

# Low back pain deprives the Japanese adult population of their quality of life: a questionnaire survey at five healthcare facilities in Japan

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## Abstract

**Objectives** To estimate the degree to which low back pain (LBP) deprives the Japanese adult population of their quality of life (QOL) in terms of quality-adjusted life-years (QALYs).

**Methods** A questionnaire survey was conducted among participants of health examinations at five healthcare facilities in Japan. Age- and sex-specific mean values of the EQ-5D score were calculated for (1) those who reported LBP and interference with daily activities (IDA) due to the pain ( $n = 251$ ), (2) those who reported LBP but no IDA ( $n = 955$ ), and (3) those who reported no musculoskeletal pain ( $n = 2887$ ). To estimate the loss of QALYs due to LBP in the Japanese adult population, we multiplied the age- and sex-specific mean differences of the EQ-5D scores between the LBP with (or without) IDA group and the no pain group by the corresponding age- and sex-specific numbers of people with LBP with (or without) IDA in Japan.

**Results** Among the entire Japanese adult population of 103 million people, 11,800,000 (4,910,000 men and 6,890,000 women) were estimated to suffer from LBP, and 2,403,000 (976,000 men and 1,427,000 women) people were estimated to encounter IDA due to the pain. The loss of QALYs due to LBP in the Japanese adult population was estimated at 947,000 (9.18 per 1000 population). The loss of QALYs due to IDA in the LBP people was estimated at 139,000 (1.35 per 1000 population).

**Conclusions** The estimated loss of QALYs due to LBP suggests that LBP substantially deprives the Japanese adult population of their QOL.

**Keywords** Japan · Low back pain · Quality adjusted life year · Quality of life

## Introduction

Low back pain (LBP) is a major health and socioeconomic problem in Western countries [1]. Many people will experience one or more episodes of LBP in their life and, as such, LBP is associated with high healthcare costs, work absenteeism, and disablement.

Our previous study showed that 41.2% of the Japanese adult population suffers from musculoskeletal pain, with the lower back being the most common site of pain for both sexes [2]. As has been found in Western populations, LBP is likely to deprive the Japanese population of their quality of life (QOL). However, to date, few studies have evaluated the impact of LBP on QOL in a Japanese population. Although the Japanese lifestyle is becoming increasingly westernized, considerable gaps remain in terms of culture, customs, and body build between Japan and Western countries. It is therefore uncertain whether the results pertaining to Western populations are applicable to the Japanese population.

We conducted a questionnaire survey among participants in health examinations at five healthcare facilities in Japan with the aim of evaluating the impact of musculoskeletal pain on QOL. Based on the results of this questionnaire survey and the national statistical data, we then estimated to the degree to which LBP deprives the Japanese adult population of their QOL in terms of quality-adjusted life-years (QALYs).

