10.15789/2220-7619-SSP-1709

SPUTUM SMEAR POSITIVITY GRADE AND CHEST X-RAY FINDINGS IN TUBERCULOSIS: A CROSS-SECTIONAL STUDY

Razieh behzadmehr ,
Elham Nejadkehkha

Department of Radiology, Zabol University of Medical Sciences, Zabol, Islamic Republic of Iran

ПОЛОЖИТЕЛЬНОСТЬ МАЗКА МОКРОТЫ И РЕНТГЕНОВСКОГО ОБСЛЕДОВАНИЯ ГРУДНОЙ КЛЕТКИ ПРИ ТУБЕРКУЛЕЗЕ: ОДНОМОМЕНТНОЕ ИССЛЕДОВАНИЕ

Разиех Бехзадмехр,
Эльхам Неджадкеха

Отделение радиологии, Заболский университет медицинских наук, Забол, Исламская Республика Иран

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

Abstract. Despite many advances in the diagnosis, screening, and rapid treatment of tuberculosis, it is still a public health concern in the world. Due to the importance of this issue in diagnosis and reduction of transmission of infection and treatment of the disease especially where this study is conducted due to the high prevalence of tuberculosis, this study was done to determine The relationship between sputum smear positivity grade and chest X-ray findings in pulmonary tuberculosis patients in a hospital in southeast of Iran. This cross-sectional study was performed on all patients with pulmonary TB referencing the health centers in Zabol city, southeast of Iran from 1 January 2015 to 30 December 2020. Sputum smear and radiographic findings of the chest X-ray were evaluated. Data was collected using a form of information and finally analyzed by SPSS 22. Out of 101 patients examined in the present study, 71 were women and 30 were men. The mean age of the patients was 62.68 ± 13.61 years. The frequency of opacity in patients with grades 1, 2, and 3 was 71.4, 78.5, and 76.5%, respectively. Frequency of cavitation in patients with Grade 1, 2 and 3 was 11.5%, 28.5% and 52.9% respectively (P value 0.001). The frequency of reticulonodular presentations in patients with grade 1, 2, and 3 was 24.2, 7.1, and 0%, respectively. In general, the results of this study showed that, with increasing grading of smears (1+, 2+, and 3+), the frequency of cavitation presentation increased significantly and the frequency of reticulonodular presentations decreased significantly. In general, the results of this study showed that, with increasing grading of smears (, the frequency of Cavitation presentation increased significantly and the frequency of reticulonodular presentations decreased significantly. The findings of the present study can help physicians better diagnose TB.

Keywords: Cross-Sectional Studies; Sputum; Iran; X-Rays; Tuberculosis; Radiography

Резюме. Несмотря на многочисленные достижения в диагностике, скрининге и быстром лечении туберкулеза, он по-прежнему вызывает

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709
озабоченность общественного здравоохранения во всем мире. Ввиду важности этого вопроса для диагностики и снижения передачи инфекции и лечения заболевания, особенно там, где проводится настоящее исследование из-за высокой распространенности туберкулеза, мы определяли взаимосвязи между степенью положительного мазка мокроты и рентгенограммой грудной клеткой в виде радиологических находок у больных туберкулезом легких в больнице на юго-востоке Ирана. Это поперечное исследование было проведено на всех пациентах с легочным туберкулезом в медицинских центрах города Забол на юго-востоке Ирана с 1 января 2015 года по 30 декабря 2020 года. Были оценены мазки мокроты и рентгенологические данные грудной клетки, собранные с использованием бланка пациента и проанализированы с помощью программы SPSS 22. Из 101 пациента, обследованного в настоящем исследовании, 71 были женщинами и 30 мужчинами. Средний возраст пациентов составил 62,68 ± 13,61 года. Частота помутнения у пациентов 1, 2 и 3 степени составила 71,4, 78,5 и 76,5% соответственно. Частота каверн у пациентов со степенью 1, 2 и 3 составила 11,5%, 28,5% и 52,9% соответственно (значение P 0,001). Частота ретикулонодулярных признаков у пациентов 1, 2 и 3 степени составила 24,2, 7,1 и 0% соответственно. В целом, результаты этого исследования показали, что с увеличением градации мазков (1+, 2+ и 3+) частота появления кавитации значительно увеличивалась, а частота ретикулонодулярных проявлений значительно снижалась. В целом, результаты этого исследования показали, что с увеличением степени градации мазков частота появления кавитации значительно увеличилась, а частота ретикулонодулярных представлений значительно снизилась. Результаты настоящего исследования могут помочь врачам лучше диагностировать ТБ.

