

CHEST X-RAY PHOTO AND PATHOGENIC BACTERIA DISTRIBUTION IN PNEUMONIA PATIENTS: A LITERATURE REVIEW

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ABSTRACT

Pneumonia is an acute infectious or inflammatory disease affecting the lung parenchyma that can be caused by microorganisms such as bacteria, viruses, and fungi. This study aims to determine the image of thorax photos and the distribution of pathogenic bacteria in pneumonia patients, as well as to see the image of thorax photos in certain pathogens. The method in this study was to search for articles through Google Scholar and Pubmed. The results showed that the distribution of pathogenic bacteria in pneumonia cases varied, but the most common bacteria causing pneumonia were Streptococcus pneumoniae, Klebsiella pneumoniae, and Mycoplasma pneumonia. The thorax photographs were also quite diverse, and the most common results were consolidation, infiltrates, and pleural effusion. In patients with pneumonia caused by Mycoplasma pneumoniae, the most common thorax images are lobar pneumonia or lobar consolidation.

KEYWORDS Pathogenic Bacteria, Thorax Photo, Pneumonia



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INTRODUCTION

Pneumonia is an acute infectious or inflammatory disease of the lung parenchyma that can be caused by viruses, bacteria, and fungi. Pneumonia is still a disease that can cause high mortality rates in the world. The World Health Organization (WHO) reports that India has the highest number of pneumonia deaths at 158,176 and Indonesia ranks seventh out of 15 developing countries with the highest number of pneumonia deaths at 20,084. According to the 2013 and 2018 Riskesdas, the prevalence of pneumonia in Indonesia reached 1.6% in 2013 and 2% in 2018. Many factors can cause death in pneumonia, including endothelial dysfunction in the vasculature, excessive inflammation in the lung organs, coagulopathy,

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and *acute lung injury*. Generally, the bacteria that cause pneumonia are *Streptococcus* and *Mycoplasma pneumonia*, while the viruses that cause pneumonia are *rhinovirus*, *influenza virus*, *para influenza virus*, *adenovirus*, and *respiratory syncytial virus* (RSV). Based on the place, pneumonia can be divided into two: *community acquired pneumonia* (CAD) and *hospital associated pneumonia* (HAD) (Indah, 2019; Pangesti, 2020; Yusanti et al., 2013).

The bacteria that cause pneumonia can be divided into two parts, namely typical and non-typical bacteria. Typical bacteria that can cause pneumonia include staphylococcus, klebsiella, and streptococcus pneumonia. In atypical pneumonia, the bacteria that usually cause pneumonia are *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, and *legionella pneumoniae*. In a study at Dr. M. Djamil Hospital Padang in patients with CAP, the results showed that there were no significant differences between the two groups. Djamil Padang in CAP patients, the distribution of pathogenic bacteria included *Streptococcus a hemolyticus* (44.4%), *Klebsiella pneumoniae* (26.7%), *Pseudomonas aeruginosa* (4.4%), *Proteus vulgaris* (4.4%), *Staphylococcus aureus* (2.2%), *Streptococcus a hemolyticus + Klebsiella pneumoniae* (13.3%), *Staphylococcus aureus + Klebsiella pneumoniae* (4.4%) (Ervina et al., 2021; Pahal & Sandeep, 2022; Yu & Fei, 2016).

Based on anatomical location, pneumonia can be divided into lobar, lobular, and interstitial pneumonia. Based on its location, pneumonia can also be divided into three parts, namely in the dextra pulmonary, sinistra pulmonary, and bilateral. In a study conducted by Nurpratiwi, Ramli, and Marti at the Prof. Dr. RD Kandou Manado General Hospital, based on location, the most pneumonia patients occurred in the dextral pulmo as much as 54% and in the sinistra pulmo 28%, while in both locations or bilateral as much as 18%. In Nur Muhamad Arjanardi's research at Dr. Kariadi Semarang General Hospital, the results of the study based on the location of the infiltrate in pneumonia patients were obtained in the lower right lung and lower left lung (Arjanardi et al., 2014; Borghesi & Maroldi, 2020).

