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Pulmonary paracoccidioidomycosis: radiology and clinical-epidemiological evaluation

Paracoccidioidomicose pulmonar: radiologia e avaliação clínico-epidemiológica

Ricardo Miguel Costa de Freitas[1,2], Renata Prado[3], Fábio Luis Silva do Prado[4], Ivie Braga de Paula[5], Marco Túlio Alves Figueiredo[6], Cid Sérgio Ferreira[7], Eugenio Marcos Andrade Goulart[8] and Enio Roberto Pietra Pedroso[9,10]

ABSTRACT

Introduction: The purpose of this study was to compare respiratory signs and symptoms between patients with and without chest X-ray abnormalities in order to establish the meaning of radiographic findings in pulmonary PCM diagnosis. **Methods:** The epidemiological, clinical and radiological lung findings of 44 patients with paracoccidiodomycosis (PCM) were evaluated. Patients were divided into two groups of 23 and 21 individuals according to the presence (group 1) or absence (group 2) of chest X-ray abnormalities, respectively, and their clinical data was analyzed with the aid of statistical tools. **Results:** As a general rule, patients were rural workers, young adult males and smokers - group 1 and 2, respectively: males (91.3% and 66.7%); mean age (44.4 and 27.9 year-old); smoking (34.7% and 71.4 %); acute/subacute presentation (38.1% and 21.7%); chronic presentation (61.9% and 78.3%). The most frequent respiratory manifestations were - group 1 and 2, respectively: cough (25% and 11.4%) and dyspnea (22.7% and 6.8%). No statistical difference was observed in pulmonary signs and symptoms between patients with or without radiographic abnormalities. The most frequent radiological finding was nodular (23.8%) or nodular-fibrous (19%), bilateral (90.5%) and diffuse infiltrates (85.7%). **Conclusions:** Absence of statistical difference in pulmonary signs and symptoms between these two groups of patients with PCM indicates clinical-radiological dissociation. A simplified classification of radiological lung PCM findings is suggested, based on correlation of these data and current literature review.

Key-words: Paracoccidioidomycosis. Epidemiology. Chest X-ray. Classification.

RESUMO

Introdução: Comparar sinais e sintomas respiratórios entre pacientes com e sem alterações à radiografia de tórax para se estabelecer o significado dos achados radiográficos no diagnóstico da paracoccidioidomicose pulmonar. **Métodos:** Os achados epidemiológicos, clínicos e radiológicos de 44 pacientes com paracoccidioidomicose (PCM) foram avaliados. Os pacientes foram divididos em dois grupos de 23 e 21 indivíduos de acordo com a presença (grupo 1) ou ausência (grupo 2) de anormalidades à radiografia de tórax, respectivamente, e seus dados clínicos foram analisados com auxílio de ferramentas estatísticas. **Resultados:** Como regra geral, os pacientes eram trabalhadores rurais do sexo masculino, tabagistas e em idade adulta jovem - grupo 1 e 2, respectivamente: homens (91,3% e 66,7%); média de idade (44,4 e 27,9 anos); tabagismo (34,7% e 71,4 %); forma aguda/subaguda (38,1% e 21,7%); forma crônica (61,9% e 78,3%). As manifestações respiratórias mais frequentes foram - grupo 1 e 2, respectivamente: tosse (25% e 11,4%) e dispnéia (22,7% e 6,8%). Nenhuma diferença estatística foi observada nos sinais e sintomas respiratórios entre pacientes com ou sem anormalidades radiográficas. Os achados radiológicos mais frequentes foram o padrão nodular (23,8%) ou nodular-fibrótico (19%), bilateral (90,5%) e infiltrado difuso (85,7%). **Conclusões:** A ausência de diferença estatística nos sinais e sintomas pulmonares entre estes dois grupos de pacientes com PCM sugere dissociação clínico-radiológica. Uma classificação simplificada dos achados radiológicos pulmonares da PCM é sugerida, com base na correlação destes dados e revisão da literatura atual.

Palavras-chaves: Paracoccidioidomicose. Epidemiologia. Radiografia de tórax. Classificação.

