Original Article

National Control of Tuberculosis: Does Primary Health Care System Play a Crucial Role in the Fight Against Tuberculosis?

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Abstract

OBJECTIVES: To analyze the tuberculosis control studies in a primary health care center and to observe the changes throughout the years.

MATERIALS AND METHODS: Data of patients followed up between 2005 and 2014 in the Elazığ Dispensary were investigated retrospectively.

RESULTS: Of the total 1,251 patients, 51.6% were male. Majority of patients were aged between 15 and 24 (19.9%), 25 and 35 (18.5%), and over 65 (14.4%). While the rate of a sputum smear examination was 71.6%, the positivity rate for Acid-Fast bacilli was 55.5%. It was detected that the drug sensitivity test was applied in only 25.8% of all patients. The treatment success of all patients was 85.8%. The cure rate of smear-positive cases was found to be 26.35%. The rate of the relapsing patients was 9.1%. An overall treatment response rate was found to be 87.4%.

CONCLUSION: The control of tuberculosis in primary health care is partially successful and insufficient. The rate of smear-positive defaulters was found to be high in young adult individuals, which indicates that the contamination is probably still going on at a dangerous rate. Furthermore, the overall rate of microscopic examination, sputum culture, and drug sensitivity tests performed in patients in the primary health care system is low and should be improved immediately.

KEYWORDS: Control, dispensary, tuberculosis

INTRODUCTION

Tuberculosis (TB) is still one of the most fatal diseases, both in our country and the world. Successful treatment of TB infection is essential for disease control. It is estimated that in 2014, a total of 9.6 million of people suffered from TB globally, and 1.2 million has died [1]. Likewise, considering overall situation in the world, as well as in Turkey, TB is a disease that should be fought decisively and systematically, which is a major threat for the general health of the society. Dispensaries play the most important role in the TB treatment in our country. As a primary health care center, they perform the main operations, which enables all individuals or patients to benefit from the best preservation techniques and also diagnosis and treatment by itself or the contribution of the other institutions, regarding the "strategy to stop TB and international standards" for TB care [2].

In the world, there is a global control program for TB run by the World Health Organization (WHO). In Turkey, there is a TB control program that holds the same standards [2]. In our country, starting from the year 2010, the actions regarding the establishment of dispensaries for each city, at least one, has started, and each of them will be serving at least 500,000. Currently, the number of active dispensaries in our country is 179. The studies coordinated by the Elazig dispensary, located in the city center, are still going on. In the districts of Elazığ, there are no TB dispensaries [3]. Therefore, the patients who have contributed to the studies represent the general picture of Elazığ. Since the data about the patients were recorded in the related registers properly, reaching the data was simple and also trustworthy. It is beneficial to see 10 years' worth of data together and show the alterations throughout the years. The city where the studies are run is in the Eastern Anatolian Region of Turkey and has a population of 568,753 according to the 2014 data [4].

In the light of this aim, we have investigated the data of the TB dispensary in Elazığ.

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MATERIAL AND METHODS

Data Collection and Analysis

The Ministry of the Health publishes a report about the control of TB in Turkey by analyzing the data of patients registered in TB dispensaries. In this scope, we have shaped our study by taking this report as a major reference. The study is based on all the records of the dispensaries of the tuberculosis control in Elazığ. We have examined the data of the clients retrospectively, which were recorded in the TB dispensary of Elazığ between the years 2005 and 2014. Patient information was collected, including age, gender, the form of TB (pulmonary and extrapulmonary), type of TB (smear-positive or negative), category of TB (new cases, relapse, or retreatment cases), and treatment outcomes. The diagnosis of TB was based upon the American Thoracic Society (ATS) guidelines for TB diagnosis. The ATS recommendation is the following: Acid-Fast bacilli (AFB) smear microscopy should be performed, rather than no AFB smear microscopy, in all patients suspected of having pulmonary TB (strong recommendation, moderate-quality evidence). The testing of three specimens is considered the normative practice pervasive issue of a poor sample quality [5].

