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LITERATURE REVIEW

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Low back pain: what is the long-term course? A review of studies of general patient populations

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Abstract It is often claimed that up to 90% of low back pain (LBP) episodes resolve spontaneously within 1 month. However, the literature in this area is confusing due to considerable variations regarding the exact definitions of LBP as well as recovery. Therefore, the claim – attractive as it might be to some – may not reflect reality. In order to investigate the long-term course of incident and prevalent cases of LBP, a systematic and critical literature review was undertaken. A comprehensive search of the topic was carried out utilizing both Medline and EMBASE databases. The Cochrane Library and the Danish Article Base were also screened. Journal articles following the course of LBP without any known intervention were included, regardless of study type. However, the population had to be representative of the general patient population and a follow-up of at least 12 months was a requirement. Data were extracted independently by two reviewers using a standard check list. The included articles were also independently assessed for quality by the same two reviewers before they were studied in relation to the course of LBP using various definitions of recovery. Thirty-six articles were included. The results of the review showed that the reported proportion of patients who still experienced pain after 12 months was 62% on average (range 42–75%), the percentage of patients sick-listed 6 months after inclusion into the study was 16% (range 3–40%), the percentage who experienced relapses of pain was 60% (range 44–78%), and the percentage who had relapses of work absence was 33% (range 26–37%). The mean reported prevalence of LBP in cases with previous episodes was 56% (range 14–93%), which compared with 22% (range 7–39%) for those without a prior history of LBP. The risk of LBP was consistently about twice as high for those with a history of LBP. The results of the review show that, despite the methodological variations and the lack of comparable definitions, the overall picture is that LBP does not resolve itself when ignored. Future research should include subgroup analyses and strive for a consensus regarding the precise definitions of LBP.

Keywords Low back pain · Natural course · Prognosis · Review · Recovery

Introduction

The natural history of a disease relates to its development in the absence of clinical intervention, whereas the clinical course is defined as the development subsequent to diagnosis and the initiation of treatment. Obviously, without a thorough understanding of the natural history of a disease, the background for evaluating the clinical course is lacking, and therapeutic interventions cannot be assessed

in a rational manner. In fact, inadequate understanding of the course of a disease can lead to false conclusions about the need for, as well as the benefit of, therapeutic interventions.

Presently, the literature in the area is confusing and inconclusive. The most obvious reason for this confusion is the lack of distinction between outcome parameters. For example, one study, which seems to be partly responsible for the widely accepted belief that 90% of low back pain (LBP) patients recover within 1 month, in fact showed that 90% LBP patients stopped consulting their medical practitioner within 1 month [15]. Furthermore, Waddell has been cited for postulating, that 80–90% of LBP attacks resolve within 6 weeks [9], but in fact he refers to return to work – not cessation of pain [43]. Another study that has had an impact on the spontaneous recovery belief, also studied return to work and found that approximately 75% of sick-listed LBP patients returned to work within 1 month [2]. However, return to work provides an incomplete picture of the natural course of LBP, because chronic pain patients may "move" in and out of employment, return to work at physically less demanding jobs, or reduce their workload [18]. In contrast, Croft et al. demonstrated that 75% of LBP patients from general practice still experienced pain 1 year later [9]. Obviously, return to work or cessation of medical consultations does not necessarily correlate with the cessation of symptoms. Although the various outcome measures (pain, disability, sick leave and medical consultations) are related, they should not be considered interchangeable [14].

Additionally, the choice of cohort represents a problem when studying the natural course of a disease. In classical epidemiologic study designs (such as cross-sectional or longitudinal surveys) the cohort is made up of prevalent cases, including subjects at different stages of the disease, which results in an "apples-and-pears cohort".

The present confusion may also be partly explained by a lack of distinction between the short-term and long-term prognosis. LBP is characterized by variation and change, rather than absolute recovery [40]. Thus, concentration on the short-term development might present the condition as cured, whereas long-term follow-up may reveal a more recurrent scenario. Therefore, this review will concentrate on the long-term course of LBP.

Although this area has been extensively studied, it remains difficult to gain a clear overview. Therefore, we conducted a systematic critical review of the epidemiologic literature to improve our understanding of the natural course of LBP and, in particular, to investigate whether there is evidence to support the popular claim of 80–90% spontaneous recovery within 1 month.

Materials and methods

Search strategy

The literature search was modified from the comprehensive search strategy recommended by the Back Review Group of the Cochrane Collaboration [38].

1. The MEDLINE database was searched from the beginning of the database (1992 via PubMed) to June 1999. The decision to use the more easily accessible database from 1992 was made because the study quality was presumed to be better in the 1990s and the up-to-date literature more relevant. The search combined the terms "low back pain" (MeSH)/ "back pain" (free text)/ "low back" (free text) with one or more of the following free text words: "epidemiology", "natural history", "natural course", "prospective", "longitudinal", "follow-up" or "prognos*" or the MeSH terms: "prognosis" or "survival analysis". An additional Medline search specifically for randomised controlled trials did not reveal additional relevant studies.
2. A similar search, modified as necessary, was run in EMBASE (the terms "prognosis" and "survival analysis" were not included here).
3. The Cochrane Library was screened for reviews on the topic.
4. Relevant systematic reviews and their references were screened.
5. Den Danske Artikelbase (the Danish Article Base) was searched for "low back pain"/ "back pain".

Article selection was based on 1948 titles, and abstracts were screened for suitability by the first author. In addition to epidemiologic studies, randomized controlled trials were included if they contained a control group that received only sham treatment or treatment from a general practitioner. In studies where there was a statistically significant difference in treatment results for the intervention as compared to the control group, only data from the control group were considered. Otherwise all relevant data were included. Eighty-four articles were found and screened for inclusion and exclusion criteria.

Criteria for consideration

The inclusion criteria were:

- Original journal articles from the Western world
- Articles written in English, Danish, Norwegian or Swedish
- Original studies
- A sample size of 50 or more (in the case of randomised controlled trails this applies to the control group) was arbitrarily chosen
- Follow-up period of at least 12 months

The exclusion criteria were:

- Articles relating to chronic LBP (absence from work for a minimum of 6 months), because this is usually considered one of the possible end-points of back pain and because a population of this type is not representative of the general population
- Studies based on a specific population such as a specific occupational group or pregnant women
- Studies of LBP due to acute injury

This selection procedure identified 36 articles, which were included in this review.