1. Radiology Unit, Sao Paulo Cancer Institute, Sao Paulo, SP, Brazil. 2. Medical School, University of Sao Paulo, Sao Paulo, SP, Brazil. 3. Dermatology Department, Denver and Health Sciences Center, University of Colorado, Aurora, CO, USA. 4. Internal Medicine Department, Sarah Kubitschek Hospital, Salvador, BA, Brazil. 5. Radiology Unit, Hermes Pardini Institute, Belo Horizonte, MG, Brazil. 6. Propedeutics Department, Medical School, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil. 7. Radiology Unit, University Hospital, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil. 8. Pediatrics Department, Medical School, Federal University of Minas Gerais Belo Horizonte, MG, Brazil. 9. Internal Medicine Department, Medical School, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil. 10. Tropical Medicine and Infectious Diseases Post-graduation Program, Medical School, Federal University of Minas Gerais, Belo Horizonte, MG, Brazil.
Addres to: Dr. Ricardo Miguel Costa de Freitas. Deptº Radiologia/ICESP. Av Dr. Arnaldo 251, 01246-000 São Paulo, SP, Brazil.
Tel: 55 11 3893-2945
e-mail: ricardomcfreitas@gmail.com
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INTRODUCTION

Paracoccidioidomycosis (PCM), an inflammatory granulomatous systemic disease first reported by Lutz in 1908, is endemic in Latin America and is caused by *Paracoccidioides brasiliensis*[1]. Mucous and skin lesions are usually common, and lung involvement may be extensive and may cause severe respiratory symptoms. Prolonged asymptomatic periods allow patients to travel far from the endemic areas before development of clinical disease[2].

Although imaging methods such as high resolution computed tomography or pulmonary scintilography provide more detailed information, conventional chest radiography is still a valuable tool in evaluating PCM lung involvement, especially in countries where costs of more sophisticated imaging methods may be prohibiting[3-7]. Chest X-ray is frequently abnormal in patients with PCM and shows non-specific lung changes. However, the correlation of radiological abnormalities with respiratory symptoms in patients with PCM is not well known[8,9].

Available radiological classification of PCM-induced chest X-ray abnormalities is heterogeneous in the specific literature[10-12] and sometimes complex, as one based in the Pneumoconiosis Radiography Classification of the International Labor Office (ILO)[13]. This heterogeneity indicates that none of the published radiological classifications is currently universally accepted. A clinically relevant standardized radiological classification of chest X-ray abnormalities in PCM is needed, as it may allow better communication among physicians further our understanding on the prognostic implications of specific findings, and ultimately improve patient care.

To establish the meaning of radiological findings in the pulmonary PCM diagnosis, we compared the clinical symptoms and epidemiologic data of 44 patients with PCM followed in the Federal University of Minas Gerais Clinics Hospital, according to the presence or absence of chest X-ray abnormalities. A review of the current pulmonary PCM radiology literature, as well as its classification, is also presented.

METHODS

Medical records and imaging studies from 61 patients with a diagnosis of PCM followed at our University Hospital from 1976 to 2005 were reviewed retrospectively with the approval of our institutional human studies review board (protocol 0082/00). Inclusion criteria were patients who received the diagnosis of PCM and who had a chest X-ray performed at the time of the first consultation. The diagnosis of PCM was performed by direct visualization of the microorganism (in tissue, using histopathology, or in fresh material such as sputum or lymph node aspiration). Exclusion criteria were other lung diseases, such as previous medical history of tuberculosis, asthma, chronic obstructive pulmonary disease (COPD), mining work, exposure to free silica particles and granulomatous diseases such as sarcoidosis. When indicated, major infectious or non-infectious granulomatous diseases were excluded by clinical examination and follow-up with serum, microbiologic or pathological findings. Since a large number of the patients were smokers, patients with proven or suspected chronic obstructive pulmonary disease could not be excluded from the study.

Clinical and epidemiological data were collected from the medical records, with special attention to gender, age, race, education level, occupation, contact with rural areas, presence of weight lost, weakness, fever, sweating, lymph node enlargement, mucosal or skin lesions, dyspnea, cough, expectoration, and chest fremitus, percussion or auscultation abnormalities.

