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SYSTEMATIC REVIEW

Does back pain prevalence really decrease with increasing age? A systematic review

CLERMONT E. DIONNE[1,2,3], KATE M. DUNN[3], PETER R. CROFT[3]

[1]Population Health Research Unit, Research Centre of the Laval University Affiliated Hospital, Quebec, Canada
[2]Department of Rehabilitation, Faculty of Medicine, Laval University, Quebec, Canada
[3]Primary Care Sciences Research Centre, Keele University, Staffordshire, UK

Address correspondence to: Clermont E. Dionne. Tel: (+1) 418 682 7511x4675; Fax: (+1) 418 682 7949. Email: clermont.dionne@uresp.ulaval.ca

Abstract

Background: it is believed that the prevalence of back pain decreases around the middle of the sixth decade. However, back pain is still among the most commonly reported symptoms in the elderly and osteoarthritis, disc degeneration, osteoporosis and spinal stenosis all increase with age. In light of this, it is difficult to understand why the prevalence of back pain would decrease with increasing age.
Objective: this study aimed at summarising the scientific evidence on the trends of back pain prevalence with age.
Methods: population-based studies reporting the prevalence of back pain, including people aged 65 years and over, were systematically retrieved from several bibliographic databases. These were read and assessed by two reviewers, and papers retained ('good quality studies') were aggregated according to specific criteria.
Results: good quality studies showed a large heterogeneity as to their methods and prevalence figures. No specific patterns were detected by country nor outcome measure. However, most studies that considered severe forms of back pain found an increase of prevalence with increasing age. The curvilinear association between age and back pain prevalence that is widely mentioned in the literature was found only for benign and mixed problems.
Conclusions: the evidence concerning the association of back pain prevalence with age is more sparse than currently believed and this association seems to be modified by the severity of the problem. This knowledge could have important public health implications, as the proportion of older people will increase considerably in the coming years in most industrialised societies.

Keywords: *back pain, age, epidemiology, systematic reviews*

Introduction

Back pain is among the most common health problems seen in primary care [**1**]. Because of its frequency and its mostly benign character, back pain is often seen as a trivial problem compared to other afflictions that generate a high mortality, like cancer or infectious diseases. However, in terms of morbidity, back disorders are the leading cause in many categories, including activity limitation and work absence. Besides the human costs, the financial costs of back pain are considerable, and take a high toll on the society's resources [**1**, **2**].

While back pain affects men and women of all ages, it is believed that adults of working age are the most vulnerable, and hence that the prevalence of back pain decreases around the middle of the sixth decade, although there is no consensus on the actual prevalence rates of back pain [**3**–**5**].

This perception arose from the early pain surveys in the general population, including the pioneering work of Sternbach, which showed that all self-reported regional pains were lower in prevalence in the older post-retirement age groups than at younger ages [6]. These were followed by population surveys specifically of low back pain which reached the same general conclusion (e.g. the South Manchester Back Pain Study and the Southampton Back Pain Survey [7–9]). Parallel work in the gerontological literature was addressing the issue of why such self-reported pain might decline in the oldest age groups [10]. Further fuelling of the idea came from the generalisation of the results of studies conducted in working populations, showing the same trend of decline in prevalence at older ages, although these were susceptible to a 'healthy worker effect' (a bias caused by the exclusion of subjects with back pain from the workforce) [11–13].

Given that the cumulative incidence of first ever back pain is already high by early adulthood, it is reasonable to suppose that first onset incidence declines with age. However, back pain is typically a recurrent intermittent problem, and so the frequency with which new episodes occur over time is closer to a measure of period prevalence. It is this occurrence of episodic or prevalent back pain that appears to decline with age.

However, back pain is still among the four most commonly reported symptoms in the elderly [14] and the prevalence of osteoarthritis, disc degeneration, osteoporosis and spinal stenosis are known to increase with age [15–20]. In light of this, and of the relatively recent evidence showing that occupational exposures might not play as important a role as was once believed in back pain [21, 22], it is difficult to understand why the prevalence of back pain would decrease with increasing age.

Because back pain has such human and financial impacts on society and since the number of people aged 65 years and more is expected to increase dramatically in the next decade in most industrialised countries, including Canada [23], the United Kingdom [24] and the United States [25], the accuracy of our understanding of the association of back pain with age could have substantial public health consequences in the coming years [17, 26].

The objective of this study was to systematically review the existing prevalence studies on back pain that included older people, in order to summarise the scientific evidence as to the trends of back pain prevalence with age.