Ключевые слова: кросс-секционные исследования; Мокрота; Иран; Рентгеновские лучи; Туберкулез; Рентгенография

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

Introduction

Despite many advances in the diagnosis, screening, and rapid treatment of tuberculosis, it is still a public health concern in the world. According to the latest WHO report, more than 10 million people worldwide are infected with tuberculosis. Geographically, most TB patients are in Africa and EMRO [1].

According to the latest meta-analysis reports, the prevalence of TB in Iran is 23%[2] to 27%[3]. TB is the biggest cause of death among single-agent infectious diseases (even more so than AIDS, malaria, and measles) and has a tenth-highest global burden of disease, and is expected to continue to maintain its present status until 2020 [4]. The basis of the diagnosis of pulmonary tuberculosis is a direct and simple screening of susceptible patients. In the best of cases, the sensitivity of the sputum test to detect pulmonary tuberculosis is fifty to sixty percent [5]. By the standard definition, patients who experience at least two positive sputum smear tests, or have only a positive sputum smear test for bacilli acid-fast associated with radiographic changes in the chest X-ray, or a positive smear for acid bacilli in addition to a positive culture are considered as positive for active tuberculosis [6-8]. The grade of the smear is determined by the bacillary load in each microscopic field. Some studies have found that the grade of primary smear can be considered as a predictive factor of patient’s morbidity and mortality, which, in the case of a higher grade of positivity, it is more likely to be a failure in treatment and cause death [9,10]. In some studies, the relationship between the grade of primary positive smear and increased clinical manifestations has been stated [11]. Chest X-ray is also a suitable and sensitive diagnostic tool for detecting pulmonary lesions, including in tuberculosis, so that in the case of a normal chest X-ray, the diagnosis of tuberculosis is partially excluded [6,12]. On the other hand, in cases where this disease is actively sought, and when it is diagnosed at an early stage, pulmonary involvement can be a sign of our success in the early detection of these patients, resulting from radiographic findings [9]. Based on the researcher's best knowledge there is no study has been conducted to investigate the relationship between the findings of chest X-

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

ray radiography and the grade of positivity of sputum smear in Iran and especially Southeast of Iran as an area with a high prevalence of tuberculosis. According to the statistics of the Ministry of Health of Iran, Sistan and Baluchestan province and Zabol city are the most common cities for tuberculosis in Iran [13,14].

Some studies have been done in this regard, and due to the importance of this issue in diagnosis and reduction of transmission of infection and treatment of the disease especially where this study is conducted due to the high prevalence of tuberculosis, this study was done to determine The relationship between sputum smear positivity grade and chest X-ray findings in pulmonary tuberculosis patients in a hospital in southeast of Iran.

Methods

This cross-sectional study was performed on all patients with pulmonary TB referencing the health centers in Zabol city, southeast of Iran from 1 January 2015 to 30 December 2020.

In this study, the national TB diagnosis protocol based on the WHO guidelines was used to diagnose TB in included patients. Patients over 18 years of age were included. Patients without smear grading that had chest radiographs were excluded. A researcher-made checklist for collecting information. The checklist were containing demographic information, smear positivity grading, and chest radiographs. The study protocol approved has in the Ethics Committee of Zabol University of Medical Sciences. Written consent was obtained from all participants prior to the study. Participants were assured that their information would be kept confidential. STROBE checklist was used to report the study.

The patient's characteristics were described using descriptive tests including mean, standard deviation, frequency, and percentage. The Kolmogorov-Smirnov test was used to evaluate data normality. SPSS Version 22 for Windows (SPSS Inc., Chicago,

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

IL, USA) was used to analyze the data. The confidence interval of 95% and a significance level of P-value less than 0.05 was considered significant.