Data extraction

All included articles were reviewed for relevant information using a standard check list (Appendix 1). This was done independently by two reviewers (L.H. and C.L-Y.) and disagreements were re-

solved by consensus. Data on study populations, study design and outcome measures (pain, sick leave, disability, recurrences and consultations) were noted and, finally, information was retrieved in relation to nationality, age and gender.

Quality assessment

All the studies were independently assessed for methodological quality as it relates to natural history by two reviewers (L.H. and C.L-Y.) using a standard check list. Where disagreement occurred, the matter was discussed and consensus reached. No existing standard criteria list was found suitable, since following the course of an event does not require the same method as a randomised controlled trial. In contrast to cause-effect research, in which internal validity is of utmost importance, representativeness and generalization are more important in descriptive epidemiological studies [3]. A list of specific criteria was adapted from Von Korff [40] to suit the requirements of the subject, including both descriptive (external validity) and methodological (internal validity) criteria. Thus, the general quality of the studies was not assessed, but only quality as it relates to natural history, and the assigned quality score does not necessarily reflect the quality of the study as a whole. The criteria for obtaining a maximum score are listed in Appendix 1. Based on these, a quality score was assigned to each study and the results are presented in Table 1. The full quality assessment can be obtained from the authors.

Analysis

It is possible that the results differ in relation to the definition of recovery, in such a way that the consequences of LBP (e.g. medical consultations and absence from work) would result in a seemingly quicker recovery than actual symptoms. Therefore, the various outcomes, such as sick leave, recurrence of sick leave, consultations, disability, pain and recurrence of pain, were studied separately. Furthermore, as sick leave and consultations may depend on legislation, which varies between countries, national differences in relation to sick leave were also analysed. We also attempted to investigate the course of LBP as it relates to age, gender, and a previous history of LBP.

Results

Twenty-eight observational studies and eight randomised controlled trials fulfilled our inclusion criteria. Information regarding these 36 studies is presented in Table 1. Studies are listed in alphabetical order according to the name of the first author.

Quality of data

The overall quality was generally good, but the following concerns are noteworthy:

1. In 42% (13/31) of the relevant articles, comparison of responders and non-responders was missing.
2. The exact anatomical demarcation of LBP was not defined in 33% (12/36) of the studies.
3. In 8% (3/36) of the studies, data had not been collected in the preferred manner, i.e. sick leave data from administrative sources and symptom data from interviews or questionnaires. All other criteria were fulfilled, and no studies scored below 67%. It was therefore decided not to exclude any of the studies on the basis of the quality assessment.

Number and type of studies

The 36 included studies were published between 1981 and 1999 (October). Only four studies were published in the 1980s [1, 2, 27, 37]. Seven studies were randomised controlled trials [6, 16, 17, 25, 34, 35, 39], five were retrospective observational studies [2, 19, 20, 21, 46], and the remaining 24 were prospective observational studies. No difference in outcome was noted between these three types of design.

Study populations

The majority of studies had a population size between 100 and 500, with a range of 62 [21] to 89,190 [20]. The exact numbers can be seen in Table 1.

Study populations were drawn from several sources: the army [10], schools [5, 21, 29, 32], the general population [28, 30] workers receiving compensation [1, 2, 20, 25, 27, 35, 37] and clinical populations [4, 6, 7, 8, 9, 12, 13, 16, 17, 19, 22, 23, 24, 31, 33, 34, 36, 39, 42, 44, 45, 46].

There were two inception cohorts [28, 44] (first onset of disease) and the rest were either consecutive (included as they appear at the study site) or prevalent (all cases with LBP at a certain point in time) cases. With only two inception studies, it is not possible to determine whether the results from such cohorts differ from those of other types.

Description of LBP

The gluteal folds were commonly defined as the lower border in the definition of LBP [16, 17, 22, 23, 24, 28, 31, 36, 45], whereas the upper border varied from the scapula [45] to the first lumbar vertebra [28]. In several studies the only description provided was “back pain” or “low back pain”. Patients with radiating pain were specifically excluded in only one study [17]. In 14 studies [2, 4, 6, 16, 20, 21, 22, 23, 27, 34, 35, 37, 39, 46], both patients with and those without leg pain were included, and in the remaining 21 studies there was no mention of radiating pain at all.

The duration of symptoms at baseline was mentioned in only one-third of the studies [6, 7, 8, 16, 17, 19, 25, 31, 33, 34, 39, 44, 45]. Because of this lack of homogeneity in relation to LBP definitions, time of inception and follow-up periods, it is difficult to compare results and to reach definitive conclusions. This heterogeneity is illustrated in Table 2 and Table 3.

Table 1 Details of the data extracted from the 36 included studies (*LBP* low back pain, *RCT* randomised controlled trial, *OR* odds ratio, *GP* general practitioner, *HMO* Health Maintenance Organization, *ICPC* International Classification of Primary Care, *MS* musculo-skeletal)

