Compliance level to Tuberculosis prophylaxis in patients undergoing therapy with tumor necrosis factor-alpha inhibitors: a cross-sectional study

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Abstract. – OBJECTIVE: Tumor necrosis factor-alpha (TNF-α) inhibitors are used to treat autoimmune diseases such as rheumatoid arthritis, ankylosing spondylitis, and inflammatory bowel disease. However, patients using TNF-α inhibitors are at a high risk of developing tuberculosis. Therefore, this study aimed to evaluate the compliance level of patients who were prescribed TNF-α-based tuberculosis prophylactic treatment.

PATIENTS AND METHODS: The study included 135 patients who were followed up at a tuberculosis dispensary between December 2020 and June 2021 and agreed to participate in the study. The study was conducted after obtaining necessary permissions from the institution, ethics committee, and patients. Data were collected using a questionnaire and evaluated using the Medication Adherence Report Scale (MARS). The MARS scale scores range from 5 to 25, with high scores indicating a high level of “medication compliance level”.

RESULTS: Of the included patients, 42.2% were females, 46.7% were primary school graduates, and their mean age was 43.75±11.86 years. Additionally, 35.6% of patients had ankylosing spondylitis, among whom 54.1% had a disease duration of 1-5 years and 57.8% had been using TNF-α inhibitors for a year. Of the patients taking isoniazid (INH) for tuberculosis prophylaxis, 47.4% missed their prescribed INH doses, with “forgetfulness” being the reason in 28.9% of these patients. The patients had a mean MARS score of 15.71±6.18.

CONCLUSIONS: Patients using TNF-α inhibitors were found to have “moderate” compliance levels for INH-based prophylactic therapy. It is recommended that the compliance levels of patients and factors influencing their compliance should be regularly monitored.

Key Words: Tumor necrosis factor-alpha, INH preventive therapy, Tuberculosis, Compliance.

Introduction

Tuberculosis (TB) is one of the most common diseases, especially in the developing world. Our study focuses well on essential aspects of INH preventive therapy for TB in patients receiving tumor necrosis factor-alpha (TNF-α) inhibitors. For over 20 years, tumor necrosis factor (TNF)-α inhibitors have been widely used for treating autoimmune diseases. TNF-α inhibitors, which are prominently used in the clinical setting, provide remarkable benefits in the treatment of chronic and inflammatory rheumatic diseases such as rheumatoid arthritis (RA), ankylosing spondylitis (AS), Crohn’s disease, and ulcerative colitis. Despite their clinically proven efficacy and widespread use, some concerns regarding the side effects of these drugs, particularly the risk of developing infectious complications, persist. Previous studies have reported that TNF-α inhibitors predispose the patients to tuberculosis (TB) due to their mechanism of action, and its increasing usage has increased the incidence rate of TB. As the presence of infection may complicate the treatment, national and international guidelines recommend comprehensive assessment of the patients before starting TNF-α inhibitor therapy. Accordingly, patients in Turkey undergo Latent Tuberculosis Infection (LTBI) screening after their chances of having an active TB infection have been excluded in the screening process before prescribing TNF-α inhibitors. LTBI is primarily diagnosed by performing the tuberculin skin test (TCT). An induration of 5 mm or more in the TCT is considered positive, and patients with positive results are referred to a TB dispensary in their region for starting isoniazid (INH) preventive therapy for 9 months.

TB is a serious condition, but it can be treated and prevented. Therefore, identifying the individuals...
at risk of TB and ensuring their adherence to the prophylactic treatment are crucial in the prevention of TB. Previous studies have found that 41.8% of patients receiving preventive treatment did not take their medications regularly, and 38.4% did not complete the treatment regimen, indicating inadequate medication compliance.