Results

Of the 101 participants, 71 (70.3%) were male and the rest were women. The mean age of patients was 62.68 years with a standard deviation of 13.61. The youngest and oldest patients were 18 and 86 years old respectively. The Women with a sputum positivity grade of 1, 2, and 3 were 73.3%, 50%, and 70.6%, respectively, and the prevalence of men in Grade 1, 2, and 3 was 25.7%, 50%, and 29.4%There was no significant difference between the two sexes in terms of smear grade ($p = 0.192$). The following table shows that the frequency of consolidation in 3 chest X-rays of patients with smear grade of 1, 2, 3 and was 71.4, 78.5, and 76.5%, respectively. This difference in the size of consolidation in patients with different grades was not statistically significant (Table 1). ($p = 0.833$)

The following table shows that the frequency of cavitation in patients with Grade 1, 2, and 3 was 11.5%, 28.5%, and 52.9% respectively. This difference in the frequency of cavity was statistically significant in three groups ($p = 0.001$) (table 2) The following table shows that **nodular** presentations in patients with grades 1, 2, and 3 were 18.6, 42.8, and 35.3%, respectively. This difference was not statistically significant in the three groups ($p = 0.086$). (table 3)

The following table shows that the prevalence of reticulonodular involvement in patients with Grade 1, 2, and 3 was 24.2%, 7.1%, and 0.0%, respectively. The difference between the frequency of reticulonodular involvement in the three groups was statistically significant. ($p = 0.022$). (Table 4)

Discussion

In this study, 101 patients with tuberculosis were examined. Among them, 71 (70.3%) were women and the rest were men. In the studied patients, 70 cases had

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

Grade 1 (74.3% female and 25.7% male), 14 had Grade 2 (male = female) and 17 Grade 3 (70.6% female and 35.7% male). There was no significant difference between the sexes in terms of smear grade. The findings of this study cannot be compared to any other studies because of the lack of similar research on the relationship between sex and grading of the smear. The mean age of patients was 62.68 years with a standard deviation of 13.61. The youngest and oldest patients were 18 and 86 years old. The mean age of patients with grades 1, 2, and 3 was 64.47, 62.07, and 55.82 years, respectively. The age difference of patients in different grades was not statistically significant. There was also no relationship between age and grading of the smear. The frequency of consolidation in patients with grades 1, 2, and 3 was 71.4, 78.5, and 76.5%, respectively. The difference in the degree of opacity in patients with different grades was not statistically significant. Although Grade 2 patients were more frequent than grade 1 and grade 3 patients, the difference between the three groups was not significant. There does not seem to be a relationship between the degree of smear and the consolidation in the graph. This finding is not consistent with other studies. In the study of BJ Parcell (2017), with increasing the degree of smear (+1, +2, +3 or +4), the frequency of consolidation increased significantly(in degrees +1, +2, +3, the frequency of consolidation was +4 81%, 95%, 100% respectively) [15]. In the study of KP Brahmapurkar, (2017), with increasing the grade of smear positivity, the number of cases also increased significantly [16] which can be the reason for this inconsistency. F Bisognin et al. (2019) also showed that the frequency of opacity increased with increasing the number of acid bacilli [17]. The difference between the findings of the present and other studies could be attributed to the fact that the present study focused on investigating chest radiographs based on smear grading, while other studies examined the relationship between CT scan and HRCT with smear grading. The frequency of cavitation in patients with grades 1, 2, and 3 was 11.5%, 28.5%, and 52.9% respectively. This difference in the frequency of cavity was statistically significant in the three groups. Different types of patients had different cavitation

