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# Association of low back pain on physical, sociodemographic and lifestyle factors across a general population sample within Greece

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## Abstract.

**BACKGROUND:** Although low back pain (LBP) is a debilitating problem internationally, there is not a lot of research on its impact on physical, psychosocial and lifestyle factors. Especially in Mediterranean countries, such as Greece, it is not sufficiently explored whether physical (pain location, activity limitation etc.), sociodemographic (education, smoking etc.) or lifestyle factors (i.e. quality of life or anxiety) are influenced by LBP.

**OBJECTIVE:** To estimate LBP prevalence in the Greek general population and explore its association with particular sociodemographic, physical and lifestyle factors.

**METHOD:** A sample of 3125 people of the Greek adult population was randomly selected by stratified sampling encompassing rural and urban representation within the Greek mainland. An extended survey form was developed entailing three sections; personal (sociodemographic) information, questions on symptomatology and physical factors (i.e. pain characteristics, recurrence, physical disability etc.) and 3 self-administered questionnaires (including mostly lifestyle factors); Hospital Anxiety and Depression (HAD) scale for anxiety and depression, SF-12 for quality of life (QoL) and Roland-Morris for disability.

**RESULTS:** A total of 471 (15%) people reported LBP (210 males, mean age:  $47.04 \pm 15.03$ ). Amongst them 60% reported sciatica, 76% suffered recurrent LBP and 70% received specialist care. Low disability levels, moderate to high pain intensity, gender differences and good self-reported QoL and psychosocial status were reported. Sociodemographic characteristics (income, smoking, marital status etc.) were not associated with LBP physical factors, apart from age which correlated with physical disability and wellness ( $r$  being 0.446 and 0.405, respectively,  $p < 0.001$ ). Physical factors (particularly pain intensity and location) correlated with lifestyle factors (QoL) and disability ( $r$  ranging between 0.396 and 0.543,  $p < 0.001$ ). Mental wellness, anxiety and depression (as lifestyle factors) were not associated with sociodemographic or physical factors.

**CONCLUSIONS:** Physical parameters were amongst the most prevalent characteristics of the Greek sample, thus offering a direction towards a more targeted treatment and rehabilitation planning. Unlike previous literature, most sociodemographic characteristics were not correlated with any LBP physical or lifestyle factors, thus possibly indicating a different socioeconomic background and aetiology domain to that of the usual non-specific LBP spectrum.

Keywords: Low back pain, prevalence, physical, sociodemographic, lifestyle, Greece

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## 1. Introduction

Low back pain is one of the commonest musculoskeletal entities, notorious in causing physical, economic, functional, psychosocial, behavioural and lifestyle problems. It is suggested to affect up to 60–80% of the general adult population at some point in their lifetime [1–4]. High prevalence rates are internationally widespread [3,5–7], from the most developed parts of the world, including US [8,9], North America [5], Australia [2], Great Britain [10,11] and other European countries [11–16], to developing ones [17,18], such as Pakistan [19], Turkey [20] and Nigeria [21,22].

LBP appears to be a highly prevalent problem within Greece, too. It is considered ninth in the list of the most common reasons requiring hospital admission [23] and first in the list of orthopaedic conditions being encountered in an emergency department [24]. It also seems to be the most common musculoskeletal problem amongst the Greek population [25]. In an extensive cross-sectional study across Greece, a group of rheumatologists investigated the prevalence of rheumatic diseases, and found that the most common one was LBP, with a point prevalence of 11% [25]. Stranjalis et al. [15] in a cross-sectional study encompassing mainly urban population, found a one-month prevalence rate of 32%. A more recent smaller-scale study investigated the annual prevalence patterns of musculoskeletal diseases in rural primary care settings in Crete, the largest Greek island [26]. LBP presented with the highest prevalence rate of approximately 57% amongst the various musculoskeletal conditions studied. A more recent study within an urban setting reported 40% LBP and 25% sciatica [27]. Some other epidemiological studies have also investigated occupational LBP in Greece, in nursing staff [28], shipyard employees [29], dentists [30], public office workers [31], all of which reported high prevalence rates.

