

# The Mediating Role of Patient Engagement in the Relationship Between Self-Efficacy and Treatment Adherence Among Patients with Multimorbidity

Seda SÖNMEZ 

Department of Health Management, Kırıkkale University Faculty of Health Sciences, Kırıkkale, Türkiye

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## What is already known on this topic?

- Multimorbidity is a significant health concern around the world.
- Adherence to treatment is an important factor in improving health outcomes in chronic diseases.
- The mechanism of adherence to treatment in patients with multimorbidity is complex.

## What this study adds on this topic?

- Increasing self-efficacy alone is not sufficient to improve treatment adherence; patient engagement is also necessary.
- The mediating role of patient engagement in patients with multimorbidity was highlighted, contributing to the limited number of studies in the literature.

## ABSTRACT

**Objective:** This study aimed to evaluate the presence of a mediating role of patient engagement in the effect of self-efficacy on treatment adherence in patients with multimorbidity.

**Methods:** In this cross-sectional study, a questionnaire was administered to 414 outpatients with multimorbidity in Kırıkkale province, Türkiye, using a face-to-face interview method between March and July 2025. In addition to questions regarding individual characteristics, the questionnaire included self-efficacy in management of chronic disease), patient engagement, and the Morisky Medication Adherence Scale. Descriptive statistics and PROCESS macro multiple regression analysis were used for data analysis.

**Results:** Participants perceived their self-efficacy as moderate and their patient engagement and medication adherence levels as good. Self-efficacy increased patient engagement, while patient engagement also increased medication adherence. As the direct effect of self-efficacy on medication adherence was not statistically significant, patient engagement was found to have a full mediating effect.

**Conclusion:** The importance of patient engagement in managing complex treatment regimens and ensuring treatment adherence, particularly in patients with multimorbidity, was highlighted. Interventions aimed at enhancing self-efficacy in patients with multimorbidity may not be sufficient on their own; strategies to increase patient engagement may be more decisive in terms of treatment adherence. These findings are expected to guide healthcare professionals and policymakers in adopting a patient-centered approach.


**Keywords:** Chronic disease, multimorbidity, patient engagement, self-efficacy, treatment adherence

## Introduction

Multimorbidity, defined as the co-occurrence of 2 or more chronic diseases/conditions,<sup>1</sup> has increased in prevalence worldwide, particularly in recent decades.<sup>2</sup> Although this increase in multimorbidity is largely associated with population aging, it is also seen in younger individuals, particularly in communities with lower socioeconomic status. In Türkiye, the prevalence of multimorbidity increased by 77% between 2008 and 2019, and this increase was relatively higher among women, those with lower levels of education, and people aged 75 years and over.<sup>3</sup>

Healthcare systems are mostly designed to manage a single disease, which complicates the management of patients with multimorbidity.<sup>4</sup> These patients have more complex health needs, which places a significant financial burden on the healthcare system. Research shows that multimorbidity is associated

**Corresponding author:** Seda Sönmez, e-mail: sedakaya@kku.edu.tr

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with an increased risk of death, disability, poor quality of life, and adverse drug events.<sup>5</sup> However, patients are also expected to manage treatments for their different conditions.<sup>6</sup> Non-adherence to treatment is a common problem, particularly among elderly patients with multimorbidity who take multiple medications.<sup>7</sup> Patients struggle to adhere to complex treatment regimens and, while they may be able to take medications for 1 condition regularly, they prefer to take medications for other conditions based on their symptoms and impact on daily life.<sup>8</sup> Non-adherence to treatment has significant negative consequences for the patient, such as worsening health outcomes, and for the healthcare system, such as increasing the number of visits and healthcare costs.<sup>9</sup>

