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A PROSPECTIVE STUDY OF LOW BACK PAIN IN A GENERAL POPULATION

II. *Location, Character, Aggravating and Relieving Factors*

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ABSTRACT. In this paper the analyses focus primarily on statements from those 62 % (281 men and 294 women) of the participants who at the primary examination reported previous or present low back pain (LBP). In a subsample the most frequent location of the LBP was in the lower lumbar area. Pain radiating to the leg(s) was felt at some time by 36 % of the men and 51 % of the women. Intense pain was more frequently reported by men, and a feeling of weakness or fatigue more frequently by women. Most of the participants felt that the LBP became worse during the day. The most common aggravating factor was stooping, reported by 65 % of the participants, followed by the sitting position, reported by 30 %. Factors of highest importance for the relief of LBP were lying down (52–54 %) and walking around (34–39 %). A stated history of pain radiating to the leg(s) was the best indicator for occurrence of LBP in the follow-up year.

Key words: Low back pain, prospective study, epidemiology, location, character, aggravating and relieving factors

Low back pain (LBP) is of subjective character, which makes an evaluation of the symptom history difficult. In addition wide disagreement exists in the medical literature about the demarcation of the lower back (2, 6, 16, 39, 49, 65, 70) and in the few attempts made to clarify how to delimit, define or classify LBP (4, 5, 11, 22–26, 29, 31, 35, 42, 47, 48, 68, 71).

The purpose of the present investigation of a general population (7–9) is to describe and analyse the frequency distribution of statements concerning location and character of LBP, as well as aggravating and relieving factors. Secondly, a determination is made of the prognostic value of these subjective statements for the occurrence of LBP during a one year follow-up period.

POPULATION AND METHODS

Population and design

The population and design has been described in earlier publications (7, 8). Apart from the results shown in Table VI this presentation will analyse only those 62 % of the participants (281 men and 294 women) who at the examination reported having had LBP at least once in their lives. All but six of these participants (five men and one woman) completed a 12-month follow-up questionnaire via the post.

Delimitation and classification of LBP

Questions about occurrence of LBP were phrased in the following way: "Have you /ever /within the last 12 months /had pain or other trouble with the lower part of your back?" LBP in relation to menstruation alone was excluded (7).

In a subsample of 127 participants, who completed a six-month follow-up examination (1, 9), 47 men and 31 women reported having experienced LBP at some time. These participants were asked to point out preferably with one finger, where they had felt the LBP. The location(s) indicated were grouped in accordance with Fig. 1, which is a modification of the figure used by Bergquist-Ullman & Larsson (6) and with the delimitation of the lower back suggested by Anderson (2): The area below the 12th rib and above the gluteal folds. None of the participants pointed outside of this area.

Based on the LBP anamnesis, a grouping into symptom diagnoses was carried out primarily with reference to the Swedish experience (22–25):

Insufficientia dorsi: Feeling of weakness, fatigue and/or stiffness in the lower back.

Lumbago: Feeling of deep cutting or other more intense pain in the lower back, possibly combined with feeling of weakness, fatigue and/or stiffness.

Lumbago sciatica: Symptoms of lumbago and pain radiating to the leg(s).

Other: Symptom histories which did not fit readily into the above categories.

In this context, pain radiating to the leg(s) meant pain below the gluteal fold(s).

Table I. *Location(s) of low back pain (LBP) pointed out by the 78 participants in the subsample*
In all, 151 locations were indicated

Location of LBP (cf. Fig. 1)	Men $n=47$ (%)	Women $n=31$ (%)
Central LBP		
A	26	23
B	51	36
C	9	16
Flank LBP		
D	43[a]	16[a]
E	45[b]	23[b]
Gluteal LBP		
F	15	32
G	19	29

Sex difference: [a]$p=0.014$, [b]$p=0.047$.

Data analyses

Apart from the information concerning the location of the pain in the lower back, data included in this presentation were obtained from questionnaires at the primary examination and from the one-year follow-up questionnaire. The parameters were analysed for possible sex differences within each age group and possible age differences within each sex.