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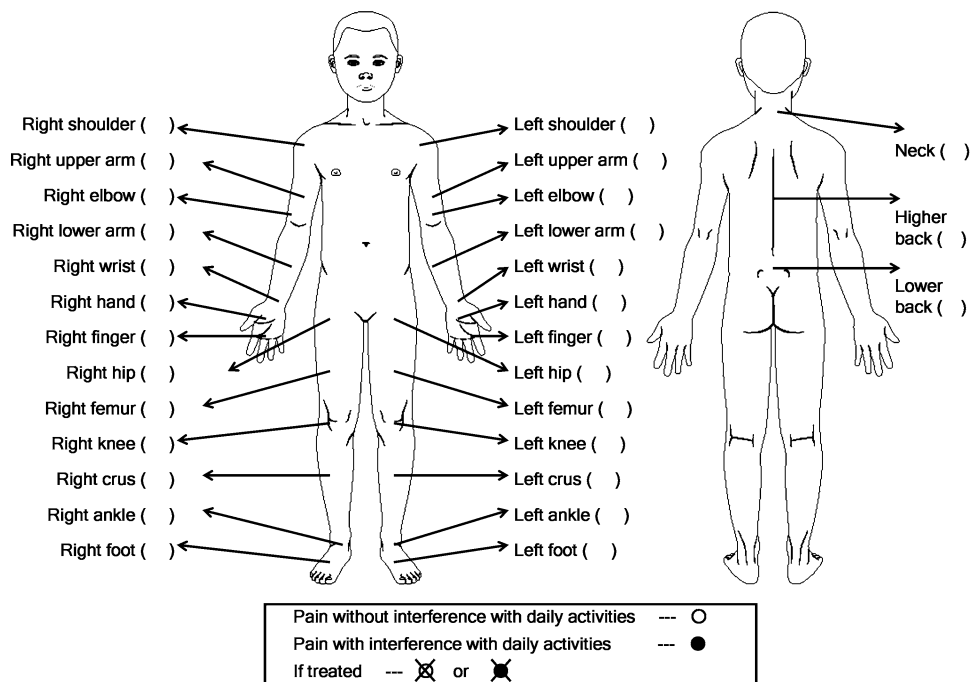
**Methods**

**Questionnaire survey on musculoskeletal pain**

A questionnaire survey was conducted in September and October 2005 at five healthcare facilities in Japan: (1) Niigata healthcare association (Niigata, Niigata prefecture), (2) Tsukuba multiphasic health examination center (Tsukuba, Ibaraki prefecture), (3) Omiya Kyoritsu hospital (Saitama, Saitama prefecture), (4) Seirei health examination center (Hamamatsu, Shizuoka prefecture), and (5) Wellness Sasaoka clinic (Fukuoka, Fukuoka prefecture). This questionnaire survey was approved by the ethics committee of St. Marianna University School of Medicine.

Approximately 1000 participants at each healthcare facility who were undergoing health examinations during the 2 months of the study period were asked to complete a questionnaire anonymously. The questionnaire consisted of two parts. In the first part, the participants marked the regions affected by musculoskeletal pain for more than 1 week during the last month on a drawing with predefined body regions (Fig. 1). Four different symbols were used to classify the types of pain as (1) treated or untreated and (2) with or without interference with daily activities (IDA) due to the pain. In the second part, the participants filled out the Japanese EQ-5D instrument [3] to assess their generic QOL. A total of 5652 people who agreed to participate in the questionnaire survey turned in their completed questionnaire then and there.

**Fig. 1** Pain drawing with predefined body regions used in the questionnaire



**EQ-5D score**

The EQ-5D instrument defines health according to five dimensions: (1) mobility, (2) self-care, (3) usual activities, (4) pain/discomfort, and (5) anxiety/depression. Each dimension consists of three levels of severity: (1) no problems, (2) some/moderate problems, and (3) extreme problems. A unique EQ-5D health state is defined by combining one level from each of the five dimensions ([3]; EuroQol Group, EQ-5D: <http://www.euroqol.org>).

Among the 5368 eligible people aged 20 years or older who completely filled out the Japanese EQ-5D instrument, 1206 (22.5%) reported LBP and 2887 (54%) reported no musculoskeletal pain. The EQ-5D health states were converted into a single index value – the EQ-5D score – by applying the EQ-5D value sets elicited from general population samples [3]. Age- and sex-specific mean values of the EQ-5D score were calculated for the following three groups: (1) those who reported LBP and IDA ( $n = 251$ , LBP with IDA group), (2) those who reported LBP but no IDA ( $n = 955$ , LBP without IDA group), and (3) those who reported no musculoskeletal pain ( $n = 2887$ , no pain group).