Self-efficacy is a key factor in improving treatment adherence in chronic patients. According to Bandura's social Cognitive Theory, this concept refers to an individual's belief that they can perform a specific behavior. It suggests that when patients believe they can successfully follow medical recommendations, such as taking medication and making lifestyle changes, they are more likely to engage in behaviors related to treatment adherence.<sup>10</sup> It is emphasized that it is not only knowledge but also the expectation of effectiveness resulting from performing the behavior that motivates people to perform that behavior.<sup>11</sup> In addition to Social Cognitive Theory, the concept of self-efficacy is central to many health behavior theories, including the Health Belief Model. According to this theory, self-efficacy represents the patient's confidence in adhering to the treatment regimen and works in conjunction with perceptions of treatment effectiveness.<sup>12</sup> In many chronic diseases (HIV, asthma, epilepsy, rheumatoid arthritis, etc.), self-efficacy has been identified as an important predictor of treatment adherence. Patients with high self-efficacy were found to be more competent in establishing routines for medication use, more confident in continuing treatment when encountering side effects, and more willing to adjust medication doses with the physician's permission to manage pain.<sup>12-15</sup>

Many health systems have adopted a patient-centered approach, which empowers patients with multimorbidity to take responsibility for their own health and encourages their active participation.<sup>16</sup> Studies show that patients who communicate more with healthcare providers and actively participate in treatment processes have higher self-efficacy, forget to take their medication less often, and thus manage their treatment better.<sup>17</sup> For example, a study conducted with patients with HIV determined that self-efficacy mediated the effect of positive interactions with healthcare professionals on treatment adherence.<sup>12</sup> Similarly, studies conducted with rheumatoid arthritis patients also show that a good relationship with the physician directly affects the patient's self-efficacy.<sup>14</sup> In fact, strong communication between the patient and the physician leads to the patient feeling more confident, and patients with increased confidence participate more actively in the treatment process. This, in turn, leads to the patient adhering better to treatment. In other words, while self-efficacy is known to be an important factor in increasing treatment adherence, it is also noted that this effect does not always occur directly. Self-efficacy is more effective when the patient perceives control over their treatment and interacts with healthcare providers.<sup>18</sup> The patient's engagement in the treatment process occurs in several successive phases. Beginning with diagnosis, during the blackout phase, the patient perceives their condition as out of control and experiences emotional confusion, while in the arousal phase, they develop awareness and anxiety about their symptoms. In the adhesion phase, they acquire sufficient knowledge about their illness and the behavioral skills necessary to comply with treatment, while in the eudaimonic project phase, they fully adapt to their condition, become empowered, and make plans for the future despite their illness.<sup>19</sup> The engagement of patients, especially those

with multimorbidity, in the treatment process is of vital importance in terms of coordination, effectiveness, and personalization of care. These patients receive healthcare from different medical units and institutions, so they act as a boundary integrator facilitating interaction between these actors. Furthermore, the treatment regimens of these patients should not only be based on evidence-based guidelines but also be appropriate to the patient's individual needs, values, and preferences. In summary, since multimorbidity care involves a complex process, patients are encouraged to become the coordinators of their own care. However, transferring this responsibility to the patient depends on the patient's capacity to take on this role, in other words, their self-efficacy.<sup>20</sup>

Therefore, it is important to examine the role of patient engagement in the relationship between self-efficacy and treatment adherence. However, it appears that there are not enough studies in the literature examining this relationship, especially in patients with multimorbidity.<sup>17,18</sup> Current studies address the effect of self-efficacy on treatment adherence through a direct relationship and do not sufficiently demonstrate the mechanisms through which this relationship emerges. Furthermore, studies are generally conducted on single-disease-focused samples, and there is a lack of information on how this relationship manifests in patients with multimorbidity. Consequently, this study examined the mediating effect of patient engagement on the relationship between self-efficacy and treatment adherence in individuals with multimorbidity.

## Methods

### Study Design

This is a cross-sectional study. The study examined the mediating effect of patient engagement on the relationship between self-efficacy and treatment adherence in individuals with multimorbidity.

### Study Population

The study was conducted between March and July 2025 at a public university faculty of medicine hospital. Participants were selected based on the following criteria: having at least 2 diagnosed chronic diseases, having been treated for their chronic diseases for at least 1 year, and having the physical and mental capacity to answer the questions and be willing to participate in the study. While the literature indicates that studies involving path analysis should have at least 10 times the number of participants as the number of items on the scale,<sup>21</sup> some researchers consider it appropriate to have at least 300 participants<sup>22</sup> or at least 400 participants.<sup>23</sup> This study also adopted the principle of having at least 400 participants. Convenience sampling was used to recruit 452 eligible outpatients from the internal medicine, cardiology, and chest diseases outpatient clinics through face-to-face interviews. After excluding 38 outpatients who did not complete the questionnaire, data from 414 participants were included in the final analysis.