Nonadherence to INH preventive treatment among individuals using TNF-α inhibitors can increase the number of individuals at risk of acquiring and disseminating TB in the community. Nurses play a key role in monitoring the changes in the condition of the patients and facilitating their compliance with the long-term treatment. Therefore, it is essential to identify the hindrances to the adherence and completion of the treatment and take timely remedial measures to prevent the spread of TB in the community. Therefore, the present study aimed to evaluate the treatment compliance among patients receiving INH preventive treatment.

Patients and Methods

Study Design

This is a cross-sectional study that examined the compliance level for INH preventive therapy among patients using TNF-α inhibitors. The study population comprised patients who presented to a TB dispensary to receive INH therapy for 9 months and were using TNF-α inhibitors. No sampling was performed, and the sample comprised 135 patients who presented to the dispensary between December 2020 and June 2021, volunteered to participate in the study, and met the inclusion criteria.

Inclusion and Exclusion Criteria

Patients were included in the study if they agreed to participate in the study, had no communication problems, were over 18 years of age, and were using INH for TB preventive treatment. Patients were excluded from the study if they refused to participate in the study, were under 18 years of age, and were not using INH for TB preventive treatment.

Data Collection Tools

Data were collected using a questionnaire pertaining to the sociodemographic and disease-related characteristics and the Medication Adherence Report Scale (MARS).

Questionnaire

This questionnaire was developed by the researchers in accordance with previous studies and had 24 questions regarding the sociodemographic and disease-related characteristics of the participants.

Medication Adherence Report Scale (MARS)

The MARS, developed by Horne and Hankins (2001) to assess medication adherence, is a generic five-point Likert scale that can be customized according to the type of disease and has been used in many studies. The validity and reliability of the Turkish version were analyzed by Şen et al. in 2019. The scores for each item were added to determine the total score, which ranged between 5 and 25. High MARS scores indicated high levels of compliance.

Procedure

The questionnaires were administered by the researchers by conducting face-to-face interviews, which lasted for approximately 10 minutes, in the TB dispensary. All patients agreed to participate in the study and completed the questionnaire.

Ethical Aspect of the Research

Informed consent was obtained from all patients before starting the study. Approval from the ethics committee and necessary permissions were obtained from the regional Provincial Health Directorate.

Statistical Analysis

The data were evaluated using the SPSS 22.0 package program (Statistical Package for Social Sciences, IBM Corp., Armonk, NY, USA). Descriptive statistics (number, percentage, mean, standard deviation) were used to analyze the data, and the Shapiro-Wilk test was used to check the conformity of the continuous variables to normal distribution. Student’s t-test, Kruskal-Wallis, Mann-Whitney U tests were also performed. The statistical significance level was set at p<0.05.

Results

Of the included patients, 42.2% were females, 46.7% were primary school graduates, their mean age was 43.75±11.86 years, and the mean MARS score was 15.71±6.18. There was a significant difference between the marital status, economic status, and household members of the patients and mean MARS scores (p < 0.05) (Table I).
Compliance level to tuberculosis prophylaxis in patients undergoing therapy with TNF-α inhibitors

