Reasons for exclusion of studies:

immunosuppressed population;[1-4] population not restricted to pneumonia;[5-9] selection of patients with chronic obstructive pulmonary disease;[10] investigation of only one virus;[11-17] no report of viral etiology;[18] no performance (or no consistent performance) of PCR for virus identification;[19-22] inclusion of children;[23-27] inclusion of cases of bilateral pneumonia only;[28]; exclusion of patients with bacterial infection;[29]; patient population restricted to those ≥ 65 year-old; restriction to atypical pneumonia;[30]; review article;[31] Chinese language;[32,33] evaluation of microbiota,[34] cohort was fully or partially included in other studies.[35-41]An additional article was excluded because we were unable to establish if PCR for virus identification was systematically performed.[42]

References

1. Gonzalez Y, Martino R, Rabella N, Labeaga R, Badell I, Sierra J. Community respiratory virus infections in patients with hematologic malignancies. *Haematologica* 1999; 84: 820-823.

2. van Elden LJ, van Kraaij MG, Nijhuis M, Hendriksen KA, Dekker AW, Rozenberg-Arska M, van Loon AM. Polymerase chain reaction is more sensitive than viral culture and antigen testing for the detection of respiratory viruses in adults with hematological cancer and pneumonia. *Clin Infect Dis* 2002; 34: 177-183.

3. Camps Serra M, Cervera C, Pumarola T, Moreno A, Perello R, Torres A, Jimenez de Anta MT, Marcos MA. Virological diagnosis in community-acquired pneumonia in immunocompromised patients. *Eur Respir J* 2008; 31: 618-624.

4. Hartung TK, Chimbayo D, van Oosterhout JJ, Chikaonda T, van Doornum GJ, Claas EC, Melchers WJ, Molyneux ME, Zijlstra EE. Etiology of suspected pneumonia in adults admitted to a high-dependency unit in Blantyre, Malawi. *Am J Trop Med Hyg* 2011; 85: 105-112.

5. Katz MA, Lebo E, Emukule G, Njuguna HN, Aura B, Cosmas L, Audi A, Junghae M, Waiboci LW, Olack B, Bigogo G, Njenga MK, Feikin DR, Breiman RF. Epidemiology, seasonality, and burden of influenza and influenza-like illness in urban and rural Kenya, 2007-2010. *J Infect Dis* 2012; 206 Suppl 1: S53-60.

6. Liu PY, Wang LC, Lin YH, Tsai CA, Shi ZY. Outbreak of influenza A and B among military recruits: evidence from viral culture and polymerase chain reaction. *J Microbiol Immunol Infect* 2009; 42: 114-121.

7. Verani JR, McCracken J, Arvelo W, Estevez A, Lopez MR, Reyes L, Moir JC, Bernart C, Moscoso F, Gray J, Olsen SJ, Lindblade KA. Surveillance for hospitalized acute respiratory infection in Guatemala. *PLoS One* 2013; 8: e83600.

8. Wolter N, Cohen C, Tempia S, Madhi SA, Venter M, Moyes J, Walaza S, Malope Kgokong B, Groome M, du Plessis M, Pretorius M, Dawood H, Kahn K, Variava E, Klugman KP, von Gottberg A. HIV and influenza virus infections are associated with increased blood pneumococcal load: a prospective, hospital-based observational study in South Africa, 2009-2011. *J Infect Dis* 2014; 209: 56-65.

9. Macfarlane J, Holmes W, Gard P, Macfarlane R, Rose D, Weston V, Leinonen M, Saikku P, Myint S. Prospective study of the incidence, aetiology and outcome of adult lower respiratory tract illness in the community. *Thorax* 2001; 56: 109-114.

10. Ko FW, Ip M, Chan PK, Ng SS, Chau SS, Hui DS. A one-year prospective study of infectious etiology in patients hospitalized with acute exacerbations of COPD and concomitant pneumonia. *Respir Med* 2008; 102: 1109-1116.

11. Bjarnason A, Thorleifsdottir G, Love A, Gudnason JF, Asgeirsson H, Hallgrimsson KL, Kristjansdottir BS, Haraldsson G, Baldursson O, Kristinsson KG, Gottfredsson M. Severity of influenza A 2009 (H1N1) pneumonia is underestimated by routine prediction rules. Results from a prospective, population-based study. *PLoS One* 2012; 7: e46816.

12. Kanchana S, Kanchana S, Vijitsopa T, Thammakumpee K, Yamwong S, Sawanyawisuth K. Clinical factors predictive of pneumonia caused by pandemic 2009 H1N1 influenza virus. *Am J Trop Med Hyg* 2013; 88: 461-463.