Anterior-posterior and lateral chest radiographies were blindly reviewed by two radiologists (MTAF and CSF) with more than 30 years of experience in thoracic imaging. The radiographies were analyzed according to Magalhães' classification[12]. A third radiologist opinion was taken in three occasions (IBP), when significant divergence between the two firsts was observed. Patients were then divided in two groups, according to the presence or absence of chest X-ray abnormalities. Clinical and demographic data was compared between both groups. Radiological classification analysis was carried out in the group of chest X-ray abnormalities.

Data were collected and analyzed using SPSS for Windows® software (8.0.0 version, 1997, Chicago, IL). Statistical analysis was performed with frequency tables, Pearson's chi-square test (X_2) and Yates' correction for continuity (X_{2CC}) in 2 x 2 tables. A p value less or equal to 0.05 was considered statistically significant. *Odds Ratio* pointed the direction of association, in case of a representative X_2 (2x2 tables).

RESULTS

Sixty-one patients met our inclusion criteria and were selected for this study. Of these, seventeen patients were excluded due to previous tuberculosis (nine patients); asthma (three patients); COPD (two patients); history of mining work (two patients); and exposure to free silica particles (one patient). PCM diagnosis was made by a positive Gomori-Groccot stain of skin or mucosal biopsies (88.6%), by direct visualization of the microorganism in KOH stained sputum (6.8%) or lymph node aspiration (2.3%), or by a positive Gomori-Groccot stain of liver biopsy (2.3%).

Epidemiological characteristics, including gender, age, ethnic, education level, and occupation are presented in **Table 1**. It was observed a predominance of men (79.5%) with a mean age of 35.5 years old (age ranged between 12 and 74 years old), with biethnic origin (african-brazilian and caucasian parents, 47.7%) and with middle and high school as the predominant highest level of education (50%). Rural contact was reported by 88.6% of patients, and 50% were agriculture workers. They were mainly from State of Minas Gerais (97.7%), and 50% from its central region - around Belo Horizonte, the state capital. According to the findings of the initial chest X-ray, patients were divided into two groups: presence of pulmonary radiographic abnormalities associated with PCM

TABLE 1 - Epidemiological data of a group of 44 patients with paracoccidiodomycosis from the southeast region of Brazil.

	Altered chest x-ray		Normal chest x-ray			
	n	%	n	%	X^2 value	p value
Gender						
male	21	47.7	14	31.8	2.72	0.09
female	2	4.5	7	15.9		
total	23	100.0	21	100.0		
Age (years old)						
12-18	2	4.5	7	15.9	7.69	0.02
19-40	8	18.2	10	22.7		
40-74	13	29.5	4	9.1		
total	23	100.0	21	100.0		
Ethnic group						
caucasian	3	6.8	3	6.8	0.025	0.99
black	7	15.9	6	13.6		
bietnhic (african-brazilian/caucasian)	11	25.0	10	22.7		
not mentioned*	2	4.5	2	4.5		
total	23	100.0	21	100.0		
School level						
illiterate	2	4.5	0	-	4.12	0.25
elementary school	0	-	2	4.5		
middle and junior high school	7	15.9	9	20.4		
high school	3	6.8	3	6.8		
not mentioned*	11	25.0	7	15.9		
total	23	100.0	21	100.0		
Occupation						
agriculture worker	14	31.8	8	18.2	5.43	0.14
unemployed	1	2.3	4	9.1		
student	0	-	2	4.5		
other	8	18.2	7	15.9		
total	23	100.0	21	100.0		
Smokers						
smokers	8	31.8	15	18.2	4.53	0.03
non-smokers	15	2.3	6	9.1		
total	23	100.0	21	100.0		

*data excluded from chi-square analysis

(23 patients) or normal thorax X-ray films (21 patients). There were no statistical significant differences in the demographic characteristics between the two groups, except for patient's age **(Table 1)**. Chest X-ray lung abnormalities were significantly more frequent in oldest patients ($p < 0.05$).