Treatment Regimen and the Evaluation of Treatment Outcomes

Treatment was based on four major drugs. All patients were treated with isoniasid (300 mgr/day), rifampicin (600 mgr/day), pyrazinamide (2000 mgr/day), and ethambutol (1500 mgr/day) according to the national TB program recommended doses [6]. The standard anti-TB treatment with four drugs was continued for 2 months initially, and maintenance therapy was made with isoniasid and rifampicin for minimum 4 months. All cases were followed up at TB dispensary and treated with partial or total directly observed treatment (DOT). The treatment response was evaluated according to microbiological, radiological, and clinical findings. Smear conversion was estimated as the time (in weeks) from the initiation of treatment to the first two consecutive negative AFB smears. Treatment outcomes were categorized according to the following WHO criteria (1): a) cured-a pulmonary TB patient with bacteriologically confirmed TB at the beginning of treatment, who was smear- or culture-negative in the last month of treatment and on at least one previous occasion; b) completed treatment-a patient with TB who completed treatment without evidence of failure but with no record to show that sputum smear or culture results in the last month of treatment and on at least one previous occasion were negative, either because tests were not done or because results were unavailable; c) died-a patient who died for any reason during the course of treatment; d) treatment failure-at the end of 5th month or longer during treatment, smear remains or becomes positive for AFB; e) treatment defaulter-any patient whose treatment is interrupted for two consecutive months or more after the date of the last attendance during the course of treatment; f) transfer out-a patient who was transferred to another center during treatment, and the ultimate treatment response is unknown. All the subjects provided written informed consent. Ethics committee approval was received for this study from the ethics committee of Dr. Abdurrahman Yurtaslan Ankara Oncology Training and Research Hospital with date 08.2018 and number 2018-08/122.

Study Design

A case-descriptive study was performed focusing on data of the patients with TB followed up in the Elazığ dispensary between the years 2005 and 2014, and dispensary reports are used. This is a national, retrospective, and non-interventional study.

Statistical Analysis

All the statistical analyses were performed using the Statistical Package for the Social Sciences software version 24.0 (SPSS IBM Corp.; Armonk, NY, USA) and mainly descriptive statistics.

RESULTS

The 51.6% of patients were male, and 48.4% were female. When the target organ involvement of TB was evaluated, 57.1% of patients were pulmonary and 42.9% were extra pulmonary. While the number of male patients had the tendency to decrease throughout the years, the number of female patients was variable, and it also had the tendency to decrease in 4 years (Table 1).

It was determined that, in the distribution of the ages, the majority of the patients were between the ages 15 and 24 (19.9%), 25 and 35 (18.5%) and 65+ (14.4%). When the distribution of the patients' case definitions was considered, it was found out that 90.9% percent of the patients had not been given a TB treatment before (new cases).

It was found out that 4.9% of cases were relapsing, and 3% of the cases were treatment defaulters. 1% and 0.1% of cases were found to be treatment failures and cases with chronic TB infection, respectively (Table 1).

According to the microbiological evaluations, of the 714 pulmonary tuberculosis patients, 511 (71.6%) have been performed sputum smear and 396 (55.5%) of them were found to be smear positive cases. The sputum culture has been obtained from 337 (52.8%) patients, and the positivity rate was 35.4% with 253 patients. Only 175 (25.8%) patients underwent a drug sensitivity test (Table 2). While calculating the microbiological examinations on pulmonary tuberculosis cases, we based our calculations on the overall number of pulmonary cases (Table 2). We think that, in the evaluation of the TB control programs, the real calculation of the microbiological examination in practice should be based on the way that is parallel to the national TB control report.

When the treatment results of all cases were evaluated, the treatment success rate was 85.8%, the treatment defaulter rate was 9.3%, the failure of the treatment rate was 0.9%, and the death rate was 4%. There is an increase in the percentage of success of treatment, and a decrease in the percentage of treatment defaulters with time (Table 3). The cure rate in smear-positive pulmonary TB cases is 26.3%; however, the treatment success (cured+treatment completed cases) rate is 87.4%. The rate of treatment defaulters was 9.1%, and the rate of death was 2.5% (Table 4).