Author, (year) country and quality score	Design and cohort	Description of sample	Age & gender	Sample size & response rate	Time & type of follow-up	Description of LBP	Outcome measures	Results	Reviewers' comments
Abenhaim et al. (1988) [1], Canada, 100%	Prospective, consecutive cases	Representative sample of all workers compensated for back pain in 1981	Working age (50% btn 25 and 44 yrs); 84.3% male	1641; response rate not applicable	1, 2 and 3 years as recorded in Quebec Workers' Compensation Board	Musculo-skeletal complaints in the lumbar or lumbosacral region	Sick leave	37.1% had recurrences of absence from work. Average no. of episodes: 2.65 over 3 yrs	
Anderson et al. (1983) [2], Sweden, 100%	Retrospective, consecutive cases	Randomly selected from the census register in a big city in Sweden	40–47 yrs; all male	940; response rate not applicable	All LBP absences recorded at the Public Health Insurance Office from 1955 to 1976	Pain, ache, stiffness or fatigue in the lower back w/wo legpain	Sick leave	*Still absent at:* 12 days: 50% 1 month: ~25% 6 months: ~5%	
Burton et al. (1991) [4], UK, 83%	Prospective, consecutive cases	Sequential LBP patients attending an orthopaedic out-patient practice and a GP	Mean age 41.8 yrs; 54% male	109/87 (82%) (with full data set)	1 mth, 3 mths and 1 yr by questionnaire or office visit	Back and/or lower limb pain	Pain ("completely better" or "steadily improving")	*"better"/"not" (n)* 1 mth: 9/90 3 mths: 20/67 1 yr:29/59 *"improving"/"not"* 1 mth: 45/53 3 mths: 55/32 1 yr: 53/36	
Burton et al. (1996) [5], UK 83%	Prospective, prevalent cases	Entire intake class of 1985 in a mixed-sex school	Mean age 11.7 yrs at index; ~50% male	216 at index, 147 at year 5 due to normal movement from the area and absence from school on the day of questioning	Yrs 1 and 2 by interview, yrs 3, 4 and 5 by questionnaire	LBP, other than occasional twinge	Pain	*Recurrent LBP of 96 pts with LBP at index:* yr 1: 44% yr 5: 59% *Point prevalence*: age 11: 3.2% age 12: 3.9% age 13: 6.4% age 14: 10.0% age 15: 12.9%	Transition in pain status not reported
Burton et al. (1999) [6], UK, 100%	Prospective, consecutive cases, RCT	Patients consulting 6 GP or osteopathic clinics for LBP of less than 3 months' duration	Mean age (SD) 44.7 (12.2) yrs; 45% male	Index: 162/188 (86%); follow-up: 126/162 (78%)	2 wks, 3 mths and 1 yr by postal questionnaire	Acute or recurrent LBP w/wo leg pain	Pain, disability	*Reduction in pain after 1 yr, mean (SD):* "pain at worst": 68.7(18.5)→50.8 (27.8) "pain at best": 15.6(18.7)→10.6 (17.8) *Reduction in Roland Disability:* ~10.4→~4.4	The control group might have been influenced by the "control booklet", which seems to reinforce fear avoidance
Carey et al. (1999) [7], USA, 67%	Prospective, consecutive cases	Sequential patients in 208 primary care practices	Mean age 41.7 yrs; 49% male	1645; follow-up: 754/921 (free of pain after 3 mths) (82%)	6 and 22 mths by telephone interview	Back pain less than 10 weeks	Pain	56% free of back pain after 3 mths	

							Recurrence	54% had recurrences from 6 to 22 mths	
							Disability	1.49% seeking disability after 22 mths Roland-Morris at 22 mths (0–23): 2.9–3.9	
Cherkin et al. (1998) [8], USA 67%	Prospective, consecutive cases	Patients consulting for LBP in two GP clinics who still had pain 7 days later	20–64 yrs; 52% male	Index: 493/714, (69%); follow-up: 55/66 (83%)	1, 4 and 12 wks and 1 and 2 yrs by telephone interview	Low back pain >7 days	Pain ("bothersomeness"), disability	*"Bothersomenes" (0–10):* 1 wk: ~4 4 wks: ~3.2 12 weks: ~3.2 1 yr: ~2.7 2 yrs: ~2.4 *Roland Disability (0–24):* Index: ~11.6 1 wk: ~7.6 4 wks: ~5.0 12 wks: ~4.5 1 yr:~4.8 2 yrs: ~4.6	
Croft et al. (1998) [9], UK (study sample drawn from the same population as [31] and [36]), 100%	Prospective, consecutive cases	Patients consulting two GP practices for a new episode of LBP (no LBP the previous 3 months)	18–75 yrs; 41% male	Medical records: 463; Interviews: 170/218 (77%)	1 wk, 3 and 12 mths by interview and review of medical records over the year	Generalised pain that included pain in the lower back	Pain and disability	*Recovery*: 1 wk: 2% 3 mths: 21% 12 mths: 25% Recovery with initial pain *and* disability: 18% Recovery with initial pain *or* disability: 44%	Selection bias may have resulted in slight underestimation of recovery. This is accounted for in the text.
							Consultations	*Consultations:* 3 mths: 40% 12 mths: 8%	
Darre et al. (1999) [10], Denmark, 83%	Prospective, prevalent cases	Military recruits	~18 yrs at index; all male	784/1058 (37 with LBP at index) (74%)	Index and 12 yrs later by questionnaire	Any back-related problems	Pain	*% at follow-up with the same status as at index:* Never LBP: 72/356 (20%) LBP once: 17/66 (26%) LBP occasionally: 92/284 (32%) LBP constantly: 6/11 (55%) Lifetime prev: 73% Annual inc.: 53% Point prev.: 26%	

Table 1 (continued)