Table I. Socio-demographic characteristics.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n (%)</th>
<th>MARS Mean ± SD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>57 (42.2)</td>
<td>16.31±5.95</td>
<td>0.339*</td>
</tr>
<tr>
<td>Male</td>
<td>78 (57.8)</td>
<td>15.28±6.34</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Literate</td>
<td>26 (19.3)</td>
<td>14.53±5.81</td>
<td>0.519**</td>
</tr>
<tr>
<td>Primary School</td>
<td>63 (46.7)</td>
<td>15.22±5.78</td>
<td></td>
</tr>
<tr>
<td>High School</td>
<td>39 (28.9)</td>
<td>16.48±7.08</td>
<td></td>
</tr>
<tr>
<td>University and above</td>
<td>7 (5.2)</td>
<td>20.28±3.63a</td>
<td></td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>101 (74.8)</td>
<td>15.01±6.00</td>
<td>0.023*</td>
</tr>
<tr>
<td>Unmarried</td>
<td>34 (25.2)</td>
<td>17.79±6.32</td>
<td></td>
</tr>
<tr>
<td><strong>Profession</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Civil servant</td>
<td>15 (11.1)</td>
<td>17.80±4.90</td>
<td>0.369**</td>
</tr>
<tr>
<td>Manual worker</td>
<td>50 (37.0)</td>
<td>14.78±6.19</td>
<td></td>
</tr>
<tr>
<td>Pensioner</td>
<td>6 (4.4)</td>
<td>18.33±5.00</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>13 (9.6)</td>
<td>14.76±7.94</td>
<td></td>
</tr>
<tr>
<td>Housewife</td>
<td>51 (37.8)</td>
<td>15.96±6.09</td>
<td></td>
</tr>
<tr>
<td><strong>Economic status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>7 (5.2)</td>
<td>21.14±3.97</td>
<td>0.017**</td>
</tr>
<tr>
<td>Middle</td>
<td>96 (71.1)</td>
<td>15.09±6.32</td>
<td></td>
</tr>
<tr>
<td>Poor</td>
<td>32 (23.7)</td>
<td>16.40±5.59</td>
<td></td>
</tr>
<tr>
<td><strong>Household members</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living alone</td>
<td>12 (8.9)</td>
<td>20.91±2.35</td>
<td>0.001**</td>
</tr>
<tr>
<td>Living with family members</td>
<td>120 (88.9)</td>
<td>15.06±6.21</td>
<td></td>
</tr>
<tr>
<td>Living with people other than family members</td>
<td>3 (2.2)</td>
<td>21.00±2.64</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>135 (100%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Student’s t-test, **Kruskal-Wallis’ test.

Of the studied patients, 35.6% had AS, 54.1% were diagnosed with their disease within 1-5 years, and 57.8% had been using TNF-α inhibitors for 1 year. Patients who were diagnosed with RA, had a disease duration of 1-5 years, and were using TNF-α inhibitors for 5 years had the lowest mean MARS scores (p > 0.05) (Table II).

Analysis of the INH-related characteristics revealed that 47.4% of patients missed taking their INH doses due to forgetfulness, unwillingness to take the medication, and lack of transportation means; mean MARS scores were significantly high among patients who informed the dispensary after missing the doses, were aware that nonadherence could lead to TB, and believed that INH provided protection against TB (p < 0.05) (Table III).