Pneumonia can be diagnosed through history, clinical symptoms, and physical examination. In addition, supporting examinations also need to be done to help establish the diagnosis of pneumonia. Supporting examinations that can be done include radiology and microbiology examinations. In radiology, a thorax photograph is the gold standard to help confirm the diagnosis of pneumonia. A thorax photograph is taken to see the lesions caused by pneumonia. The images that can be found on thorax photographs of patients with pneumonia are images of consolidation, infiltrate, *ground-glass opacity*, or pleural effusion. In a study at Dr. Kariadi Semarang General Hospital in adult patients with community pneumonia, infiltrates were found in the right lower lung (17.21%), infiltrates in the left lower lung (15.81%), and infiltrates in more than one location or lobe (37.21%). In the study at Anutapura General Hospital, the results of the study showed a picture of infiltrate (84.9%), consolidation (9.4%), and pleural effusion (5.7%) (Natasya, 2022; Permana et al., 2023).

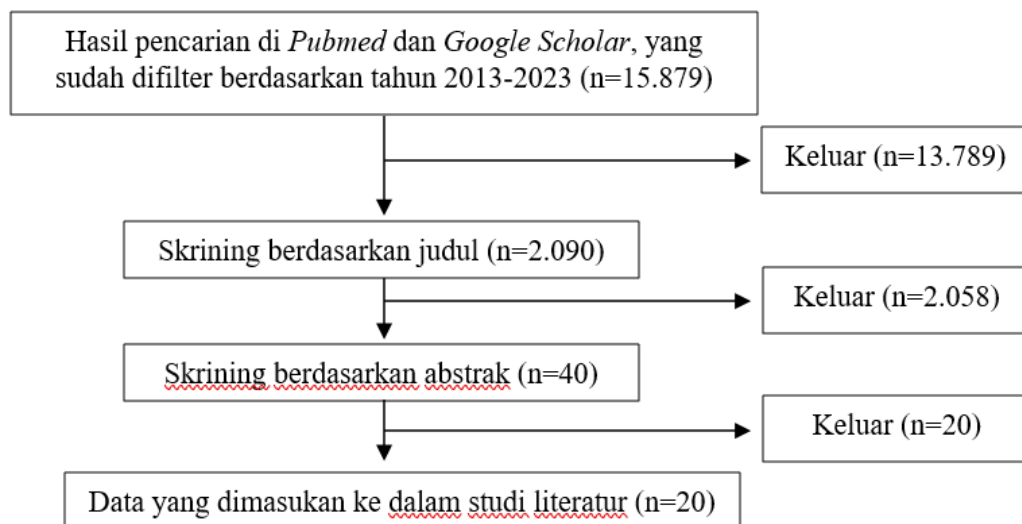
Some researchers say that there are differences in the images of thorax photos for each etiology or different causative bacteria. In pneumonia caused by viruses, there is a *ground-glass opacity* picture on the thorax, while in *Klebsiella sp* there are infiltrates in the upper lobe of the lung. However, some researchers say that the

lesion image from the thorax photo cannot determine the pathogenic bacteria causing pneumonia. Therefore, blood or sputum culture still needs to be done to determine the pathogenic bacteria causing pneumonia. However, it takes more time to determine the pathogenic bacteria causing pneumonia from the culture results (Freeman & Airlangga, 2021; Jain et al., 2015). In this study, researchers wanted to find out how the image of thorax photos and the distribution of pathogenic bacteria in pneumonia patients.

RESEARCH METHOD

The research method used in this research is *literature review*. *Literature review* is secondary research by collecting and analyzing various studies with a systematic process. This study used *online databases*, namely *Google Scholar* and *Pubmed* to obtain research data. The keywords used in this study for journal searches were "Pneumonia" AND "Chest X-Ray" AND "Finding" OR "Distribution" OR "Pathogenic Bacteria" with the last 10 years, from 2013 to 2023, a total of 15,879 research articles were obtained. The inclusion criteria in this study were scientific articles or journals with a publication limit of the last 10 years with a time frame from 2013 to 2023 that discussed the images of thorax photos and the distribution of pathogenic bacteria of pneumonia. Exclusion criteria for this study were journals or scientific articles that were not *free full text*, journals or scientific articles about COVID-19 pneumonia, not using Indonesian or English, only in the form of abstracts and did not have a manuscript body.