Author, (year) country and quality score	Design and cohort	Description of sample	Age & gender	Sample size & response rate	Time & type of follow-up	Description of LBP	Outcome measures	Results	Reviewers' comments
Dionne et al. (1995) [12], USA (same population as [13] and [42]), 83%	Prospective, consecutive cases	Patients consulting for LBP with one of HMO's primary care physicians	Mean age (SD) 46.6 (14.2) yrs; 47% male	Index: 1213/1685 (72%); follow-up: 1009/1213 (83%)	1 month, 1 and 2 yrs by interview	Back pain	Disability	*Mean Roland Morris*: At index: 34.40 After 1 yr: 25.20 After 2 yrs: 22.44	
Dionne et al. (1997) [13], USA (same population as [12] and [42]), 67%	Prospective, consecutive cases	Patients consulting for LBP with one of HMO's primary care physicians	18–75 yrs; mixed sex	Index: 1213/1685 (72%); follow-up: 1024/1213 (84%)	4–6 wks and 2 yrs by telephone interview	Back pain	Disability	*Roland-Morris >50*: At index: ~32% After 2 yrs: ~20%	
Faas et al. (1993) [16], The Netherlands (study sample drawn from the same population as [17]), 100%	Prospective, consecutive cases, RCT	Patients from 40 GP practices in the Netherlands	16–65 yrs; 41–47% male	Index: 473/525 (90%); follow-up: 413/473 (87%) divided into 3 groups	2 wks, 4 wks and 12 mths by GP, monthly questionnaire in between	T12 to gluteal folds, <3 mths	Pain recurrence	78% had at least 1 recurrence. Mean no. of recurrences: 1.6	
Faas et al. (1995) [17], The Netherlands (study sample drawn from the same population as [16]), 100%	Prospective, presumably consecutive cases, RCT	Working patients from 40 GP practices in the Netherlands. (at index 64% were sick listed)	16–65 yrs; 34% male	322/363 (89%), Control: 108/119 (90%)	2 wks, 4 wks and 12 mths by GP, monthly questionnaire in between	T12 to gluteal folds, <3 wks, no radiation	Sick leave	Control group: Absence at least 1 day: In mth 1: 61% In mths 2&3: 27% In mths 4–12: 31%	All absences included, unknown how many of these are back-related
Greenough (1993) [19], Australia, 83%	Retrospective, consecutive cases	Patients referred to an orthopaedic surgeon for LBP with specific cause of onset	18–65 yrs; 49% male	287/300 (96%)	Interview by author at different times. Median follow-up: 47–56 months (4 groups)	Back, hip and/or leg pain, <1 wk	Sick leave	*Months off work: median (range)* Compensation: Male: 12 (0.25–84) Female: 15 (0–132) No compensation: Male: 0.25 (0–180) Female: 0.5 (0–22)	Various follow-up times
Hagen and Thune (1998) [20], Norway 100%	Retrospective, prevalent cases	Cases identified from National Medical Insurance files in Norway	16–66 yrs; mixed sex	89,190 Response rate not applicable	All LBP absences registered in the National Insurance Administration 1995 and 1966	ICPC codes L02, L03, L84, L86 (LBP w/wo radiation)	Sick leave	*Still absent at:* 1 mth: ~65% 3 mths: ~30% 6 mths ~15% *In 1 year*: 1 absence: 74% 2 absences: 19% >2 absences: 7%	In Norway there is 100% sickness benefit from 1st day to 12 mths

Harreby et al. (1996) [21], Denmark, 100%	Retrospective, prevalent cases	All 14-year-old pupils in a Danish town in 1965	46% male	Index: 640; traced: 578; response: 481 (83%)	History of LBP and X-rays at age 14 and questionnaire at age 38	Pain or discomfort in the lower part of the spine	Pain	Point prevalence: 90% of subjects with history of LBP in 1965 had LBP during the year prior to questioning	
van den Hoogen et al. (1997) [22], The Netherlands (same study as [23] and [24]), 100%	Prospective, consecutive cases	Patients consulting for LBP in 11 GP practices in Amsterdam over 2 years	>16 yrs; mixed sex	Index: 443/603 (73%); follow-up: 269/443 (61%)	Monthly questionnaires for 12 mths (incl. LBP diary)	T12 to gluteal folds or radiating therefrom	Pain	*Pain intensity (0–50) for acute cases*: Index: 25 4 wks: 5 3 mths: 0 6 mths: 0 *and for subacute cases:* Index: 21 4 wks: 5 3 mths: 7 6 mths: 5	
							Disability	*Daily functioning (0–7) for acute cases:* Index: 3 4 wks: 1 3 mths: 0 6 mths: 0 *and for subacute cases*: Index: 2 4 wks: 1 3 mths: 1 6 mths: 0	
van den Hoogen et al. (1997) [23], The Netherlands (same study as [22] and [24]), 100%	Prospective, consecutive cases	Patients consulting for LBP in 11 GP practices in Amsterdam over 2 years	>16 yrs; mixed sex	Index: 443/603 (73%); follow-up: 269/443 (61%)	Monthly questionnaires for 12 mths (incl. LBP diary)	T12 to gluteal folds or radiating therefrom	Pain	*LBP at*: 4 wks: 70% 8 wks: 48% 12 wks: 35% 1 yr: 10% Median time of recovery from index episode: 7 wks	Dropouts were younger and less severe cases
							Recurrence	76% experienced recurrences	
van den Hoogen et al. (1998) [24], The Netherlands (same study as [22] and [23]), 100%	Prospective, consecutive cases	Patients consulting for LBP in 11 GP practices in Amsterdam over 2 years, median duration 10 days	>16 yrs; mixed sex	Index: 443/603 (73%); follow-up: 269/443 (61%)	Monthly questionnaires for 12 mths (incl. LBP diary)	T12 to gluteal folds or radiating therefrom	Pain, recurrence	Same as [23] and median duration of relapse: 3 wks	
Indahl et al. (1998) [25], Norway, 83%	Prospective, consecutive cases, RCT	All patients in a Norwegian county expected to take >8 weeks sick leave	18–65 yrs; 61% male	Control group: 244; response rate not applicable	5 yrs, data from insurance files	LBP of 4–12 wks	Sick leave	65% returned to work, 34% on long-term disability, 74% had recurrences	

Table 1 (continued)

