁹ (eg, "Does the nurse greet you cordially and respectfully when you arrive at the office?" or "Does the nurse guide you in simple words about your illness?"). Responses were categorized into 3 response items from "never" to "always".

Health Education

Also, health education provided by nurses was assessed by 5 items based on a previous study²⁹ (eg, "Does the nurse advise you about the possible adverse effects of the treatment and how to resolve them?" or "Does the nurse advise you

about the consequences, in case of abandoning the treatment?“). Each item contains 3 response options ranging from “never” to “always”.

Social Support

The measurement items for the social support variable were adopted from previous studies.³⁰ The social support questionnaire has 14 items (eg, “someone to advise you when you have problems”) and a Likert-type scale with 5 response options from “never” to “always”.

Adherence to TB Treatment

The TB treatment adherence questionnaire has 5 items (eg, “When do you go to the health center and receive full treatment?”) with 3 response options ranging from “never” to “always”. All items of the scales were adapted for the purposes of the study.³¹

Statistical Analysis

Partial least squares (SmartPLS 3) were used to analyze the strength of the measurement model. The PLS allows the relationship between latent variables to be represented simultaneously and does not allow for indeterminacy of factor scores.³² Besides assuming the nonparametric assumption of predictors, PLS is a suitable tool because of its predictive power, focusing on variances and does not provide an established overall goodness-of-fit criterion.^{33,34} It is also reliable in small or large sample sizes, with consistent parameter estimation as the sample size increases. It can be used in a systematic two-step process to measure the model quality that evaluates the measurement model and the structural model,³⁵ thus, convergent validity was used to validate the model by analyzing the composite reliability (CR)³³ and Average Variance Extracted (AVE);³² as well as the discriminant validity with the Fornell and Larcker criterion.

For the reliability analysis by scale, Cronbach’s Alpha was used, which ranges from 0 to 1, where a rating of 0.90, 0.80, 0.70 indicate excellent, good and acceptable, respectively.³³ The values obtained were: quality of care (0.799), health education (0.818), social support (0.944), and adherence to treatment (0.824). Likewise, the CR was used as a test of convergent validity and covers some deficiencies of Cronbach’s alpha.³³ The results indicated adequate composite reliability: quality of care (0.846), health education (0.874), social support (0.950), the adherence to treatment (0.880). The results met the required indicators.

Convergent validity was analyzed, which consists of showing the level at which an indicator correlates positively with other indicators of the same variable. Convergent validity seeks to ensure that the items of the variables used in the study reflect the corresponding factor. Three indicators are considered to determine the convergent validity in Structural equation modeling (SEM), (1) Average Variance Extracted (AVE), (2) reliability, and (3) factor loadings.³² The AVE threshold should be greater than 0.50, indicating that the factors explain half of the variances of their respective indicators. An AVE below 0.50 indicates that the explained variance is less than the error variance.³⁶ In this study, the AVE for all variables exceeded the threshold, ranging from 0.527 to 0.647; therefore, they were acceptable. For the reliability analysis per scale, Cronbach’s Alpha was used, which ranges from 0 to 1, where a rating of 0.90, 0.80, and 0.70 indicates excellent, good, and acceptable internal consistency, respectively.³³ The values of Cronbach’s Alpha for the variables quality of care, health education, social support, and adherence to treatment were 0.799, 0.818, 0.944, and 0.824, respectively. Likewise, the component reliability (CR) was used as a test of convergent validity, which covers some deficiencies of Cronbach’s alpha.³³ According to the results, the CRs for quality of care, health education, social support, and treatment adherence were 0.846, 0.874, 0.95, and 0.880, respectively. The results complied with the required indicators. Regarding item loadings, values higher than 0.6 were considered as recommended by Hair et al.³⁷

Once convergent validity was completed, discriminant validity was checked and the Fornell and Larcker criterion was used.³⁸ Discriminant validity refers to the fact that two indicators are statistically different, it shows the level at which one variable is different from another. The correlations between variables and the square root of the AVE were analyzed, comparing the upper values of the diagonal that should be greater than those shown in the following values of the same column.³⁹

Results

The sample was composed of 162 adult participants: mean age = 38.09, SD= 16.03), ranging from 18 to 82 years. Among them, the majority were male, representing 62.3% of the sample. The greatest proportion were single (51.9%) and 53.1% had secondary education (see [Table 1](#)).