**Discussion**

Current guidelines recommend INH preventive treatment for patients with a positive TST test who use TNF-α inhibitors for diseases such as RA, AS, Crohn’s disease, and ulcerative colitis. Patients prescribed with INH preventive treatment receive the treatment free of charge from TB dispensaries but currently do not receive directly observed treatment (DOT). As many patients receive INH preventive treatment, the follow-up of these patients is difficult. Previous studies have reported that patients using TNF-α inhibitors have a 10% risk of developing TB. A multicenter cohort study from Turkey that included 10,434 patients found that TB developed in 73 (0.69%) patients with RA and AS who used TNF-α inhibitors, and the study concluded that the duration of the INH preventive treatment shorter than 9 months was a risk factor for TB. A study conducted on healthcare workers who were prescribed INH preventive treatment in cases of LTBI for 9 months found that 37.7% of healthcare workers did not get to complete their treatment. In addition, another study that analyzed 15,035 patients found that only 45% of patients were able to complete the INH preventive treatment regimen. Thus, this study aimed to evaluate the compliance level among patients using TNF-α inhibitors to the INH preventive treatment and contribute to the clinical management of these patients.
Table II. Disease-related characteristics of the patients.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n (%)</th>
<th>MARS Mean ± SD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>47 (34.8)</td>
<td>13.85±5.98</td>
<td>0.067*</td>
</tr>
<tr>
<td>Ankylosing Spondylitis</td>
<td>48 (35.6)</td>
<td>16.04±6.19</td>
<td></td>
</tr>
<tr>
<td>Psoriasis</td>
<td>19 (14.1)</td>
<td>18.10±5.13</td>
<td></td>
</tr>
<tr>
<td>Crohn's Disease</td>
<td>9 (6.7)</td>
<td>18.66±5.89</td>
<td></td>
</tr>
<tr>
<td>Ulcerative Colitis</td>
<td>7 (5.2)</td>
<td>14.42±7.41</td>
<td></td>
</tr>
<tr>
<td>Multiple Sclerosis</td>
<td>2 (1.5)</td>
<td>15.50±13.43</td>
<td></td>
</tr>
<tr>
<td>Uveitis</td>
<td>3 (2.2)</td>
<td>19.00±2.00</td>
<td></td>
</tr>
<tr>
<td>Duration of illness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-5 years</td>
<td>73 (54.1)</td>
<td>15.31±6.29</td>
<td>0.502**</td>
</tr>
<tr>
<td>5-10 years</td>
<td>62 (45.9)</td>
<td>16.19±6.06</td>
<td></td>
</tr>
<tr>
<td>Duration of TNF α inhibitor use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 year</td>
<td>78 (57.8)</td>
<td>15.67±6.38</td>
<td>0.927*</td>
</tr>
<tr>
<td>2 years</td>
<td>27 (20.0)</td>
<td>15.70±5.98</td>
<td></td>
</tr>
<tr>
<td>3 years</td>
<td>14 (10.4)</td>
<td>16.50±6.17</td>
<td></td>
</tr>
<tr>
<td>4 years</td>
<td>8 (5.9)</td>
<td>16.12±4.58</td>
<td></td>
</tr>
<tr>
<td>5 years</td>
<td>8 (5.9)</td>
<td>14.37±7.44</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>135 (100%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Kruskal-Wallis’ test, **Mann-Whitney U test.

Table III. INH-related characteristics.