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

levels; in patients with grade 3 cavitation, there was a significant increase in grade 3 and grade 1 patients. Therefore, there seems to be a relationship between the degree of smear and the presence of the cavity. In the M Saffari study, with the increase in the degree of smear (+1, +2, +3, or +4), the frequency of CT scan findings including cavitation also increased significantly, so that the frequency of cavitation cases in degrees +1, +2, +3, and +4 was 33%, 68%, 94% and 100% respectively [18]. In the study of A Penn-Nicholson (2019), with increasing the degree of smear, cavitation also increased significantly [19]. Matsuka (2004) also showed that the frequency of covariation increased with increasing the number of acid bacilli [20]. In the study of M Hassanzad et al., cavitation had a significant correlation with smear gradation [21]. This study showed that nodular facial abnormalities in patients with Grade 1, 2, and 3 were 18.6, 42.8, and 35.3%, respectively. Nodular features were not significantly different in the three groups. Although grade 2 patients had more nodular features in comparison with grade 1 and grade 3 patients, the difference between the three groups was not significant; therefore, there is no significant relationship between the degree of smear and nodular feature abnormalities. Mattsuka (2004) also showed that the incidence of nodular presentation increased with increasing degree of smear, but their differences were not statistically significant [6].

The incidence of reticulonodular involvement in patients with grades 1, 2, and 3 was 24.2%, 7.1%, and 0%. This difference in the frequency of reticulonodular involvement in the three groups was statistically significant. On the other hand, patients with reticulonodular involvement were significantly more likely to have a grade 1 smear. The lowest frequency of reticulonodular appearance belonged to grade 3. These results showed that there is a significant relationship between the degree of smear and reticulonodular involvement in a way that an increase in the grade of smear (1+, 2+, 3+) decreases the frequency of reticulonodular appearance. The findings of this study cannot be compared to any other studies because of the lack of similar research on the relationship between sex and grading of the smear.

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

The most important limitations of the present study were: This is a cross-sectional study. When interpreting the results, the specific limitations of this type of study should be considered. The most important strength of this study was that this is the first report in this long period of this region as the most common area of the tuberculosis outbreak.

Conclusion

In general, the results of this study showed that, with increasing grading of smears (, the frequency of Cavitation presentation increased significantly and the frequency of reticulonodular presentations decreased significantly. The findings of the present study can help physicians better diagnose TB.

Conflict of interest

All authors declare that they have no conflict of interest.

Acknowledgments

We would like to thanks a lot to research deputy of Zabol university of medical science and head of health centers to cooperation of data collection.

Funding statement

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author contributions

RB and EN designed study. EN collected, analyzed, interpreted data and wrote the manuscript. RB analyzed data, reviewed and revised the manuscript. All authors approved the final version of manuscript.

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

TABLES

Table 1: Frequency of consolidation in chest X-ray in association with the grading of sputum smear

Grade of smear positivity		**Grade1**	**Grade2**	**Grade3**	**P-value**
Consolidation	Yes	50 71.4%	11 78.5%	13 76.5%	0.833
	No	20 28.5%	3 21.4%	4 23.5%	

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

Table 2: Frequency of cavitation by the degree of smear

Grade of smear positivity		Grade1	Grade2	Grade3	P-value
Cavitation	Yes	8 11.5%	4 28.5%	9 52.9%	0.001
	No	62 88.5%	10 71.4%	8 47.05%	

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

Table 3: Frequency of nodular presentation by the grade of sputum smear positivity

Grade of smear positivity		Grade1	Grade2	Grade3	P-value
Nodular presentation	Yes	13 18.6%	6 42.8%	6 35.3%	0.086
	No	57 81.4%	8 57.1%	11 64.7%	

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

Table 4: Frequency of reticulonodular presentations by the grade of smear positivity

		Grade1	Grade2	Grade3	P-value
reticulonodular	Yes	17 24.2%	1 7.1%	0 0%	0.022
	No	53 75.7%	13 92.8%	17 100%	

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

TITLE PAGE_METADATA

SPUTUM SMEAR POSITIVITY GRADE AND CHEST X-RAY FINDINGS IN TUBERCULOSIS: A CROSS-SECTIONAL STUDY

Razieh behzadmehr ,

Elham Nejadkehkha

Department of Radiology, Zabol University of Medical Sciences, Zabol, Islamic Republic of Iran

