



The Relationship Between Family Support and Medication Adherence Among Tuberculosis (TB) Patients

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Abstract

Background: Tuberculosis remains a public health problem, and incomplete treatment can adversely affect recovery and community tuberculosis control. Family support may influence medication-taking behavior during therapy and may be related to treatment adherence. **Objective:** To determine the association between family support and medication adherence among patients receiving tuberculosis treatment in the working area of Cidahu Health Center, Sukabumi Regency. **Methods:** This quantitative correlational study used a cross-sectional design involving 61 tuberculosis patients selected through purposive sampling. Family support and medication adherence were categorized into low, moderate, and high levels. Because the 3×3 contingency table contained sparse and zero cells, the association was analyzed using the Fisher Freeman Halton exact test, with Cramer's V as the effect-size measure. **Results:** Family support was significantly associated with medication adherence ($p < 0.001$; Cramer's V = 0.47). Among patients with low family support, 79.3% had low adherence, whereas 66.7% of those with high family support demonstrated high adherence. **Conclusion:** Family support was strongly associated with medication adherence in this sample. However, the cross-sectional design precludes causal inference, and residual confounding from unmeasured clinical, behavioral, and socioeconomic factors should be considered when interpreting the findings.

Keywords: family support, medication adherence, tuberculosis, FSSQ, MMAS 8

Introduction

Tuberculosis (TB), caused by *Mycobacterium tuberculosis*, remains a major infectious disease worldwide. The World Health Organization estimated that 10.7 million people developed TB in 2024, demonstrating that sustained diagnosis, treatment, and treatment completion remain essential components of TB control¹. Medication adherence is especially important because TB therapy extends over months and requires patients to continue treatment even after symptoms improve. A recent scoping review found that family support is repeatedly linked with medication adherence and quality of life among people

receiving TB treatment². Indonesian evidence also shows that adherence is shaped by several interacting behavioral and treatment related factors, so family support should be interpreted within the broader clinical and social context³.

Incomplete or irregular medication use can contribute to treatment failure, continuing transmission, and the emergence of drug resistance. Interventions intended to improve adherence include education, counseling, reminders, community support, and treatment supervision, but their effects vary according to patient needs and service settings⁴. Social support has also been identified as an important driver of treatment continuation among patients

facing demanding TB regimens⁵. This clinical relevance is reinforced by evidence published in *Healthy Tadulako Journal* showing that treatment history and adherence are among the factors related to resistance to anti tuberculosis drugs⁶. These findings provide a strong rationale for evaluating modifiable social resources, including family support, in primary care TB programs.

The treatment experience is not only biomedical. Patients may face stress, stigma, financial pressure, work disruption, fatigue, adverse drug effects, and uncertainty about recovery. *Healthy Tadulako Journal* has reported psychological stress among people with pulmonary TB, supporting the need to consider psychosocial needs during treatment⁷. At the program level, TB control also depends on case detection, treatment organization, patient follow up, and coordination between health services and communities⁸. Family members can contribute through emotional reassurance, practical assistance, information, medication reminders, accompaniment to services, and observation of daily treatment routines. International evidence likewise suggests that family, social, and policy support can be related to adherence among newly diagnosed patients⁹.

Evidence from Indonesian primary care settings is not completely uniform. A study in South Kuta reported an association between family support and adherence to pulmonary TB medication¹⁰, while research in Bandung also examined family support in relation to anti TB medication adherence¹¹. Prospective evidence from other settings shows that adherence may vary across the treatment period and should not be reduced to a single personal characteristic¹². Another Indonesian study found a strong positive correlation between family support and medication adherence in a community health center setting¹³, whereas a study in Bitung did not identify a statistically significant

relationship¹⁴. This variability indicates that the magnitude of association may depend on population characteristics, measurement, treatment context, and other unmeasured determinants.

The present study therefore focused on the relationship between family support and medication adherence among TB patients in the working area of Cidahu Health Center, Sukabumi Regency. The research question was whether the distribution of medication adherence differed according to the level of family support. The study hypothesized that higher family support would be associated with better adherence. Previous Indonesian evidence has reported that stronger family support can accompany better treatment adherence¹⁵. The findings are expected to provide local evidence for community nursing and TB services. However, because the design measures exposure and outcome at one time, any practical implication should be proportional to an observational association and should not be interpreted as proof that increasing family support alone will cause better adherence.