All questions concerning possible aggravating/relieving factors were structured in the same way with three possibilities concerning the factor's influence on LBP: aggravates/does not affect/relieves. The analyses in Table VII for aggravating and relieving factors were made by testing the number of statements of aggravation/relief against the number of the other two alternatives together. This means that the tests are performed on the basis of the same answers with two different groupings.

The statements made by the participants at the primary examination were tested for their value as indicators for recurrence or persistence of LBP in the follow-up year. For the aggravating/relieving factors the tests were carried out with groupings as described above.

Chi-square and Fisher's exact tests were used. All p-values calculated two-sided.

RESULTS

Location of LBP

In accordance with the delimitation in Fig. 1 the locations of LBP for the participants in the subsample are shown in Table I. A total of 151 locations were indicated by the 78 participants, giving an average of 1.9 locations per person. The most common location or location-combinations given were B by 17% of all participants, B+D+E by 13% and D+E by 12%. Each of the locations A, C, F and G and locations F+G were reported by 5% of the participants.

Table II shows participants with LBP who at some time had experienced pain radiating to the legs (sciatica). For all age groups, more women than men reported having felt pain radiating to the leg(s), and more participants in the older age groups reported having experienced such pain. No differences were found in any of the groups regarding pain radiating to the right or left leg or both legs ($p \geq 0.13$ in all instances).

The value of a statement of pain radiating to the leg(s) as an indicator for LBP in the follow-up year is illustrated in Table III, which shows that those with a history of such pain had a 16–19% greater risk of experiencing LBP in the follow-up year. This pattern was uniform for all eight sex/age groups.

Character of LBP

Table IV shows how the LBP was felt by the participants. The "other" category included mainly statements of mild pain or ache, soreness or dull pain. Intense pain was most frequently felt by the men, while a feeling of weakness or fatigue was

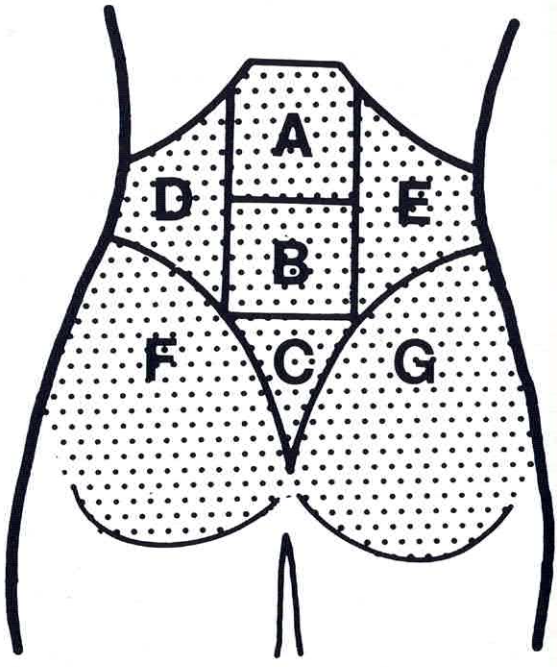

Fig. 1. Delimitation of the lower back, i.e. the hatched area. (A) First to third lumbar vertebra and the corresponding soft tissue. (B) Fourth and fifth lumbar vertebra and the lumbo-sacral junction and the corresponding soft tissue. (C) Sacral and coccygeal regions. (D, E) Flanks. (F, G) Gluteal regions.

Table II. *Occurrence at any time of radiating pain to the legs (sciatica) among those participants with low back pain at some time*

Unknown for five men

	Men (%)	Women (%)
30 years	23	36
40 years	34	52
50 years	40[1]	59[1]
60 years	48	55
All ages	36[2a]	51[2b]

Sex difference: [1]$p=0.017$, [2]$p=0.0004$.
Age difference: [a]$p=0.020$, [b]$p=0.0033$.

reported more often by women than men. No particular age trends were observed. This parameter had no clear relation to the participants' experience of LBP in the follow-up year.