Author, (year) country and quality score	Design and cohort	Description of sample	Age & gender	Sample size & response rate	Time & type of follow-up	Description of LBP	Outcome measures	Results	Reviewers' comments
Lloyd and Troup (1983) [27], UK (study sample drawn from the same population as [37]), 67%	Prospective, consecutive cases	Workers sick listed from three industries in northern England	18–65 yrs; 97% male	Index: 936; follow-up: 682/790 (86%)	1 yr after return to work or cessation of treatment by postal questionnaire	Back or sciatic pain	Pain, sick leave, consultations	30% free of pain, 49% sought treatment, 43% had absences, 12% received hospital care	Mainly blue-collar workers
Mannion et al. (1996) [28], UK, 100%	Prospective, inception cohort	Healthcare workers without previous "serious LBP"	18–39 yrs; 92% female	370–400/403, (92–99%)	6, 12 and 18 mths by questionnaire	L1 to gluteal folds	Pain	~47% pain free consistently, ~75% pain free at 6 mths.	
Mikkelson (1997) [29], Finland, 67%	Prospective, prevalent cases	All pupils from 3rd and 5th grade in a Finnish town	9 or 11 yrs; mixed sex	Index: 1756/2116, (83%); follow-up: 1628/1756 (93%)	1 yr by questionnaire in class	All MS pain combined, and LBP specifically	Pain	*No MS pain in 1995:* 12% with MS pain in 1996 *MS pain in 1995:* 52% with MS pain in 1996 34% of LBP cases in 1995 persisted in 1996	
Müller et al. (1999) [30], Denmark, 67%	Prospective, prevalent cases	All inhabitants in a Danish county born in 1928, 1938 and 1948, except the 36 persons on disability pension in 1993	45, 55 and 65 yrs in 1993; mixed sex	538/621 (87%)	Questionnaire in 1978. Postal questionnaire in 1993 for LBP previous year and LBP past 7 years	Low back trouble	Pain	*OR (95% CI) in case of LBP in 1978:* 2.59 (1.35–4.98) for LBP past year 2.71 (1.74–4.21) for LBP previous 7 yrs	
Papageorgiou et al. (1996) [31], UK (study sample drawn from the same population as [9] and [36]), 100%	Prospective, prevalent cases	Patients at two GP practices in South Manchester, who had not consulted for LBP the previous month	18–75 yrs; 42% male	1540/2606 (59%)	12 mths, questionnaire to people who had not consulted for LBP	12th rib to gluteal fold; any ache or pain >24 h	Pain (past and present)	OR for developing LBP in case of previous LBP: 2.2–5.6 31% reported LBP during the year	
Salminen et al. (1995) [32], Finland, 83%	Retrospective, consecutive cases	1503 8th grade pupils from Finland. Follow-up on 40 with LBP at index and 40 matched controls	14 yrs at baseline; 47% male	62/80 (78%) (31 matched pairs)	3 yrs by questionnaire	LBP	Pain	LBP during the 3 yrs' follow-up in case of LBP at index: 93% versus 39% for the rest Prevalence of continuous or recurrent LBP at index: 7.8%	

Schiøtz-Christensen et al. (1999) [33], Denmark, 83%	Prospective, consecutive cases	Patients consulting 130 GPs in a Danish county	18–60 yrs; 62% male	503/524 (96%)	1, 6 and 12 mths by postal questionnaire	Low back pain, <2 wks	Pain/disability (functional or complete recovery)	*Not functionally recovered at:* index: 57% 1 mth: 16% 6 mths: 9% 12 mths: 8% *Not completely recovered at*: index: 100% 1 mth: 59% 6 mths: 56% 12 mths: 46%	
							Sick leave	*Sick-listed at:* index: 43% 1 mth: 3% 6 mths: 3% 12 mths: 2%	
Seferlis et al. (1998) [34], Sweden, 100%	Prospective, consecutive cases, RCT	Consecutive patients referred to an orthopaedic department	19–64 yrs; 53% male	123/180 (68%)	1, 3 and 12 mths by questionnaire	LBP w/wo sciatica, sick-leave <2 wks	Pain	*Pain intensity (1–11):* index: 5.1 1 mth: 4.6 3 mths: 3.5 12 mths: 2.5	
							Sick leave recurrence	No recurrence (of sick leave): 64%Two or more recurrences: 11%	
Strøm and Nilsen (1997) [35], Norway, 83%	Prospective, consecutive cases, RCT	Consecutive cases of sick-leave >8 weeks in a Norwegian community	19–66 yrs; 44% male	131/186 (70%); Control: 77/95 (81%)	6 and 12 mths by supervised questionnaire. Sick leave by administrative data	Back pain w/wo radiation	Pain	*Pain (1–6):* index: 3.0 6 mths: 2.9 12 mths: 2.9	
							Sick leave	*Still absent at:* 6 mths: ~40% 12 mths ~25%	
Thomas et al. (1999) [36], UK (study sample drawn from the same population as [9] and [31]), 100%	Prospective, consecutive cases	Patients consulting for LBP during an 18-month period at two GPs	18–75 yrs; 41% male	Index: 246/442; follow-up: 180/246 (73%)	1 wk, 3 and 12 mths by interview	12th rib to gluteal folds	Pain	*Pain at*: 1 wk: 73% 3 mths: 48% 12 mths: 42% persistent (all 3): 34%	
Troup and Martin (1981) [37], UK (study sample drawn from the same population as [27]), 67%	Prospective, consecutive cases	Patients sick listed from three industries in northern England	18–70 yrs; 97% male	Year 1: 503/802 (87%); year 2: 177/221 (80%)	1 and 2 yrs by postal questionnaire	Back and sciatic pain	Sick leave	*Absences:* 1st year: 44% 2nd year: 31%	Mainly blue-collar workers
							Consultations	*Further treatment:* 1st year: 49% 2nd year: 32%	

Table 1 (continued)

Author, (year) country and quality score	Design and cohort	Description of sample	Age & gender	Sample size & response rate	Time & type of follow-up	Description of LBP	Outcome measures	Results	Reviewers' comments
Van Tulder et al. (1998) [38], The Netherlands, 83%	Prevalent cases	Patients from 26 GP practices in the Netherlands	20–60 yrs; 51% male	Index: 368/524 (70%); follow-up: ?	4, 8 and 12 mths by postal questionnaire	ICPC codes L03 and L86	Pain and disability	*Complaints at:* 0 follow-ups: 6% 1 follow-up: 15% 2 follow-ups: 23% all 3 follow-ups: 57%	
						Current symptoms >3 mths		LBP continuously: 10%	
Von Korff et al. (1993) [42], USA (same study sample as [12] and [13]), 67%	Prospective, consecutive cases	Cross-section of back pain patients seen in primary care in the Seattle area	18–74 yrs; 47% male	Index: 1213/1685 (70%); follow-up: 1128/1213 (94%)	One yr by interview	Back pain	Pain/disability combined	*At 1-yr follow-up:* BP previous mth: Recent onset patients (rop): 69% Prevalent patients (pp): 82% Painfree prev. 6 mths: rop: 21%, pp: 12% BP>30 days prev. 6 mths: rop: 26%, pp: 46% Poor/fair outcome rop: 24%, pp: 36%	Outcome based on recall of the past 6 mths. Not comparable to studies of pain at time of interview
Wahlgren (1997) [44], USA, 83%	Prospective, inception cohort	Patients at a naval medical centre	18–50 yrs; all male	Index: 138/146 (95%); 12mths: 76/138, (55%)	6 and 12 mths by interview and orthopaedic examination	Below T6 on a daily basis 6–10 wks. No prior episodes of daily pain	Pain	Pain 6/12 mths: 78%/72%.	
							Disability	Disability 6/12 mths: 26%/14% No participants worsened from index to 12 mths	
van der Weide et al. (1999) [45], The Netherlands, 83%	Prospective, consecutive cases	Patients at 8 occupational health services	Mean age 39 yrs; 33% male	120; index: 117; 3 mths: 110; 12 mths: 108 (90%)	3 and 12 mths by questionnaire	Pain btn scapulae and gluteal folds; Sick leave <10 days	Sick leave	50% return to work <8 wks and 75% <18 wks Median time to return to work: 56 days	
Zufferey et al. (1998) [46], Switzerland, 83%	Retrospective, consecutive cases	All LBP patients at a rheumatology department at Geneva Hospital in 1993	28–62 yrs; 40% male	80/99 (81%)	2 yrs by telephone interview	LBP w/wo radiation not due to specific cause	Pain (duration and frequency of symptoms) and sick leave	28% of patients with chronic and 70% of those with acute LBP had substantial relief 45/76 applied for disability pension	Intervention unknown (no control)

