

Supplementary Material 1. Literature Search Strategies

PubMed:

#1 (severe pneumonia [MeSH Terms]) OR (severe pneumon*[Title/Abstract]) OR (severe community acquired pneumon*[Title/Abstract])

#2 atypical pathogens OR atypical pneumonia OR mycoplasm* OR Pneumonia, Mycoplasma OR legionell* OR legionnaire* OR Legionellosis OR Legionnaires' disease OR chlamydi* OR chlamydia pneumonia OR chlamydia pneumoniae OR chlamydial pneumonia

#1 AND #2

Embase:

#1 'severe pneumonia'/exp OR 'severe pneumon*':ab,ti OR 'severe community acquired pneumon*':ab,ti

#2 'atypical pathogen*' OR 'atypical pneumonia*' OR 'mycoplasm*' OR 'pneumonia, mycoplasma' OR 'legionell*' OR 'legionnaire*' OR 'chlamydi*' OR 'chlamydia pneumonia' OR 'chlamydia pneumoniae' OR 'chlamydial pneumonia'

#1 AND #2

Web of Science:

#1 TI=(severe pneumon*) OR AB=(severe pneumon*) OR TI=(severe community acquired pneumon*) OR AB=(severe community acquired pneumon*)

#2 TS=(atypical pathogen* OR atypical pneumon* OR mycoplasm* OR Pneumonia, Mycoplasma OR legionell* OR Legionellosis OR Legionnaires' disease OR chlamydi* OR chlamydia pneumonia OR chlamydia pneumoniae OR chlamydial pneumonia)

#1 AND #2

The Cochrane Library:

#1 (severe pneumonia): ti,ab,kw OR (severe community acquired pneumonia):ti,ab,kw

#2 (atypical pathogen* OR atypical pneumonia OR mycoplasm* OR Pneumonia, Mycoplasma OR legionell* OR legionnaire* OR chlamydi* OR chlamydia pneumonia OR chlamydia pneumoniae OR chlamydial pneumonia)

#1 AND #2

Abbreviation: MeSH, medical Subject Headings in MEDLINE.

Supplementary Material 2

Supplementary Table 1: Characteristics of Studies of the Prevalence of Chlamydia, Mycoplasma, and Legionella in Patients with Severe Pneumonia.

Study	Region	Age group	Pneumonia category	Pathogen	Total/Case	Study period	Diagnostic method	Diagnostic criteria	Quality Score*
Adults=53									
Woodhead et al,1985	United Kingdom#	>14y	CAP*	MP, LP, CP	50/16	1972-1981	Serology	Admitted to ICU	8
Sörensen et al,1986	Sweden	>14y	CAP*	MP, LP, C.psittaci	30/6	1981-1982	Serology, Culture	Admitted to ICU	7
Sörensen et al,1989	Sweden	>14y	CAP	MP, LP, LB, C.psittaci	36/4	1984-1987	Serology, Culture	Admitted to ICU	9
Potgieter et al,1992	South Africa	>14y	CAP, HAP, AP, ICP	MP, LP	178/6	1987.01-1989.12	Serology, Culture	Admitted to ICU	9
Woodhead et al,1992	United Kingdom#	>15y	CAP*	MP, LP	60/11	1987.01-1987.12	Serology, Culture	Admitted to ICU	10
Rello et al, 1993	Spain	>23y	CAP	LP	35/8	1988.01-1990.12	Serology, UA	Admitted to ICU	8
Moine et al,1994	France#	≥15y	CAP*	MP, LP, C.psittaci	132/6	1987.06-1989.12	Serology, Culture	Admitted to ICU	10
Almirall et al,1995	Spain	Adults	CAP, HAP	MP, LP, C.psittaci	127/28	1986,03-1989,02	Serology, Culture	Admitted to ICU	9
Leroy et al, 1995	France	>17y	CAP*	CP, MP, LP	299/7	1987.01-1991.12	Serology, Culture	Admitted to ICU	7
Cosentini et al, 1996	Italy	>23y	CAP	MP, CP, LP	61/9	1992.07-1993.06	Culture, indirect immunofluorescent	ATS1993	8
Lee et al, 1996	Singapore	>19y	CAP	MP, LP	59/3	1991.06-1993.02	Serology, Culture	Admitted to ICU	9
Hirani et al, 1997	UK	>15y	CAP*	MP, CP, LP	57/12	1984.01-1993.12	Serology, ELISA	IDSA/ATS	7
Ruiz et al-1, 1999	Spain	Adults	CAP	MP, LP	64/0	1996.10-1997.12	Serology, Culture	BTS1987	9
Ruiz et al-2, 1999	Spain	Adults	CAP*	MP, LP, CP, C.psittaci	89/11	1996.10-1998.09	Serology, Culture, UA	ATS1993	8
Vegelin et al, 1999	Netherlands	>19y	CAP*	MP, LP	62/3	1992-1996	Culture	IDSA/ATS	6