We were able to reach the data of DOT just after September 2009, and we have accepted the year 2010 as the initiation point. It has been observed that within years, the application

Table 1. Gender distribution and site involvement according to years and patient distribution according to case descriptions

	Male	Female	Pulmonary	Extrapulmonary	New cases	Relapsing	Treatment defaulter	Treatment failure	Chronic TB infection	Total
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n
2005	112 (55.7)	89 (44.3)	123 (61.2)	78 (38.8)	173 (86)	9 (4.5)	11 (5.5)	7 (3.5)	1 (0.5)	201
2006	75 (52.8)	67 (47.2)	92 (64.8)	50 (35.2)	133 (93.7)	6 (4.2)	3 (2.1)	-	-	142
2007	81 (57.9)	59 (42.1)	81 (57.9)	59 (42.1)	132 (94.3)	7 (5)	1 (0.7)	-	-	140
2008	73 (61.3)	46 (38.7)	71 (59.7)	48 (40.3)	104 (87.4)	7 (5.9)	8 (6.7)	-	-	119
2009	61 (50.4)	60 (49.6)	71 (58.7)	50 (41.3)	113 (93.4)	7 (5.8)	1 (0.8)	-	-	121
2010	63 (48.5)	67 (51.5)	71 (54.6)	59 (45.4)	124 (95.4)	3 (2.3)	3 (2.3)	-	-	130
2011	48 (51.6)	45 (48.4)	56 (60.2)	37 (39.8)	88 (94.6)	3 (3.2)	2 (2.2)	-	-	93
2012	58 (53.7)	50 (46.7)	49 (45.3)	59 (54.7)	90 (83.3)	8 (7.4)	4 (3.7)	6 (5.6)	-	108
2013	41(44.1)	52(55.9)	53 (56.9)	40 (43.1)	88 (94.6)	3 (3.2)	2 (2.2)	-	-	93
2014	34 (32.7)	70 (67.3)	47 (45.1)	57 (54.9)	92 (88.5)	9 (8.6)	3 (2.9)	-	-	104
Total	646 (51.6)	605 (48.4)	714 (57.1)	537 (42.9)	1,137 (90.9)	62 (4.9)	38 (3)	13 (1)	1 (0.1)	1,251

TB: tuberculosis

Table 2. Results of microbiological findings of the tuberculosis cases presented by years

Year	Total pulmonary cases	Performed sputum smear	Positivity of sputum smear	Performed sputum culture	Positivity of sputum culture	Performed drug sensitivity test
	n	n (%)	n (%)	n (%)	n (%)	n (%)
2005	123	73 (59.3)	55 (44.7)	71 (57.7)	44 (35.8)	28 (22.7)
2006	92	59 (64.1)	49 (53.3)	51 (55.4)	38 (41.3)	28 (30.4)
2007	81	51 (63)	45 (55.6)	23 (28.4)	14 (17.3)	4 (4.9)
2008	71	55 (77.5)	43 (60.6)	31 (43.7)	25 (35.2)	18 (25.4)
2009	71	47 (66.2)	33 (46.5)	29 (40.8)	23 (32.3)	15 (21.1)
2010	71	46 (64.8)	36 (50.7)	31 (43.6)	17 (23.9)	13 (18.3)
2011	56	48 (85.7)	34 (60.7)	34 (60.7)	24 (42.9)	14 (25)
2012	49	45 (91.8)	39 (79.5)	34 (69.3)	22 (44.9)	17 (34.6)
2013	53	47 (88.6)	27 (50.9)	39 (73.6)	20 (37.7)	14 (26.4)
2014	47	40 (85.1)	35 (74.4)	34 (72.3)	25 (53.1)	19 (40.4)
Total	714	511 (71.6)	396 (55.5)	377 (52.8)	253 (35.4)	170 (25.8)