In the group with pulmonary radiographic abnormalities, eight were smokers (34%), while the group with normal initial chest X-rays had 15 (65%, $p < 0.03$) smokers. General or respiratory signs and symptoms were similar between patients with or without lung radiological abnormalities. Dyspnea and cough were more frequent in patients with chest X-ray abnormalities, but this difference did not reach statistical significance. Comparison of the other signs and symptoms between the two groups also showed no significant statistical difference, a part from lymph node enlargement, more frequent observed in patients with normal chest X-rays **(Table 2)**.

Twenty-six patients presented with respiratory signs and symptoms: one group with chest X-ray abnormalities (n = 16) and other group with normal chest X-rays (n = 10); eighteen patients had no respiratory signs and symptoms: the group with chest X-ray abnormalities (n = 7) and the other with normal chest X-rays (n = 11); each group had patients with oropharyngeal or upper respiratory tract lesions and no statistical difference between respiratory signs and symptoms and chest X-ray abnormalities was observed (*Pearson Chi-square* value = 2,187; $p < 0.139$).

Initial clinical presentation is listed in **Table 2**. Most (70.5%) patients had chronic multifocal presentation. Half of the patients presented with respiratory symptoms.

The radiographic lung abnormalities of 21 patients are presented in **Table 3**. Bilateral involvement was seen in 90.5% of the images, and most patients had abnormal findings affecting more than one third of the lungs (85.7%) with no predilection for upper or lower lobes. An isolated radiological lung pattern (nodular, micronodular, fibrous, infiltrative or lung consolidation) was present in 52.2%. Nodular pattern was the most (23.8%) frequent, followed by fibrous (9.5%) and micronodular (9.5%). A radiological mixed pattern was defined as any simultaneous combination of the above patterns. In these radiographs, it was noted that the nodular pattern was always present, and the combination of nodular and fibrous pattern was the most (19%) frequent mixed pattern observed. Pneumothorax, cardiomegaly, or bone abnormalities were not observed. The most representative radiographies with PCM lung patterns were presented in **Figures 1A** and **1B**. Two patients with mediastinal enlargement or pleural effusion at chest radiographies were excluded from the radiological analysis, as we aimed to evaluate the specific radiological abnormalities of the lung parenchyma.

TABLE 2 - Most frequent general and respiratory signs and symptoms and initial clinical presentation of a group of 44 patients with paracoccidiodomycosis coming from the southeast region of Brazil.

	Altered chest x-ray		Normal chest x-ray			
Signs and symptoms	n	%	n	%	X^2 value	p value
General						
weight loss	17	38.6	13	29.5	0.73	0.39
lymph node enlargement	11	25.0	17	38.6	5.20	0.02
weakness	14	31.8	10	22.7	0.77	0.37
fever	8	18.2	12	27.3	2.21	0.13
pallor	9	20.4	8	18.2	0.005	0.94
mucosal lesions	14	31.8	10	22.7	0.77	0.38
skin lesions	6	13.6	9	20.4	1.37	0.24
Sweating	5	11.4	2	4.5	0.48	0.48
dizziness	4	9.1	3	6.8	0.08	0.77
dysphonia	2	4.5	4	9.1	0.99	0.32
hoarseness	4	9.1	2	4.5	0.57	0.45
nasal obstruction	1	2.3	3	6.8	1.31	0.25
lower extremity edema	1	2.3	2	4.5	0.46	0.49
Respiratory						
cough	11	25.0	5	11.4	1.79	0.18
expectoration/productive cough	11	25.0	4	9.1	2.86	0.09
dyspnea	10	22.7	3	6.8	3.20	0.07
rales	5	11.4	2	4.5	0.48	0.4
abnormal fremitus	4	9.1	1	2.3	0.71	0.39
thorax deformity	3	6.8	2	4.5	0.00	1.00
limited thoracic expansibility	3	6.8	1	2.3	0.18	0.66
pleural friction rub	2	4.5	0	-	1.91	0.16
wheezes	2	4.5	0	-	1.91	0.16
abnormal thorax percussion	1	2.3	0	-	0.93	0.33
Clinical presentation						
acute/subacute	8	38.1	5	21.7		
chronic (unifocal)	5	23.8	0	-		
chronic (multifocal)	8	38.1	18	78.3		
Total	**21**	**100.0**	**23**	**100.0**		