The search process was based on inclusion and exclusion criteria:



RESULT AND DISCUSSION

Table 1: Journal Review of Thorax Photographs and Distribution of Pathogenic Bacteria of Pneumonia

Author (Year)	Journal Title	Methods	Subject	Results
(Freeman & Airlangga, 2021)	Thoracic photo features and characteristics of pediatric patients <17 years old With a diagnosis of pneumonia at the Medan Hajj Hospital	<i>Retro-spective Study</i>	Pediatric patients with a diagnosis of pneumonia at Hajj Hospital Medan 2017-2019	<ul style="list-style-type: none"> Of the 54 patients, the thorax photos showed right perihilar consolidation (37%), bilateral perihilar consolidation (24.1%), bilateral infiltrates (11.1%), right lung infiltrates (5.6%), right basal consolidation (5.6%), right apex consolidation (3.7%), right center consolidation (1.9%), left basal consolidation (1.9%), and normal (9%).
(Permana et al., 2023)	Analysis of thoracic photographs with severity of clinical symptoms in pediatric pneumonia patients at Anutapura General Hospital, Palu City, Central Sulawesi Province	<i>Retro-spective Study</i>	Patients with a diagnosis of pneumonia from 1 month - 18 years old	<ul style="list-style-type: none"> Of the 159 patients, 60.4% were male and 39.6% were female. Thorax images were 84.9% infiltrate, 9.4% consolidation, and 5.7% pleural effusion.
Roslina, et al (2023)	Characteristics of Causative Bacteria and Antibiotic Sensitivity Tests in Nosocomial Pneumonia at Haji Adam Malik Hospital Medan	<i>Cross sectional</i>	Nosocomial pneumonia patients at the Haji Adam Malik Central General Hospital Medan for the period January-December 2022.	<ul style="list-style-type: none"> Of the 62 patients, 56.5% were male and 43.5% were female. The 5 pathogenic bacteria causing pneumonia were <i>Klebsiella pneumoniae</i> 32.3%, <i>Acinetobacter baumannii</i> 27.4%, <i>Pseudomonas aeruginosa</i> 19.4%, <i>Staphylococcus aureus</i> 9.7%, and <i>Streptococcus pneumoniae</i> 6.5%.
(Farida et al., 2015)	<i>Viruses and Gram-negative bacilli dominate the etiology of community-acquired</i>	<i>Prospective Cohort Study</i>	Adult patients with CAP diagnosis in 2 hospitals in Semarang	<ul style="list-style-type: none"> Of the 148 patients, 70% had <i>bronchopneumonia</i>, 21% had <i>alveolar pneumonia</i>, and 9% had <i>interstitial pneumonia</i>. 49% male and 51% female