Measurement Model

[Table 2](#) shows the loadings, reliability (Cronbach's alpha and PR), and Average Variance Extracted (AVE) and [Table 3](#) shows the discriminant validity (Fornell-Larcker and HTMT). Therefore, the measurement model is valid.

Structural Model

The model analysis evidenced that social support has a positive and significant influence on health education ($\beta = 0.255$, $t = 3.075$, $p < 0.01$). Quality of care had a positive and significant influence on health education ($\beta = 0.412$, $t = 2.035$, $p < 0.05$), thus these results support H1. Finally, health education had a positive and significant influence on adherence to TB treatment ($\beta = 0.597$, $t = 4.673$, $p < 0.000$); similarly, H2 is not rejected. The model, in total, explains 35.6% of the variation in adherence to TB treatment. Social support and quality of TB care explain 26.3% of the variation in health education. The structural equation model is presented in [Figure 2](#).

Table 1 Demographic Characteristics of Patients

| Descriptions | N | % |
|--------------------|-----|------|
| Age | | |
| 18–30 | 64 | 39.5 |
| 31–43 | 46 | 28.4 |
| 44–56 | 19 | 11.7 |
| 57–69 | 29 | 17.9 |
| 70–82 | 4 | 2.5 |
| Gender | | |
| Male | 101 | 62.3 |
| Female | 61 | 37.7 |
| Marital status | | |
| Single | 84 | 51.9 |
| Married | 30 | 18.5 |
| Cohabitant | 43 | 26.5 |
| Widower | 5 | 3.1 |
| Level of education | | |
| Primary | 31 | 19.1 |
| Secondary | 86 | 53.1 |
| Higher education | 45 | 27.8 |

Table 2 Measurement Model

| Construct | | Items | M | SD | Factor |
|---------------------------|--------|--|-------|-------|--------|
| Quality of TB care | QTC 1 | The nurse greets you cordially and respectfully when you arrive at the office. | 2.969 | 0.206 | 0.693 |
| | QTC 2 | You are pleased when the nurse calls you by name. | 2.963 | 0.246 | 0.602 |
| Alfa=0.799 | QTC 3 | The nurse establishes a trusting relationship with you. | 2.957 | 0.232 | 0.834 |
| CR=0.846 | QTC 4 | The nurse encourages your participation during your treatment. | 2.981 | 0.135 | 0.680 |
| AVE=0.527 | QTC 5 | The nurse gives you comfort when you are grieving because your personal family life is affected because of your illness. | 2.901 | 0.388 | 0.798 |
| Health education | HE 1 | The nurse orients you with simple words about your illness. | 2.963 | 0.219 | 0.662 |
| | HE 2 | The nurse guides you on the possible adverse effects of the treatment and how to resolve them. | 2.969 | 0.173 | 0.766 |
| | HE 3 | The nurse gives you information leaflets about tuberculosis. | 2.864 | 0.451 | 0.777 |
| | HE 4 | The nurse expresses in simple words her interest in your compliance with your treatment. | 2.969 | 0.173 | 0.909 |
| | HE 5 | The nurse advises you on the consequences of abandoning the treatment. | 2.981 | 0.135 | 0.680 |
| Social support | SP 1 | Someone to help you when you have to be in bed. | 4.259 | 0.966 | 0.870 |
| | SP 2 | Someone you can count on when you need to talk. | 4.327 | 0.776 | 0.735 |
| | SP 3 | Someone to give you advice when you have problems. | 4.284 | 0.820 | 0.786 |
| | SP 4 | Someone to take you to the doctor when you need it. | 4.284 | 0.828 | 0.820 |
| | SP 5 | Someone to show you love and affection. | 4.284 | 0.766 | 0.642 |
| | SP 6 | Someone to have a good time with. | 4.148 | 0.811 | 0.769 |
| | SP 7 | Someone to confide in or talk to about yourself and your concerns. | 4.105 | 0.790 | 0.794 |
| | SP 8 | Someone who embraces you. | 4.123 | 0.830 | 0.817 |
| | SP 9 | Someone with whom you can relax a little. | 4.099 | 0.818 | 0.758 |
| | SP 10 | Someone to prepare food for you if you are unable to do so. | 4.136 | 0.813 | 0.756 |
| | SP 11 | Someone whose advice you really want. | 4.142 | 0.777 | 0.816 |
| | SP 12 | Someone to help you with your household chores if you are sick. | 4.105 | 0.829 | 0.781 |
| | SP 13 | Someone with whom you can share your innermost fears and problems. | 4.148 | 0.780 | 0.770 |
| | SP 14 | Someone to advise you on how to solve your personal problems. | 4.179 | 0.845 | 0.786 |
| Adherence to TB treatment | ATBT 1 | When you go to the health center do you receive clear and timely recommendations given by the health personnel regarding your treatment? | 2.932 | 0.252 | 0.750 |
| | ATBT 2 | Do you know when you are due for your sputum? | 2.920 | 0.351 | 0.714 |
| | ATBT 3 | At the doctor's office, are they concerned about the evolution of the disease? | 2.963 | 0.219 | 0.732 |
| | ATBT 4 | Are you asked for a sputum sample when you go to the health center? | 2.975 | 0.155 | 0.742 |