Table 2 The spread of LBP definitions and length of follow-up

LBP definition	Length of follow-up														
	1 wk	2 wks	1 mth	2 mths	3 mths	4 mths	6 mths	8 mths	1 yr	18 mths	22 mths	2 yrs	3 yrs	4 yrs	≥5 yrs
Back pain			[12, 13, 42]				[7]				[7]	[12, 13]			
Low back pain	[8]		[8, 33]		[8]		[33]		[5, 8, 29, 33]			[5, 8]	[5, 34]	[5]	[5, 25, 30]
Pain btn scapulae and gluteal folds					[45]				[45]						
Pain btn T12 and gluteal folds		[17]	[17]						[17]						
Pain btn T12 and gluteal folds or radiating therefrom		[16]	[16, 22, 23, 24]	[22, 23, 24]	[22, 23, 24]		[22, 23, 24]		[16, 22, 23, 24]						
Pain btn L1 and gluteal folds							[28]		[28]	[28]					
LBP with/without radiation		[6]	[20, 34]	[20]	[6, 20, 34]	[39]	[20, 35]	[39]	[6, 20, 34, 35, 39]			[46]			
Back and/or leg/sciatic pain			[4]		[4]				[4, 27, 37]			[37]			
Any back-related problems															[10]
Pain btn 12th rib and gluteal folds	[36]				[36]				[31, 36]						
Generalized pain including the lower back	[9]				[9]				[9]						
Pain below T6							[44]		[44]						
Pain or discomfort in the lower part of the spine															[21]
Musculo-skeletal complaints in the lumbar or lumbosacral region									[1]			[1]	[1]		
Pain, ache, stiffness or fatigue in the lower back w/wo radiation		[2]	[2]				[2]								
Back, hip and/or leg pain									[19]						

Table 3 The spread of LBP definition and duration of symptoms at baseline

LBP definition	Duration of symptoms											
	Undefined	>24 h	<1 wk	>1 wk	<10 days	<2 wks	<3 wks	4–12 wks	6–10 wks	<10 wks	<3 mths	>3 mths
Back pain	[12, 13, 42]									[7]		
Low back pain	[5, 29, 30, 34]			[8]		[33]		[25]				
Pain btn scapulae and gluteal folds					[45]							
Pain btn T12 and gluteal folds											[17]	
Pain btn T12 and gluteal folds or radiating therefrom	[22, 23, 24]						[16]					
Pain btn L1 and gluteal folds	[28]											
LBP with/without radiation	[20, 35, 46]					[34]					[6]	[39]
Back and/or leg/sciatic pain	[4, 27, 37]											
Any back-related problems	[10]											
Pain btn 12th rib and gluteal folds	[36]	[31]										
Generalized pain including the lower back	[9]											
Pain below T6									[44]			
Pain or discomfort in the lower part of the spine	[21]											
Musculo-skeletal complaints in the lumbar or lumbosacral region	[1]											
Pain, ache, stiffness or fatigue in the lower back w/wo radiation	[2]											
Back, hip and/or leg pain			[19]									

Outcome measures

In two studies [30, 32], the only outcome measure was "pain", another two (authored by the same group and based on the same sample) [12, 13] measured only "disability" and in four studies [1, 2, 20, 25] "return to work" was the only outcome measure. In the remaining 28 studies, different combinations of "pain", "disability", "recurrence", "sick leave", and/or "consultations" were reported. In addition, the duration of episodes was analysed in three of the studies [19, 24, 45].

The definitions of decreased pain varied greatly (from "completely better" [4, 33] to "no longer disabling LBP" [36]). Figure 1 illustrates the course of LBP over time as measured by pain. It was not possible to compare disability rates over time due to the large variety of ways in which disability was reported. Likewise, the definitions of "recurrence" were difficult to compare, since most authors failed to define what constituted a recurrence. Nevertheless, in a large number of studies, previous LBP was found to be an important prognostic factor for the development of a new episode [5, 9, 10, 16, 21, 27, 28, 29, 30, 32, 33, 36, 37]. Figure 2 shows the incidence of recurrence. Figure 3 shows the risk of having LBP at follow-up in individuals with LBP at baseline and in those without LBP at baseline. It should be noted that, in this context, there is no distinction between recurrences and entirely new episodes.

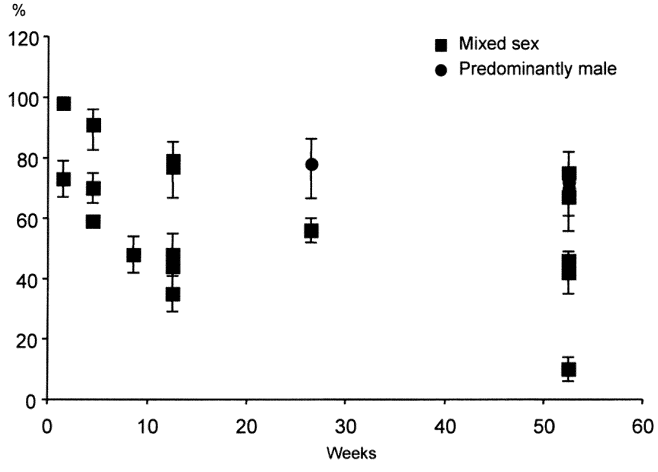

Fig. 1 Percentage of people with low back pain (LBP) at baseline who still report pain at follow-up (95% CI). The time of follow-up is indicated on the *x*-axis. This figure is based on the eight studies containing the relevant data [4, 7, 9, 22, 27, 33, 36, 44]