The distribution of the symptom diagnoses in Table V shows an age trend with greater frequency of insufficientia dorsi in the younger age groups and of lumbago sciatica in the older. This reflects the trend for sciatica alone in Table II and is probably a result of an accumulating effect with age. The uniform tendency that men more frequently have lumbago and the women lumbago sciatica is also correlated to the distribution of intense pain (Table IV) and sciatica (Table II). The symptom diagnoses as indicators for future LBP (Table III) show the same trends as for sciatica alone, but in a weaker form. In none of the eight sex/age groups were p-values below 0.12 found.

Table V shows that a little less than half of the participants stated that their LBP became worse during the day, especially among the younger groups, while constant LBP was most predominant in the older age groups. The time of day when the LBP was worst did not turn out to be an indicator for LBP in the follow-up year.

Severity of LBP

Table VI, contains the statements on the severity of LBP in the follow-up year. No sex or age differences were observed (all p-values above 0.3).

At the primary examination the severity of LBP was evaluated by the following three parameters: 1) Whether the participants ever woke up during the night because of LBP, 2) whether they ever were unable to put on their stockings and shoes, or 3) whether they had been impeded in their daily work (including house work) because of LBP (Table VII). Of these parameters only the first one turned out to be of any importance as an indicator for occurrence of LBP in the follow-up year (Table III). The pattern was uniform for all eight sex/age groups but, as seen in the table, the difference was only of major significance for women, i.e. 13% (74% against 61%).

Table III. *The value of pain radiating to the leg(s) (sciatica), the symptom diagnoses, and the statement "ever woke up during the night because of low back pain (LBP)" as indicators for occurrence of LBP in the follow-up year*

All groups together

	Men			Women		
LBP in the follow-up year	*n*	Yes (%)	No (%)	*n*	Yes (%)	No (%)
Previous sciatica						
Yes	98	74	26	149	71	29
No	173	55	45	144	55	45
p-value		0.0014			0.0039	
Insufficientia dorsi	73	63	37	71	55	45
Lumbago	78	47	53	53	55	45
Lumbago sciatica	55	71	29	73	66	34
p-value		0.018			0.32	
Woke up because of LBP						
Yes	45	71	29	87	74	26
No	220	61	39	200	61	40
p-value		0.20			0.034	

Table IV. *The character of the reported low back pain. Two characteristics were stated in combination by 62 participants, and three by four participants. Unknown for eight men and three women. All age groups together*

	Men $n=273$ (%)	Women $n=291$ (%)
Weakness or fatigue in the lower back	23	37
Feeling of stiffness in the lower back	27	21
Deep cutting or other intense pain	52	44
Other	8	12

Table V. *The symptom diagnoses for low back pain (LBP), and time of day when LBP was indicated as worst (%)*

	30-year-olds		40-year-olds		50-year-olds		60-year-olds		All ages	
	Men n= 68–76	Women n= 72–74	Men n= 62–64	Women n= 59–60	Men n= 69–76	Women n= 72–76	Men n= 61–65	Women n= 77–84	Men n= 260–270	Women n= 280–291
Symptom diagnoses										
Insufficientia dorsi	32 [1]	39	36	23	21	16	17	19	27 [1][a]	24 [a]
Lumbago	37	16	20	18	25	18	32	20	30*	19
Lumbago sciatica	9	12	14	28	26	28	29	31	20	25
Other	22	32	30	30	28	38	22	30	22	32
Time of day when worst										
During the night	3	3	3 [1]	3	3	3	3	7	3 [b]	4 [c]
In the morning	25	21	34	12	35	33	25	33	30	26
Later in the day	54	66	44	59	35	35	30	32	41	47
Equally constant around the clock	18	11	19	25	28	29	43	30	27	24

Sex difference: [1]$p<0.05$. Age difference: [a]$p<0.05$, [b]$p<0.01$, [c]$p<0.001$.