Materials and Methods

Study Design

This study used a quantitative correlation design with a cross sectional approach. Exposure and outcome information were obtained during the same study period, so the analysis was designed to estimate association rather than temporal or causal influence. Quantitative research principles were applied to define the study variables and summarize the observed distributions¹⁶. The analytical interpretation followed categorical association principles, with particular attention to the assumptions of the statistical test because the outcome table included small cells¹⁷. The independent variable was family support and the dependent variable was medication adherence among TB patients receiving

treatment in the working area of Cidahu Health Center, Sukabumi Regency.

Sample

The source population consisted of TB patients receiving treatment through Cidahu Health Center. The study used purposive sampling and included 61 respondents. The original study documentation states that the sample was derived using the Slovin formula with a precision level of 0.1 and that reserve respondents were prepared to anticipate nonparticipation¹⁸. Because this formula is not an effect based justification for an analytical association study, it is reported here as the historical sampling procedure rather than as proof of statistical power. A sensitivity calculation for a 3 by 3 association table indicates that a sample of 61 has approximately 80 percent power at a two sided alpha of 0.05 to detect an effect around Cramer's $V = 0.44$. The observed effect was slightly larger than this threshold. The archived manuscript available for this revision does not document the complete inclusion and exclusion criteria, exact treatment phase, treatment duration for each respondent, age distribution, adverse drug effects, access to care, socioeconomic status, or comorbidity. These details should be checked against the original protocol and case record before final publication because they are relevant to selection and residual confounding.

Data Collection Technique

Primary data were collected directly from respondents using questionnaires for family support and medication adherence. The manuscript identifies the family support measure as the FSSQ and the adherence measure as the MMAS 8. The Duke UNC Functional Social Support Questionnaire is an established functional social support instrument described in the literature¹⁹, and the eight item Morisky scale has published

translation and validation work in Asian populations²⁰. Nevertheless, the archived study manuscript does not establish the exact FSSQ version used, the number and wording of items administered, response options, domain structure, scoring range, category cut offs, Indonesian adaptation procedure, current sample reliability, or instrument permission status. It likewise does not preserve the MMAS 8 scoring algorithm, language adaptation documentation, current sample reliability, or license documentation. These study specific details are not reconstructed in this revision because doing so without the original instrument files would risk reporting information that was not actually used. The authors should verify these elements from the approved study protocol and original questionnaires before publication.

Data Analysis Technique

Data were analyzed using descriptive and bivariate procedures. Frequencies and percentages summarized gender, family support, and medication adherence. For Table 2, percentages within each family support category were calculated using the corresponding row total as the denominator, while the total row used the full sample of 61. The observed 3 by 3 table included several small cells and a zero cell, so the Pearson Chi Square test was not used as the inferential test. The association between family support and medication adherence was evaluated with the Fisher Freeman Halton exact test, which is appropriate for an R by C contingency table when asymptotic assumptions are not satisfied. Statistical significance was interpreted at $p < 0.05$, with p values smaller than 0.001 reported as $p < 0.001$ rather than as a zero value.

Effect size was summarized using Cramer's V . Based on the observed contingency table, Cramer's V was 0.47, indicating a substantial association in this

sample. The effect size was reported together with the exact p value category because statistical significance alone does not describe the magnitude of association. No adjusted regression model was performed because the manuscript archive did not contain individual level values for potential confounders such as age, treatment phase, adverse drug effects, distance to care, socioeconomic status, and comorbidity. Consequently, the reported result is an unadjusted association and residual confounding cannot be excluded.

Ethical Consideration

Ethical approval was obtained from the Ethics Committee of the Faculty of Health Sciences, Muhammadiyah University of Sukabumi, with approval number 092/KET/KE-FKES/I/2025. Participation was described in the study record as voluntary. The manuscript archive available for this revision does not provide the approved informed consent script or a detailed description of confidentiality procedures. These procedural details should therefore be verified against the ethics submission and original data collection documents before publication rather than inferred or recreated.

Result

This study was conducted in the working area of Cidahu Health Center, Sukabumi Regency, from September 2025 to January 2026 and included 61 TB patients receiving treatment. Results are presented descriptively for respondent characteristics, family support, and medication adherence, followed by the exact analysis of the 3 by 3 association between family support and adherence. The descriptive findings provide an overview of the demographic and treatment-related characteristics of the study participants and the distribution of the main study variables. The subsequent exact analysis was used to determine whether differences in medication

adherence were associated with different levels of family support in this sample.

