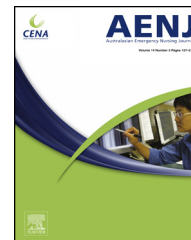




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SYSTEMATIC REVIEW

What is the seasonal distribution of community acquired pneumonia over time? A systematic review



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KEYWORDS

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Summary

Background: Community-acquired pneumonia (CAP) is a growing public health concern in many developed countries including Australia. CAP account for an estimated two percent of all overnight hospital admissions in Australia. Despite the significant burden on the Australian healthcare system and the high level of morbidity and mortality associated with CAP, there has been a paucity of research on the incidence of disease in this country, particularly in relation to seasonal variation of emergency department presentations and subsequent admission.

Methods: The following search terms were used: community-acquired AND pneumonia AND/OR seasonal AND season AND/OR variation OR differences. The limits used for the search terms included: "All Adult"; the years 1948 to current or 1948 to week 1 May 2012, (depending on the database); English language; and with full text. The databases searched included MEDLINE, Embase and CINAHL.

Results: Distinct seasonal patterns in the occurrence of CAP were observed: 34% of CAP admissions occurred in spring; 18% in autumn; 26% in winter; and 22% in summer ($p = 0.036$). Hospital admissions for CAP were significantly higher in the winter and spring ($p < 0.001$) and highest in December (20.5%) and January (25.1%). Peak hospitalisations from January through to April were observed. The included studies were conducted in the northern hemisphere where the months December to February relate to winter.

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Conclusions: International studies have shown an association between seasonal variation and the occurrence of CAP in temperate and subtropical climates. Selected studies had methodological limitations that limit conclusions and applicability to clinical practice. There are no studies in the Australian context. Further epidemiological studies are required to elucidate this important aspect of the epidemiology of CAP.

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What is known

- Despite vast improvements in antibiotic and supportive therapy, community-acquired pneumonia (CAP) remains a persistent global public health problem.
- Understanding the seasonal variations in emergency department (ED) presentations and hospital admissions for CAP is important. Identifying seasonal peaks enables predictions in clinical demand to be more accurately made. This may facilitate better planning and utilisation of services both within EDs and across wider organisations. This has been largely unexplored in the Australian context.

What this paper adds

- The seasonal distribution of CAP admissions varies by age and gender in countries with varying geography, climate, population distributions and other environmental conditions.
- Similar studies in Australia are necessary as this is a major gap in our knowledge of understanding CAP emergency department presentations and hospital admissions over time.

Introduction

Despite vast improvements in antibiotic and supportive therapy, community-acquired pneumonia (CAP) remains a persistent global public health problem. Lower respiratory infections including pneumonia remain the fourth leading cause of death worldwide.¹ In Australia, it is estimated that pneumonia accounts for two percent of all hospital overnight admissions.² Australian studies examining the occurrence of CAP have predominantly focused on the association between circulating respiratory viruses and CAP^{3–6}; the empiric treatment and management of CAP^{7–9}; or the efficacy of severity scores to rate the severity of CAP.^{10–12}

An aspect of incidence that has been largely unexplored in the Australian context is seasonal variation in emergency department (ED) presentations and admissions for CAP in isolation. CAP exists year round so understanding seasonal variations in and of its self will be valuable in understanding the burden this disease places on hospital services over time. Seasonal peaks in ED demand have been shown to have a negative impact on ED length-of-stays and access to in-patient beds.⁵ These directly contribute to ED overcrowding. Identifying seasonal peaks will enable predictions in clinical demand to be more accurately made. At a macro level this

can facilitate better planning and utilisation of services both within EDs and across wider organisations.

The correlation between increases in influenza and other circulating respiratory viruses and admissions for CAP and pneumonia has been widely documented internationally^{13–24} and within Australia.^{4–6} Kelly and associates (2009) examined patients hospitalised with either influenza or CAP during the H1N1 pandemic. Only a small proportion of patients admitted with CAP were identified as having concurrent influenza.⁶ These findings indicate that seasonal presentations for CAP alone place a significant burden on hospital admissions during peak influenza periods. Whether this is the case during non-influenza seasons and over time is worth investigating independently (Fig. 1).

The aims of this review were to investigate seasonal differences in the occurrence of CAP in relation to hospital admissions and to identify age and gender variations in the occurrence of the seasonal distribution of the disease.

Methods

Search methods

A systematic review of the current literature was conducted using the following databases: MEDLINE; Embase; and CINAHL. The following search terms were applied: community-acquired AND pneumonia AND/OR seasonal AND season AND/OR variation OR differences. The limits used for the search terms included: "All Adult"; the years 1948 to current or 1948 to week 1 May 2012, (depending on the database); English language; and with full text.

No additional records including papers not in circulation or other unpublished material were identified through searching other sources.

Selection of studies for the review: To be included, a study had to fulfil several criteria. Studies were selected where outcome measures were specifically defined as the incidence of hospital admissions for CAP or pneumonia over time using daily, monthly or yearly diagnoses of pneumonia from hospital medical records. The search included both viral and bacterial pneumonia. Given we were interested in the seasonal variation of pneumonia specifically, studies examining pneumonia and concurrent circulating respiratory viruses were excluded. Studies were also selected where the exposure measurements were defined as day of admission for CAP or pneumonia, season and age and gender. As we are interested in modelling the seasonal variations in CAP and pneumonia by age and gender over time we included studies where time series techniques such as correlational analysis and regression models were used. Studies which included only paediatric study samples were excluded. In all studies included in the review we assessed the applicability of the

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