Aggravating and relieving factors

Table VII also shows the frequencies with which the factors listed were reported to aggravate the LBP. The most conspicuous factor in this relation was stooping, reported by around 65% of the participants, followed by the sitting position, with around 30%, and climatic factors such as change in the weather or cloudy or rainy weather, indicated by 26–27%. The most pronounced age difference observed was for the climatic factors with a tendency towards increased frequency of aggravation with increasing age. The most marked sex difference was seen for feelings of tension, pressure or stress with an overall preponderance among the women, 14% of whom experienced this as an aggravating factor. The significant influence of menstruation on the LBP among the younger women is noteworthy because, as mentioned, LBP experienced in relation to menstruation only was excluded.

The relieving factors which the participants reported in the questionnaire were identical with the aggravating factors listed. The factors actually claimed to relieve LBP are shown in Table VII. The factors found to be of highest importance for relief of LBP were lying down, reported by 52–54%, and walking around, by 34–39%. For the sake of completeness, we also note that two participants reported that change in weather, cloudy or rainy weather relieved their LBP, while one reported tension, pressure or stress and one bowel movement as relieving factor.

The significance of these factors as indicators for the occurrence of LBP in the follow-up year was tested. The following factors showed a uniform pattern in this respect within the four age groups. Among the women who claimed that the standing position aggravated their LBP, 16% more (78% against 62%) cases of LBP were reported in the follow-up year ($\chi^2=6.52$, df 1, $p=0.011$). The men showed the same trend, with a figure of 11% (75% against 64%, $\chi^2=2.17$, df 1, $p=0.14$). When change in the weather, cloudy or rainy weather were claimed to aggravate the LBP, the men were found to report an excess of LBP in the follow-up year of 18% (80.3 against 62.2%, $\chi^2=6.41$, df 1, $p=0.011$). For the women the excess was 9% (74.6%

Table VI. *Severity of the low back pain (LBP) evaluated by those participants who experienced LBP in the follow-up year*

Unknown for 15 men and 13 women. All age groups together. Very severe: in periods had completely to stop their normal function—paid work, house work etc. Severe: in periods had to leave certain things undone during their normal function. Moderate: in periods were impeded but not prevented from performing their normal function. Light: could carry out their normal function

	Men n=183 (%)	Women n=202 (%)
Very severe	8	6
Severe	12	15
Moderate	37	43
Light	43	36

Table VII. *Whether, because of low back pain (LBP), the participants: 1) ever woke up during the night, 2) ever were unable to put on stockings and shoes, or, 3) had been impeded in their daily work (including house work); and factors claimed to aggravate or relieve LBP (%)*

	30 years		40 years		50 years		60 years		All ages		
	Men n= 64–75	Women n= 62–74	Men n= 51–63	Women n= 46–60	Men n= 55–73	Women n= 57–76	Men n= 38–62	Women n= 51–80	Men n= 213–270	Women n= 229–288	Unknown (number)
Whether the participant											
Woke up during the night	8	12	13^{2}	35^{2}	18^{1}	34^{1}	31	40	17^{3b}	30^{3b}	(17)
Unable to put on stockings/shoes	9	11	6	10	19	19	20	22	14	16	(19)
Impeded in daily work	32	36	40	40	39	45	52	56	40	45	(17)
Factors aggravating											
Sitting position	28	25	24	24	33	36	18^{2}	47^{2}	26	34^{a}	(80)
Standing position	13^{2}	35^{2}	26	34	31	29	19	28	22^{1}	31^{1}	(88)
Walking around	9	17	13	17	19^{2}	4^{2}	8	11	12	12	(75)
Lying down	14	7	7	8	10	8	13	21	11	11^{a}	(83)
Stooping	69	66	64	74	57	72	61	70	63	70	(130)
Change in weather, cloudy or rainy	9	7	20	27	41	26	39	42	27^{c}	26^{c}	(74)
Feeling of tension, pressure or stress	13	22	7^{2}	27^{2}	13	23	4^{2}	23^{2}	10^{3}	24^{3}	(95)
Sneezing	16	15	19	28	31	21	37	23	25^{a}	21	(128)
Coughing	20	15	15	17	27	22	37	21	24	19	(129)
Bowel movement	12	9	0^{1}	15^{1}	18	9	12	20	11^{a}	13	(131)
Menstruation	–	54	–	39	–	–	–	–	–	–	–
Factors relieving											
Sitting position	21	15	14	16	27	16	14	24	19	18	(80)
Standing position	22^{2}	4^{2}	7	4	13	7	15	8	14^{2}	6^{2}	(88)
Walking around	31	28	25	25	44	50	33	51	34	39^{b}	(75)
Lying down	57	58	48	60	61	47	40	51	52	54	(83)
Stooping	8	13	5	6	7	7	3	–	6	–	(130)