Luna et al, 2000	Argentina	>17y	CAP	MP, CP, LP	39/7	1997.10-1998.09	UA, IFA	IDSA/ATS	8
Park et al, 2001	USA	Adults	CAP	MP, CP, LP	72/11	1994.06-1996.05	Serology, Culture	ATS1993	8
Rello et al, 2003	Spain#	Adults	CAP	MP, CP, LP	210/26	1993.01-2000.01	Serology, Culture, UA	ATS2001	8
Tomic et al, 2003	Slovenia	>20y	CAP	Atypical bacteria	55/4	1998.01-1998.12	Serology, UA	ATS2001	9
Vallés et al, 2003	Germany#	Adults	HAP	LP	96/18	1993.01-2000.01	Serology, bronchoalveolar lavage, UA	APACHE	8
Kawai et al, 2004	Japan	≥15y	CAP	MP, CP	60/1	1998.01-2000.12	Serology	JRS2000	9
Reechaipichitkul et al, 2004	Thailand	≥15y	CAP	MP	105/1	1999.01-2001.12	Serology	ATS2001	8
Diaz et al, 2005	Chile	> 15y	CAP*	MP, LP	113/3	1999-2001	Serology, Culture, UA	Admitted to ICU	8
Gutierrez et al, 2005	Spain	>15y	CAP	MP, CP, LP	123/14	1999.10-2001.10	CF test, UA	PSI: IV or V	10
Templeton et al, 2005	Netherlands#	≥18y	CAP	MP	28/0	2000.9.1-2002.9.30	Serology, Culture, RT-PCR	PSI: IV or V	9
Wilson et al, 2005	Australia	≥18y	CAP	MP, LP, CP	44/3	2001.1-2003.7	Culture, UA, PCR	PSI	7
Yang et al, 2007	Singapore	Adults	CAP*	LP	103/2	over a 2-year period	/	Admitted to ICU	7
Stralin et al, 2010	Sweden	>18y	CAP	MP, CP, LP	80/5	1999.11-2002.04	Culture, UA, PCR	PSI, CRB-65: 2-4	8
Cillóniz et al, 2011	Spain	Adults	CAP*	MP, LP, CP	301/22	1996.11-2008.07	Serology, Culture, UA	PSI: V	10
Hartung et al, 2011	Malawi	> 18y	CAP	MP, LP, CP, C.pittaci	51/0	2006.02-2006.09	PCR, Culture	Admitted to ICU	10
Choi et al, 2012	Korea	≥18y	CAP, HCAP	MP, LP, CP	198/5	2010-2011	Culture, UA, PCR	IDSA/ATS2007	9
Dagaonkar et al, 2012	India	Adults	CAP*	MP, LP, CP	19/2	over 18 months	/	mBTS	7
Zobel et al, 2012	Germany#	>18y	CAP*	MP, CP, LP	105/21	2001.01-2006.12	Culture, UA, PCR	CRB, CRB-65	9