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>n (%)</th>
<th>MARS Mean ± SD</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of INH use</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-90 days</td>
<td>59 (43.7)</td>
<td>16.16±6.24</td>
<td>0.259*</td>
</tr>
<tr>
<td>91-180 days</td>
<td>49 (36.3)</td>
<td>14.61±6.60</td>
<td></td>
</tr>
<tr>
<td>181-270 days</td>
<td>27 (20.0)</td>
<td>16.74±5.06</td>
<td></td>
</tr>
<tr>
<td>Have you ever missed out INH doses?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>64 (47.4)</td>
<td>11.46±5.77</td>
<td>0.000**</td>
</tr>
<tr>
<td>No</td>
<td>71 (52.6)</td>
<td>19.54±3.43</td>
<td></td>
</tr>
<tr>
<td>What is the reason for the disruption? (n = 64)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forgetfulness</td>
<td>39 (28.9)</td>
<td>11.84±5.86</td>
<td>0.066*</td>
</tr>
<tr>
<td>Unwillingness to take medicine</td>
<td>17 (12.6)</td>
<td>9.11±4.85</td>
<td></td>
</tr>
<tr>
<td>Difficulties with transportation</td>
<td>8 (5.9)</td>
<td>14.62±5.85</td>
<td></td>
</tr>
<tr>
<td>Do you inform the dispensary when you fail to use INH regularly?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19 (14.1)</td>
<td>21.68±2.64</td>
<td>0.000**</td>
</tr>
<tr>
<td>No</td>
<td>116 (85.9)</td>
<td>14.74±6.05</td>
<td></td>
</tr>
<tr>
<td>Have you received information regarding the use of INH for TB?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>96 (71.1)</td>
<td>16.90±5.72</td>
<td>0.000**</td>
</tr>
<tr>
<td>No</td>
<td>39 (28.9)</td>
<td>12.79±3.37</td>
<td></td>
</tr>
<tr>
<td>Do you experience INH-related side effects?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>5 (3.7)</td>
<td>11.60±6.30</td>
<td>0.103***</td>
</tr>
<tr>
<td>No</td>
<td>130 (96.3)</td>
<td>15.87±6.14</td>
<td></td>
</tr>
<tr>
<td>Do you know you may develop TB in case of irregularly using INH?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>39 (28.9)</td>
<td>18.30±5.95</td>
<td>0.002**</td>
</tr>
<tr>
<td>No</td>
<td>96 (71.1)</td>
<td>14.66±5.98</td>
<td></td>
</tr>
<tr>
<td>Do you have difficulty using INH?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>78 (57.8)</td>
<td>15.53±5.80</td>
<td>0.694**</td>
</tr>
<tr>
<td>No</td>
<td>57 (42.2)</td>
<td>15.96±6.70</td>
<td></td>
</tr>
<tr>
<td>Do you believe INH protects against TB?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>93 (68.9)</td>
<td>18.17±4.44</td>
<td>0.000**</td>
</tr>
<tr>
<td>No</td>
<td>42 (31.1)</td>
<td>10.28±6.06</td>
<td></td>
</tr>
<tr>
<td>Have you told others that you are using INH?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>51 (37.8)</td>
<td>18.76±4.10</td>
<td>0.000**</td>
</tr>
<tr>
<td>No</td>
<td>84 (62.2)</td>
<td>13.86±6.51</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>135 (100%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Kruskal-Wallis’ test, **Student’s t-test, ***Mann-Whitney U test.
Previous studies\textsuperscript{21,22} have reported that patients receiving INH preventive treatment usually have AS, RA, and Crohn’s disease. Coşkunol et al\textsuperscript{21} reported that the mean age of patients receiving INH preventive treatment was 43.4±12.6 years; and 51%, 33.7%, and 6.7% patients had AS, RA, and Crohn’s disease, respectively. Ozdemir et al\textsuperscript{22} reported that 47% of patients had been using TNF-α inhibitors for over 4 years, whereas Börekci et al\textsuperscript{3}, investigating the risk of TB among patients on TNF-α inhibitors, reported that 16 patients who developed TB had been using TNF-α inhibitors for 1-60 months. In the present study, the majority of the patients had been using TNF-α inhibitors for one year, and the group of patients who had been on TNF-α inhibitors for 5 years had the lowest mean MARS scores. This result may be associated with the reluctance among patients to take medication as the prescribed duration of the medication increases. Previous studies\textsuperscript{23,24} have reported that compliance with the treatment is positively correlated with high education levels. Moreover, high education levels were reported to be positively correlated with adherence to preventive treatment, and married and female patients had relatively low levels of compliance with the treatment\textsuperscript{19}. Another systematic review\textsuperscript{20} reported that compliance to the treatment was influenced by the sex of the patients, and marital status was negatively associated with medication adherence. Similarly, the mean MARS score in the present study increased with high education levels, and female and unmarried patients had relatively high mean MARS scores. This finding suggested that patients with low education levels have insufficient awareness of the importance of medication adherence and thus require stricter medication monitoring. Moreover, it also warrants the planning of patient education based on the evaluation of factors influencing medication adherence.

Previous studies\textsuperscript{25,26} have reported that lack of information about LTBI is a barrier to medication adherence\textsuperscript{22}, and affects treatment initiation, adherence, and completion rates\textsuperscript{26}. Another study\textsuperscript{25} found that receiving treatment for LTBI was deemed unnecessary by the patients. A qualitative study reported that patients did not have enough knowledge about TB and LTBI and could not explain the difference between the two\textsuperscript{27}. The present study found that the mean MARS score was significantly high among patients who knew about the INH treatment and TB, contacted the dispensary in case of nonadherence to INH therapy, and were aware of the possibility of developing TB upon irregularly using INH.