Methods

Search strategy

Four computerised bibliographic databases were searched from 1966 (or their date of inception if later), with strategies that included 'back pain or backache or neck pain' and 'incidence or prevalence' in the title: Web of Science (Institute for Scientific Information), MEDLINE (Index Medicus), CINAHL (Cumulative Index of Nursing and Allied Health Literature) and EMBASE (Excerpta Medica). This search was complemented by systematic hand searching of citations referenced in articles and existing reviews. A few papers were identified from suggestions by colleagues. Unpublished and non-English language papers were included. Such a specific search strategy was chosen over a more sensitive one because of the generic character of our theme (it was easy to get thousands of articles by widening the search strategies). Papers dealing with the incidence of back pain were included because prevalence is determined in part by incidence (prevalence = incidence × duration). They were, however, considered separately. Papers that did not report the prevalence of back pain by age (the range of which needed to include individuals aged 65 years) from population-based samples, were identified from their titles (first step) and abstracts (second step), and excluded from further analysis. Back pain was defined as 'pain in any segment(s) of the spine, including the cervical spine'. All other articles were read by the first author and, when in accordance with the topic of the review, assessed separately as to their methodological quality by two of the authors and summarised in a table (third step). When the two reviewers did not agree on the methodological quality of a paper, the article was to be read by a third reviewer and a consensus approach was used. When one of the authors of the current paper had a possible apparent conflict of interest with the authors of an article (e.g. present or past collaboration), this article was graded by an independent reviewer (Dr Helen Boardman) who was blinded to the authors' names and affiliations and of the geographical setting of the study, as much as was achievable. Non-English language papers were graded by only one reviewer.

Selection criteria

The methodological quality of articles in relation to the question under study was assessed using a grid inspired by those published by Walker [**3**], Leboeuf-Yde and Lauritsen [**4**] and Loney and Stratford [**27**] (Table 1). Criteria were considered 'fulfilled', 'not fulfilled' or 'not applicable'. Each paper was given a score that corresponded to the percentage of applicable criteria that were considered fulfilled. When the information necessary to rate a criterion was not available in a paper or another clearly specified reference, the criterion was rated 'not fulfilled'. Only papers that were given an arbitrary score of 75% and more ('good quality studies') were used in the analyses and interpretation of results.

Among papers that were assessed, data were extracted by two of the authors from a randomly selected sample of nine (18%), for standardisation purposes.

Table 1. Quality criteria used for scoring articles

A. Sample representativeness
  1. At least one of the following:
    (i) Entire target population
    (ii) Randomly selected sample
    (iii) Sample stated to represent target population
  2. At least one of the following:
    (i) Reasons for non-response described
    (ii) Non-responders described
    (iii) Comparison of responders and non-responders
    (iv) Comparison of sample and target population
  3. Response rate (60% minimum) and, if applicable, drop-out rate (40% maximum) reported

B. Quality of data
  4. Data are primary data on back pain or pain syndromes (vs. general health surveys)
  5. Data were collected directly from the subjects
  6. Same mode of data collection used for all subjects
  7. Questionnaire, interview or examination: standardised and acceptable reproducibility and/or validity demonstrated

C. Definition of back pain
  8. Specific anatomic delineation of the spine/low back or reference to an article that contains such delineation
  9. Further specifications of the definition of back pain (frequency, duration, intensity or character) or reference to an article that contains such specifications
  10. Recall periods clearly stated

D. Consideration of age
  11. Clear definition of age
  12. Statistical analysis on age (confidence intervals, trend analysis, chi-square test, etc.)

Analyses

Good quality studies were grouped in turn by country, type of outcome and severity, to investigate any specific patterns. Then, in order to summarise the good quality studies' results as to the question under examination, prevalence figures (weighted by the inverse of their variance) were plotted against age and a curve of predicted prevalence with increasing age was drawn using the least squares method. Given that studies used different age categories, the mid-points of each category were used for this analysis, and calculated as follows: Mid-point = [LL+(UL–LL)/2], where LL is the lower limit of age category and UL the upper limit of age category. This analysis was conducted only for good quality studies that provided enough information to calculate prevalence and variance, with neck pain and incidence studies excluded. Quadratic and linear trends of the predicted equation were tested in multiple regression. This procedure is equivalent to conducting a meta-analysis [**28**].