**Estimation of the number of LBP people**

Age- and sex-specific prevalence rates of LBP were derived from the 2004 National Life Survey [4]. To estimate the number of people with LBP in Japan, we

multiplied the age- and sex-specific prevalence rates of LBP by the corresponding age- and sex-specific population estimates as of October 1, 2004 [5]. Age- and sex-specific percentages of IDA in people with LBP that were derived from the questionnaire survey on musculoskeletal pain were used to estimate the number of people who encounter IDA due to the pain in Japan because these data were unavailable in the national statistical data.

#### Estimation of the loss of QALYs due to LBP

Quality-adjusted life-years are widely used as a measure of health outcomes as it quantifies the overall difference between two or more health states. The QALY combines the quantity and the quality of life in a single index value. A year of perfect health is considered to be equal to 1 QALY, while a year of ill health is discounted according to the degree to which the illness deprives the patients of their QOL [6, 7]. To determine the QALY value, the years lived in a given health state are multiplied by the utility value of that health state. For example, a year lived in a health state with a utility value of 0.5 is equal to 0.5 QALYs, the same as half a year lived in perfect health. The utility values of the health states, ranging from 1 (indicating perfect health) to 0 (indicating death), can be estimated using a series of techniques, such as Standard Gamble, Time Trade-Off, and Rating Scale, or by means of health state scoring systems, such as the EQ-5D and Health Utilities Index. The EQ-5D instrument has produced a set of utilities values for 245 health states ([3]; EuroQol Group, EQ-5D: <http://www.euroqol.org>).

To estimate the loss of QALYs due to LBP in the Japanese adult population, we multiplied the age- and sex-specific mean differences of EQ-5D scores between the LBP with (or without) IDA group and the no pain group by the corresponding age- and sex-specific numbers of people with LBP and with (or without) IDA in Japan. To estimate the loss of QALYs due to IDA in people with LBP, the age- and sex-specific mean differences of EQ-5D scores between the LBP with and without IDA groups were multiplied by the corresponding age- and sex-specific numbers of people with both LBP and IDA in Japan.

#### Statistical analyses

Statistical analyses were performed with the Statistical Analysis Systems (SAS, ver. 8.2; SAS Institute, Cary, NC). The percentages of problems in five dimensions were compared using the chi-square test. The mean EQ-5D scores were compared by one-way analysis of variance. Tukey's HSD multiple comparisons were performed to

calculate the difference between each pair of means with a 95% confidence interval (CI).

#### Results

Table 1 shows the percentages of problems in five dimensions and EQ-5D scores in the questionnaire survey on musculoskeletal pain. The LBP with and without IDA groups reported more problems than the no pain group in all dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression). For the total subjects, a significant difference among the three groups was found in all dimensions except for self-care in women where the percentage of the problem was extremely low. The lowest EQ-5D score was observed in the LBP with IDA group, followed by the LBP without IDA group and the no pain group ( $P < 0.001$ ). This trend was consistently found for all age groups and both sexes; the most striking difference was observed in the group of men aged 60+ years.

Multiple comparisons showed that the LBP with and without IDA groups had a significantly lower EQ-5D score than the no pain group for all age groups and both sexes. The mean differences (95% CI) in EQ-5D scores between the LBP with IDA group and the no pain group were 0.064 (0.027–0.100), 0.079 (0.063–0.094), and 0.220 (0.178–0.263) for the age groups 20–39, 40–59, and 60+ years, respectively, for men and 0.085 (0.039–0.131), 0.120 (0.095–0.145), and 0.128 (0.022–0.234) for the age groups 20–39, 40–59, and 60+ years, respectively, for women. The mean differences (95%CI) in EQ-5D scores between the LBP without IDA group and the no pain group were 0.034 (0.014–0.053), 0.052 (0.043–0.061), and 0.038 (0.015–0.062) for the age groups 20–39, 40–59, and 60+ years, respectively, for men and 0.070 (0.048–0.092), 0.067 (0.052–0.083), and 0.104 (0.042–0.166) for the age groups 20–39, 40–59, and 60+ years, respectively, for women. These mean difference values were used to estimate the loss of QALYs due to LBP. Multiple comparisons also showed that the LBP with IDA group had a significantly lower EQ-5D score than the LBP without IDA group in the age groups 40–59 and 60+ years for men and 40–59 years for women. The mean differences (95%CI) in EQ-5D scores between the LBP with and without IDA groups were 0.030 (–0.010 to 0.069), 0.027 (0.001–0.044), and 0.182 (0.137–0.228) in the age groups 20–39, 40–59, and 60+ years, respectively, for men and 0.015 (–0.034 to 0.064), 0.053 (0.025–0.080), and 0.024 (–0.089 to 0.136) in the age groups 20–39, 40–59, and 60+ years, respectively, for women. These mean difference values were used to estimate the loss of QALYs due to IDA in people with LBP.