Sex differences: $^{1}p<0.05$, $^{2}p<0.01$, $^{3}p<0.001$. Age differences: $^{a}p<0.05$, $^{b}p<0.01$, $^{c}p<0.001$.

against 65.3%, $\chi^2=2.06$, df 1, $p=0.15$). Finally women who reported aggravation of the LBP in relation to feelings of tension, pressure or stress showed a 15% higher frequency of LBP in the follow-up year (78% against 63%, $\chi^2=4.63$, df 1, $p=0.031$). No similar trend was observed among the men.

DISCUSSION

Descriptive/analytical information

None of the participants pointed outside of the area defined as the low back (Fig. 1) which thus seems to be large enough. Within the area, only the distal parts of the gluteal regions were not pointed out. The central location in the lower lumbar area (area B in Fig. 1) was most frequently pointed out, with the flanks next most frequent; this is in good agreement with the study by Bergquist-Ullman & Larsson (6), in which 87% were men. Unfortunately the patterns for men and women is not available from the Swedish study (6), but the present investigation, showed a difference in this respect which has no obvious explanation. In contrast to the Swedish study (6), which reported pain to be more common in the right gluteal region than on the left side, the present data did not verify any side difference. The locations pointed out in the lower lumbar and the gluteal regions corresponded very often to the tender points in these regions described by other authors (17, 51, 52, 72).

The frequencies for pains radiating to the leg(s), i.e. below the gluteal fold(s), (Table II) are of the same magnitude as in most previous studies (23, 24, 29, 32, 34, 48, 49, 57, 61, 68), but lower frequencies have been found by some investigators (14, 25, 63). Different delineations of the meaning of pain radiating down the leg(s) might account

for the difference, as some authors only include pain below the knee in this connection. The relatively marked sex difference demonstrated in the present study does not seem to have been reported previously. That the frequencies are generally increasing with age is most probably due to an accumulating effect. Weber (66) found an average interval of 10 years between the first attack of LBP and the onset of radiating pain. He interpreted this as a consequence of intradiscal degenerative and regenerative forces resulting in a maximal risk for a sciatica attack at the age of 40. This hypothesis seems to be confirmed by the present data since the largest increase in the frequency of radiating pain was found from age 30 to 40 years.

The bias introduced in the study via the exclusion of participants with sciatica who never had LBP, by using the LBP question as the criterion for inclusion (delimitation of LBP), is probably of minor significance, as several investigations (18, 21, 30, 57) have shown that around 99% of those with sciatica also have experienced LBP.

Feelings of stiffness (14, 54, 56, 57, 63, 68), weakness or fatigue (14, 38, 54, 56, 57, 68) in the back have earlier been reported as commonly stated symptoms, as were slight pain or ache (38, 56, 57) and intense or sharp pain (14, 38, 56, 57). The frequencies of these symptoms are somewhat different in the various studies which may be due to different methods of questioning.

The frequencies of symptom diagnoses (Table V) used in the present investigation were of a magnitude comparable with the previous Swedish studies (22–25), although the high percentage of unclassified symptoms in the present material has to be taken into account. The substantially higher frequency of lumbago among men as compared to women, especially at 30 years of age, may be due to differences in exposure to occupations with heavy physical work.