ПОЛОЖИТЕЛЬНОСТЬ МАЗКА МОКРОТЫ И РЕНТГЕНОВСКОГО ОБСЛЕДОВАНИЯ ГРУДНОЙ КЛЕТКИ ПРИ ТУБЕРКУЛЕЗЕ: ОДНОМОМЕНТНОЕ ИССЛЕДОВАНИЕ

Разиех Бехзадмехр,

Эльхам Неджадкеха

Отделение радиологии, Заболский университет медицинских наук, Забол, Исламская Республика Иран

Corresponding Author: **Razieh behzadmehr**, email: razbebehzadmehr@gmail.com

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

REFERENSES

1	Organization WH (2020) Global tuberculosis report 2020: executive summary.		https://apps.who.int/iris/rest/bitstreams/1312164/retrieve
2	Nasiri MJ, Dabiri H, Darban-Sarokhalil D, Rezadehbashi M, Zamani S (2014) Prevalence of drug-resistant tuberculosis in Iran: systematic review and meta-analysis. American journal of infection control 42 (11):1212-1218		https://pubmed.ncbi.nlm.nih.gov/25242634/
3	. Jimma W, Ghazisaeedi M, Shahmoradi L, Abdurahman AA, Kalhori SRN, Nasehi M, Yazdi S, Safdari R (2017) Prevalence of and risk factors for multidrug-resistant tuberculosis in Iran and its neighboring countries: systematic review and meta-analysis. Revista da Sociedade Brasileira de Medicina Tropical 50 (3):287-295		https://pubmed.ncbi.nlm.nih.gov/28700044/
4	Kyu HH, Maddison ER, Henry NJ, Ledesma JR, Wiens KE, Reiner Jr R, Biehl MH, Shields C, Osgood-Zimmerman A, Ross JM (2018) Global, regional, and national burden of tuberculosis, 1990–2016: results from the Global Burden of Diseases, Injuries, and Risk Factors 2016 Study. The Lancet Infectious Diseases 18 (12):1329-1349		https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(18)30625-X/fulltext
5	Shankar S U, Kumar AM, Venkateshmurthy NS, Nair D, Kingsbury R, Velu M, Gupta J, Ahmed J, Hiremath S, Jaiswal RK (2021) Implementation of the new integrated algorithm for diagnosis of drug-resistant tuberculosis in Karnataka State, India: How well are we doing? PloS one 16 (1):e0244785		https://pubmed.ncbi.nlm.nih.gov/33406153/
6	Nakiyingi L, Bwanika JM, Ssengooba W, Mubiru F, Nakanjako D, Joloba ML, Mayanja-Kizza H, Manabe YC (2021) Chest X-ray interpretation does not complement Xpert MTB/RIF in diagnosis of smear-negative pulmonary tuberculosis among TB-HIV co-infected adults in a resource-limited setting. BMC Infectious Diseases 21 (1):1-10		https://pubmed.ncbi.nlm.nih.gov/33435896/
7	Ayaz M, Shaukat F, Raja G (2021) Ensemble learning-based automatic detection of tuberculosis in chest X-ray images using hybrid feature descriptors. Physical and Engineering Sciences in Medicine:1-12		https://europepmc.org/article/pmc/pmc7812355