13. Lindblade KA, Arvelo W, Gray J, Estevez A, Frenkel G, Reyes L, Moscoso F, Moir JC, Fry AM, Olsen SJ. A comparison of the epidemiology and clinical presentation of seasonal influenza A and 2009 pandemic influenza A (H1N1) in Guatemala. *PLoS One* 2010; 5: e15826.

14. Sohn CH, Ryoo SM, Yoon JY, Seo DW, Lim KS, Kim SH, Hong SB, Lim CM, Koh YS, Kim WY. Comparison of clinical features and outcomes of hospitalized adult patients with novel influenza A (H1N1) pneumonia and other pneumonia. *Acad Emerg Med* 2013; 20: 46-53.

15. Yang SQ, Qu JX, Wang C, Yu XM, Liu YM, Cao B. Influenza pneumonia among adolescents and adults: a concurrent comparison between influenza A (H1N1) pdm09 and A (H3N2) in the post-pandemic period. *Clin Respir J* 2014; 8: 185-191.

16. Singh V, Sharma BB, Patel V, Poonia S. Clinical profile of pneumonia and its association with rain wetting in patients admitted at a tertiary care institute during pandemic of influenza A (H1N1) pdm09 virus infection. *Indian J Chest Dis Allied Sci* 2014; 56: 21-26.

17. Lee JE, Choe KW, Lee SW. Clinical and radiological characteristics of 2009 H1N1 influenza associated pneumonia in young male adults. *Yonsei Med J* 2013; 54: 927-934.

18. Eman Shebl R, Hamouda MS. Outcome of community-acquired pneumonia with cardiac complications. *Egyptian Journal of Chest Diseases and Tuberculosis*.

19. Endeman H, Schelfhout V, Voorn GP, van Velzen-Blad H, Grutters JC, Biesma DH. Clinical features predicting failure of pathogen identification in patients with community acquired pneumonia. *Scand J Infect Dis* 2008; 40: 715-720.

20. Loens K, Beck T, Ursi D, Overdijk M, Sillekens P, Goossens H, Ieven M. Evaluation of different nucleic acid amplification techniques for the detection of M. pneumoniae, C. pneumoniae and Legionella spp. in respiratory specimens from patients with community-acquired pneumonia. *J Microbiol Methods* 2008; 73: 257-262.

21. Liu PY, Wang LC, Lin YH, Tsai CA, Shi ZY. Outbreak of influenza A and B among military recruits: evidence from viral culture and polymerase chain reaction. *J Microbiol Immunol Infect* 2009; 42: 114-121.

22. van de Garde EM, Endeman H, van Hemert RN, Voorn GP, Deneer VH, Leufkens HG, van den Bosch JM, Biesma DH. Prior outpatient antibiotic use as predictor for microbial aetiology of community-acquired pneumonia: hospital-based study. *Eur J Clin Pharmacol* 2008; 64: 405-410.

23. Lindblade KA, Arvelo W, Gray J, Estevez A, Frenkel G, Reyes L, Moscoso F, Moir JC, Fry AM, Olsen SJ. A comparison of the epidemiology and clinical presentation of seasonal influenza A and 2009 pandemic influenza A (H1N1) in Guatemala. *PLoS One* 2010; 5: e15826.

24. Turner P, Turner C, Watthanaworawit W, Carrara V, Cicelia N, Deglise C, Phares C, Ortega L, Nosten F. Respiratory virus surveillance in hospitalised pneumonia patients on the Thailand-Myanmar border. *BMC Infect Dis* 2013; 13: 434-2334-13-434.

25. Wolter N, Tempia S, Cohen C, Madhi SA, Venter M, Moyes J, Walaza S, Malope-Kgokong B, Groome M, du Plessis M, Magomani V, Pretorius M, Hellferscee O, Dawood H, Kahn K, Variava E, Klugman KP, von Gottberg A. High nasopharyngeal pneumococcal density, increased by viral coinfection, is associated with invasive pneumococcal pneumonia. *J Infect Dis* 2014; 210: 1649-1657.

26. Shen H, Zhu B, Wang S, Mo H, Wang J, Li J, Zhang C, Zeng H, Guan L, Shi W, Zhang Y, Ma X. Association of targeted multiplex PCR with resequencing microarray for the detection of multiple respiratory pathogens. *Front Microbiol* 2015; 6: 532.

27. Edin A, Granholm S, Koskiniemi S, Allard A, Sjostedt A, Johansson A. Development and laboratory evaluation of a real-time PCR assay for detecting viruses and bacteria of relevance for community-acquired pneumonia. *J Mol Diagn* 2015; 17: 315-324.