Table 3. Treatment outcome rates for all cases

|	Number of cases	Treatment success	Treatment defaulter	Treatment failure	Death
	n	n (%)	n (%)	n (%)	n (%)
2005	193	156 (80.8)	25 (13.0)	2 (1.0)	10 (5.0)
2006	142	114 (80.3)	23 (16.2)	1 (0.7)	4 (2.8)
2007	139	119 (85.6)	19 (13.6)	-	1 (0.7)
2008	115	99 (86.1)	15 (13)	-	1 (0.9)
2009	120	103 (85.8)	11 (9.2)	-	6 (5)
2010	123	112 (91)	5 (4.1)	1 (0.8)	5 (4.1)
2011	93	81 (87.1)	3 (3.2)	4 (4.3)	5 (5.3)
2012	95	82 (86.3)	5 (5.3)	1 (1.1)	7 (7.4)
2013	84	74 (88.1)	4 (4.7)	2 (2.3)	4 (4.7)
2014	104	96 (92.3)	3 (2.9)	-	5 (4.8)
Total	1,208	1,036 (85.8)	113 (9.3)	11 (0.9)	48 (4)

Table 4. Treatment outcomes of smear-positive pulmonary TB cases

	Total number of cases n	Cured n (%)	Treatment success n (%)	Treatment defaulter n (%)	Treatment failure n (%)	Death n (%)
2005	55	1 (1.8)	46 (83.6)	7 (12.7)	1 (1.8)	1 (1.8)
2006	49	1 (2)	42 (85.7)	6 (12.2)	-	1 (2.0)
2007	45	14 (31.1)	35 (77.3)	9 (20.5)	-	1 (1.3)
2008	43	-	37 (86)	6 (14)	-	-
2009	33	12 (36.4)	29 (87.9)	2 (6.1)	-	2 (6.1)
2010	36	27 (75)	31 (86.1)	2 (5.6)	1 (2.8)	2 (5.6)
2011	34	5 (14.7)	30 (88.2)	2 (5.9)	1 (2.9)	1 (2.9)
2012	39	15 (38.5)	34 (87.2)	2 (5.1)	1 (2.6)	2 (5.1)
2013	27	14 (51.9)	27 (100)	-	-	-
2014	35	15 (42.9)	35 (100)	-	-	-
Total	396	104 (26.3)	346 (87.4)	36 (9.1)	4 (1)	10 (2.5)

Table 5. DOT Strategy

	Total number of patients	Patients DOT not applied	Number of patients DOT applied by HCW(*)	Number of patients DOT applied not by HCW(*)	DOT application percentage (%)	DOT application percentage by HCW(*)(%)
2010	130	7	45	78	94.6	34.6
2011	93	2	53	38	97.8	56.9
2012	108	3	63	42	97.2	58.3
2013	93	0	63	30	100	67.7
2014	104	0	68	36	100	65.3

*: HCW, health care workers; DOT: directly observed treatment
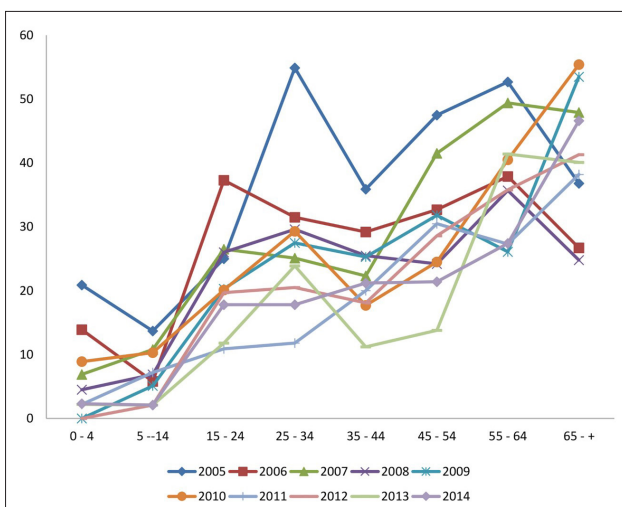
Figure 1. Case notification rate regarding the age of the TB cases in Elazığ: 2005–2014

When the case notification rate of TB according to the age groups was analyzed for 10 years, it was realized that the majority of the patients was young. When the graph of the TB case notification rate regarding the age groups was observed, a sudden increase among the ages 15–24 and in the elderly group was observed, which continued with a few fluctuations on the line (Figure 1).