### Data Collection

Data for the study were collected through a structured survey form. The form consists of 4 sections. The first section contains questions about participants' individual characteristics (age, gender, chronic diseases, duration of diagnosis, etc.). The second section includes the self-efficacy scale for chronic disease management, developed by Lorig et al<sup>24</sup> and adapted into Turkish by Gün Özkan,<sup>25</sup> to measure participants' self-efficacy. The scale consists of a total of 6 items (unidimensional) and is a 10-point Likert scale. The total score of the scale is calculated by taking the average of the scores obtained from 6 items and ranges from 0 to 10. If more than 1 option is marked for a question, the lower score is considered. At least 4 items must be answered for the scale to be calculated. A higher score indicates an increase in

the individual's self-efficacy in managing chronic disease. The internal consistency coefficient of the original scale is 0.91, while that of the Turkish adaptation is 0.95. The third section includes the Patient Health Engagement Scale, developed by Graffigna et al<sup>26</sup> and adapted into Turkish by Usta et al,<sup>19</sup> to measure participants' engagement in the treatment process. The scale consists of 5 items across 4 progressive engagement levels (unidimensional) and measures individuals' perceptions of how they feel when thinking about their illness. Each item presents 7 response options, asking patients to position themselves on a continuum between contrasting statements based on their personal illness experience. The total score is calculated using the median value of the 5 item responses. This median score indicates the patient's engagement phase as follows: 1 = Blackout, 2 = Arousal, 3 = Adhesion, and 4 = Eudaimonic Project. Higher scores indicate higher levels of patient engagement. The internal consistency coefficient of the original scale is 0.85, while that of the Turkish adaptation is 0.80. The final section includes the Morisky Greene Levine Medication Assessment Questionnaire (MGL-MAQ), developed by Morisky et al<sup>27</sup> and adapted into Turkish by Yilmaz<sup>28</sup> to measure participants' adherence to treatment. The scale consists of a total of 4 items (unidimensional) and is answered with yes (1)/no (0) responses. Item 2 of the scale is reverse coded. The score obtained from the scale consists of the total of the scores obtained from the answers given to the questions and ranges from 0 to 4. In the original scoring of the scale, higher scores indicate lower treatment adherence. However, for ease of interpretation within the mediation model, the items were reverse coded so that higher scores reflect higher levels of treatment adherence. The internal consistency coefficient of the original scale is 0.61, while that of the Turkish adaptation is 0.52.

### Ethical Considerations

The study was approved by the Non-Interventional Research Ethics Committee of Kırıkkale University (Date: February 12, 2025; Decision Number: 2025.01.37). Prior to data collection, the necessary administrative approval was obtained from the hospital administration of Kırıkkale University Faculty of Medicine Hospital (Date: December 10, 2024; Document Number: E.298897). All participants in the study were included on a voluntary basis and their written consent was obtained.

### Data Analysis

The data collected during the study were systematically organized and stored within a computerized database. IBM SPSS (Statistical Package for Social Sciences) 22.0 software and PROCESS 4.2 macro were used to analyze the data. Descriptive statistics (frequency, percentage, mean, standard deviation, min-max) were used in the analysis of the data, Cronbach's alpha coefficient was used to assess the reliability of the scales, and skewness-kurtosis values were used to assess normal distribution. The PROCESS macro (Model 4) developed by Hayes<sup>29</sup> was used to test the mediating effect.