In terms of reported physical factors, such as pain intensity and location, disability, chronicity, information on symptoms, work absence and care-seeking or other lifestyle parameters, such as quality of life or psychosocial impact, there is scarcity of relevant research within the Greek setting. Spyropoulos et al. [31] reported an 11% of his affected population (public office workers) suffering from severe LBP, 43% of which suffered from recurrent episodes. Within the occupational studies, work absence ranged between 10% and 30% [28–30] whereas, Stranjalis et al. [15] reported a sick leave rate of 19% amongst the general popula-

tion with a mean duration of 5 days off work. In terms of healthcare utilisation, approximately 30% of the affected LBP samples consulted a physician doctor or a general practitioner for their symptoms [15,26].

From the above, it is evident that in Greece, LBP is a debilitating problem, however, there is not a lot of available research on its impact on physical factors, such as pain parameters and physical disability, or on lifestyle factors, such as quality of life (QoL) and other psychosocial parameters. Furthermore, as LBP is acknowledged as a health problem with not only biomedical, but also social, psychological, economic and functional consequences, it is important to explore how several sociodemographic (i.e. marital status, smoking, education etc.) and lifestyle factors (i.e. anxiety or physical quality of life) within the Greek setting are influenced by LBP.

Given the above, the aims of the present study were to estimate LBP prevalence in a Greek general population sample and explore its association with several physical, sociodemographic and lifestyle factors.

## 2. Methods

### 2.1. Sample

The sample included Greek citizens over the age of 16, which were selected by multistage sampling with definition of the sample quotas based on sex, and geographical type of residence (urban, semi-urban, rural), according to the results of the 2011 National Census of the Hellenic Statistical Authority (ELSTAT), the Greek official statistical authority. The geographical area covered included central and western Greece, and according to the 2011 National Census, urban representation corresponded to cities with more than 10.000 inhabitants, semi-urban to towns with population between 2000 and 10000 people, and rural areas corresponded to villages with less than 2000 inhabitants. In order to obtain a representative sample of Greek citizens, the sample was stratified according to geographical location, to obtain as greatest representation as possible. For the geographical location, central and western Greek mainland was divided into 5 urban areas, encompassing 2 large (Athens, Patras), 2 medium sized (Ioannina, Trikala) and one smaller city (Korinthos). In addition, 20 rural areas (10 towns and 10 villages) surrounding each selected city except for Athens were picked up for the study.

The survey was conducted and administered by 8 physiotherapists, well trained in this questionnaire ad-

99 ministration procedure, who attended a full-day train-  
100 ing by the principal investigator (EB) on interview ad-  
101 ministration utilising the presenting assessment form.

102 The study was approved by the Scientific Commit-  
103 tee of the Technological Educational Institute (TEI) of  
104 Western Greece (former TEI of Patras).

## 105 2.2. Survey development

106 An extended survey form based on current litera-  
107 ture was developed. The survey form which was devel-  
108 oped (*Greek survey*) was self-reported including per-  
109 sonal (sociodemographic) information (age, education,  
110 marital status, annual income, smoking history etc.)  
111 and 18 questions on physical features, that is, symp-  
112 toms, functionality and LBP-associated history (recur-  
113 rence, treatment, other musculoskeletal etc.), which ac-  
114 cording to the literature have been found to be strongly  
115 associated with LBP [3,4,15,32]. The majority of the  
116 questions were taken from an assessment sheet (*Greek*  
117 *proforma*), which has previously been tested for its re-  
118 liability and has already been utilised among Greek  
119 LBP samples [33,34]. Questions on symptoms in-  
120 cluded pain areas by numbered areas on a body chart),  
121 pain intensity on a visual analogue scale (VAS) being  
122 reported on three levels; average pain (i.e. what is their  
123 pain on average), pain at its 'worst' (i.e. what is their  
124 maximum amount of pain) and pain at its 'best' (what  
125 is the minimal amount of pain they have), reported sci-  
126 atica, frequency, etc. LBP was reported if the partici-  
127 pant suffered during the past 7 days (including the day  
128 of the survey) [35] and pain was located in the lumbar  
129 (low back) region.