Results

The search strategy resulted in 299 unique papers, of which 51 met all the inclusion criteria and were retained for quality assessment. The majority of these (30/51) were identified from the reference lists of other articles. A few papers assessed were written in non-English languages: one in Japanese, two in German, one in French and one in Spanish. When one of the authors was not familiar with a specific foreign language, the help of a colleague was sought. Six papers were identified as possibly in conflict with one or more of the reviewers and were assessed independently. Twenty-two papers that had assessed the relationship between back pain prevalence and age in 34 instances (several papers looked at the association of back pain prevalence and age in different subgroups of subjects or using different measures of back pain) met the threshold of quality and were included in the analyses. Their mean quality score was 81 (range: 75–100). The average quality score of papers excluded from the analyses was 57 (range: 42–67). Overall, criteria most often fulfilled were numbers 1 (sample representativeness) and 11 (definition of age). Criteria most often not fulfilled were numbers 7 (quality of data) and 8 (definition of back pain).

A supplementary table giving a summary of all good quality studies is available online at www.ageing.oxfordjournals and demonstrates the heterogeneity in methods and results that exists in the literature on back pain prevalence. Overall, in five instances, there was an increase of back pain prevalence with increasing age, a decrease was found in seven instances, there were nine instances of a curvilinear relationship, i.e. an increase in the prevalence of back pain until about 55 years and then a decrease, and in 13 instances the prevalence of back pain did not change with age.

Analysis by country

Articles which met the quality criteria were conducted in the United Kingdom (four articles) [**29**–**32**], Canada (three articles on same study) [**33**–**35**], Australia [**36**] Belgium [**37**, **38**], China [**39**], Denmark [**40**], Finland [**41**], Germany [**42**], Norway [**43**, **44**], Spain [**45**, 46], Switzerland [**47**], Sweden [**48**, **49**], the United States [**50**] and the Netherlands [**51**, 52]. No patterns were evident by country of study.

Analysis by outcome

Papers were regrouped according to the type of outcome measured, defined from available information: Point prevalence (six studies) [**31**, **33**, **34**, **37**, **42**, **51**, 52], one-month period prevalence (four studies) [**32**, **40**, **41**, **44**], six-month period prevalence (seven studies) [**33**–**36**, **38**, **45**, 46, **50**], one-year period prevalence (six studies) [**30**, **39**, **42**, **47**, **49**, **51**, 52], lifetime prevalence (seven studies) [**33**, **34**, **37**, **39**, **41**, **48**, **50**] and 'chronic' pain (nine studies) [**31**, **33**–**36**, **38**, **41**, **48**, **51**, 52]. Again, no clear patterns emerged, but we observed that the curvilinear relationship was almost exclusively found among studies that looked at one-year period prevalence measures and some measures of 'chronic' pain. That fact brought us to notice that these two categories of studies had rarely defined back pain according to any severity criteria.

Analysis by severity

The study results were finally classified according to the severity of the back pain problems. Each study result was labelled 'benign or mixed back pain problems' (marked with an 'M' in the 'Trend' column of the supplementary table)—when a general definition of back pain was used—or 'severe back pain' (marked with an 'S')—when back pain definition explicitly mentioned a severity criterion specific to the back problem (e.g. low back pain interfering with daily activities, back-related functional limitations, Chronic Pain Grade [**63**]). Excluded from this analysis were 'chronic' back pain problems defined only by duration, and incidence studies. Nineteen studies included results on back pain that were considered benign or mixed problems in 23 instances. These results were a mixture of an inverse relation of the prevalence of back pain with increasing age (in seven instances) [**32**–**34**, **36**, **38**, **43**, **44**], no association of back pain with age (in nine instances) [**33**, **39**, **40**, **43**–**47**, **50**–52] or a curvilinear relationship with a peak in prevalence around 60 years (in seven instances) [**29**–**31**, **37**, **42**, **44**, **49**]. None of these studies showed results supporting a direct association between the prevalence of back pain and increasing age.

Seven studies reported results on back problems that were classified as 'severe' in seven instances. Four of them reported an increase in the prevalence of severe back pain with increasing age [**30**, **33**, **38**, **42**]. Three studies did not find any association of severe back pain with age [**32**, **34**, **36**].

Weighted analyses

Some results of the weighted analyses conducted in different subgroups of studies are presented graphically in Figure 1. These analyses revealed a statistically significant curvilinear association ($P = 0.0002$) between age and the prevalence of 'benign and mixed' back pain. In subgroup analyses, no other curvilinear trend was significant. There was, however, a significant linear positive trend for point prevalence studies ($P = 0.02$—this category included, however, only one good quality study) and studies that considered severe back pain ($P = 0.005$). When the analysis was restricted to those aged