Table 1. Distribution of Respondent Characteristics (n = 61)

Characteristics	n	%
Gender		
Male	31	50.8
Female	30	49.2
Family support		
Low	29	47.5
Moderate	26	42.6
High	6	9.8
Medication adherence		
Low	35	57.4
Moderate	18	29.5
High	8	13.1

Source: Primary data

Table 1 shows a nearly balanced sex distribution, with 31 male respondents (50.8 percent) and 30 female respondents (49.2 percent). Family support was most frequently classified as low in 29 respondents (47.5 percent), followed by moderate in 26 (42.6 percent) and high in 6 (9.8 percent). These values describe the composition of the sample only and were not used to infer an effect of sex on adherence.

Medication adherence was low in 35 respondents (57.4 percent), moderate in 18 (29.5 percent), and high in 8 (13.1 percent). Thus, more than half of the sampled patients were in the low adherence category. Because the study did not report individual treatment phase, adverse effects, access, socioeconomic variables, or comorbidity, the descriptive distribution should not be attributed to family support alone before considering the bivariate result and potential residual confounding.

Table 2 shows a clear gradient in the observed distribution. Among the 29 patients with low family support, 23 (79.3 percent) had low medication adherence, 6 (20.7 percent) had moderate adherence, and none had high adherence. Among the 26 patients with moderate family support, 10 (38.5 percent) had low adherence, 12 (46.2 percent) had moderate

adherence, and 4 (15.4 percent) had high adherence. Among the 6 patients with high family support, 2 (33.3 percent) had low adherence and 4 (66.7 percent) had high adherence.

Table 2. Relationship Between Family Support and Medication Adherence (n = 61)

Family Support	Medication Adherence						Total	P	
	Low		Moderate		High				
	F	%	F	%	F	%	F	%	
Low	23	79.3	6	20.7	0	0	29	100	0.00
Moderate	10	38.5	12	46.2	4	15.4	26	100	
High	2	33.3	0	0	4	66.7	6	100	
Total	35	57.4	18	29.5	8	13.1	61	100	

Source: Primary data. Percentages in the three family support rows use the row total as denominator; the total row uses $n = 61$. Fisher Freeman Halton exact test, $p < 0.001$; Cramer's $V = 0.47$.

Because of the sparse and zero cells, the association was evaluated using the Fisher Freeman Halton exact test rather than the conventional Pearson Chi Square test. The result was statistically significant, $p < 0.001$, with Cramer's $V = 0.47$. This indicates a strong unadjusted association between family support category and medication adherence within the study sample. The result does not establish that family support caused the adherence pattern because exposure and outcome were assessed within a cross sectional design and relevant clinical and social covariates were not available for adjusted analysis.

Discussion

The descriptive characteristics show that men and women were represented in nearly equal proportions. This is useful for describing the sample but does not support a conclusion that sex influenced adherence, because no inferential comparison of adherence by sex was reported. The original discussion also referred to age related differences, but age distribution was not presented in the Results and no

prespecified age analysis was available. Those causal or comparative claims have therefore been removed. The main interpretation is restricted to the measured relationship between family support and medication adherence. This approach avoids attributing adherence to demographic characteristics that were not tested in the study.

The finding that 57.4 percent of respondents had low adherence is clinically important in the context of prolonged TB treatment. Adherence barriers may include treatment fatigue, adverse effects, competing responsibilities, access difficulties, and psychosocial burden, and these factors can interact rather than operate independently. Health coaching and structured education have been reviewed as potential strategies for improving adherence in pulmonary TB, although intervention effects depend on implementation and patient context²¹. Research from Ethiopia also identified multiple factors associated with nonadherence, illustrating why family support should be considered together with clinical, behavioral, and service determinants²². The present study did not measure all of these covariates, so the high proportion of low adherence cannot be explained by family support alone.

The row distributions nevertheless show an ordered pattern: low support was concentrated in the low adherence category, while two thirds of patients in the small high support group were in the high adherence category. This pattern is compatible with review evidence indicating that practical assistance, reminders, encouragement, and emotional support may help patients sustain treatment routines²³. Indonesian research in outpatient settings has also reported relationships between family support and treatment adherence²⁴. These observations support the plausibility of the association, but they should not be interpreted as proof of a direct causal mechanism. Family

support may also reflect household resources, living arrangements, access to transport, patient health status, or other factors that were not captured in the available dataset.