	<i>pneumonia in Indonesia, a cohort study</i>			<ul style="list-style-type: none"> The top 5 pathogens were <i>influenza virus</i> 18%, <i>Klebsiella pneumoniae</i> 14%, <i>Streptococcus pneumoniae</i> 13%, <i>Mycobacterium tuberculosis</i> 5%, and <i>Chlamydia pneumoniae</i> 5%.
Jain, et al (2015)	<i>Community-Acquired Pneumonia Requiring Hospitalization among U.S. Adults</i>	<i>Active Population-based Surveillance</i>	Adult patients with pneumonia	<ul style="list-style-type: none"> Of the 2259 pneumonia patients, 38% had pathogens found, and the most common pathogens were <i>human rhinovirus</i> (9%), <i>influenza virus</i> (6%), and <i>S. pneumoniae</i> (5%).
Jain, et al (2015)	<i>Community-Acquired Pneumonia Requiring Hospitalization among U.S. Children</i>	<i>Active Population-based Surveillance</i>	Pediatric patients with CAP who require hospital admission	<ul style="list-style-type: none"> Consolidation (58%), alveolar or interstitial infiltrates (51%), and pleural effusion (13%) were found. Commonly detected pathogens were RSV (28%), HRV (27%), HMPV (13%), AdV (11%), <i>M. pneumoniae</i> (8%), PIV (7%), influenza (7%), CoV (5%), <i>S. pneumoniae</i> (4%), <i>S. aureus</i> (1%), and <i>S. pyogenes</i> (<1%).
(Saraya et al., 2017)	<i>The Correlation between Chest X-ray Scores and the Clinical Findings in Children and Adults with Mycoplasma pneumoniae Pneumonia</i>	<i>Retro-spective Study</i>	Pediatric and adult patients with MPP at Kyorin University Hospital from April 2006 to July 2014.	<ul style="list-style-type: none"> Of the 125 patients, 71 were pediatric patients and 54 were adults. Of the 71 pediatric patients, 34 were male and 37 were female. Of the 54 adult patients, 18 were male and 36 were female. Based on the picture of thorax photos in children obtained consolidation (87.3%), <i>air bronchogram</i> (60.6%), reticular shadows (28.2%), small nodules (24%), bronchial wall thickening (33.8%), pleural effusion (1.4%), and atelectasis (9.9%). Based on the picture of thorax photos in adults, consolidation (83.3%), <i>air bronchogram</i> (33.3%), reticular shadows (20.4%), small nodules (22.2%), thickening of the bronchial wall (14.8%), and pleural effusion (7.41%).
(Ziko et al., 2022)	<i>Aetiology and prognosis of community acquired pneumonia at the Adult</i>	<i>Prospective Cohort Study</i>	327 CAP patients at UTH Lusaka Hospital, Zambia from March - December 2018	<ul style="list-style-type: none"> Of the 327 patients, 166 were male (50.76%) and 161 were female (49.23%).

	University Teaching Hospital in Zambia			<ul style="list-style-type: none"> • Of the 286 patients with sputum examination, the most common pathogen distribution was <i>Mycobacterium tuberculosis</i> (20%), <i>Candida sp</i> (18%), <i>Klebsiella pneumoniae</i> (12%), and <i>Pseudomonas aeruginosa</i> (7%). • <i>Streptococcus pneumoniae</i> was found in only 4 patients.
(Qu et al., 2022)	<i>Aetiology of severe community pneumonia in adults identified by combined detection methods: a multi-centre prospective study in China</i>	Multi-centre Prospective Study	All adult patients (>18 years old) with a diagnosis of SCAP at 17 hospitals in 10 different regions in mainland China during the period June 1, 2018 - December 31, 2019.	<ul style="list-style-type: none"> • Of the 275 patients, 199 were male (72.4%) and 76 were female (27.6%). • Consolidation (70.6%), <i>ground-glass opacity</i> (65.1%), and pleural effusion (44%) were found. • Based on the identified pathogens, <i>influenza virus</i> (20.7%), <i>S. pneumonia</i> (17.6%), <i>Legionella pneumophila</i> (11.3%), <i>Mycoplasma pneumoniae</i> (9.9%), <i>Chlamydia psittaci</i> (6.8%), <i>S. Aureus</i> (4.5%), <i>Pseudomonas aeruginosa</i> (3.2%), and <i>Entrobacteriaceae</i> (13.1%), including <i>Klebsiella pneumoniae</i> (86.2%) and <i>Escherichia coli</i> (6.9%).
(Suh et al., 2023)	<i>Etiology and Clinical Characteristics of Community-Acquired Pneumonia in Korean Children During the Pre-COVID-19 Period, 2015-2020</i>	Retro-spective Study	Hospitalized children ≤ 18 years old with a diagnosis of CAP at four referral hospitals in Korea	<ul style="list-style-type: none"> • Of the 489 patients, 235 were male (48.1%) and 76 were female (51.9%). • Consolidation (54.4%), pleural effusion (13.5%), and <i>necrotizing pneumonia</i> (1.0%) were found. • The most common pathogens were <i>Mycoplasma pneumonia</i> (16.8%) and <i>Respiratory syncytial virus</i> (13.7%).
(Su et al., 2021)	<i>Pathogen distribution and bacterial resistance in children with severe pneumonia</i>	Retro-spective Study	Pediatric Patients with SCAP	<ul style="list-style-type: none"> • Of the 734 patients, 462 were male and 272 were female. • <u>Of the</u> 444 pathogenic bacteria, (63.96%) gram-negative bacteria and (36.04%) gram-positive bacteria were found. • The most pathogenic bacteria were <i>Haemophilus influenza</i> (12.91%), <i>Streptococcus pneumonia</i> (10.38%), and <i>Staphylococcus aureus</i> (7.09%).