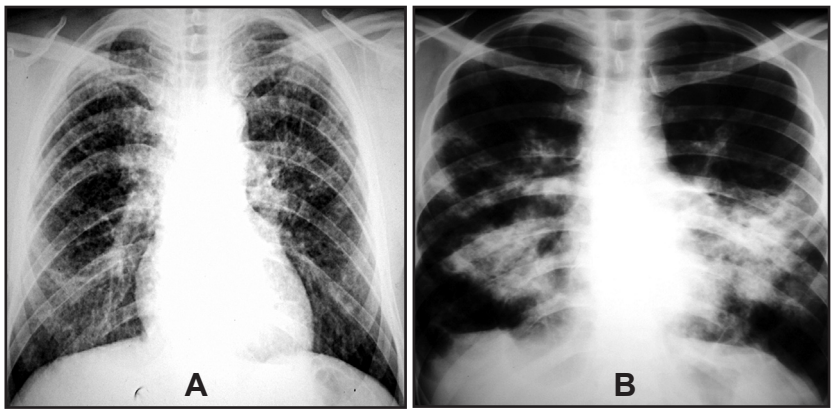

FIGURE 1 - A) Postero-anterior chest x-ray. Case #2, male, 49 year-old: reticular-nodular pattern. B) Postero-anterior chest X-ray. Case #10, male, 36 year-old: lung consolidation pattern.

TABLE 3 - General chest X-ray abnormalities and lung opacities patterns of 21 patients with paracoccidiodomycosis in a group of 44 patients coming from the southeast region of Brazil.

Abnormality	Number	Percentage
Distribution		
unilateral	2	9.5
bilateral	19	90.5
Extension		
≤ 1/3 of lung area	3	14.3
> 1/3 of lung area	18	85.7
Localization		
upper, middle and basal zones	10	47.6
upper and middle zones	6	28.5
middle and basal zones	2	9.5
basal zones alone	2	9.5
middle zones alone	1	4.7
upper zones alone	0	0.0
Isolated pattern		
nodular	5	23.8
fibrous	2	9.5
micro-nodular	2	9.5
infiltrative	1	4.7
lung consolidation	1	4.7
Sub-total	11	52.2
Mixed pattern		
nodular-fibrous	4	19.0
nodular-infiltrative	2	9.5
nodular-micro-nodular	1	4.7
nodular-lung consolidation	1	4.7
nodular-lung consolidation-fibrous	1	4.7
nodular-fibrous-cavity	1	4.7
Sub-total	10	47.8
Total	**21**	**100.0**

DISCUSSION

PCM, formerly known as South-American blastomycosis, is a specific endemic entity in Latin America. As a chronic systemic mycosis it carries a high morbidity and mortality, especially in cases of diffuse systemic involvement[14] or when associated with immune compromising conditions[15-17], as also noticed with other endemic fungal diseases[18-20]. The prevalence of PCM in Brazil is estimated by regional serological surveys or epidemiological mortality reviews[2,21-23]. PCM was the 8th cause of mortality by chronic infectious diseases in Brazil, causing 3,181 deaths between 1980 and 1995. Agriculture and civil construction workers represented 55.8% and 19.2% of deaths by PCM, respectively[21].

In our study, patients with PCM were predominantly young adult men, agriculture workers in the economically active population, and/or with previous contact to rural areas – which is similar to the epidemiologic data found in the literature[2,8,9,11,13,21,22,24-27]. Interestingly, our male to female ratio was 3.9:1, and it has varied from 5.4-10:1 in other studies[8,22]. As PCM literature is updated, women prevalence rises as their work prevalence increases in rural or urban regions[28], as well as their increasing participation in the smokers population[29]. Women's protection by hormonal or genetic factors[30] may actually be less important than previously thought.