DISCUSSION

Global and national fight against the TB infection is essential with knowledge of epidemiologic features, such as the age groups that are more likely to be affected, areas with higher rates of tuberculosis, and patients' socioeconomic characteristics. Having knowledge about the TB situation in society enables an effective fight against the disease.

We have compared Elazığ's data of 10 years with the 2011 data from the Report of Tuberculosis Fight in Turkey published by the Ministry of Health. Since the year 2005, the ministry has reported the national annual data.

of DOT has reached nearly 100%. Also the percentage of DOT applied by heath care workers is currently increasing (Table 5). In 2009, the Ministry of Health issued a circular letter announcing a DOT strategy. In this letter, related forms and application methods were explained in detail.

A total of 43 (3.4%) patients registered in the dispensary were recognized as TB over-diagnosed during the follow-up period. Therefore, treatment outcomes of this group are not given in the study.

In our study, of all the cases, 51.6% were male, and 48.4% were female. Throughout the years, the female cases have increased from 44.3% to 67.3%. Our country results revealed 58.6% male and 41.4% female patients with TB [3]. When the involvement of the systems with TB infection was evaluated in our study, 57.1% of cases were pulmonary, and 42.9% were extrapulmonary. It was also observed that the number

of cases of pulmonary TB has decreased; however, extra pulmonary tuberculosis has increased with time. According to the Elazığ data, extrapulmonary TB rate has increased from 38.8% to 54.9% ultimately across all the years. In a study that included dispensaries of Çorum, it was reported that the rate for pulmonary TB was 63.7%, and 36.3% for extrapulmonary tuberculosis. Similar studies were performed in different regions such as Isparta, İstanbul, and Şanlıurfa, and the extrapulmonary TB rates were found at 21.7%, 20.9%, and 28.8%, respectively [7, 8]. Relatively higher rates of extrapulmonary TB cases in Elazığ reveal that the contamination of infection has partially decreased with the help of the control program. Our subjective opinion about this rate is that effective TB control programs applied as a national approach might have relatively reduced the pulmonary involvement.

It was observed that the accumulation in age groups 15–24, 25–35, and >65 years was 19.9%, 18.5%, and 14.4%, respectively. The similar age groups were examined in the Çorum study, and the rates of TB were found as 14.4%, 17.1%, and 16.8%, respectively [7]. Also, in a study performed in İstanbul, the rates were found to be 36%, 27%, and 2.9%, respectively for the above-mentioned age groups [8]. When the graphic of case notification rate regarding the ages is examined, it is vivid that there is a sudden increase between the ages 15 and 24, and the increase is maintained with a few fluctuations. The reason is that the majority of the population consists of young individuals [4]. The age distribution is similar to the one in countries that apply successful control programs, have a low rate of incidence, and the disease is seen in elderly. It is also similar to the one in countries that have a high rate of incidence, and the disease is seen in young adults. This situation shows us that the epidemic of tuberculosis is still an ongoing issue in Elazığ, and there is a partial success in tuberculosis control. When the years 2005 and 2014 are compared, while the rate was 27.9% in the year 2005 in the age group 15–24, in the year 2014, the rate decreased to 17.3%; in 2005, the rate of the age over 65 was 7.5%, which increased up to 22.1% in the year 2011.

When the distribution of the patients' case definition is observed, the rate of new cases was found to be 90.9%. The rate of relapsing cases was 4.9%, the rate of treatment defaulters was 3%, and the rate of treatment failure and chronic cases was 1% and 0.1%, respectively. A remarkable difference between the relapsing cases was found in a study performed in İstanbul with a rate of 7.5% [8]. According to the overall Turkish data in 2011, the rate of new cases was 92%, relapse was 6.3%, the rate of treatment defaulter was 1.1%, the rate for treatment failure was 0.6%, and the rate of chronic patients was 0.03%. We think that since the rate of "treatment failure" and "chronic cases" has decreased, we are running a partially successful program in Elazığ [3].