**Table 1** Percentages of problems in five dimensions and EQ-5D scores in the questionnaire survey on musculoskeletal pain

Age (years)	Men			Women		
	No pain	Low back pain		No pain	Low back pain	
		Without IDA	With IDA		Without IDA	With IDA
<b>All</b>						
Number of subjects	1835	585	151	1052	470	100
Percentages of problems <sup>a</sup>						
Mobility	0.7	3.4	8.6***	1.0	5.4	8.0***
Self-care	0.1	0.0	2.0***	0.2	0.5	1.0
Usual activities	0.5	2.1	4.6***	0.5	4.1	13.0***
Pain/discomfort	3.6	35.0	48.3***	7.2	49.7	67.0***
Anxiety/depression	6.5	9.7	9.9*	10.4	18.4	20.0***
EQ-5D score (mean ± SD)	0.91 ± 0.04	0.86 ± 0.09	0.82 ± 0.16***	0.90 ± 0.06	0.83 ± 0.14	0.78 ± 0.15***
<b>20–39</b>						
Number of subjects	391	102	24	307	104	16
Percentages of problems <sup>a</sup>						
Mobility	0.5	1.0	4.2	0.3	0.0	0.0
Self-care	0.3	0.0	0.0	0.3	0.0	0.0
Usual activities	1.3	2.0	4.2	0.3	2.3	6.3*
Pain/discomfort	4.6	28.4	37.5***	6.2	44.3	43.8***
Anxiety/depression	7.9	11.8	8.3	13.4	28.4	18.8**
EQ-5D score (mean ± SD)	0.90 ± 0.06	0.87 ± 0.09	0.84 ± 0.14***	0.90 ± 0.04	0.83 ± 0.12	0.82 ± 0.18***
<b>40–59</b>						
Number of subjects	1253	408	109	643	309	72
Percentages of problems <sup>a</sup>						
Mobility	0.5	3.7	6.4***	0.9	5.5	8.3***
Self-care	0.0	0.0	0.9***	0.2	0.0	1.4
Usual activities	0.4	1.7	2.8**	0.6	3.8	9.7***
Pain/discomfort	3.4	37.7	45.9***	7.3	51.5	68.1***
Anxiety/depression	6.3	9.6	10.1*	9.6	15.6	20.8**
EQ-5D score (mean ± SD)	0.91 ± 0.04	0.86 ± 0.10	0.83 ± 0.14***	0.90 ± 0.06	0.83 ± 0.11	0.78 ± 0.16***
<b>60+</b>						
Number of subjects	191	75	18	102	57	12
Percentages of problems <sup>a</sup>						
Mobility	2.1	5.3	27.8***	3.9	15.6	16.7*
Self-care	0.0	0.0	11.0***	0.0	4.4	0.0
Usual activities	0.0	4.0	16.7***	0.0	8.9	41.7***
Pain/discomfort	3.1	29.3	77.8***	9.8	51.1	91.7***
Anxiety/depression	4.7	8.0	11.1	5.9	13.3	16.7
EQ-5D score (mean ± SD)	0.91 ± 0.03	0.87 ± 0.07	0.69 ± 0.24***	0.90 ± 0.07	0.79 ± 0.25	0.77 ± 0.07***