In the mediating effect analysis shown in Figure 1, self-efficacy was the independent variable, patient engagement was the mediating variable, and treatment adherence was the dependent variable; age, gender, marital status, education status, and length of treatment were included as control variables. Research has shown that sociodemographic factors such as age, gender, and marital status can lead to differences in patients' engagement and adherence to treatment, while educational level affects the capacity to understand and evaluate health information and participate in health-related decisions. Furthermore, the length of diagnosis and treatment can shape the patient's engagement process and adherence behavior.<sup>17,18</sup> Accordingly, in order to more clearly demonstrate the effect of self-efficacy and patient engagement on treatment adherence and to control for possible confounding effects, the relevant variables were included in the

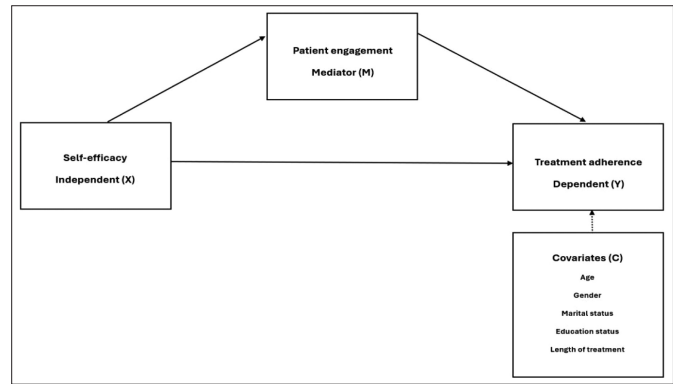


Figure 1. Research model.

model as control variables. A  $P$ -value of  $<.05$  was accepted for statistical significance. The bootstrap method with 5000 samples was used to test indirect effects, and statistical significance was indicated by CIs not containing the 0 value.

### Results

Descriptive statistics related to the individual characteristics of the participants in the study are presented in Table 1. The distribution of participants by gender is similar; the mean age is 60.23 ( $\pm 9.52$ ), most of the participants are married (83%), and have completed primary education (55%). Many of the participants have cardiovascular diseases (90%) and metabolic diseases (78%). However, participants also have respiratory diseases, kidney diseases, and other diseases, respectively. The diagnosis period of chronic diseases, which is the primary reason for participants' visits to healthcare institutions, is longer than the treatment period in the early years.

Table 1. Descriptive Statistics for Participants (n = 414)

| Characteristics             | n         | %    |
|-----------------------------|-----------|------|
| Gender                      |           |      |
| Female                      | 212       | 51.2 |
| Male                        | 202       | 48.8 |
| Marital status              |           |      |
| Single                      | 69        | 16.7 |
| Married                     | 345       | 83.3 |
| Education status            |           |      |
| Literate                    | 69        | 16.7 |
| Primary education           | 227       | 54.8 |
| Secondary education         | 75        | 18.1 |
| Bachelor's                  | 43        | 10.4 |
| Chronic disease             |           |      |
| Cardiovascular diseases     | 371       | 89.6 |
| Metabolic diseases          | 322       | 77.8 |
| Respiratory diseases        | 118       | 28.5 |
| Kidney diseases             | 25        | 6.0  |
| Other*                      | 18        | 4.3  |
| Length of diagnosis (years) |           |      |
| 0-5                         | 80        | 19.3 |
| 6-10                        | 108       | 26.1 |
| 11-15                       | 94        | 22.7 |
| 16 and above                | 132       | 31.9 |
| Length of treatment (years) |           |      |
| 0-5                         | 72        | 17.4 |
| 6-10                        | 107       | 25.8 |
| 11-15                       | 97        | 23.4 |
| 16 and above                | 138       | 33.4 |
| Age (years)                 | $\bar{x}$ | SS   |
|                             | 60.23     | 9.52 |

\*Cancer, musculoskeletal disorders, and neurological disorders are included.

**Table 2.** Descriptive Statistics for Measurement Tools

| Measurement Tools | Min  | Max   | Mean     | Standard Deviation | Cronbach's Alpha | Skewness | Kurtosis |
|-------------------|------|-------|----------|--------------------|------------------|----------|----------|
| SEMCD             | 0.50 | 10.00 | 4.87     | 1.71               | 0.786            | 0.043    | 0.067    |
| MGL-MAQ           | 0.00 | 4.00  | 3.12     | 1.17               | 0.706            | 1.153    | 0.362    |
| PHE (Continuous)  | 1.00 | 4.00  | 2.64     | 0.78               | 0.896            | -0.530   | -0.098   |
| PHE (Categorical) |      |       | <b>n</b> |                    |                  | <b>%</b> |          |
| Blackout phase    |      |       | 42       |                    |                  | 10.10    |          |
| Arousal phase     |      |       | 103      |                    |                  | 24.90    |          |
| Adhesion phase    |      |       | 231      |                    |                  | 55.80    |          |
| Eudaimonic phase  |      |       | 38       |                    |                  | 9.20     |          |

Table 2 presents descriptive statistics for the measurement tools used in the study. According to this, participants perceive their self-efficacy in managing their chronic illnesses as moderate, their adherence to treatment as good, and their patient engagement as good. Indeed, in categorical assessments of patient engagement, most participants are in the adherence phase (56%).