The low education level and the biethnic origin predominance of our patients is data not previously well explored[8,9,13,22,24,26,27] and it agrees with the consensus that PCM has an occupational character, being more frequent in the rural and poor Brazilian population. Southeast, south and mid-west Brazil regions aggregate the majority of patients, although new cases have been reported in the past years in forest frontiers, such as in the Amazon region, infecting Indians and immigrants (e.g. mining or agriculture workers)[21]. With increasing international traveling, people from non-endemic countries may become exposed to this yeast, rendering this disease an entity to be promptly recognized and included as a differential diagnosis in many clinical situations.

Chest X-ray lung abnormalities were significantly more frequent in oldest patients ($p < 0.05$), which correlates with the increase of pulmonary abnormalities found in the chronic presentation of the disease (**Table 1**). However, the impact of duration of smoking in the radiographic alterations was not evaluated in this study, and cannot be excluded. In our study, 52.3% of patients were smokers, but only the minority of these patients (34.7%) had radiographic lung abnormalities. Smoking is a significant intervenient variable among PCM patients, with a prevalence of 65.5% to 90.3% in the literature[8,13,26]. In a case control study by Santos et al, smoking was found to be an important risk factor to the development of chronic PCM. The number of cigarettes smoked per day was also found to be inversely correlated with the age of the patient at the disease onset[29]. However, a comparative study of chest X-ray abnormalities between smokers and no smokers with pulmonary PCM has not yet been performed.

The most common general signs and symptoms found in our study were weight loss, lymph node enlargement, mucous lesions, weakness, and fever. Cough, expectoration and dyspnea were the most common reported respiratory symptoms, which is consistent with the literature[8,11,13,22,27]. Our study demonstrates that respiratory symptoms were similar in patients with or without chest X-ray abnormalities, indicating a clinical-radiological dissociation. Lymph node enlargement was more frequently seen in patients with normal chest x-rays ($p < 0.05$), and this was probably due to clinical presentations (**Table 2**), where lymph node involvement was observed in 59.1% of all patients from this study but only 11.4% had associated pulmonary PCM; otherwise the mucocutaneous presentation associated with lymph node enlargement was observed in 36.3%. Although pulmonary PCM has been exhaustively studied in other Brazilian regions, very little is known about the correlation between respiratory symptoms and radiographic abnormalities in patients with this disease. Gomes et al reports clinical radiological dissociation in a study with 40 patients, although the data presented suggests a trend towards an association with respiratory symptoms and more severe radiologic abnormalities in the chest X-ray[31]. However, as in our study, the limited number of patients, as well as other intervening factors such as smoking, limits more definitive conclusions. Despite the difficulties to study patients with PCM in which all intervening variables are excluded, our results are in agreement with the trend found in the current literature and published studies, and indicate the presence of a clinical radiological dissociation in the chest x-ray of patients with PCM. We are currently conducting studies using more sensitive techniques to further investigate the effects of PCM in the lung.

Since the 1950's, the lung is known to be the most frequently involved viscera in PCM, and the respiratory system the primary mode of spread of the disease[32]. Our data showed that chest X-ray

abnormalities, when present, were bilateral in 90.5% and involved more than one third of the lungs (85.7%), similarly to the current literature[10,11,13]. The pulmonary radiological findings of PCM have been extensively explored in previous studies. Formerly, the pattern *miliary grouped* was thought to be predominant[10]. In 1966, Ferreira[11] presented the following classification and the frequency of lesions: *predominant nodular pattern* (48.2%); *exclusive miliary pattern* (22.2%); *predominant miliary pattern* (14.8%); *predominant reticular pattern* (11.1%) and *bronchopneumonic pattern* (3.7%)[11]. Many other studies have reported predominance of interstitial opacities, but in a heterogeneous fashion. Martins et al[27] reported a high percentage of consolidated lesions (30%), mixed patterns (21.5%), as well as cavity lesions (27.2%) in a series of 121 patients with PCM chest X-ray abnormalities. This data was not well correlated with the literature, likely because patients with previous or concomitant tuberculosis were not excluded[27]. A review of 170 cases of chest x-ray abnormalities due to PCM and interpreted with the aid of specific classification[12,33], showed reticular (26%) and reticular-nodular (23%) patterns, followed by reticular-nodular-cavity pattern (13%), to be the more common radiologic lung patterns, although chest x-ray films choice criteria included the most significant presentations in any moment of the disease[25]. Results from analysis of 64 chest x-rays of patients with only extra-respiratory PCM signs and symptoms were briefly reported in another study: confluent or non-confluent alveolar active opacities (25%), interstitial opacities fibrosis or pleural pulmonary adherences suggesting chronic lesions (40.6%), or both (23.4%)[34]. More recently, an analysis of 270 chest x-ray films of PCM patients showed interstitial opacities and mixed patterns, mainly observed in chronic presentations instead of in acute or sub-acute forms. No information concerning if they were taken at the first consultation was available[8].