The exact test strengthens the statistical reporting because the original 3 by 3 table contained a zero cell and several small counts. Under such conditions, asymptotic Pearson Chi Square inference may be unreliable. Recalculation using one denominator convention also changes the interpretation of the high support row: 2 of 6 patients had low adherence, equal to 33.3 percent, and 4 of 6 had high adherence, equal to 66.7 percent. The previously printed percentages were based on inconsistent denominators. The effect size of Cramer's $V = 0.47$ indicates that the observed association was not only statistically detectable but also substantial in magnitude. A similar positive relationship between family support and medication adherence has been reported in another Indonesian community setting²⁵, while other studies have produced weaker or nonsignificant findings. This heterogeneity reinforces the need for replication with larger samples and adjusted models.

Several limitations should frame interpretation. The study used purposive sampling from one health center and only six respondents were in the high support category, limiting precision and generalizability. The cross sectional design does not establish whether stronger support preceded better adherence. The available study archive did not include individual level values for treatment phase, adverse drug effects, distance or access to services, socioeconomic status, comorbidity, or detailed age categories, so residual confounding remains possible. In addition, the manuscript archive did not preserve enough information to verify the exact FSSQ and MMAS 8 versions, scoring algorithms, category cut offs, Indonesian adaptation procedures, reliability coefficients in this

sample, or licensing documentation. These measurement details should be confirmed from the original protocol and instruments before publication. Recent evidence from pulmonary TB patients in Eastern Uganda also shows that family support itself varies according to patient and social characteristics²⁶, underscoring the importance of measuring those covariates in future work. Future prospective or intervention studies should use probability based or consecutive recruitment where feasible, prespecified power calculations, validated and fully documented instruments, and multivariable analysis to estimate whether family support remains independently associated with adherence.

From a clinical and community nursing perspective, family support should be understood as a set of behaviors rather than a single undifferentiated exposure. Emotional reassurance may help patients tolerate uncertainty and treatment fatigue, informational support may reinforce understanding of the treatment schedule, instrumental support can reduce practical barriers such as transport or obtaining medication, and supervision or reminders may help patients maintain daily routines. These mechanisms are plausible and are consistent with literature that describes family involvement as one element of adherence support^{2,5,23}. At the same time, the present data do not separate these dimensions, so it is not possible to identify which type of support was most strongly related to adherence. The high support category also contained only six respondents. Consequently, a family program should not be designed on the assumption that all patients need the same form of support. A more appropriate use of these findings is to encourage health workers to assess what support is available, what the patient wants from family members, and which barriers remain unresolved. This is particularly relevant

because excessive supervision can be experienced differently from supportive involvement, and patient autonomy should remain central to treatment decisions. Future studies can strengthen this aspect by reporting domain scores for family support and by evaluating whether emotional, informational, instrumental, appraisal, or practical support has a distinct association with adherence.

The pattern observed in Cidahu can also be interpreted within the broader TB control pathway. Adherence is influenced by interactions among the patient, household, treatment regimen, healthcare service, and social environment. Family reminders may be helpful when forgetfulness is a barrier, but they may have limited effect when the main problem is a severe adverse drug effect, loss of income, transportation cost, medication stock problems, stigma, or another clinical condition. For this reason, family involvement should complement rather than replace clinical assessment and programmatic follow up. The literature suggests that adherence strategies are more useful when they respond to patient specific barriers and are integrated with education, counseling, treatment monitoring, and accessible services^{4,21}. The Healthy Tadulako Journal evidence on TB resistance and TB control further supports the importance of consistent treatment and coordinated program implementation^{6,8}. In practice, the current findings could therefore be used to support a brief family support assessment during routine TB visits, followed by targeted education for willing family members and referral of clinical or social barriers to the appropriate service. Such an approach remains a program implication, not a tested intervention effect from this study. Evaluation of any future family support program should use prospective outcomes such as treatment completion, missed doses, loss to follow up, bacteriological

response, and patient reported treatment burden.