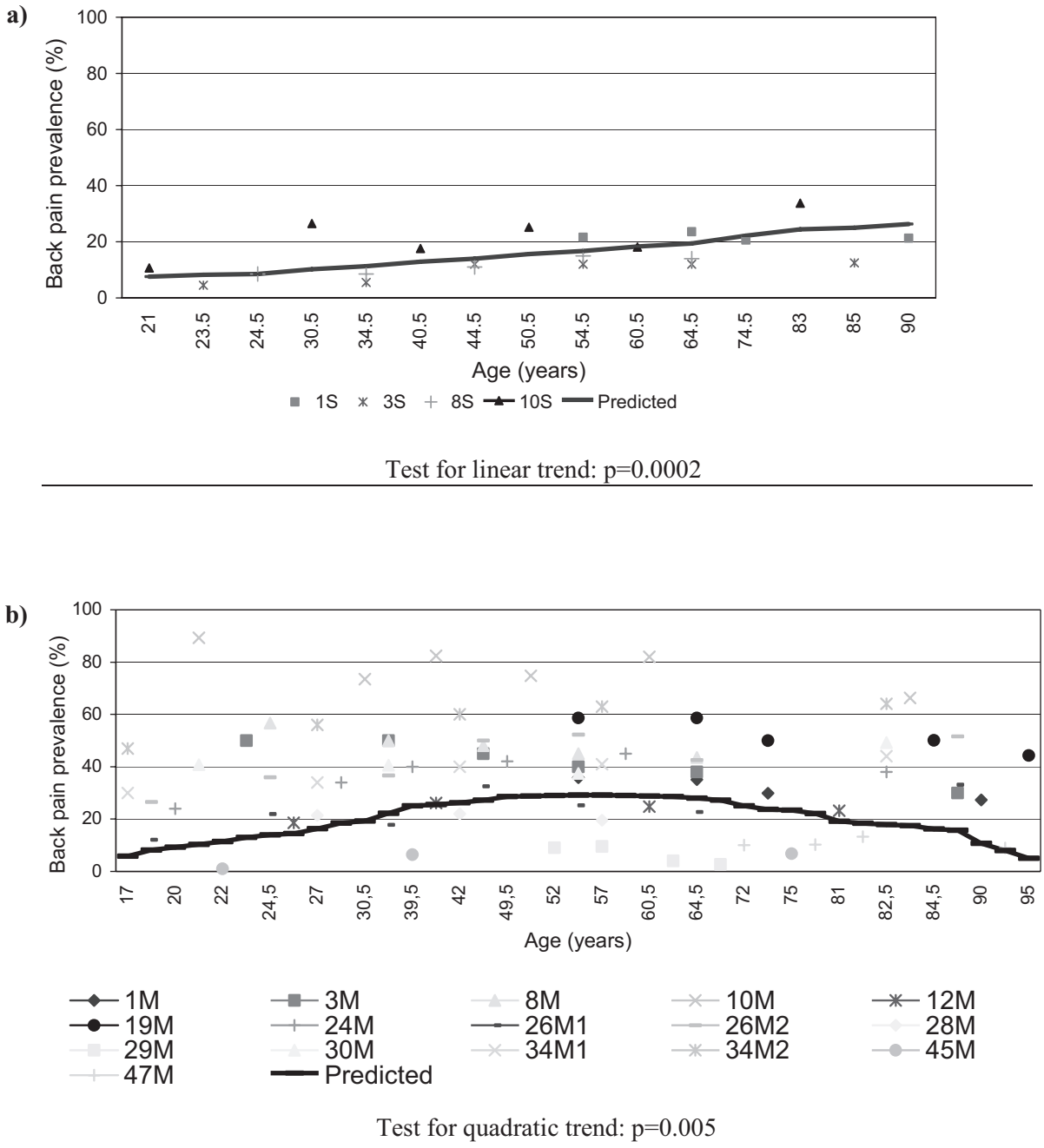

Figure 1. Graphic summary of the association between the prevalence of back pain and age according to severity. Prevalence figures are weighted by the inverse of their variance. (**a**) Severe back pain; (**b**) benign and mixed back pain. The numbers 1S, 3S, 1M, 3M etc. refer to the study number given in the first column of the supplementary table and one subgroup mentioned in the 'Trend' column of the supplementary table (available online at www.ageing.oxfordjournals.org).

60 years and more (all types of back pain problems included, i.e. a mixture of the 'severe' and 'benign and mixed' back pain problems), the trend was relatively flat, with predicted prevalence figures consistently around 20%.

Discussion

Using a systematic approach, we summarised the results of the scientifically strongest articles reporting the population prevalence of back pain by age. Our findings show important heterogeneity in methods and results across studies. They suggest a modifying effect of back pain severity on the association between age and back pain prevalence, and a lack of clear evidence for the curvilinear association often mentioned in the literature.