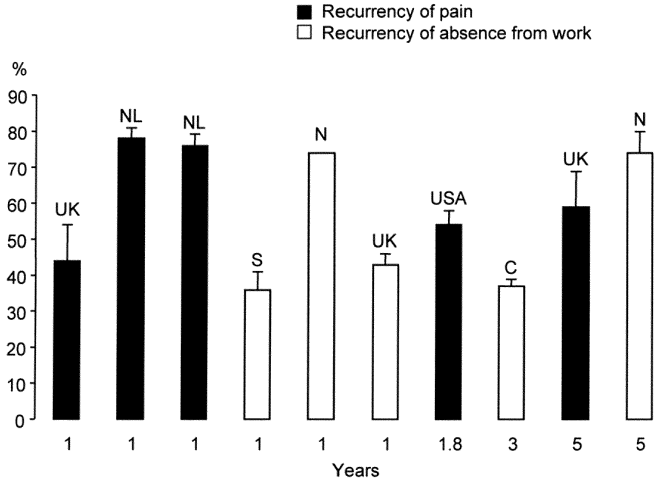

Fig. 2 Period prevalence of recurrence in people with LBP at baseline (95% CI). The time of follow-up is indicated on the *x*-axis. Each bar represents one study, with the country of origin indicated at the top. This figure is based on the nine studies containing the relevant data [4, 7, 9, 16, 20, 22, 25, 34, 37]

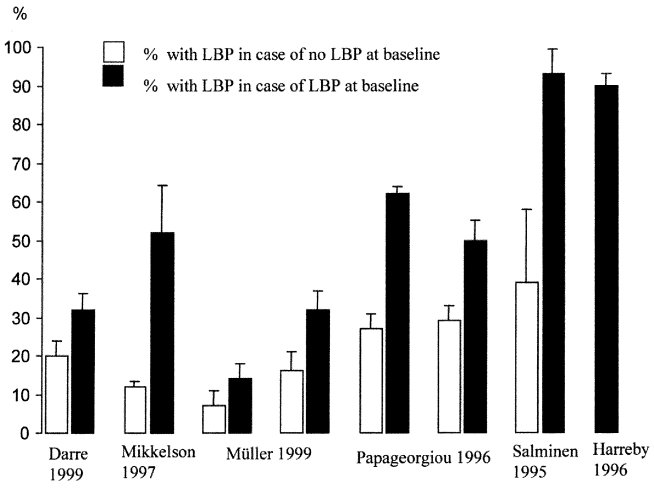

Fig. 3 Previous LBP as a predictor for current LBP (95% CI). This figure is based on the six studies containing the relevant data [10, 21, 29, 30, 31, 32]

In five studies [6, 9, 27, 37, 39], consultations were recorded. Two of these were based on the same population, made up of sick-listed industrial workers [27, 37], and the others from medical practitioners' practices. Not surprisingly, the sick-listed workers seemed to consult more (49% the 1st year and 32% the 2nd year) than the consecutive office patients (8% [9], 40% [6] and 42% [39] in the 1st year). The results from these four studies indicated a high degree of persistence or recurrence.

Figure 4 illustrates the natural course of LBP in relation to sick leave. This is based on two Norwegian, one Swedish, one Danish and one Dutch study [2, 20, 33, 35, 45]. The Norwegian studies demonstrated the highest persisting absence [20, 35]. Looking at the levels of recurrence of sick leave in Fig. 2, Norway also had the highest level of recurrence within 1 year [20], but otherwise no difference between countries was detected.

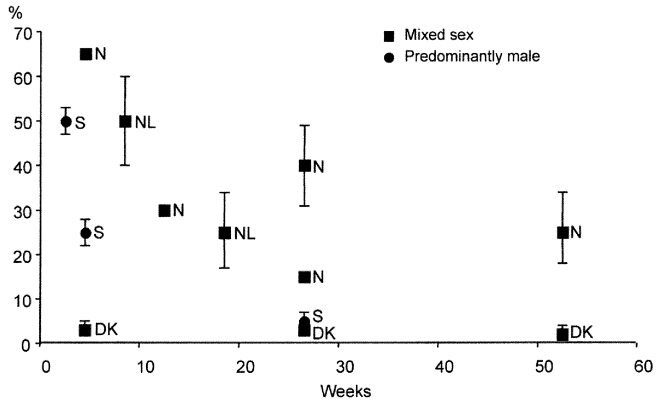

Fig. 4 Percentage of people with LBP at baseline who still report absence from work at follow-up (95% CI). The time of follow-up is indicated on the *x*-axis and the country of origin shown next to the estimate. This figure is based on the five studies containing the relevant data [2, 20, 33, 35, 45]

Age and gender

Most populations consisted of people of working age, but three populations consisted of children or adolescents [5, 29, 32]. The latter showed a steady increase in the point prevalence of LBP, from about 3% around age 10 to 13% at age 15. Apart from these, the age-specific prevalence of LBP was reported in only two studies: 26% at age 30 [10] and 19% at age 28 [46].

There were no major differences in results between studies involving predominantly male subjects [1, 2, 10, 27, 30, 37] and those with a mixed population (Fig. 2, Fig. 3, Fig. 4). However, the results are very widespread, so differences could well be hidden within the general variation.

Summary of results

The reviewed studies were not sufficiently homogeneous to make meta-analyses possible. Ranges of study estimates are therefore employed to illustrate the extent of persistent or recurring symptoms of LBP.

- Between 42 and 75% of subjects still experience pain after 12 months (Fig. 1) and between 3 and 40% are still sick listed 6 months after inclusion in a study (Fig. 4).
- Between 44 and 78% of subjects experience relapses of pain, and for relapses of work absence the estimates range between 26 and 37% (Fig. 2).
- The point prevalence rates of LBP in persons with one or more previous episodes of LBP range from 14 to 93%, whereas the corresponding rates for those without a prior history of LBP are from 7 to 39%, with the risk of LBP being consistently about twice as high for those with a history of LBP (Fig. 3).