IDA, interference with daily activities

\*  $P < 0.05$ ; \*\*  $P < 0.01$ ; \*\*\*  $P < 0.001$  (difference among the three groups)

<sup>a</sup> People who reported some/moderate or extreme problems of the dimension were counted as having problems in the dimension

Table 2 shows the estimated number of LBP people and the estimated loss of QALYs due to LBP in the Japanese adult population. Among the entire Japanese adult population of 103 million people, 11,800,000 (4,910,000 men and 6,890,000 women) were estimated to suffer from LBP, and 2,403,000 (976,000 men and 1,427,000 women) were

estimated to encounter IDA due to the pain. The prevalence rate of LBP was estimated at 114.4 (men 98.7, women 128.9) per 1000 population, with a significant increase with age; the prevalence rate in the 60+ year age group was 2.7-fold that in the age group 20–39 years for both sexes. The loss of QALYs due to LBP in the Japanese adult population

**Table 2** Burden of low back pain in the Japanese adult population

Age (years)	Men			Women		
	Prevalence × 1000	Loss of QALYs		Prevalence × 1000	Loss of QALYs	
		Due to pain	Due to IDA		Due to pain	Due to IDA
<b>All</b>						
Total	4909.8 (98.7)	299862 (6.03)	–	6890.5 (128.9)	647423 (12.11)	–
Pain with IDA	976.8 (19.6)	–	93627 (1.88)	1426.6 (26.7)	–	45437 (0.85)
<b>20–39</b>						
Total	1018.3 (57.4)	40247 (2.27)	–	1242.6 (72.1)	89622 (5.20)	–
Pain with IDA	193.5 (10.9)	–	5727 (0.32)	191.4 (11.1)	–	2870 (0.17)
<b>40–59</b>						
Total	1670.8 (96.5)	96331 (5.57)	–	1980.6 (113.9)	157321 (9.04)	–
Pain with IDA	352.5 (20.4)	–	9448 (0.55)	461.5 (26.5)	–	24227 (1.39)
<b>60+</b>						
Total	2220.7 (151.1)	163284 (11.11)	–	3667.4 (194.8)	400480 (21.27)	–
Pain with IDA	430.8 (29.3)	–	78452 (5.34)	773.8 (41.1)	–	18340 (0.97)

QALYs, Quality-adjusted life-years; IDA, interference with daily activities  
 Values in parentheses are prevalence and loss of QALYs per 1000 population

was estimated to be 947,000 (9.18 per 1,000 population). The loss of QALYs due to IDA in the LBP people was estimated at 139,000 (1.35 per 1000 population).

**Discussion**

This study is the first attempt to estimate the loss of QALYs due to LBP in the Japanese adult population. QALYs are widely used as a measure of health outcomes as it quantifies the overall difference between two or more health states [6, 7]. The measurement of QALYs provides useful information for underpinning resource allocation decisions [8]. Despite its higher prevalence, LBP has not received the same level of attention by health professionals in Japan as cancers and cardiovascular diseases. However, the estimated loss of QALYs due to LBP suggests that LBP substantially deprives the Japanese adult population of their QOL. Ohkusa reported that the Japanese people may be willing to pay one million YEN to improve 1 QALY [9]. When this value applies to the estimated loss of QALYs due to LBP, the improvement of QOL in people with LBP may be worth an investment of 947 thousand million YEN (equivalent to 0.2% of the gross domestic product; Cabinet Office, Government of Japan. Quarterly estimates of GDP: <http://www.esri.cao.go.jp/en/sna/menu.html>) in Japan.

