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A nationwide survey of pulmonary rehabilitation practices in Türkiye: A multidimensional perspective

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Abstract:

BACKGROUND AND AIM: Pulmonary rehabilitation (PR) is a cornerstone of chronic respiratory disease management; however, its organization and accessibility vary widely across countries. National data on PR practices in Türkiye are limited. This study aimed to describe the current landscape of PR services in Türkiye and to identify key organizational characteristics and barriers to implementation.

METHODS: A cross-sectional, web-based survey was conducted by the Pulmonary Rehabilitation Working Group of the Turkish Respiratory Society (TÜSAD). The questionnaire was distributed to healthcare professionals involved in PR and explored institutional infrastructure, team composition, program components, assessment practices, target patient populations, and perceived barriers to PR delivery.

RESULTS: Responses were obtained from 40 centers. Fifteen centers (38%) had an active PR unit, while 16 (40%) provided PR through staff-delivered or consultation-based services. Among centers offering PR (n=31), 58% reported reimbursement through the national social security system. Only 35% met the minimum recommended core interdisciplinary team requirements. PR programs were delivered through multiple service delivery models, most commonly in inpatient (71%) and outpatient (52%) settings, and primarily targeted patients with chronic obstructive pulmonary disease (COPD) and other chronic lung diseases. Exercise training and patient education were included in nearly all programs, whereas nutritional counseling (39%) and psychosocial support (23%) were less frequently offered. The mean patient acceptance rate for prescribed PR programs was 60% (standard deviation: 31). Major barriers to PR implementation included transportation difficulties, financial constraints, and lack of patient motivation.

CONCLUSIONS: Pulmonary rehabilitation services in Türkiye have expanded but remain heterogeneous in structure and delivery. Only approximately one-third of centers providing PR meet the recommended minimum core team composition. Our findings highlight the need to strengthen workforce capacity and to standardize PR delivery nationwide.

Keywords:

Pulmonary rehabilitation, policy, healthcare services, access

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Introduction

Chronic respiratory diseases (CRDs), including chronic obstructive pulmonary disease (COPD) and interstitial lung diseases, represent a major and growing global health burden, leading to reduced quality of life, frequent hospitalizations, and increased mortality. Among available non-pharmacological interventions, pulmonary rehabilitation (PR) is recognized as a cornerstone of evidence-based management. PR has been shown to improve exercise capacity, reduce dyspnea, enhance health-related quality of life, and decrease healthcare utilization.[1,2] International statements recommend that PR be integrated into the standard care of individuals with chronic respiratory conditions; however, global practice indicates that this integration is far from complete.[3,4] The persistent gap between strong guideline recommendations and limited real-world implementation continues to hinder the effective translation of evidence into routine clinical practice.

Despite clear evidence supporting its benefits, substantial inequalities exist in PR provision worldwide. Studies have documented wide variation in program structure, staffing, referral pathways, and funding, even among high-income countries.[5,6] In low- and middle-income settings, the availability of PR remains critically low, and patient access is often restricted by inadequate awareness, insufficient numbers of trained personnel, and limited institutional support.[7,8] In recent years, new delivery models such as home-based and tele-rehabilitation programs have emerged, offering promising solutions where resources are scarce or patient mobility is limited; however, their sustainability and integration into national healthcare systems remain inconsistent.[9,10] These ongoing disparities highlight the need for country-specific evaluations of PR organization and accessibility to support systematic improvement and standardization efforts.

In Türkiye, the integration of PR into respiratory care has progressed gradually; however, comprehensive national data on the organization and delivery of these services are still lacking. The diversity of healthcare institutions, variations in workforce capacity, and differences in funding mechanisms further complicate the establishment of unified standards. Understanding these factors is essential for capacity building, policy development, and professional training initiatives. Therefore, this study was conducted by the Pulmonary Rehabilitation Working Group of the Turkish Respiratory Society (TÜSAD) to perform a nationwide survey characterizing the current landscape of PR practice in Türkiye and to identify key facilitators and barriers to its implementation.

Materials and Methods

Study design and participants

A cross-sectional descriptive study was conducted. The target population included all members of the Turkish Respiratory Society, as well as other professionals involved in PR, such as physiotherapists or pulmonologists working in tertiary or secondary care institutions. The survey link was distributed electronically via the society's official mailing list and through professional messaging groups of pulmonary rehabilitation practitioners. Participation was voluntary, and each respondent represented a single healthcare center. Duplicate responses from the same institution were consolidated, resulting in data from 40 distinct centers across the country.