Two studies involving chest x-ray analysis of 173 and 139 patients with PCM[9,35] showed predominance of interstitial opacities, but with different incidence in the *pneumonic-interstitial bat wings* mixed pattern (50% and 16.6%, respectively) as well as in the fibrous pattern (18.2% and 5%, respectively).

The classification of chest x-ray PCM abnormalities based upon ILO's Pneumoconiosis Standards showed an interstitial pattern predominance (50%), followed by a reticular-nodular pattern (39.6%); alveolar pattern (13.7%); and the mixed pattern (interstitial and alveolar) in 29.3%[13]. ILO's methodology may not be a prompt useful tool to the internist although the final result is a convergence of abnormalities into three great patterns (interstitial, alveolar and mixed patterns).

It is recommended that the initial diagnostic analysis of PCM should include anterior-posterior and lateral chest x-ray films, and the exam should be repeated during follow up of PCM patients under medical treatment[36]. Although there are many different methodological reports as previously mentioned, thoracic PCM radiography abnormalities are in general bilateral, symmetric, with a nodular-interstitial pattern[34,35]. PCM chest radiography classification, as the one used in our study[12] is morphologically elucidative. However it is not known if this classification provides the clinician information regarding disease severity or prognosis. Our statistic results show a trend towards independency between chest x-ray findings and clinical disease presentation. Extensively detailed and complex radiographic PCM lung classification plays, therefore, a limited role in the clinical setting, as long as other differential diagnosis such as tuberculosis, are excluded. In this setting, we propose to limit chest x-ray reports to alveolar, interstitial or mixed patterns, when approaching PCM patients, initially and under antimicrobial therapy follow up. A simpler radiographic description may facilitate communication between radiologist and internists, and may allow comparison between studies.

The classification of chest x-ray film abnormalities in PCM patients remains very important whenever the differential diagnosis is required, since tuberculosis and PCM are frequently polymorphic at thoracic imaging. Most importantly, it is essential to recognize that PCM is a disease that can cause a large variety of pulmonary radiographic alterations, and should be included in the differential diagnosis of patients with history of exposure to endemic areas.

Several factors limit our study. The real profile of PCM in State of Minas Gerais must not be concluded from our data, as milder forms of the disease are often followed in the primary care centers. The limited number of patients in our study does not allow us to make definitive statistical conclusions, but shows a trend towards clinical-radiological dissociation. Further studies would be required to confirm this hypothesis. Smoking is still a significant intervenient variable. Currently, little is known about anatomopathological and radiological correlation in PCM, and such studies are needed to increase our knowledge on the pathophysiology of this disease, as well as on its radiological expression in different moments of the inflammatory process.

Clinical, epidemiological and chest x-rays records from 44 adult patients with PCM from State of Minas Gerais, Brazil, were presented. Nodular-interstitial, bilateral and diffuse lung infiltrate was the main chest x-ray abnormalities in chronic PCM. This is the first report of a non-parametric statistical analysis indicating a trend towards independency between respiratory PCM manifestations when compared two groups of patients with or without radiographic lung abnormalities. Since it is yet unknown the relation of initial different morphologic chest x-ray patterns and differences in outcome of patients with PCM after treatment, a simplified PCM chest x-ray pattern classification reporting alveolar, interstitial or mixed lung abnormalities is proposed as a result, in order to allow a practical initial approach and follow up of these patients by the internist. Further studies evaluating initial radiological findings with mortality, cure rate and post treatment lung functional capacity would be desirable and clinically relevant.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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