(Hirai et al., 2020)	<i>Clinical characteristics of community-acquired pneumonia due to Moraxella catarrhalis in adults: a retrospective single-center study</i>	<i>Retro-spective Study</i>	CAP patients over the age of 20 years old and with culture results of <i>Moraxella catarrhalis</i> and <i>Streptococcus pneumoniae</i> at Okinawa Miyako Hospital from May. 2013 - April 2018	<ul style="list-style-type: none"> • Of 134 CAP patients with <i>Moraxella catarrhalis</i> sputum culture results (MC-CAP), 127 (94.8%) had <i>bronchopneumonia</i> and 7 (5.2%) had lobar pneumonia. • Of the 130 CAP patients with <i>Streptococcus pneumoniae</i> sputum culture results (SP-CAP), 84 (64.6%) had <i>bronchopneumonia</i> and 46 (35.4%) had lobar pneumonia.
(Cho et al., 2019)	<i>Correlation between chest radiographic findings and clinical features in hospitalized children with Mycoplasma pneumoniae pneumonia</i>	<i>Retro-spective Study</i>	Pediatric patients hospitalized with a diagnosis of <i>Mycoplasma pneumoniae pneumonia</i>	<ul style="list-style-type: none"> • Of the 393 patients with <i>M. pneumoniae pneumonia</i>, 146 (37%) had lobar/segmental consolidation, 107 (27%) had severe peribronchial infiltrates, 57 (15%) had patchy infiltrates, and 83 (21%) had localized reticulonodular infiltrates.
(Y. Wang et al., 2020)	<i>Epidemiology and clinical characteristics of pathogens positive in hospitalized children with segmental/lobar pattern pneumonia</i>	<i>Retro-spective Study</i>	Pediatric patients with a diagnosis of croupous or segmental pneumonia at Zibo Central Hospital from January 1, 2014 to December 31, 2018	<ul style="list-style-type: none"> • Of 593 pediatric patients diagnosed with lobar/segmental pattern pneumonia (S/L-PP), 398 were male and 195 were female. • The most common pathogen found in S/L-PP was <i>Mycoplasma pneumoniae</i> (50%) in 2014, (68.37%) in 2015, (83.48%) in 2016, (77.37%) in 2017, and (74.52%) in 2018.
(Yoon et al., 2017)	<i>Radiologic findings as a determinant and no effect of macrolide resistance on clinical course of Mycoplasma pneumoniae pneumonia</i>	<i>Retro-spective Study</i>	Pediatric patients with <i>M. pneumoniae pneumonia</i> in five Korean hospitals in the period 2010-2015	<ul style="list-style-type: none"> • The 82 patients with macrolide-resistant <i>M. pneumoniae pneumonia</i> were found to have homogeneous dense lobar consolidation (42.7%), uneven consolidation (29.3%), <i>nodular opacity</i> (14.6%), bilateral perihilar infiltrates (13.4%), and pleural effusion (22%).
(Yang et al., 2021)	<i>Differences of clinical features and prognosis between</i>	<i>Retro-spective Study</i>	Pediatric patients with <i>necrotizing pneumonia</i> at the hospital from	<ul style="list-style-type: none"> • Patients with <i>necrotizing pneumonia</i> with <i>Mycoplasma pneumoniae pneumonia</i> (MPNP) were found to have bilateral <i>lobar lesions</i> (36.36%), <i>right lobe</i>