Discussion

When interpreting the results of this review, the selection process must be kept in mind. Including only articles written in the English and Scandinavian languages might introduce some bias. It has been proposed that positive results from non-English speaking countries are more likely to be published in English and negative results in the authors' native language [38]. However, in this case, we do not believe this to be a serious problem, as negative or positive results are not defined in descriptive studies, and in the randomised controlled studies only control groups were studied for the purpose of this review. On the other hand, there may be national differences in pain perception, reimbursement policy, etc. This means that the results from this review may not be transferable to countries outside the English and Scandinavian language regions.

Disability pension, worker's compensation and absence from work all depend on legislation, and care seeking is also influenced by the system of payment. Therefore, national differences in legislation and the level of reimbursement/sickness benefit must be considered before comparing results between countries. With regard to sick leave, the figures from Norwegian studies are higher than the others. This could very well be related to the fact that Norway has a very generous reimbursement system. However, due to the different study populations, this is not certain to be a result of national differences – whether legislative, cultural or otherwise – but might be attributable to differences in LBP status at inclusion. There were no Norwegian studies reporting persistence of symptoms, hence it was not possible to determine whether such figures would be correspondingly high compared to other countries.

Additionally, the type of work and the question of whether the person has no option but to return to the same function and/or hours obviously has a large influence on the length of sick leave. This aspect is nevertheless most often ignored [18]. It could be argued that return to work is merely a manifestation of both the extent to which an individual's job can be adapted in order to avoid them being forced to resign, and the extent to which monetary necessity may force them to stay in an unsuitable job despite the pain.

With these arguments in mind, pain and disability may be more suitable parameters – at least for the individual, although not necessarily for society. Although they may not be sufficiently objective, an individual's perception of their own pain and functional ability is of paramount importance for the way the problem impacts on the quality of daily life and should not be ignored. These are also measures recommended by Deyo et al. in an effort to promote the standardization of outcome: pain, function, well-being, disability and satisfaction with care [11]. With regard to pain and disability, no national differences were detected.

Recurrence rates and risk ratios for developing LBP in case of previous LBP are measures that clearly illustrate the recurring pattern of LBP. This pattern questions the value of short-term "recovery" as a valid outcome mea-

sure. Long-term prevention of recurrences may be a more relevant measure.

The choice of cohort also requires careful consideration, as it may limit generalisability. Obviously, the optimal method for studying the natural course of LBP would be to study the general population in a lifelong prospective study. As this is impossible, prospective study cohorts most often consist of consecutive cases from clinical settings who are followed for a limited period of time. When studying clinical populations, some selection bias cannot be avoided, as care-seeking in itself and the choice of provider constitute a selection process. This must be considered when extrapolating results to the general population. Among others, Borghouts et al. [3] consider an inception cohort (included at onset of first episode) to be of optimal value when studying the course of a disease. However, bearing in mind the early onset of LBP [26], if adult cases are selected this might bias the selection against patients with chronic back pain, as some of them may have had problems since childhood. The results of the von Korff and Saunders study [41] did not indicate that recent onset of symptoms was an important prognostic variable. Therefore, except for studies including young populations, cohorts made up of prevalent or consecutive cases might provide a better picture of the diversity of the problem, but great care must be taken to record and analyse the different characteristics of the individuals' LBP (such as previous LBP, duration of present period, disability, anatomical extent of LBP and intensity of pain).

It would be useful to divide LBP patients into subgroups in relation to symptoms, which might follow different patterns of recovery. In particular, the presence or absence of leg pain has been reported to be an important prognostic factor [27, 30, 36, 37, 45], and the duration of symptoms at baseline also seems to influence the course of LBP [22, 27, 37, 46]. Nevertheless, the magnitude and duration of symptoms are poorly defined in the majority of studies. Only four studies [16, 17, 31, 45] describe both the anatomical demarcation of pain and the duration of pain at baseline, and they do so in very different ways. Therefore, it is not possible, presently, to analyse data as they relate to symptomatic subgroups.

The only sub-categorization of subjects that this material allows relates to age. Here the high point prevalence of LBP in children is noteworthy, especially considering the high risk of recurrence. Mikkelson et al. [29] and Salminen et al. [32] showed that 52 and 93% of teenage subjects respectively had LBP at follow-up in case of LBP at baseline, as compared to 12 and 39% of those who did not have LBP at baseline (Fig. 3), and Burton [5] found that the proportion of children with LBP who reported their trouble to be recurrent rose from 44% at age 11 to 59% at age 15.

Recommendations for future studies

In order to further clarify issues relating to the course of LBP, future studies should:

1. Provide a clear definition of LBP
2. Provide subsets of data for various LBP-subgroups
3. Where relevant, report clearly what constitutes a "recurrence"
4. If possible, report raw data
5. Where relevant, discuss limitations of the chosen cohort and choice of outcome measures

Conclusion

Due to the methodological variations and the lack of clear definitions in the included articles, no firm conclusions regarding the natural course of LBP can be reached. However, despite the large heterogeneity, the overall picture is clearly that LBP is not a self-limiting condition. There is no evidence supporting the claim that 80–90% of LBP patients become pain free within 1 month.

Unfortunately, it was not possible to study the outcome of various types of LBP from the retrieved material, but it is strongly recommended that researchers emphasize this. For this purpose, it is essential first to reach a consensus regarding the definition of LBP, as this will allow subgroup analysis. Furthermore, a greater degree of homogeneity of outcome measures is warranted. If such homogeneity is not reached, we will continue to gather bits and pieces of scattered evidence, and overall conclusions will not be firmly founded.

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Appendix

Quality Assessment Form (adapted from Von Korff 1994 [40])

1. Was the source of the cases described?
2. Was a minimum set of information describing the enrolled cohort obtained (at least age and gender)?
3. Was there a definition of LBP including at least an anatomical border or a recording of the presence or non-presence of radiating pain?
4. Were the data obtained from interviews/questionnaires for pain and from administrative data for sick-leave/consultations and disability pension?
5. Were follow-up rates clearly reported?
6. Was information presented assessing differences between responders and non-responders both at baseline and at follow-up?

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