Considering the microbiological examinations, which were performed in 714 patients with pulmonary TB, the rate of microscopic examination was 71.6%; otherwise the diagnosis was based upon clinical and radiological suspicion. The microscopic examination rate was higher in Çorum dispensaries (83.5%). The AFB positivity rate in sputum was 55.5%; the application of the sputum culture rate was 52.8%, and

the sputum culture positivity rate was 25.8%. The rate of the application of microscopic examination, sputum culture and drug sensitivity test was substantially low. Throughout the years, these rates have decreased. In the calculations from the Reports of Fight of Tuberculosis (2007–2010), the rates of pulmonary TB are mentioned and included [6].

The inefficiency in diagnosing should be eliminated, and also the microbiological treatments should be used wisely in diagnosis and treatment. Primary health care facilities should be extended for more microbiological approaches. The education and awareness of health care workers is an essential issue.

When the treatment results are evaluated, the city-based success rate is 85.8%, and it is lower than the country average. The success rate is 89.2% in Turkey [3]. Also, in Turkey, in 2010, the defaulters rate for all the cases was 2.7% [3]. In the city of Elazığ, this rate was 9.3%. Even though the rate of the treatment defaulters, starting from the year 2005, has decreased, it is still not below the Turkey average. In a previous study by Sahile et al. [9] and Zinatsa et al. [10] , non-adherence to TB treatment was a major problematic issue with the need for DOTS service providers and more training.

In the city of Elazığ, the cure rate for smear-positive pulmonary TB was 26.3%, and the success rate of treatment (cured + treatment completed cases) was 87.4%. When the whole country is evaluated, within the all data recorded to the dispensaries in 2010, the rate of cure of smear-positive pulmonary TB is 59.1%, and the success rate of treatment is 88.2% [3]. It is a great problem to have a low cure rate around the region for TB control. A microbiological treatment should be used for diagnosis, follow-up, and treatment ending; this problem should be improved immediately. Within the all cases and also smear-positive pulmonary TB cases, the treatment defaulter rate was 9.9%, which is high, and which creates a major problem for TB control. Non-adherence to treatment is a major problem in our country as well as other countries. In our study, the treatment discontinuation rate among young adult clients is high, which indicates that defaulters change their cities and lives to seek for new seasonal jobs out of the region. Also, migration is another problematic issue that ruins the treatment and follow-up schedule. Our results are contrary to the study of Anunnatsiri et al. [11], which revealed other than young clients; people older than 60 years were found to be defaulters or had a treatment failure.

In general, the sputum culture is an important tool to confirm patients with noncontagious TB. Also, the use of a serial sputum examination has been described as the most definite, cost-effective, and dependable test for an accurate diagnosis of pulmonary TB [12].

The rate of application of microscopic evaluation, sputum culture, and drug sensitivity test for the patients with pulmonary tuberculosis in primary health care centers was found to be not enough, and thus, it should be developed. Microbiologic diagnostic approaches should be focused, and more confirmation of diagnosis rather than clinical suspicion should be an initiation point for therapy in the daily practice of dispensaries. The rate of defaulters was found to be high in

young adult patients, which indicates that contamination is still at a dangerous level. Since young people are at the peak of social life and in close contact and relationship with their partners, children, and friends, this group of patients should be focused for an efficient TB fight. The percentage of the patients who discontinued treatment is high. The influential factors (age, gender, social-economic situation, etc.) should be evaluated in a more detailed way, and a DOT application by health care workers is a necessary issue for TB control. Aforementioned lacking points in our study should be considered and eliminated immediately.

Our study has some limitations due to its retrospective design and is completely based on dispensary data reported primarily by heath care providers. Subjective approaches and alterations in health care professionals might have affected data collection.

In our study, no data were obtained with regard to etiological factors for extrapulmonary involvement, so this situation can be considered to be our retrospective data limitation.