Survey development and content

A structured questionnaire was developed based on previous international surveys and expert consensus. The questionnaire consisted of multiple sections covering:

1) demographic and professional characteristics of respondents;
2) the organization and structure of PR services, including availability of PR units, reimbursement, and referral mechanisms;
3) team composition and components of PR programs;
4) evaluation methods routinely used;
5) targeted patient populations; and
6) barriers to service delivery and patient participation.

Most questions were multiple-choice and allowed selection of more than one option when applicable. Skip logic was applied so that certain questions were displayed only to respondents from institutions providing PR services.

The study was conducted in accordance with the Declaration of Helsinki. Formal ethics committee approval was not required, as the study did not involve patient data and participation was entirely voluntary. All respondents provided electronic informed consent prior to completing the survey.

Data collection and processing

The survey was open between March and December 2024. Responses were collected anonymously using Google Forms. Before completing the questionnaire, participants reviewed an electronic information page describing the study objectives and confirming data confidentiality, which served as informed consent. No personally identifiable information was collected.

Responses were exported for data cleaning and analysis. In cases where multiple respondents represented the same center, data were merged using a "union" approach for multiple-choice items and a majority-rule approach for binary questions. Centers that did not provide PR services were asked additional questions regarding institutional barriers and reasons for not offering such services.

Table 1: Characteristics of participating centers (n=40 centers; 40 respondents)

Respondent characteristics	n
Mean age (years)	43.9±9.7
Female sex	30 (75%)
Professional background, n (%)	
Pulmonologist	18 (45)
Physiotherapist	18 (45)
Thoracic surgeon	2 (5)
Physiatrist	2 (5)
PR service availability, n (%)	
On-site PR unit	15 (38)
No PR unit, staff-delivered PR	8 (20)
No PR unit, PR via consultation	8 (20)
No PR service	9 (22)
PR services reimbursed by SGK	18 (58% of PR-providing centers)

Values are presented as mean±standard deviation (SD) or n (%).
PR: Pulmonary rehabilitation, SGK: Social security institution.

Statistical analysis

All analyses were descriptive. Continuous variables were expressed as mean±standard deviation (SD), and categorical variables were summarized as frequencies and percentages. Data were analyzed at the center level. No inferential statistical tests were performed, given the exploratory and descriptive nature of the study. Statistical analyses were conducted using SPSS software (IBM SPSS Statistics, version 20.0, Chicago, IL, USA).

Results

Responses were obtained from 40 participants representing 40 different centers. The characteristics of respondents and participating centers are presented in Table 1. The mean age of respondents was 43.9±9.7 years, and 75% were female. Of the respondents, 45% were pulmonologists, 45% were physiotherapists, 5% were thoracic surgeons, and 5% were physiatrists.

Of the 40 centers, 15 (38%) had an active PR unit. Eight centers (20%) did not have a PR unit but provided staff-delivered PR, while another eight centers (20%) delivered PR through consultation when needed. Nine centers (22%) neither had a PR unit nor provided any PR services. Among the 31 centers providing PR, 18 (58%) reported that their services were reimbursed through the national social security system (SGK). Among the nine centers that did not provide any PR services, four (44%) reported no intention of establishing a PR unit. Among these four centers, the most commonly cited reasons were lack of belief in cost-effectiveness (50%), lack of qualified personnel (50%), and unwillingness of institutional management (25%). The geographical distribution of all responding centers by city and region is presented in Appendices 1 and 2. İstanbul was the most frequently represented city, accounting for 35.0% of all responding centers, 35.5% of centers providing PR, and 46.7% of centers with an active PR unit (Appendix 1). Similarly, the Marmara Region predominated geographically, representing 50.0% of all responding centers, 48.4% of PR-providing centers, and 60.0% of centers with an active PR unit, exceeding all other regions (Appendix 2).