Abbreviations: QTC, quality of care; HE, health education; SP, Social Support; ATBT, adherence to tuberculosis treatment; Alpha, Cronbach's alpha; CR, composite reliability; AVE, average variance extracted; M, mean; SD, standard deviation.

Mediator Analysis

To evaluate the effect of the mediator variable, the bootstrapping procedure was used.⁴⁰ Subsamples of 5000 were used to evaluate the model. For the mediation analysis, a significant relationship was considered to exist through the mediator between the independent and dependent variable. Significant indirect effect was considered for evidence of measurement (t value > 1.96, 2-tailed, $p < 0.05$). Therefore, the mediation effect of health education between social support and TB

Table 3 Discriminant Validity

| Variable | ATBT | SP | QTBC | H |
|---------------------------|--------------|--------------|--------------|--------------|
| Adherence to TB treatment | 0.804 | 0.261 | 0.518 | 0.652 |
| Social support | 0.249 | 0.760 | 0.336 | 0.161 |
| Quality of care | 0.515 | 0.138 | 0.726 | 0.463 |
| Health education | 0.597 | 0.312 | 0.447 | 0.764 |

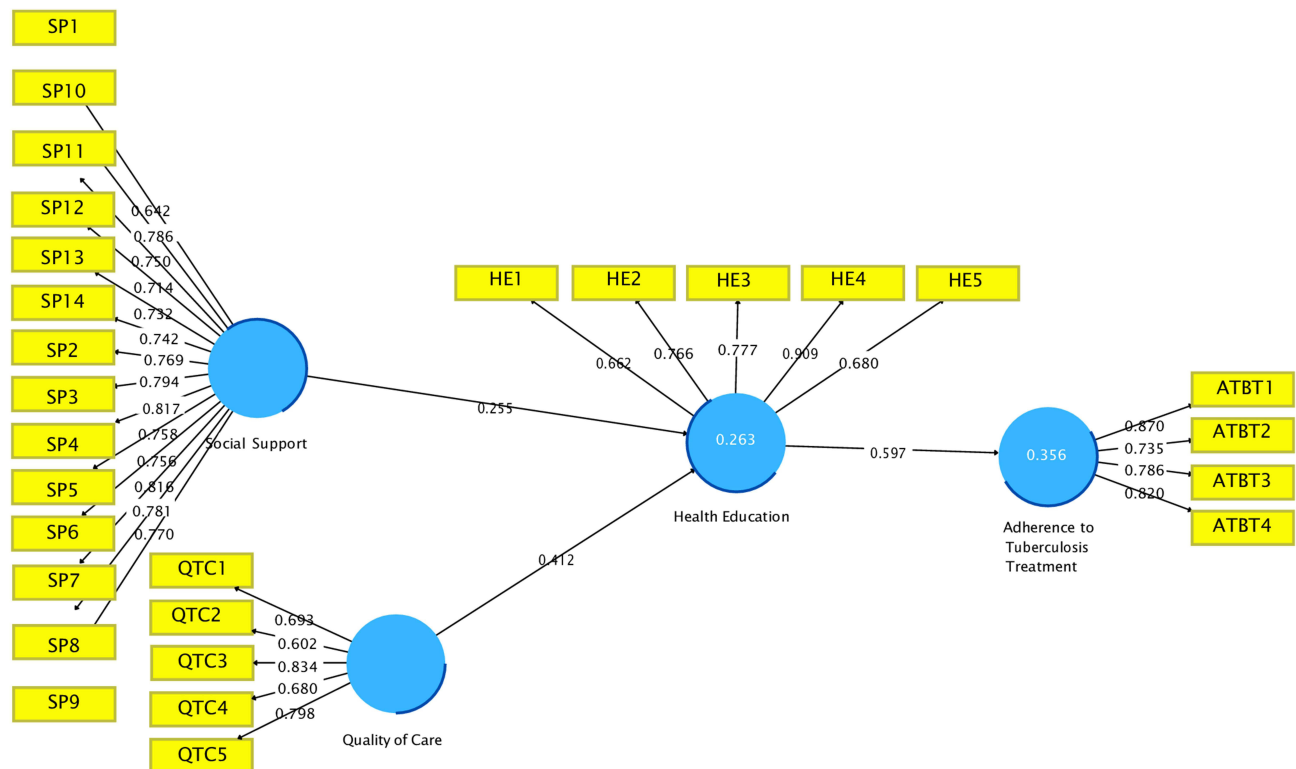
Notes: The square root of the AVEs is presented in and under the bold diagonal. The heterotrait-monotrait ratio of correlations (HTMT) is presented on the diagonal.

Abbreviations: QTNC, quality of care; HE, health education; SP, social support; ATBT, adherence to tuberculosis treatment.

treatment adherence was confirmed ($\beta = 0.152$, $t = 2.434$, $P < 0.05$). That is, health education influences the link between social support and treatment adherence, therefore, H3 is supported. However, the mediating effect of health education between quality of care and treatment adherence was not supported and was insignificant ($\beta = 0.246$, $t = 1.576$, $P > 0.05$), so quality of care affects treatment adherence; however, its effects are insignificant (Table 4). The results of the mediation model can be seen in Figure S1.

In addition, the coefficient of determination (R^2), cross-validated redundancy (Q^2), and the effect size (f^2) of the dependent variables on the independent variables were evaluated. The R^2 values were 0.356 and 0.263, indicating that the independent variables explain 35.6% of the variances in adherence to TB treatment and 26.3% of the variances in health education, indicating adequate explanatory power (Table 5).

The Q^2 was also determined by the blindfolding procedure.³⁶ For the model to have predictive relevance according to a dependent variable, the Q^2 value must be greater than 0.⁴¹ The results indicated that the Q^2 values were 0.172 for

**Figure 2** Structural equation model.

Abbreviations: QTC, quality of care; HE, health education; SP, social support; ATBT, adherence to tuberculosis treatment.