Our study results support the hypothesis that older people experience or report less frequent benign or mild back pain, but experience a higher prevalence of episodes

which are severe or disabling. Many factors could explain the decline in benign back pain with age, including cognitive impairment, depression, decreased pain perception and increased tolerance to pain [**5**, 9, 53–58]. If this decline is real, it probably results from several of these factors. Other non-specific symptoms have been found to decrease in prevalence with increasing age, often after a peak in the sixth decade, possibly as a result of similar factors: general fatigue, abdominal pain, nausea, diarrhoea, cough, depression, difficulty in relaxing, impaired concentration, nervousness, overweight, sweating, chest pain and headache [59].

Our study also suggests that, by contrast, the frequency of severe back pain increases with increasing age. Evidence from elsewhere [**32**, 60, 61] suggests that there is an age-related increase in the prevalence of pain and other symptoms and conditions which interfere with life and restrict social and physical functioning. If the finding with respect to severe back pain is confirmed, the implication for public health in the coming years is potentially considerable, as many western countries will experience a substantial increase in the number and proportion of people aged 65 years and more. This suggests at the very least that more attention should be paid to back pain in older people given that currently the problem tends to be bracketed as a disease predominantly of working age and has rarely been studied in the elderly.

Although several previous literature reviews have looked at the prevalence of back pain [**3**–**5**, **27**, 62], none has focused specifically on identifying the trend of its relationship with age. This study thus constitutes a first attempt on this regard. Furthermore, it used a systematic approach to assess the quality of studies to be included as well as to summarise the results.

A secondary finding was the wide range and variety of definitions of back pain, and the potential importance that the definition might have on the measurement of study outcomes. This highlights the need for further standardising definitions and measures of back pain for population and clinical research.

Because of the topic of this review, it was impossible to use the most sensitive search strategies for identifying papers and keep the number of papers to review to a manageable size. That is why we favoured more specific search terms. However, the largest proportion of papers was identified from the hand searching of references in articles. This method tends to saturate at some point, and we are confident that we have included most existing studies, although it is always possible that some studies have been missed out.

We have used a standardised approach, applied by two reviewers, to assess the methodological quality of papers considered in this review. However strict the quality criteria, there is always some room for subjectivity; likewise, the 75% threshold for identifying 'good quality studies' is an arbitrary choice and although it seems reasonable, a different threshold would have slightly changed the constitution of the 'good quality study' group, possibly affecting the results.

We have tried to apply, in this study, as objective and systematic an approach as possible, although in many cases the heterogeneity of methods across the reviewed papers, including the definition of severity criteria, might reasonably have precluded any attempt at summarising the results. The lack of a universally applicable definition of severity, for example, might have undermined the validity of our classification of results by severity; we are reassured, however, by the use of back pain specific measures of severity in the studies reviewed and by the fact that any misclassification would mean that our finding was an underestimate of the true difference between mild and severe groups. Furthermore, we believe there is more to learn from attempting a detailed summary than refraining from it, but within the context of recalling the limits imposed by the heterogeneity of the existing back pain prevalence definitions and studies when interpreting our findings. These results are probably as far as one can go with the available material, and need to be interpreted as an indication of what the truth might be, not as a definitive answer. Future research on this topic would need to compare the trends of age with prevalence of back pain defined in different ways within the same study (e.g. stratified by severity), so that the methods are 'controlled for'.

Conclusions

The results of this systematic review, although not definitive, point to a modifying effect of back pain severity on the association between age and the prevalence of back pain. The prevalence of benign back pain appears indeed to decrease with increasing age, after a peak in the sixth decade, but that of severe back pain continues to increase with increasing age. These results suggest that the frequency of severe back pain will rise sharply in the coming years as another important public health consequence of the ageing of populations in many countries. This study also stresses a need to further standardise back pain definitions and to consider back pain severity in new studies.

Key points

- It is widely believed that adults of working age are the most vulnerable to back pain, and hence that the prevalence of back pain decreases around the middle of the sixth decade.
- As the prevalence of osteoarthritis, disc degeneration, osteoporosis and spinal stenosis are known to increase with age, it is difficult to understand why the prevalence of back pain would decrease with increasing age.
- Our weighted analyses revealed a statistically significant curvilinear association between age and the prevalence of 'benign and mixed' back pain and a significant linear positive trend for severe back pain.
- These results suggest that more attention should be paid to back pain in older people given that currently the problem tends to be bracketed as a disease predominantly of working age and has rarely been studied in the elderly.

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The long list of references supporting this review has meant that only the most important are listed here and are represented by bold type throughout the text. The full list of references is available on the journal website http://www.ageing.oxfordjournals.org/ as appendix 1.

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