To our knowledge, this is the first study that has evaluated the impact of musculoskeletal pain on QOL in the Japanese adult population. We previously conducted a questionnaire survey to estimate the prevalence of musculoskeletal pain in the Japanese adult population [2], but

the measurement of QOL was not included in the survey questions. The result of the questionnaire survey on musculoskeletal pain (Table 1) showed that people with LBP reported more health problems than those without musculoskeletal pain in all dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression). Note that significant differences were found in both physical and psychological dimensions. Similar results have been found for population samples from other countries [10–13]. One reasonable explanation for the relatively poorer health of people with LBP is that LBP induces stress, distress, anxiety, and/or depression along with dysfunction. On the other hand, a review of literature suggested that psychological problems may be associated with the onset and development of LBP [14]. Because of the cross-sectional design of our study, our results do not allow us to determine the causal relationship between LBP and psychological problems. However, it is important to note that LBP people may be damaged both physically and psychologically.

The use of the EQ-5D instrument makes it possible to express each health state in a single index value, that is, EQ-5D score. The EQ-5D instrument is widely used to compare generic QOL of different health state groups. Many investigators have reported that EQ-5D scores decrease with increasing prevalence of chronic conditions in general population samples. In a Swedish population, people with LBP showed lower EQ-5D scores than those with hypertension, diabetes, asthma, and ischemic heart disease; next to depression, LBP was associated with the greatest loss of QOL [10, 11]. Similar results were obtained

in Finnish and U.S. populations [15, 16]. Unfortunately, data on EQ-5D scores for people with chronic conditions are scarce in Japan. However, it is unlikely that the relative importance of each chronic condition in the Japanese population is completely different from that in Western populations. Further studies may be required to compare the impacts of chronic conditions on QOL in the Japanese adult population, which may contribute to optimal resource allocation decisions.

This study was not without its limitations. First, both acute and chronic cases were mixed together in the LBP people of this study. Due to the cross-sectional design, it was difficult to determine the course and prognosis of LBP. The loss of QALYs due to LBP may be overestimated when some of the LBP people eventually completely recover from the pain and disabilities. However, the DMC3 study, which is a population-based study carried out in the Netherlands, showed that 95% of LBP people described the pain as continuous or recurrent [17]. Pengel et al. [18] found that most people with acute LBP experienced rapid improvements in pain and disabilities within 1 month but that the cumulative risks of at least one recurrence within 3 and 12 months were 26% (95% CI: 19–34) and 73% (95% CI: 59–88), respectively. Hestbaek et al. [19] showed that the percentage of people with LBP who still experienced pain after 12 months was 42–75% (average 62%). Consequently, the estimated loss of QALYs due to LBP may be somewhat higher but not so different from the actual value. Second, participants in health examinations were recruited to the questionnaire survey on musculoskeletal pain. Generally speaking, participants in health examinations are rather healthy people, excluding bedridden patients. They are more likely to be aware of their own health and sensitive to impairment of QOL. The impact of LBP on QOL (Table 1) may have been affected by the selection bias. Third, comorbidity was not adjusted in the estimation of the loss of QALYs due to LBP. Many investigators have reported that comorbidity has a significant negative effect on the QOL of people with LBP [10–12]. The loss of QALYs due to LBP may have been overestimated when some of the people with LBP had chronic conditions, particularly depression and other musculoskeletal disorders. The QOL of LBP people may possibly be affected by socio-economic factors, such as low educational level, manual occupation, and low income [10–12]. Further studies may be required to explain the impact of LBP on QOL in detail.

In conclusion, the estimated loss of QALYs due to LBP suggests that LBP substantially deprives the Japanese adult population of their QOL. Although LBP has not received the same level of attention by health professionals in Japan as a number of other serious conditions, the control of LBP

should not be bypassed in attempts to improve the QOL. Low back pain is typically classified as being “specific” or “non-specific”. Approximately 90% of all people with LBP will have non-specific LBP, which is a diagnosis based on the exclusion of specific pathology [20]. Health professionals should pay attention to the implementation of effective preventive and therapeutic interventions for non-specific LBP [20].

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