Alzubaidy et al, 2013	France	Adults	CAP	MP	69/7	/	PCR	Admitted to ICU	6
Ishiguro et al, 2013	Japan	Adults	CAP	MP, LP, CP, C.psittaci	133/33	2002.01-2011.11	Serology, UA	IDSA/ATS2 007	7
Lee et al, 2013	Taiwan, China	≥15y	CAP	MP, CP, LP	88/15	2007.01-2008.12	Serology, UA	PSI>90	9
Arancibia et al, 2014	Chile#	> 18y	CAP*	MP, LP, CP	104/19	2005.01-2006.06	Culture, UA, Serology	ATS2001	8
Ishida et al, 2014	Japan	> 15y	CAP	MP, LP, CP, C.psittaci	461/52	1994.07-2012.07	Culture, Serology, UA	IDSA/ATS2 007	10
Valles et al, 2014	Spain	> 18y	CAP, HCAP, ICP	MP, LP, CP	726/43	2011.04-2012.12	Culture, UA, Serology	Admitted to ICU	7
Walden et al, 2014	European #	>18y	CAP	MP, CP, LP	1135/85	2005.09-2009.10	Serology, Culture, UA	IDSA/ATS	9
Jain et al, 2015	USA#	≥18y	CAP	MP, CP, LP	784/16	2010.01-2012.06	PCR, UA	PSI: IV or V	10
Elshamly et al, 2016	Egypt	Adults	CAP	LP	54/1	2015.8-2016.3	Culture, UA	IDSA/ATS2 007	7
Voiriot et al, 2016	France	Adults	CAP	MP, CP, LP	174/14	2011.10-2015.6	mPCR	PSI/SAPS	7
Gong et al, 2018	China#	≥18y	CAP	MP, CP	797/7	since 2014	RT-PCR	CTS2013	9
Mahendra et al, 2018	India	Adults	CAP	LP, CP	42/0	2015.03-2015.07	Culture, Serology, UA	CURB-65 > 2	9
Qin et al, 2019	China#	Adults	CAP	LP	286/11	2014-2016	UA, Culture	CSRD2016	9
Xie et al, 2019	China	18-85y	NR*	LP	178/4	2010.01-2018.06	Culture, NGS	IDSA/ATS	9
Wu et al, 2020	China#	≥18y	CAP*	LP, CP	329/45	2018.06-2020.2	mNGS	IDSA/ATS	8
De Mangou et al, 2022	USA	>18y	CAP	MP, CP, LP	572/9	2016.01-2018.12	UA, PCR	ATS2019	8
Dogan et al, 2022	Turkey	≥18y	CAP	MP, CP, LP	63/4	2016.11-2017.10	PCR	IDSA/ATS2 009	8
Dogan et al, 2022	Turkey	≥18y	HAP	MP, CP, LP	137/4	2016.11-2017.10	PCR	IDSA/ATS2 009	8
Guillot et al, 2022	/	> 18y	CAP	MP, CP, LP	856/26	over 6 years	UA	Admitted to ICU	5

Qu et al, 2022	China#	>18y	CAP*	MP, CP, LP	275/62	2018.06-2019.12	Culture, UA, mNGS	Admitted to ICU	8
Children=17									
Forgie et al,1991	Gambia	1-9y	ALRI	MP, CP	74/12	1987.06-1988.05	Serology, Culture	WHO1988	7
Samransamruajkit et al,2008	Thailand	1m-15y	CAP	MP, CP	52/25	2005-2006	Serology	WHO1991	8
Zhang et al, 2013	China	1m-5y	CAP	MP	707/78	2007.01-2010.12	Serology, Culture, ELISA	WHO2005	8
Howie et al,2014	Gambia	2-59m	NR	MP, LP, CP	55/0	2007-2009	Culture, PCR	WHO	8
Jroundi et al,2014	Morocco	2-59m	NR	MP, CP	684/10	2010.11-2011.02	Culture, PCR	WHO2005	8
Breiman et al,2015	Kenya	< 5y	SARI	MP, LP, CP	815/0	2007.03-2011.02	Culture, PCR	WHO2008	10
Salih et al,2015	Sudan	< 5y	NR	MP, LP, CP	189/6	2011.01-2012.06	Culture	WHO2005	8
Jonnalagadda et al,2017	Ecuador	2-59m	NR	MP, CP	406/3	2008.02-2010.04	PCR	WHO	9
Koh et al,2017	Singapore	1m-18y	CAP, HAP	MP	237/10	2010-2014	Culture, Serology, PCR	WHO2014	9
Thea et al, 2017	Southeast Asia, South Africa#	1m-59m	CAP	MP, CP	1166/38	2011.08-2014.01	mPCR	WHO, Radiography	8
Gong et al, 2018	China#	<18y	CAP	MP, CP	274/19	since 2014	RT-PCR	CTS2013	9
El-Nawawy et al, 2019	Egypt	1m-12y	CAP*	MP, CP	43/8	2015.05-2018.03	IgA, ELISA	admitted to PICU, mechanical ventilation	9
Mojtahedi et al, 2019	Iran#	<18y	HAP	LP	96/19	2013-2014	PCR	Admitted to ICU	8
Krittigamas et al, 2020	Thailand	1m-18y	CAP	MP, CP, LP	208/1	2017.10-2020.04	RT-PCR	WHO2014	9
Su et al, 2021	China	<14y	CAP	MP	734/142	2016.01-2019.12	Culture, PCR	WHO	7
Zhou et al, 2021	China	1m-18y	CAP	MP	817/203	2017.01-2019.12	Serology, PCR	Admitted to ICU	9
Tran et al, 2022	Vietnam	2m-15y	CAP	MP	95/8	2020.03-2020.08	RT-PCR	WHO/BTS2013	8