The reliability levels of the scales are above the accepted limits ( $>0.70$ ). The skewness and kurtosis levels indicate a normal distribution ( $\pm 1.5$ ).

Table 3 presents the findings on the mediating role of patient engagement in the relationship between self-efficacy and treatment adherence. Self-efficacy statistically significantly affects patient engagement ( $\beta = 0.259$ ;  $P < .05$ ), and accordingly, as self-efficacy increases, patient engagement also increases. The age variable was negatively associated with patient engagement, indicating that older individuals demonstrated lower levels of engagement ( $\beta = -0.1342$ ;  $P < .05$ ). The gender variable was also found to be statistically significant, with males having lower levels of patient engagement than females ( $\beta = -0.1042$ ;  $P < .05$ ). However, self-efficacy did not have a statistically significant effect on treatment adherence ( $\beta = 0.018$ ;  $P > .05$ ). Patient engagement has a statistically significant effect on treatment adherence ( $\beta = 0.614$ ;  $P < .05$ ), and treatment adherence increases as patient engagement

increases. In addition, treatment adherence was found to increase as treatment length increased ( $\beta = 0.099$ ;  $P < .05$ ). According to the indirect effect, patient engagement plays a mediating role in the relationship between self-efficacy and treatment adherence ( $\beta = 0.1591$ ; 95% CI 0.0898-0.2281). The total effect of self-efficacy in managing chronic illness on treatment adherence is statistically significant ( $\beta = 0.177$ ;  $P < .05$ ) and, due to the lack of significance of the direct effect, the effect of patient engagement is a fully mediated effect.

### Discussion

This study examined the mediating role of patient engagement in the relationship between self-efficacy and treatment adherence. The majority of patients included in the study were found to have cardiovascular, metabolic, and respiratory diseases. Indeed, in Türkiye, cardiovascular diseases rank first among causes of death in 2024, followed by cancer and respiratory diseases.<sup>30</sup> However, it was observed that patients did not start treatment immediately after diagnosis; in other words, they delayed treatment after being diagnosed. Research shows that delaying treatment for chronic diseases worsens health outcomes, worsens the prognosis of the disease, increases the risk of mortality, and places a significant burden on the healthcare system.<sup>31,32</sup>