The organization and content of PR services across the 31 centers providing rehabilitation are summarized in Table 2. Pulmonary rehabilitation programs were most commonly delivered in inpatient (71%) and outpatient (52%) settings, with many centers offering multiple delivery models. Home-based (29%) and tele-rehabilitation (39%) approaches were also reported by several centers. Pulmonologists (71%) and physiotherapists (100%) were the most commonly involved team members, followed by nurses (39%), dietitians (29%), and psychologists (13%).

Exercise training was included in nearly all programs (97%), along with patient education (90%) and physical activity counselling (71%). Nutritional counseling (39%) and psychosocial support (23%) were reported less frequently. Most centers routinely assessed pulmonary function (90%) and exercise capacity using the six-minute walk test (81%); fewer centers included quality-of-life (58%), nutritional (45%), or psychological (58%) assessments.

Table 2: Structure and implementation of pulmonary rehabilitation (PR) services in Türkiye (n=31 centers providing PR)

Service delivery models, n (%)	
Inpatient	22 (71)
Outpatient	16 (52)
Tele-rehabilitation	13 (39)
Home-based (unsupervised)	6 (19)
Healthcare professionals involved, n (%)	
Physiotherapist	31 (100)
Pulmonologist	22 (71)
Nurse	12 (39)
Dietitian	9 (29)
Physiatrist	8 (26)
Psychologist	4 (13)
Program components, n (%)	
Exercise training (aerobic, resistance, or breathing exercises)	30 (97)
Patient education	28 (90)
Physical activity counseling	22 (71)
Nutritional counseling	12 (39)
Psychosocial support	7 (23)
Routine assessments, n (%)	
Pulmonary function testing	28 (90)
Six-minute walk test	25 (81)
Quality-of-life questionnaires	18 (58)
Psychological assessment	18 (58)
Nutritional assessment	14 (45)
Patient groups most frequently included, n (%)	
COPD	31 (100)
Bronchiectasis	23 (74)
Interstitial lung disease	22 (71)
ICU patients	19 (61)
Thoracic surgery patients	18 (58)
Acceptance rate for PR programs (%)	60±31
Most frequently reported barriers to PR, n (%)	
Transportation difficulties	22 (71)
Financial constraints	18 (58)
Lack of patient motivation	15 (48)

Values are presented as n (%) or mean±standard deviation (SD). PR: Pulmonary rehabilitation, SGK: Social security institution, COPD: Chronic obstructive pulmonary disease, ICU: Intensive care unit.

All centers providing PR reported offering rehabilitation to patients with COPD (100%). In addition, 74% of centers included patients with bronchiectasis, followed by interstitial lung disease (71%), intensive care–related conditions (61%), and thoracic surgery cases (58%). The mean patient acceptance rate for prescribed PR programs was 60% (SD: 31). The leading barriers to program participation were transportation difficulties (71%), financial constraints (58%), and lack of motivation (48%).

Team composition across 31 centers providing PR is presented in Table 3. Only 35% of centers met the minimum

Table 3: Team composition of centers providing pulmonary rehabilitation (n=31)

	n (%)
Centers Meeting Core Interdisciplinary Team Requirements	11 (35)
Physician – Physiotherapist – Nurse – Dietitian – Psychologist	4 (13)
Physician – Physiotherapist – Nurse – Dietitian	3 (9)
Physician – Physiotherapist – Nurse	4 (13)
Centers Not Meeting Core Interdisciplinary Team Requirements	20 (65)
Physician – Physiotherapist – Dietitian	2 (6)
Physician – Physiotherapist	11 (36)
Physiotherapist – Nurse	1 (4)
Physiotherapist	6 (19)

Table 4: Team composition of centers with active pulmonary rehabilitation (PR) unit (n=15)

	n (%)
Centers Meeting Core Interdisciplinary Team Requirements	8 (53)
Physician – Physiotherapist – Nurse – Dietitian – Psychologist	4 (27)
Physician – Physiotherapist – Nurse – Dietitian	2 (13)
Physician – Physiotherapist – Nurse	2 (13)
Centers Not Meeting Core Interdisciplinary Team Requirements	7 (47)
Physician – Physiotherapist – Dietitian	2 (13)
Physician – Physiotherapist	4 (27)
Physiotherapist	1 (7)

core interdisciplinary team requirement (physician, physiotherapist, and nurse), while 65% did not. When the analysis was restricted to the 15 centers with an active PR unit, 53% met the minimum staffing criteria (Table 4). Compliance of PR-providing centers with core interdisciplinary team requirements is also summarized in Figure 1.