	<i>Mycoplasma pneumoniae necrotizing pneumonia and non-Mycoplasma pneumoniae necrotizing pneumonia in children</i>		January 1, 2013 to January 31, 2020.	<i>lesion (27.27%), left lobe lesion (36.36%), pleural effusion (54.55%), pneumothorax (9.09%), and atelectasis (18.18%).</i>
(Ling et al., 2020)	<i>Identify clinical factors related to Mycoplasma pneumoniae pneumonia with hypoxia in children</i>	<i>Retro-spective Study</i>	MPP patients in Tianjin Children's Hospital from January 2017 - June 2019	<ul style="list-style-type: none"> • In MPP patients with hypoxia, there were images of consolidated thorax (79.71%), lobar atelectasis (31.88%), pleural effusion (65.22%), and pleural thickening (50.72%).
(Fan et al., 2023)	<i>Clinical characteristics and serum inflammatory markers of community-acquired mycoplasma pneumonia in children</i>	<i>Prospective Study</i>	Pediatric patients with MPP in No.2 People's Hospital of Changzhou affiliated to Nanjing Medical University from 2020 to 2021	<ul style="list-style-type: none"> • Of the 265 MPP patients, the thorax images showed consolidation (23%), <i>bronchopneumonia</i> (31.3%), unilateral lobar pneumonia (35.1%), bilateral lobar pneumonia (33.6%) pleural effusion (2.3%), and lobar atelectasis (2.6%).
(Medjo et al., 2014)	<i>Mycoplasma pneumoniae as a causative agent of community-acquired pneumonia in children: clinical features and laboratory diagnosis</i>	<i>Prospective Study</i>	Pediatric patients with CAP in the emergency department of Belgrade Children's Hospital from April 2012 to March 2014.	<ul style="list-style-type: none"> • In MPP patients, <i>linear opacities</i> (50%), uneven infiltrates (16.7%), lobar consolidation (8.3%), interstitial infiltrates (8.3%), reticulonodular infiltrates (8.3%), and pleural effusions (8.3%) were obtained.
(X. Wang et al., 2018)	<i>Necrotizing pneumonia caused by refractory Mycoplasma pneumoniae pneumonia in children</i>	<i>Retro-spective Study</i>	Patients with <i>necrotizing pneumonia</i> with <i>Mycoplasma pneumoniae</i> in Children's Hospital of Zhejiang Medical University from January 1, 2008 - December 31, 2015	<ul style="list-style-type: none"> • Of the 25 patients, the thorax photos showed consolidation (76%), atelectasis (44%), pleural effusion (80%), and pleural thickening (20%).

Discussion

Based on these studies, it was found that the distribution of pathogenic bacteria in pneumonias was very diverse, including *Mycoplasma pneumoniae*, *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Mycobacterium tuberculosis*, *Chlamydia pneumoniae*, *S. pyogenes*, *Candida sp*, *Chlamydia psittaci*, *Haemophilus influenzae*, and *Moraxella catarrhalis*. This is in accordance with the research of Farida, et al (2015) found *Klebsiella pneumoniae* (14%), *Streptococcus pneumoniae* (13%), *Mycobacterium tuberculosis* (5%), and *Chlamydia pneumoniae* (5%). *Pseudomonas aeruginosa* bacteria can also be found in pneumonia patients, according to the study of Ziko, et al (2022) out of 286 obtained *Pseudomonas aeruginosa* (7%). In the study of Qu, et al (2022), other pathogenic bacteria such as *Legionella pneumophila* (11.3%), *Mycoplasma pneumoniae* (9.9%), *Chlamydia psittaci* (6.8%), *S. Aureus* (4.5%), and *Enterobacteriaceae* (13.1%) were found, including *Klebsiella pneumoniae* (86.2%) and *Escherichia coli* (6.9%). *Haemophilus influenzae* can also be found in pneumonia patients, as in the study by Su, et al (2021), it was found that the most pathogenic bacteria were *Haemophilus influenzae* (12.91%).^{15,18-24} The diverse distribution of pathogenic bacteria in pneumonia can occur because the etiology of pneumonia is influenced by the living environment and varied population characteristics, so each region or country has differences in the distribution of pathogenic bacteria that cause pneumonia.¹⁸⁻²⁴