Tuberculosis in the world, as well as in our country, is a lethal but preventable disease that needs struggling decisively, globally and systematically not only at the moment but also in the future. Accurate detection and treatment of smear-positive and latent patients with TB are major components of the TB control and prevention. Dispensaries play the most important role in the TB treatment in our country. As a primary health care center, dispensaries perform the main operations that enable all individuals or patients to benefit from the best preservation techniques and also diagnosis and treatment by itself or the contribution of the other institutions. In the city of Elazığ, the control of tuberculosis is partially successful and insufficient. The rate of smear-positive defaulters was found to be high in young adult individuals, which indicates that contamination is probably at a dangerous level. The rate of microscopic examinations, sputum culture, and drug sensitivity tests performed in patients in primary health care centers is low, and it should be improved immediately. If these problems are solved in the region, we will probably not face such issues in general. Therefore, conducting studies based on regions will direct and highlight national control programs.

REFERENCES

1. World Health Organization. Global Tuberculosis Report 2015; 2015. Avaible from: http://apps.who.int/iris/bitstream/handle/10665/191102/9789241565059_eng.pdf;jsessionid=FEA8C6F803082B2678CA8288E098A150?sequence=1
2. Turkish Republic Ministry of Health. The Guideline of Tuberculosis Diagnosis and Treatment; 2011. Avaible from: https://dosyaism.saglik.gov.tr/Eklenti/9042,tuberkuloz-tani-tedavi-rehberipdf.pdf?
3. Yıldırım A, Mutlu SM, Baykal F. The Report for Tuberculosis Fight in Turkey; 2014. Available from: http://tuberkuloz.thsk.saglik.gov.tr/Dosya/Dokumanlar/raporlar/turkiyede_verem_savasi_2014_raporu.pdf
4. Turkish Institution of Statistics. Basic Statistics -> Population and Demography. Avaiable from: http://www.tuik.gov.tr/UstMenu.do?metod=temelist
5. Diagnostic Standards and Classification of Tuberculosis in Adults and Children. This official statement of the American Thoracic Society and the Centers for Disease Control and Prevention was adopted by the ATS Board of Directors, July 1999. This statement was endorsed by the Council of the Infectious Disease Society of America, September 1999. Am J Respir Crit Care Med 2000;161:1376-95. **[CrossRef]**
6. Gümüşlü F, Özkara Ş, Özkan S, Baykal F, Güllü Ü. The Report for Tuberculosis Fight in Turkey; 2007. Avaiable from: http://www.verem.org.tr/pdf/verem_savasi_2007_raporu.pdf
7. Özdemir T, Türkkanı MH, Yılmaz Aydın L, et al. Provincial assessment in the scope of the tuberculosis control program . Tuberk Toraks 2014;62:183-90.
8. Talay F, Altın S, Çetinkaya E, Kümbetli Ş. İstanbul Eyüp Verem Savaş Dispanserindeki Tüberküloz Hastalarının Değerlendirilmesi. Van Tıp Dergisi 2003;10:40-5.
9. Sahile Z, Yared A, Kaba M. Patients' experiences and perceptions on associates of TB treatment adherence: a qualitative study on DOTS service in public health centers in Addis Ababa, Ethiopia. BMC Public Health 2018;18:462. **[CrossRef]**
10. Zinatsa F, Engelbrecht M, van Rensburg AJ, Kigozi G. Voices from the frontline: barriers and strategies to improve tuberculosis infection control in primary health care facilities in South Africa. BMC Health Serv Res 2018;18:269. **[CrossRef]**
11. Anunnatsiri S, Chetchotisakd P, Wanke C. Factors associated with treatment outcomes in pulmonary tuberculosis in northeastern Thailand. Southeast Asian J Trop Med Public Health 2005;36:324-30.
12. Tetteh AK, Agyarko E, Otchere J, et al. An Evaluation of Treatment Outcomes in a Cohort of Clients on the DOTS Strategy, 2012-2016. Tuberc Res Treat 2018;2018:4287842. **[CrossRef]**