Discussion

This multicenter survey provides the first nationwide overview of PR practices in Türkiye, situating the findings within the broader global challenge of translating well-established evidence into routine clinical care. Although PR is firmly endorsed as a cornerstone intervention in the management of chronic respiratory diseases, its real-world delivery remains highly inconsistent across regions and healthcare systems.[2–4] Recent policy and guideline statements emphasize that the primary challenges relate to health system implementation rather than lack of evidence, calling for expanded capacity, workforce training, and stronger integration of PR into chronic care pathways.[2,4,6] Consistent with these global observations, the present study documents similar gaps

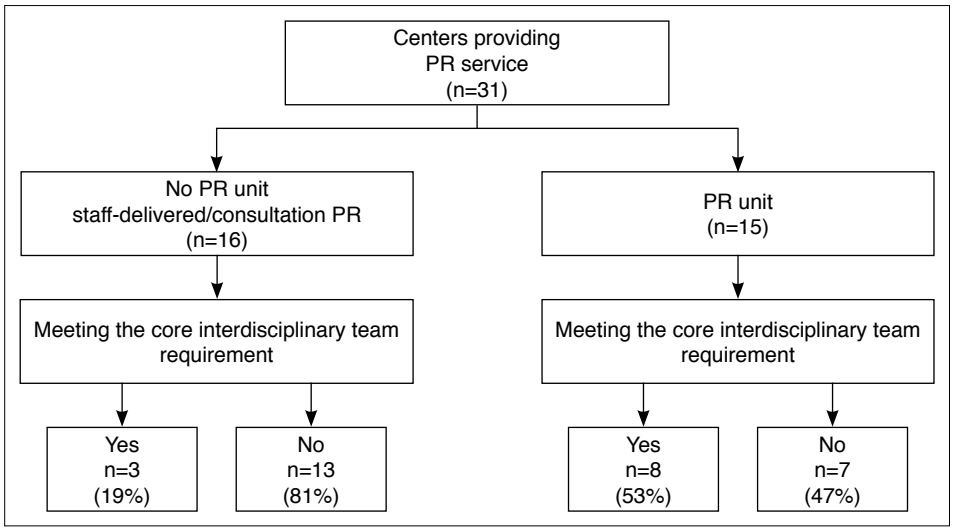

Figure 1: Compliance of centers providing pulmonary rehabilitation (PR) with the core interdisciplinary team requirement (i.e., physician, physiotherapist, and nurse)

in service availability and accessibility in Türkiye, providing essential baseline data to support future national standardization and resource planning efforts.

In this survey, 38% of centers had established PR units, while 40% provided staff-delivered or consultation-based services. European audits have demonstrated wide variation in PR infrastructure,[11] and only 1.2% of individuals with COPD in Canada[5] and 1.5% of Medicare beneficiaries in the United States[12] have access to these programs. Notably, our finding that 23% of centers in Türkiye provide no PR services closely mirrors data from Sweden (24%),[13] suggesting that limited accessibility represents a systemic implementation gap rather than an issue unique to lower-income settings. Recent research has attributed this gap in part to insufficient clinician awareness; some healthcare professionals have even reported that they have never heard of pulmonary rehabilitation, underscoring the need for enhanced education and training.[14] In addition, a study from the United Kingdom identified time constraints, unclear referral pathways, and lack of feedback mechanisms as major barriers, emphasizing the importance of improved communication and structured referral systems to increase PR uptake.[15] Consequently, the heterogeneity observed in the PR landscape in Türkiye highlights the need for unified national strategies to standardize and integrate PR into routine respiratory care. Moreover, the geographical clustering of responding centers—particularly the predominance of İstanbul and the Marmara Region—may reflect broader regional disparities in healthcare infrastructure, workforce availability, and socioeconomic context. Although the present study was not designed to formally assess socioeconomic determinants, the observed regional distribution provides important contextual insight into potential structural influences on PR availability and underscores the importance of region-sensitive planning in future implementation efforts.