Based on several studies, there are common thorax photo images that can occur in pneumonia cases, namely images of consolidation, infiltrates and pleural effusion. This is in accordance with the research of Permana, et al (2023), which found 15 consolidations (9.4%), 135 infiltrates (84.9%), and 9 pleural effusions (5.7%). In line with the research of Jain, et al (2015) in adult CAP patients obtained a picture of consolidation (62%), alveolar or interstitial infiltrates (40%), pleural effusion (31%). Research Jain, et al (2015) in pediatric CAP patients found a picture of consolidation (58%), alveolar or interstitial infiltrates (51%), pleural effusion (13%). However, in addition to these three images, pneumonia patients can also find other images of thorax photos, this is related to the research of Saraya, et al (2017) in pediatric patients obtained an *air bronchogram* (60.6%), reticular shadows (28.2%), small nodules (24%), thickening of the bronchial wall (33.8%), and atelectasis (9.9%). While in adult patients, *air bronchogram* (33.3%), reticular shadows (20.4%), small nodules (22.2%), and bronchial wall thickening (14.8%) were obtained. In addition, in the study of Qu, et al (2022), a *ground-glass opacity* picture was also found (65.1%) in pneumonia patients.^{12,16,20,22}

In 8 out of 9 journals that examined pneumonia caused by *Mycoplasma pneumoniae* (MPP), a frequent picture was obtained, namely lobar consolidation or lobar pneumonia. This is as found in the study of Cho, et al (2019) that the most common thorax photo images in pediatric patients with MPP were lobar/segmental consolidation in 146 patients (37%), severe peribronchial infiltrates in 107 patients (27%), uneven infiltrates in 57 patients (15%), and localized reticulonodular infiltrates in 83 patients (21%). In line with the research of Yoon, et al (2017) in pediatric patients with MPP in five hospitals in Korea from 82 patients resistant to macrolides

obtained a picture of homogeneous solid lobar consolidation thorax (42.7%), uneven consolidation (29.3%), *nodular opacity* (14.6%), bilateral perihilar infiltrates (13.4%), and pleural effusion (22%). In line with the research of Wang, et al (2017); Fan, et al (2022); Ling, et al (2020); and Yang, et al (2021) the results found in MPP patients are generally lobar consolidation. In Wang, et al's (2020) study on croupous pneumonia at Zibo Central Hospital, it was found that the most common pathogen found in patients with croupous segmental pneumonia or S/L-PP was *Mycoplasma pneumoniae* (50%) in 2014, (68.37%) in 2015, (83.48%) in 2016, (77.37%) in 2017, and (74.52%) in 2018. Based on these 8 studies that examined pneumonia caused by *Mycoplasma pneumoniae* and segmental/global pneumonia, it was found that in cases of pneumonia caused by *Mycoplasma pneumoniae*, the most common thorax image found in MPP cases was a picture of lobar consolidation or lobar pneumonia. Therefore, in patients with lobar pneumonia or pneumonia patients with a thorax photo image in the form of lobar consolidation, we can suspect *Mycoplasma pneumoniae* infection, but it does not rule out the possibility that it can also be caused by other pathogens.^{20,26-33}

CONCLUSION

Thorax images and the distribution of pathogenic bacteria in pneumonia patients are very diverse. In pneumonia cases, the distribution of pathogenic bacteria that can be found include *Mycoplasma pneumoniae*, *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Mycobacterium tuberculosis*, *Chlamydia pneumoniae*, *S. pyogenes*, *Candida sp*, *Chlamydia psittaci*, *Haemophilus influenza*, and *Moraxella catarrhalis*. The most common pathogenic bacteria found were *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, and *Mycoplasma pneumoniae*.

On thorax photographs, the images that can be found in pneumonia patients are consolidation, infiltrates, pleural effusion, air bronchogram, reticular shadows, small nodules, bronchial wall thickening, atelectation, and *ground-glass opacity*. Frequent thorax images found in patients with pneumonia are consolidation, infiltrates, and pleural effusion.

In pneumonia caused by *Mycoplasma pneumoniae*, the image of lobar consolidation or lobar pneumonia is often found on thorax photo examination, indicating that there is a typical pattern of images in *Mycoplasma pneumoniae* pathogens. further research needs to be done to see if there is a relationship between the image of thorax photos and the distribution of bacterial pathogens of pneumonia.

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