**Table 3.** Mediation Effect of Patient Engagement in the Relationship Between Self-efficacy and Treatment Adherence

| Model/Effect Type   | B (unst.) | $\beta$ (std.) | SE     | t      | P      | 95% CI (Lower Limit – Upper Limit) | Model Summary                        |
|---|-----------|----------------|--------|--------|--------|------------------------------------|--------------------------------------|
| <b>Model 1: Self-efficacy → Patient engagement</b>                                |           |                |        |        |        |                                    | F = 8.653<br>R <sup>2</sup> = 0.113  |
| Self-efficacy   | 0.1192    | 0.2592         | 0.0232 | 9.386  | <.001* | 0.0736 0.1649                      |                                      |
| Age   | -0.0111   | -0.1342        | 0.0040 | -2.735 | .006*  | -0.0190 -0.0031                    |                                      |
| Gender  | -0.1637   | -0.1042        | 0.0772 | -2.121 | .034*  | -0.3154 -0.0120                    |                                      |
| Marital status  | 0.0586    | 0.0278         | 0.0999 | 0.586  | .557   | -0.1379 0.2551                     |                                      |
| Education status  | -0.0003   | -0.0003        | 0.0423 | -0.006 | .995   | -0.0834 0.0829                     |                                      |
| Length of treatment   | -0.0092   | -0.0154        | 0.0285 | -0.324 | .745   | -0.0652 0.0467                     |                                      |
| <b>Model 2: Self-efficacy + Patient engagement → Treatment adherence</b>          |           |                |        |        |        |                                    | F = 37.823<br>R <sup>2</sup> = 0.395 |
| Patient engagement  | 0.9117    | 0.6137         | 0.0609 | 14.969 | <.001* | 0.7919 1.0314                      |                                      |
| Self-efficacy (direct effect)   | 0.0124    | 0.0181         | 0.0294 | 0.420  | .674   | -0.0455 0.0702                     |                                      |
| Age   | 0.0062    | 0.0504         | 0.0050 | 1.231  | .218   | -0.0037 0.0161                     |                                      |
| Gender  | 0.0124    | 0.0053         | 0.0953 | 0.129  | .896   | -0.1750 0.1998                     |                                      |
| Marital status  | -0.1842   | -0.0588        | 0.1228 | -1.499 | .134   | -0.4257 0.0573                     |                                      |
| Education status  | 0.0889    | 0.0748         | 0.0519 | 1.711  | .087   | -0.0132 0.1911                     |                                      |
| Length of treatment   | 0.0883    | 0.0993         | 0.0350 | 2.524  | .012*  | 0.0195 0.1570                      |                                      |
| <b>Model 3: (Self-efficacy → Treatment adherence)</b>                             |           |                |        |        |        |                                    | F = 4.380<br>R <sup>2</sup> = 0.060  |
| Self-efficacy (total effect)  | 0.1211    | 0.1772         | 0.0355 | 3.412  | .0007* | 0.0513 0.1908                      |                                      |
| Age   | -0.0039   | -0.0319        | 0.0062 | -0.632 | .527   | -0.0161 0.0083                     |                                      |
| Gender  | -0.1368   | -0.0586        | 0.1180 | -1.160 | .246   | -0.3687 0.0950                     |                                      |
| Marital status  | -0.1307   | -0.0418        | 0.1528 | -0.855 | .392   | -0.4311 0.1696                     |                                      |
| Education status  | 0.0887    | 0.0746         | 0.0646 | 1.372  | .170   | -0.0384 0.2158                     |                                      |
| Length of treatment   | 0.0798    | 0.0898         | 0.0435 | 1.835  | .067   | -0.0057 0.1654                     |                                      |
| <b>Indirect effect (Self-efficacy → Patient engagement → Treatment adherence)</b> |           |                |        |        |        |                                    |                                      |
| Patient engagement (mediation effect)   | 0.1087    | 0.1591         | 0.0246 | —      | —      | 0.0898 0.2281                      | —                                    |

\* $P < .05$ .

The patients perceived their self-efficacy levels as moderate and their patient engagement and treatment adherence as good. Since the concept of self-efficacy reflects individuals' internal perceptions of their own abilities, whereas patient engagement and treatment adherence relate to perceptions of behavioral outcomes such as regular medication use, they may perceive their self-efficacy levels as moderate and their patient engagement and treatment adherence as good. Studies investigating self-efficacy levels in chronic diseases in Türkiye have found that patients generally perceive their self-efficacy levels as low or moderate.<sup>33</sup> However, the fact that a significant proportion of patients (33.4%) have been receiving treatment for 16 years or more may have improved their treatment adherence over the years. The fact that health systems have embraced the necessity of the patient's active role in the long-term management of chronic diseases in recent decades<sup>34</sup> may also have ensured that patient engagement is perceived as being at a good level. A study conducted among hypertensive patients in Türkiye also found that patients' self-efficacy was moderate and their adherence to treatment was good.<sup>35</sup> However, there are also studies that perceive adherence to treatment as low,<sup>36</sup> and this may be due to differences in the measures used or the patient population.