Mix=7									
Pachon et al,1990	Spain	Mix	CAP*	MP, LP, C.psittaci	67/7	1985-1987	Serology, Culture	Admitted to ICU	8
Torres et al,1991	Spain	Mix	CAP*	MP, LP, C.psittaci	92/19	1984.01-1987.12	Serology, Culture	Admitted to ICU	7
Dahmash et al,1994	Saudi Arabia	> 12y	CAP, HAP	MP, LP, CP	113/5	1991.09-1992.12	Serology, Culture	Admitted to ICU	10
Tan et al,1998	Singapore	>12y	CAP*	MP, LP	57/6	1989.01-1993.05	Serology, Culture	Admitted to ICU	8
Phares et al, 2007	Thailand#	Mix	CAP	MP, CP, LP, LL	755/130	2003.09-2004.08	Serology, UA, PCR	Admitted to ICU	7
Li et al, 2018	China	Mix	NR	MP, CP	106/26	/	TEM	Admitted to ICU	5
Kübler et al, 2021	New Zealand	Mix	NR	LP	133/8	2004.01-2020.08	Culture	VV-ECMO	7
<p>HCAP=healthcare-associated pneumonia; ICP=Immunocompromised patient; AP=aspiration pneumonia; ICP=Immunocompromised pneumonia; ALRI=acute lower respiratory tract infections; SARI=severe acute respiratory infection; MP=Mycoplasma pneumoniae; LP=Legionella pneumophila; LB=Legionella Bozemanii; LL=Legionella longbeachae; C.psittaci=Chlamydia psittaci; CP=Chlamydia pneumoniae; IDSA=Infectious Diseases Society of America; ATS=American Thoracic Society; APACHE =Acute Physiology and Chronic Health Evaluation; mBTS=modified British Thoracic Society rule; JRS=Janpan Respiratory Society; CSR=Chinese Society of Respiratory Diseases; SAPS=Simplified Acute Physiologic Score; WHO=the World Health Organization; UA=urine antigen testing; PCR=polymerase chain reaction; NGS=next generation sequencing; NR=not reported</p> <p>* Study excludes immunocompromised patients</p> <p># multicenter study</p>									

***The citations of Diagnostic Criteria have been provided in Supplementary Table 2.**

*** Quality assessment score: Low quality = 0–3; Moderate quality = 4–7; High quality = 8–11.**

AHRQ Assessment Criteria: (Yes=1, No=2, Unclear=3; Answering “Yes” gets 1 score, otherwise get 0 score.)

Q1. Define the source of information (survey, record review)

Q2. List inclusion and exclusion criteria for exposed and unexposed subjects (cases and controls) or refer to previous publications

Q3. Indicate time period used for identifying patients

Q4. Indicate whether or not subjects were consecutive if not population-based

Q5. Indicate if evaluators of subjective components of study were masked to other aspects of the status of the participants

Q6. Describe any assessments undertaken for quality assurance purposes (e.g., test/retest of primary outcome measurements)

Q7. Explain any patient exclusions from analysis

Q8. Describe how confounding was assessed and/or controlled

Q9. If applicable, explain how missing data were handled in the analysis

Q10. Summarize patient response rates and completeness of data collection

Q11. Clarify what follow-up, if any, was expected and the percentage of patients for which incomplete data or follow-up was obtained

Supplementary Table 2. Details on the severity diagnosis of pneumonia

Diagnostic Criteria of Severe Pneumonia	Number of Studies
Admitted to ICU	26
IDSA/ATS criteria	19
ATS1993	3
ATS2001	4
ATS2007	4
IDSA/ATS2009	2
IDSA/ATS2019	1
WHO criteria	13
WHO1988	1
WHO1991	1
WHO2005	3
WHO2008	1
WHO2013	1
WHO2014	2
BTS criteria (BTS1987; modified BTS)	2
PSI score	8
CRB/CURB-65	3
APACHE	1
Others: CSRD2016, CTS2013 and JRS2000	3
Total	75