Table 4 Mediating Effect

| Path | O | M | SD | t-value | T- value | Decision |
|---|-------|-------|-------|---------|----------|---------------|
| Social Support -> Health Education | 0.255 | 0.227 | 0.086 | 2.976 | 0.003 | Supported |
| Quality of Care -> Health Education | 0.412 | 0.482 | 0.195 | 2.115 | 0.034 | Supported |
| Health Education -> Adherence to TB treatment | 0.597 | 0.638 | 0.148 | 4.042 | 0.000 | Supported |
| Social Support -> Health Education -> Adherence to TB treatment. | 0.152 | 0.143 | 0.062 | 2.434 | 0.015 | Supported |
| Quality of Care -> Health Education -> Adherence to TB treatment. | 0.246 | 0.319 | 0.156 | 1.576 | 0.115 | Not supported |

Abbreviations: O, original sample; SM, sample mean; M, mean; SD, standard deviation.

Table 5 Determination of Coefficient (R^2), Adjusted R-Squared (R^2_{adj}), Predictive Relevance (Q^2), and Effect Size (F^2)

| Variable | R^2 | R^2_{adj} | Q^2 | f^2 | Size of Effect |
|---------------------------|-------|-------------|-------|-------|----------------|
| Adherence to TB Treatment | 0.356 | 0.352 | 0.172 | 0.553 | Large |
| Health Education | 0.263 | 0.254 | 0.119 | | |
| Quality of Care | | | | 0.225 | Medium |
| Social Support | | | | 0.086 | Small |

Abbreviations: TB, tuberculosis; R^2 , coefficient; R^2_{adj} , Adjusted R-Squared; Q^2 , predictive relevance; f^2 , effect size.

adherence to tuberculosis treatment and 0.263 for health education, thus indicating the impact of the independent variables have predictive significance on the dependent variables.³⁶ The f^2 indicates the impact of the independent variables on the dependent variables. The results show that the effect of quality of care ($f^2 = 0.225$) on health education is greater than social support ($f^2 = 0.086$), indicating that quality of care would have a greater effect on health education (Table 5).

Discussion

This research shows the positive and significant effect of social support on health education, indicating that patients with tuberculosis have a need for health information and social support to provide motivation and supervision in treatment adherence. This result is in line with previous studies.⁴² In fact, patient support, community support culturally, and treatment plans to patients provide directly and positively impact patients. In addition, social support favors adherence to TB treatment, improving psychological health, decreasing stress, and increasing self-efficacy in the face of the disease.^{7,13,14} Improved self-efficacy in the face of TB involves patients' belief in their own ability to succeed in managing the disease.⁴³ On the other hand, one study found that social support is considered an effective strategy for improving treatment outcomes of TB patients.¹³ Also, another study conducted among patients with tuberculosis in the Philippines showed that the social support provided by nurses to patients influenced adherence to TB treatment.⁷ However, the lack of resources impedes the provision of support to patients, including for home treatment monitoring.⁴⁴

Likewise, it was shown that the quality of nursing care significantly influences the health education provided by nurses. This finding is consistent with a previous study in which they found that improved quality of care is closely related to health education in the provision of adequate diagnosis, treatment, and outcome assessment.⁴⁵ Improved quality of care provided by the nurse may allow for openness, improved communication, and patient confidence, and the patient may be more likely to listen to and apply educational information.⁴⁶ In the absence of adequate quality of care, the patient may not receive health education with enthusiasm, which may influence the receipt of and adherence to

treatment.⁴⁷ Therefore, the interaction between the nurse and patient should be enthusiastic, motivated, and responsive to the individual and educational needs of the patient.⁴³ This is particularly important because the health education patients receive can improve how they approach treatment goals, health care-related assignments, and challenges related to health improvement.⁴⁸ In addition, it is worth mentioning that the relationship between the health professional and the patient can be a determining factor in the compliance with the treatment, therefore, it is necessary to provide better quality care characterized by adequate counseling.⁴⁹