The time of day when LBP is worst (Table V) has not previously been investigated. With higher age an increased frequency of constant complaints was found, indicating LBP to be chronic. However, this was not confirmed in the follow-up study. In a recent Polish investigation (12) on the "circadian rhythm of pain in ischalgia" the majority of patients reported that their pain increased during the evening and night hours, while the rest of the patients stated that the peak intensity was during morning hours or without any circadian fluctuations. These observations are in accordance with the present findings for LBP.

Pain at night has been found in frequencies of 40–49% among probands with LBP in Swedish studies (6, 57, 67). An investigation in Holland (61) showed night pain among 21% of men and 32% of women. This is close to the frequencies seen in this presentation (Table VII). Bergquist-Ullman & Larsson (6) found sleep disturbances among 23%.

The severity of the LBP evaluated by questioning participants on interference with normal functions (Table VI) shows a pattern which is in agreement with recent findings in a male Swedish population (57). The figures do not differ much from those given in other investigations (14, 38), although in these last mentioned studies no clear definition of the severity scale used has been indicated.

The sitting position is more often an aggravating than a relieving factor for LBP, particulary among the women (Table VII). This has been reported previously (6, 36, 38, 45, 64, 67). Somewhat fewer reported that standing aggravated their LBP, although the difference is small. Studies on the intradiscal pressure (41, 43) have shown that the load on the third lumbar disc is higher in unsupported sitting than in the standing position. The studies have also revealed (40) that bending or a stooped position while sitting as well as while standing increases the load significantly, and this is verified by electromyographic measurements (3, 46). These findings seem to confirm the present observation of the stooping position to be the most frequent aggravating factor for LBP. Other reports (6, 33, 44, 59, 68) support this observation. Walking around and in particular lying down were the factors most often stated to relieve LBP, although in 11–12% of the participants these actions were said to aggravate their LBP. Magora (38) also found these factors to be relieving, although to a lesser degree. On the other hand he found standing to be the most pain-relieving factor in no less than 70% of the cases. When considering the lying position, the hardness of the bed or couch is probably of significance, as discussed earlier (15, 53, 55, 62). The only known controlled trial (15) indicates that hard beds should remain the first choice of patients with chronic LBP.

Changes in the weather and particularly cloudy or rainy weather may be associated with LBP, as previously noted (24, 27, 29, 33, 69), and this may

particularly be so where the LBP is of muscular origin (50, 72).

The relation between LBP and the feeling of tension, pressure or stress has also been reported (10, 19, 20, 29, 37, 58, 67). A possible mechanism may be an increased muscle tension (20), which may explain the sex difference found (72).

The experience that coughing or sneezing may aggravate LBP in some participants has previously been indicated (6, 13, 19, 28, 38). On the basis of further investigation into this aspect, Magora (38) found the pain arising during coughing or sneezing to be related to the anteflexion of the spine and not to an increase of the intraspinal pressure, which would indicate a root compression syndrome, such as a disc protrusion or herniation. This point of view seems reasonable, as it can hardly be expected that 20–25% (Table VII) of all participants with LBP should have root compression syndromes.

Prognostic value

Few of the variables analysed in this study proved to be predictors for occurrence of LBP in the follow-up year. A history of pain radiating to the leg(s) was the only really outstanding indicator in this respect (Table III), and the use of symptom diagnoses did not supply more predictive power.

The importance of radiating pain in the history as regards future risk of LBP was also demonstrated in two recent prospective studies (49, 60), while Dillane et al. (11) did not find this association. Magora & Taustein (39) could show that persons who had experienced sciatica had sick leave more often and of longer duration as compared to those without sciatica. Thus radiating pain seems to indicate a more severe course for the LBP.

Other variables in this study which showed some indicative value for occurrence of LBP in the follow-up year were: Waking up during the night because of LBP, aggravation of LBP in standing position or with changes in the weather, cloudy and rainy weather or when feeling tension, pressure or stress. No uniform pattern for the two sexes was demonstrated for any of these variables which might be due to true sex difference or, more likely, might be because the associations are weak.

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