28. Memish ZA, Almasri M, Turkestani A, Al-Shangiti AM, Yezli S. Etiology of severe community-acquired pneumonia during the 2013 Hajj-part of the MERS-CoV surveillance program. *Int J Infect Dis* 2014; 25: 186-190.

29. Brittain-Long R, Westin J, Olofsson S, Lindh M, Andersson LM. Prospective evaluation of a novel multiplex real-time PCR assay for detection of fifteen respiratory pathogens-duration of symptoms significantly affects detection rate. *J Clin Virol* 2010; 47: 263-267.

30. Tokman HB, Aslan M, Ortakoylu G, Algingil RC, Yuksel P, Karakullukcu A, Kalayci F, Saribas S, Cakan H, Demir T, Kocazeybek BS. Microorganisms in respiratory tract of patients diagnosed with atypical pneumonia: results of a research based on the use of reverse transcription polymerase chain reaction (RT-PCR) DNA microarray method and enzyme-linked immunosorbent assay. *Clin Lab* 2014; 60: 1027-1034.

31. Cohen-Bacrie S. HP. Prospects for molecular point-of-care diagnosis of lower respiratory infections at the hospital's doorstep. *Future Virology* 2013; 8: 43-52.

32. Liu YF, Chen MF, Gao Y, Cao B, Dong JP, Zhang YX, Gao F, Hu M, Ma XH, Jin XH, Xu Q, Wei L. Etiologic characteristics of adult patients with community-acquired pneumonia in Beijing. *Zhonghua Yi Xue Za Zhi* 2013; 93: 2043-2047.

33. Park JW, Jung SY, Eun HS, Cheon S, Seong SW, Park DI, Park MR, Park HS, Jung SS, Kim JO, Kim SY, Lee JE. Respiratory virus detection rate in patients with severe or atypical community-acquired pneumonia. *Tuberc Respir Dis* 2011; 71: 335-340.

34. Bousbia S, Papazian L, Saux P, Forel JM, Auffray JP, Martin C, Raoult D, La Scola B. Repertoire of intensive care unit pneumonia microbiota. *PLoS One* 2012; 7: e32486.

35. Huijskens EG, Rossen JW, Kluytmans JA, van der Zanden AG, Koopmans M. Evaluation of yield of currently available diagnostics by sample type to optimize detection of respiratory pathogens in patients with a community-acquired pneumonia. *Influenza Other Respir Viruses* 2014; 8: 243-249.

36. Huijskens EG, van Erkel AJ, Palmen FM, Buiting AG, Kluytmans JA, Rossen JW. Viral and bacterial aetiology of community-acquired pneumonia in adults. *Influenza Other Respir Viruses* 2013; 7: 567-573.

37. Luchsinger V, Piedra PA, Ruiz M, Zunino E, Martinez MA, Machado C, Fasce R, Ulloa MT, Fink MC, Lara P, Avendano LF. Role of neutralizing antibodies in adults with community-acquired pneumonia by respiratory syncytial virus. *Clin Infect Dis* 2012; 54: 905-912.

38. Johansson N, Kalin M, Hedlund J. Clinical impact of combined viral and bacterial infection in patients with community-acquired pneumonia. *Scand J Infect Dis* 2011; 43: 609-615.

39. Afzal Z, Minard CG, Stager CE, Yu VL, Musher DM. Clinical Diagnosis, Viral PCR, and Antibiotic Utilization in Community-Acquired Pneumonia. *Am J Ther* 2013.

40. Liu YF, Gao Y, Chen MF, Cao B, Yang XH, Wei L. Etiological analysis and predictive diagnostic model building of community-acquired pneumonia in adult outpatients in Beijing, China. *BMC Infect Dis* 2013; 13: 309-2334-13-309.

41. Cao B, Ren LL, Zhao F, Gonzalez R, Song SF, Bai L, Yin YD, Zhang YY, Liu YM, Guo P, Zhang JZ, Wang JW, Wang C. Viral and Mycoplasma pneumoniae community-acquired pneumonia and novel clinical outcome evaluation in ambulatory adult patients in China. *Eur J Clin Microbiol Infect Dis* 2010; 29: 1443-1448.

42. Kothe H, Bauer T, Marre R, Suttorp N, Welte T, Dalhoff K, Competence Network for Community-Acquired Pneumonia study group. Outcome of community-acquired pneumonia: influence of age, residence status and antimicrobial treatment. *Eur Respir J* 2008; 32: 139-146.