According to international standards, PR programs should be delivered by an interdisciplinary team with clearly defined professional roles. The American Thoracic Society (ATS) guidelines recommend a core team consisting of a physician, physiotherapist, and nurse, each contributing expertise in medical oversight, exercise prescription, and symptom management, respectively. Additional professionals, such as dietitians, psychologists, and occupational therapists, are recommended to ensure holistic patient care.[2,3] However, in this survey, only one-third of centers providing PR services met this minimum staffing requirement, indicating a substantial shortfall in the multidisciplinary infrastructure necessary for comprehensive PR delivery. In these centers, physiotherapists and pulmonologists were the most consistently involved professionals, whereas nurses, dietitians, and psychologists participated less frequently. This pattern reflects the global variability in multidisciplinary team composition reported in previous studies.[11,13] In particular, the limited involvement of dietitians and psychologists mirrors international trends and likely reflects workforce constraints or underrecognition of the biopsychosocial dimensions of PR. In addition, the lim-

ited integration of educational and psychosocial counseling components suggests that the holistic model recommended by current guidelines has not yet been fully implemented.[2,3] Strengthening multidisciplinary collaboration and incorporating broader professional expertise may enhance the comprehensiveness and sustainability of PR services within Türkiye's healthcare system.

Most centers routinely assessed pulmonary function (90%) and exercise capacity (81%) using standardized measures such as spirometry and the six-minute walk test, in line with international guideline recommendations.[2] However, the lack of routine cardiopulmonary exercise testing represents a critical gap, as this assessment provides objective and standardized data for individualized exercise prescription and may significantly improve the effectiveness and safety of PR programs. Moreover, fewer centers assessed nutritional status, psychological well-being, or quality-of-life outcomes, reflecting the heterogeneity in outcome assessment previously reported across PR programs worldwide.[3,11] Evidence suggests that program effectiveness is influenced by its design and the inclusion of educational and psychosocial components.[16] In our cohort, PR programs most frequently targeted patients with COPD (100%), followed by bronchiectasis (74%), interstitial lung disease (71%), intensive care-related conditions (61%), and thoracic surgery cases (58%), indicating that PR delivery in Türkiye remains predominantly COPD-focused, similar to global trends.[6,17] While the 60% patient acceptance rate in our survey suggests a general willingness to participate, many patients may never receive a formal referral or offer for PR. Reported barriers to participation included transportation difficulties (71%), financial constraints (58%), and lack of motivation (48%), consistent with findings from other regions.[7,8] In addition to patient-related challenges, systemic barriers such as unclear referral pathways, time constraints, and limited professional feedback further hinder participation.[15,18] To address these accessibility issues, emerging approaches such as web-based or home-based telerehabilitation may help sustain patient engagement.[19]

Overall, the findings of this survey highlight both encouraging progress and persistent disparities in PR delivery across Türkiye. Although the presence of active programs in several institutions reflects growing recognition of pulmonary rehabilitation as an essential component of respiratory care, substantial variability in access, workforce capacity, and program content remains a significant challenge. Recent clinical statements from the British Thoracic Society have emphasized the importance of equitable access, standardized quality frameworks, and the incorporation of home-based and digital models to expand PR availability and sustainability.[20] Similarly, recent reports have underscored that embedding PR within existing healthcare pathways, securing reimbursement mechanisms, and promoting national audit systems are critical for long-term integration.[6] The implementation of post-discharge referral protocols, systematic follow-up, and targeted awareness initiatives has been shown to improve enrollment and participation.[21] Regional experiences indicate that successful large-scale implementation depends on the integration of local leadership, interprofessional collaboration, and supportive health policies.[22] In this context, the similarities observed between Türkiye and other countries regarding implementation barriers also underscore the value of professional engagement and experience sharing. Active participation in scientific platforms and professional societies may facilitate the dissemination of best practices, strengthen interdisciplinary collaboration, and support the development of more consistent and sustainable pulmonary rehabilitation services. Beyond its clinical benefits, pulmonary rehabilitation has also been associated with reduced healthcare utilization, including fewer hospital admissions and shorter lengths of stay, suggesting potential cost savings for healthcare systems. From this perspective, strengthening PR capacity may contribute not only to improved patient outcomes but also to the long-term sustainability of national social security and reimbursement systems facing increasing economic pressure.