This study also showed that health education has a positive influence on adherence to tuberculosis treatment. This result is consistent with the findings of previous studies that found that increased health education such as monitoring, nurse-led educational intervention is helpful in increasing adherence to anti-TB drugs.⁵⁰ Similarly, other studies have reported that health education can lead to better adherence to TB treatment,¹⁹ this may be due to the fact that it favors a better understanding of the side effects, the duration of treatment, and facilitates the procedures for receiving treatment.²⁰ Health education strengthens social support and enables improved TB treatment rates.²¹ Similarly, the quality of care helps to build trust between nurses and patients and to achieve treatment success. The education that patients receive improves their level of knowledge, which allows the use of strategies for approaching and managing the disease, guaranteeing greater diagnostic information, control, and better adherence to treatment.²² Therefore, the understanding of health information allows a correct follow-up of the treatment.²³ It is important to mention that increased adherence to treatment may be due to patients having a good understanding of TB prevention and treatment; therefore, health education on treatment and comprehensive patient counseling is an important step in adherence to medication and treatment of the disease.⁵¹

Likewise, health education was evaluated as a mediating variable in the relationship between social support and adherence to tuberculosis treatment. An indirect relationship was found between the variables under study. This indirect relationship is supported by previous research given that social support encourages adherence to tuberculosis treatment and that this is directed by the personal and social support of health professionals.^{52,53} It is worth mentioning that the success of treatment of tuberculosis depends to a large extent on the ability of patients to comply with various clinical requirements and lifestyle changes.⁵⁴ In addition, lack of adherence to treatment remains a major barrier in the management of tuberculosis.⁵⁴ Similarly, health education can promote successful social support, which has been consistently linked to improved health outcomes in a variety of communicable and noncommunicable diseases.⁵⁵ Both health education and social support can promote better communication and care for the patient, which allows individual risk factors for noncompliance to be addressed, since patient health education and social support are the main components for adequate adherence to treatment.⁵⁶

Finally, health education was evaluated as a mediating variable between quality of care and adherence to treatment. Based on the results, quality of care had no indirect relationship with adherence to treatment. Previous results indicate that quality of care is linked to treatment mediated by improved education on interventions.⁵⁷ The relationship of the current study is supported by the results of this research given that to activate health education by nurses, the patient must first experience quality of care, leading to treatment adherence. This may be due to poor motivation of nurses to implement the guidelines, poor supervision, lack of clinical support, and insufficient knowledge inhibiting adherence to treatment guidelines.⁵⁸

Limitations

The findings of the current study should be interpreted considering certain limitations. First, the sample was limited because data were collected from patients attending only four health centers in the metropolitan region of Lima, Peru; therefore, the results cannot be generalized. In addition, future studies should consider large hospital centers located in the three regions (coast, jungle, and highlands) of the country in order to provide evidence that can be generalized to patients in other countries. Secondly, this is a cross-sectional study, therefore, it is recommended that patient perception be assessed longitudinally to provide more information. Finally, it is unclear whether the results regarding the mediating action of health education can have the same influence in other contexts, as patient perceptions in other countries may differ.

Public Health Implications

Despite the limitations of the current study, we believe that the results may be relevant for the implementation of policies and strategies to strengthen the mediating effect of nurse health education and ensure adherence to treatment for the benefit of patients. In fact, health education coupled with real-time electronic monitoring, quality of care, and better communication between nurses and patients can promote medication adherence.^{47,59} In addition, these results may be useful for the activation of social support systems for the benefit of TB patients. Finally, it is important to mention that the success of these aspects (quality of care, adherence to treatment, and health education) will depend on an improvement in the quality of the work environment, regulation of working hours, avoidance of burnout, and favoring better monetary compensation, which can decrease the attrition rate of the workforce and can lead to better practice and performance in nurses.

Conclusion

The findings of the present study could contribute to the implementation of efficient measures to achieve greater adherence to treatment in TB patients. Nurses have the potential to contribute significantly to treatment success by providing better health education that improves preventive behavior, as well as increased participation and decreased prevalence of people affected by TB. The importance of this study lies in presenting the first attempts to develop and test a mediating model linking social support and quality of nursing care through health education to treatment adherence. Research shows that health education may be essential for successful adherence to TB treatment.

Data Sharing Statement

Data supporting the conclusions of this research will be made available in coordination with the corresponding authors.

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Disclosure

The authors have declared that no competing interests exist.

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