Statistically, the complete pattern in Table 2 deserves careful interpretation because the association is strong but the table is sparse. Exact testing protects the p value from the unreliable large sample approximation that would occur when expected counts are small, but it does not remove uncertainty created by the small high support group. Cramer's V summarizes the overall strength of association without implying direction or causality. The value of 0.47 indicates a substantial separation of adherence distributions across support categories in this sample, yet the estimate may be unstable in another sample from the same population. Confidence intervals for the effect size were not added because the available archive contained only the summarized contingency table and did not include the individual level analytical file needed for a prespecified resampling analysis with covariates. A larger future study should define the expected effect before recruitment, calculate sample size for the intended multivariable model, avoid unnecessary categorization of continuous or ordinal scores, and retain the original instrument scores where possible. It should also prespecify how sparse cells will be handled. Longitudinal measurement would help establish temporal order by recording family support early in treatment and adherence over subsequent months. If sufficient sample size is available, adjusted models could then examine whether family support remains associated with adherence after accounting for age, sex, treatment phase, adverse effects, comorbidity, socioeconomic status, distance to care, and other relevant determinants^{22,26}.

Measurement transparency is especially important because both variables were converted into categories before analysis. Categorization can make results easier to

communicate, but the meaning of low, moderate, and high categories depends entirely on the instrument version and its scoring rules. Without the original questionnaires and scoring sheet, this revision cannot confirm whether the cut points used in the dataset correspond to published thresholds, locally adapted thresholds, sample based thresholds, or another prespecified rule. The same concern applies to the family support categories. For reproducibility, the final author verification should identify the exact instrument source, number of items, response scale, scoring direction, possible score range, missing response rule, and categorical thresholds. If an Indonesian translation was used, the translation source and evidence of validity should be reported. If the instruments require permission, the manuscript should state that the required permission was obtained. Reliability from the present sample would also be useful if the item level responses are available. These details would allow readers to distinguish a true difference in patient experience from a difference created by scoring choices. Until those records are verified, the categorical association reported here is best regarded as a valid analysis of the archived table rather than a complete psychometric validation of the measurement process.

The sampling process also affects how widely the result can be applied. Purposive sampling was practical for recruiting patients who were receiving TB care, but it does not provide every member of the source population with a known selection probability. Patients who attended the health center and were able or willing to complete the questionnaires may differ from people who missed visits, interrupted treatment, transferred care, or were too unwell to participate. Those groups may also have different family support and adherence profiles. Consequently, the observed association should not be generalized

automatically to all TB patients in Sukabumi Regency. A future study could use a clearly defined sampling frame covering all eligible patients during a specified recruitment period and record the number screened, eligible, approached, enrolled, and excluded with reasons. If consecutive recruitment is used, the dates and service points should be reported. Comparing basic characteristics of participants and nonparticipants, when ethically and operationally possible, would help readers judge selection bias. A multicenter design involving several health centers would further improve external validity by capturing variation in urban access, travel distance, household structure, and local TB service organization.

The practical message is therefore specific rather than universal. The results justify asking about family support as part of a broader adherence assessment, but they do not justify labeling families with low support as the cause of nonadherence. Some patients may prefer assistance from a spouse, child, sibling, treatment supporter, peer, or health worker, and others may have limited family contact. Support should be negotiated with the patient and should respect privacy, autonomy, and household circumstances. In settings where patients welcome family involvement, health workers can provide concise education about the treatment plan, expected duration, management of common treatment difficulties, the importance of attending scheduled visits, and when to seek clinical help. Evidence from adherence reviews indicates that multicomponent approaches can be more useful than assuming a single reminder strategy will work for everyone^{4,21}. The Cidahu findings can therefore inform local assessment and hypothesis generation, while stronger prospective evidence is needed before claiming that a specific family intervention improves treatment completion or prevents resistance.

This restrained interpretation is consistent with the study design and preserves the distinction between an observed association and an intervention effect.

Conclusion

Based on the 61 TB patients studied in the working area of Cidahu Health Center, family support was significantly associated with medication adherence using the Fisher Freeman Halton exact test, $p < 0.001$, with Cramer's $V = 0.47$. Low family support was predominantly observed with low adherence, whereas most patients in the small high support group had high adherence. The result supports consideration of family involvement in TB care, particularly through respectful communication, reminders, emotional reassurance, and practical assistance. However, the cross sectional design, purposive sampling, sparse cells, incomplete measurement documentation, and absence of adjustment for relevant clinical and social factors prevent causal interpretation. The findings should therefore be used as local evidence for assessment and for planning stronger prospective studies rather than as proof that increasing family support alone will improve adherence.

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Conflict of Interest Statement

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