The study concluded that self-efficacy does not directly affect treatment adherence but indirectly influences it through patient engagement. In other words, self-efficacy was found to increase patient engagement, which in turn enhances treatment adherence. This finding is particularly significant as it demonstrates that enhancing self-efficacy alone is insufficient to improve treatment adherence in patients with multimorbidity. It indicates that if treatment adherence is to be increased in these patients, it is necessary to ensure active patient engagement in treatment, in addition to increasing self-efficacy. Particularly in cases of multiple chronic diseases, situations such as multiple medication use can make treatment adherence more complex. In such cases, the patient's perception of being able to manage their chronic disease may not be sufficient on its own to transform into adherence behavior, and patient engagement emerges as an important factor influencing the process of transforming belief into behavior. Similarly, Graffigna et al<sup>37</sup> found in their structural equation modeling of patient engagement that it was an important mediator in increasing treatment adherence. However, other studies have shown that self-efficacy increases treatment adherence and that this relationship can be shaped by patient-physician interaction and the patient's perception of control over the treatment process.<sup>18</sup> Individual characteristics were also included as covariates in the model. The variables of age, gender, and treatment length had a significant effect in the model. It was observed that older age was associated with lower levels of treatment engagement. The literature indicates that as the disease burden increases in older patients, the need for engagement also increases, and interventions aimed at increasing engagement have positive effects on health outcomes and resource utilization.<sup>38</sup> Men were found to have lower levels of patient engagement than women. Research also supports that women show greater engagement than men.<sup>39,40</sup> Treatment length, another variable, was found to have a positive effect on treatment adherence. Patients who have been undergoing treatment for a long time may have developed routine adherence behaviors over time, and their familiarity with the healthcare system may have reduced uncertainty about the treatment process. A cohort study examining antidepressant use showed that a large proportion of patients discontinued treatment within the first few months and that shorter treatment periods were associated with lower adherence.<sup>41</sup>

### Strengths and Limitations

This study focuses on patients with multimorbidity, a significant public health issue worldwide and in Türkiye. The effect of potential variables that could influence treatment adherence in these patients, who have

complex treatment processes, was tested using a mediating model. A strength of the study is that there are only a limited number of studies examining the mediating effect of patient engagement, a concept of current importance in the literature. The findings were strengthened by including control variables in the model. However, the study has some limitations. The cross-sectional nature of the research design, the collection of data at a single center, and the use of patient-reported scales make it difficult to generalize the research findings to the population and establish a causal relationship. In this study, the 4-item MGL-MAQ scale was chosen to measure treatment adherence. Using this publicly available short form instead of longer Morisky treatment adherence scales (e.g., MMAS-8) that require a license provided practicality in the data collection process. However, due to its fewer items, it may have assessed treatment adherence behavior at a more limited level. Therefore, the use of more comprehensive measurement tools in future studies may be recommended. Despite these limitations, the findings from the study provided valuable insights.

### Conclusion and Implications

This study highlighted that self-efficacy in patients with multimorbidity does not improve treatment adherence on its own, but rather through patient engagement. The results obtained reveal that patient engagement plays a decisive role, particularly in patients with multimorbidity. Multiple diseases and concurrent treatment processes conducted in different clinics require more than just a high perception of self-efficacy; unless the patient takes an active role in the treatment process, participates in information sharing, and ensures treatment coordination, it becomes difficult for self-efficacy to translate into adherence. Therefore, treatment adherence in the context of multimorbidity requires organizing individual capacity through active participation, beyond individual capacity alone. This finding highlights the importance of considering patient engagement as a central actor in interventions aimed at improving treatment adherence in patients with multimorbidity. It may be advisable to adopt a system that strengthens communication between healthcare professionals and patients and enables patients to take an active role, and to educate both healthcare providers and patients on this subject. It is particularly important to implement interventions that increase patient engagement in male patients. Furthermore, as the length of treatment is also related to treatment adherence, delayed initiation of treatment after diagnosis may complicate the disease management process. A strategy needs to be developed that enables healthcare professionals to follow up with patients after diagnosis and reduce the time interval between diagnosis and treatment.

In conclusion, this study provided important evidence-based information to the limited number of studies in the literature. Future studies using other variables and measurement tools may provide different results. Longitudinal studies may reveal the causal effect of patient engagement.

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**Data Availability Statement:** The data that support the findings of this study are available on request from the corresponding author.

**Artificial Intelligence Usage Statement:** The author declared that no Artificial Intelligence Tool was used in the preparation of the manuscript.

**Ethics Committee Approval:** Ethical committee approval was received from the Ethics Committee of University of Kırkkale (Approval no: 2025.01.37, Date: February 12, 2025).

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