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

8	Zeng J, Yang Q, Xu D, Chen Q, Huang K, Cai Y, Dai Y, Hai X, Zeng Z, Gong X (2021) Predictive Value of a Five-biomarker Signature to Diagnose Active Pulmonary Tuberculosis Patients .		https://assets.researchsquare.com/files/rs-148655/v1/dab3400c-592e-490f-9187-4a1b699292d8.pdf?c=1611232084
9	Kebede W, Gudina EK, Balay G, Abebe G (2021) Diagnostic Implications and Inpatient Mortality Related to Tuberculosis at Jimma Medical Center, Southwest Ethiopia. Journal of Clinical Tuberculosis and Other Mycobacterial Diseases:100220		https://pubmed.ncbi.nlm.nih.gov/33553681/
10	Talluri Rameshwari K, Jayashree K, Anuradha K Raghuraj Singh Chouhan and Sumana K, An Overview of Extra Pulmonary Tuberculosis in Smear Negative Cases and their Analysis.(2021). Int J Life Sci Pharma Res 11 (1):204-217		https://www.ijlpr.com/admin/php/uploads/698_pdf.pdf
11	WANG JY, LEE LN, Yu CJ, CHIEN YJ, YANG PC, Group T (2009) Factors influencing time to smear conversion in patients with smear-positive pulmonary tuberculosis. Respirology 14 (7):1012-1019		https://pubmed.ncbi.nlm.nih.gov/19659516/
12	Krusiński A, Grzywa-Celińska A, Szewczyk K, Grzycka-Kowalczyk L, Emeryk-Maksymiuk J, Milanowski J (2021) Various Forms of Tuberculosis in Patients with Inflammatory Bowel Diseases Treated with Biological Agents. International Journal of Inflammation 2021		https://pubmed.ncbi.nlm.nih.gov/33489084/
13	Abedipour F, Tirabadi NM, Khodaverdi E, Roham M A Review of Drug-resistant Tuberculosis, Risk Factors and TB Epidemiology and Incidence in Sistan and Baluchestan Province. European Journal of Molecular & Clinical Medicine 7 (11):2020		https://www.ejmcm.com/article_6614.html
14	Marvi A, Asadi-Aliabadi M, Darabi M, Rostami-Maskopaee F, Siamian H, Abedi G (2017) Silent changes of tuberculosis in Iran (2005–2015): A joinpoint regression analysis. Journal of family medicine and primary care 6 (4):760		https://pubmed.ncbi.nlm.nih.gov/29564259/
15	Parcell BJ, Jarchow-MacDonald AA, Seagar A-L, Laurenson IF, Prescott GJ, Lockhart M (2017) Three year evaluation of Xpert MTB/RIF in a low prevalence tuberculosis setting: a Scottish perspective. Journal of Infection 74 (5):466-472		https://pubmed.ncbi.nlm.nih.gov/28237624/
16	Brahmapurkar KP, Brahmapurkar VK, Zodpey SP (2017) Sputum smear grading and treatment outcome among directly observed treatment-short course patients of tuberculosis unit, Jagdalpur, Bastar. Journal of family medicine and primary care 6 (2):293		https://pubmed.ncbi.nlm.nih.gov/29302535/
17	Bisognin F, Amodio F, Lombardi G, Bacchi Reggiani M, Vanino E, Attard L, Tadolini M, Re MC, Dal Monte P (2019) Predictors of time to sputum smear conversion in patients with pulmonary tuberculosis under treatment. New Microbiol 42 (3):171-175		https://pubmed.ncbi.nlm.nih.gov/31157399/

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)

10.15789/2220-7619-SSP-1709

18	Saffari M, Jolandimi HA, Sehat M, Nejad NV, Hedayati M, Zamani M, Ghasemi A (2017) Smear grading and the Mantoux skin test can be used to predict sputum smear conversion in patients suffering from tuberculosis. GMS hygiene and infection control 12		https://pubmed.ncbi.nlm.nih.gov/28840092/
19	Penn-Nicholson A, Hraha T, Thompson EG, Sterling D, Mbandi SK, Wall KM, Fisher M, Suliman S, Shankar S, Hanekom WA (2019) Discovery and validation of a prognostic proteomic signature for tuberculosis progression: a prospective cohort study. PLoS medicine 16 (4):e1002781		https://pubmed.ncbi.nlm.nih.gov/30990820/
20	Matsuoka S, Uchiyama K, Shima H, Suzuki K, Shimura A, Sasaki Y, Yamagishi F (2004) Relationship between CT findings of pulmonary tuberculosis and the number of acid-fast bacilli on sputum smears. Clinical imaging 28 (2):119-123		https://pubmed.ncbi.nlm.nih.gov/15050224/
21	Hassanzad M, Khalilzadeh S, Bloorsaz MR, Velayati AA (2015) Diagnostic criteria in children with tuberculosis. International Journal of Mycobacteriology 4:103		https://www.ijmyco.org/article.asp?issn=2212-5531;year=2015;volume=4;issue=5;spage=103;epage=103;aulast=Hassanzad;type=0

ISSN 2220-7619 (Print)
ISSN 2313-7398 (Online)