This study has several limitations that should be acknowledged. The survey relied on self-reported responses and may therefore reflect subjective interpretation or institutional bias. In addition, there is currently no centralized national registry or official database documenting the number or distribution of pulmonary rehabilitation centers in Türkiye. Consequently, it was not possible to determine the total number of eligible centers nationwide or to calculate a formal response rate. Although the participating centers represented a broad geographic distribution, the absence of national baseline data limits the ability to assess sample representativeness, and the overall sample size was relatively small. The cross-sectional design also precluded causal or temporal analyses, and only descriptive statistics were applied. Future studies

involving larger and more diverse samples, longitudinal follow-up, and direct comparisons between public and private sectors are warranted. Furthermore, incorporating patient perspectives and outcome-based evaluations could provide a more comprehensive understanding of PR implementation and its nationwide impact.

Conclusion

This nationwide survey provides the first comprehensive overview of pulmonary rehabilitation practices across Türkiye. The findings indicate that, although PR is increasingly recognized and implemented, substantial variation persists in service organization, staffing, and program content. While several centers offer PR services, our data show that only approximately one-third meet the recommended minimum core team composition of a physician, physiotherapist, and nurse. Access to PR remains uneven, and both patient-related and systemic barriers continue to limit participation. Addressing these challenges will require coordinated national strategies that promote workforce development, professional awareness, and equitable resource distribution. Strengthening collaboration between clinicians, policymakers, and professional societies will be essential to integrate PR as a standard and sustainable component of respiratory care nationwide.

Informed Consent

All respondents provided electronic informed consent prior to completing the survey.

Conflicts of Interest

The authors have no conflicts of interest to declare.

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Use of AI for Writing Assistance

No use of AI-assisted technologies was declared by the authors.

Author Contributions

Concept – G.G.; Design – G.G., M.Z., B.A., N.A., S.T.; Supervision – G.G.; Resource – G.G., M.Z., B.A., N.A., S.T.; Data Collection and/or Processing - G.G., M.Z., B.A., N.A., S.T.; Analysis and/or Interpretation - G.G., M.Z., B.A.; Literature Review –M.Z., B.A.; Writing – M.Z., B.A.; Critical Review – G.G., N.A., S.T.

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Appendix 1: Geographic distribution of responding centers

All responding centers (n=40)		PR-providing centers (n=31)		Centers with active PR units (n=15)	
İstanbul	14 (35.0%)	İstanbul	11 (35.5%)	İstanbul	7 (46.7%)
Ankara	5 (12.5%)	Ankara	5 (16.1%)	Ankara	3 (20.0%)
Bursa	3 (7.5%)	Bursa	3 (9.7%)	Bursa	2 (13.3%)
İzmir	3 (7.5%)	İzmir	3 (9.7%)	İzmir	1 (6.7%)
Aydın	2 (5.0%)	Malatya	2 (6.5%)	Düzce	1 (6.7%)
Malatya	2 (5.0%)	Kocaeli	1 (3.2%)	Malatya	1 (6.7%)
Tekirdağ	1 (2.5%)	Düzce	1 (3.2%)		
Kocaeli	1 (2.5%)	Aydın	1 (3.2%)		
Çanakkale	1 (2.5%)	Denizli	1 (3.2%)		
Eskişehir	1 (2.5%)	Ordu	1 (3.2%)		
Düzce	1 (2.5%)	Tokat	1 (3.2%)		
Denizli	1 (2.5%)	Gaziantep	1 (3.2%)		
Ordu	1 (2.5%)				
Tokat	1 (2.5%)				
Kayseri	1 (2.5%)				
Yozgat	1 (2.5%)				
Gaziantep	1 (2.5%)				

Appendix 2: Geographical regions of responding centers

	All responding centers (n=40)	PR-providing centers (n=31)	Centers with active PR units (n=15)
Marmara Region	20 (50.0%)	15 (48.4%)	9 (60.0%)
Central Anatolia Region	8 (20.0%)	5 (16.1%)	3 (20.0%)
Aegean Region	6 (15.0%)	5 (16.1%)	1 (6.7%)
Black Sea Region	3 (7.5%)	3 (9.7%)	1 (6.7%)
Eastern Anatolia Region	2 (5.0%)	2 (6.5%)	1 (6.7%)
Southeastern Anatolia Region	1 (2.5%)	1 (3.2%)	0 (0.0%)
Mediterranean Region	0 (0.0%)	0 (0.0%)	0 (0.0%)