This finding suggested that patients should be informed about the rationale for INH preventive treatment and the importance of regular use of medications, especially at the initial stages of the treatment and during the treatment period, while considering their educational level and cultural differences.

Studies in literature have reported that patients with LTBI experienced stigmatization, albeit at a low level, and may be reluctant to disclose their condition to others, including their family members\textsuperscript{28}. A qualitative study\textsuperscript{29} found that patients with a positive LTBI test result felt stigmatized and experienced shock and denial upon receiving the test result; although some patients who disclosed their use of LTBI treatment to the family members received positive and motivating reactions, some felt excluded and stigmatized. A cohort study\textsuperscript{28} examining the relationship between stigmatization and completion of INH preventive treatment found that perceived stigmatization was high among patients who dropped out of follow-up. This study found that 62.2% of patients could not reveal their use of INH to friends and family members, and these patients had significantly low mean MARS scores. Based on the cultural differences in the region where the study was conducted and the reactions to the disease, it can be suggested that patients conceal their use of medications, fearing possible ostracization and isolation from the community. This indicated the necessity of educating the patients with LTBI about the difference between TB and LTBI and emphasizing that they do not have TB, but they may develop IT if they fail to take INH preventive treatment regularly.
The regular use of medication and compliance with the treatment among patients are influenced by several factors. Many factors such as fear of side effects, financial problems, poverty, inability to attend hospital appointments due to conflicting priorities including work, difficulty in transportation, lack of knowledge, the belief that LTBI does not require treatment, forgetfulness, and stigmatization have been reported as barriers to treatment compliance. Although the rate of completion of preventive treatment varies among different populations, the reported rate ranges between 19% and 90%. In this study, 47.4% of patients missed their INH doses, mostly due to forgetfulness (28.9%), unwillingness to take medication (12.6%), and lack of transportation (5.9%).

Patients receiving INH preventive treatment had “moderate” Mean MARS scores. This result suggested that LTBI should be effectively treated for eradicating TB. One of the crucial elements of effective treatment is the patient’s compliance with the 9-month-long INH preventive treatment. Nurses have the greatest responsibility. As nurses play a major role in ensuring the compliance of patients, it is essential that they evaluate patients’ medication adherence during the treatment and use patient-centered approaches in patient education by evaluating the compliance of patients during the treatment while considering the barriers to treatment compliance.

**Limitations**

The major limitations of this study are that the compliance was evaluated solely based on a scale, and the study was limited to a specific region.

**Conclusions**

This study found that patients using TNF-α inhibitors had “moderate” levels of adherence to the INH preventive treatment, which was influenced by various factors such as education level, marital status, lack of knowledge, fear of stigmatization, and forgetfulness.

In long-term treatment, patient adherence to the medication may fluctuate and be influenced by other underlying factors. Therefore, it is recommended that patients should be regularly educated during the treatment, medication adherence should be evaluated using appropriate measurement tools, and necessary precautions should be taken before the patient stops taking the medication.

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**Ethics Approval**

Approval from the Ethics Committee and necessary permissions were obtained from the regional Provincial Health Directorate (2020/235).

**Informed Consent**

Informed consent was obtained from all patients before starting the study.

**Conflict of Interest**

The authors declare that there is no conflict of interest.

**Acknowledgments**

We thank the patients who participated in the study.

**Funding**

This study received no funding.

**Availability of Data and Materials**

The data that support the findings of this study are available from the Provincial Health Directorate, but restrictions apply to the availability of these data, which were used under license for the current study and so are not publicly available. Data are available from the authors upon reasonable request and with permission of the Provincial Health Directorate.

**Authors’ Contributions**

Study conception and design: SA, ÖO.

Data collection: SA.

Data analysis and interpretation: SA, SD.

Drafting of the article: SA, ÖO, SD.

Critical revision of the article: ÖO, SD.

**References**


Compliance level to tuberculosis prophylaxis in patients undergoing therapy with TNF-α inhibitors