130 In addition, three reliable, validate and extensively  
131 used self-administered questionnaires were added in  
132 the Greek survey form: i) The Roland-Morris Disabil-  
133 ity Questionnaire, which is one of the most popular  
134 questionnaires (entailing 24 questions), assessing mild  
135 to moderate physical disability caused by LBP, ii) The  
136 Hospital Anxiety and Depression (HAD) scale, which  
137 is a 14-item scale detecting anxiety (7 items) and de-  
138 pression (7 items) in people with physical health prob-  
139 lems, and finally iii), the SF-12 Health Survey, of-  
140 ten reported as a QoL measure. It is a shorter version  
141 of the SF-36 Health Survey (version 2), entailing 12  
142 questions for measuring physical health and well-being  
143 (mental health). All three questionnaires have previ-  
144 ously been cross-culturally validated within the Greek  
145 setting and have been utilised across similar popula-  
146 tions [34,36–38].

147 Prior to being administered, the survey form was pi-  
148 loted in a LBP sample of 30 people, for clarity and

comprehensiveness. Following this, some minor cor-  
149 rections based on the pilot sample feedback were un-  
150 dertaken.  
151

## 152 2.3. Procedure undertaken

153 For each of the 25 testing sites in total, the 'start-  
154 ing point zero', corresponded to the biggest (and most  
155 popular) square of the town, city or village; which usu-  
156 ally constitutes the buzziest location in the Greek set-  
157 tings. From this zero point, each tester was directed to-  
158 wards an eastern and northern direction and included  
159 in the study every third household/building situated on  
160 the right side of the central road (number 3 was a ran-  
161 domly selected number). Testers were instructed to ask  
162 each subject a standardised question in order to iden-  
163 tify if they suffered LBP. Age and sex of people who  
164 did not suffer from LBP were reported whereas, people  
165 who suffered LBP were provided a full informed con-  
166 sent prior to their participation in the study. In cases  
167 where there was no answer from a given household  
168 (i.e. people were absent), interviewers would visit for  
169 a second time (evening time). When each tester would  
170 reach the end of road or the border of the given city,  
171 town or village, he was instructed to return to the cen-  
172 tral square again following a parallel road or avenue  
173 and start again surveying by using a 5-point star-type  
174 clockwise route. The study was carried out between  
175 October and November 2012.

## 176 2.4. Data analysis

177 Prevalence was estimated descriptively by frequen-  
178 cies and percentages, whereas, LBP factors (sociode-  
179 mographic, physical and lifestyle data) were also es-  
180 timated descriptively (means and standard deviations  
181 for interval/ratio data and percentages and frequen-  
182 cies for nominal/ordinal type data). The association of  
183 LBP features with several sociodemographic, physi-  
184 cal and lifestyle parameters was tested using  $\chi^2$ , in-  
185 dependent sample *t* tests and Pearson's correlation co-  
186 efficient. Regression analysis was carried out using  
187 two linear regression analysis models with two depen-  
188 dent variables for predicting associations; i) pain in-  
189 tensity (based on the worst pain intensity on the VAS)  
190 and ii) disability (based on the Roland-Morris Disabil-  
191 ity Questionnaire). Analysis was performed utilising  
192 SPSS (Version 20.0).

Urban area	Reported inhabitants*	People being asked (number)	People with LBP number (percentage)	Men number (percentage)
Athens (central)	3089698	1167	74 (6,34%)	33 (44,6%)
Patras (west)	213984	837	129 (15,4%)	74 (57,3%)
Ioannina (north west)	89061	389	99 (25,45%)	42 (42,4%)
Trikala (centre-north)	61653	407	83 (20,34%)	29 (34,9%)
Korinthos (central-west)	58192	325	86 (24,46%)	32 (37,2%)
<b>Total</b>	<b>3512588</b>	<b>3125</b>	<b>(15,07%)</b>	<b>210 (44,6%)</b>

\*Based on 2011 National census of the Hellenic Statistical Authority (ELSTAT).

		Percent (nu)
<b>Sociodemographic</b>		
Residence	Rural	17% (81)
	Urban	44% (206)
	Semi-urban	40% (184)
Education	Primary	22% (102)
	High school	48% (224)
	Higher education	31% (145)
Smoking	Non-smokers	61% (285)
	Heavy smokers (> 2 p/day)	21% (99)
Marriage	Not married	25% (119)
	Married	64% (300)
	Divorced/widowed	11% (51)
Income (annual)	< 7200€	30% (140)
	7200–24000€	60% (281)
	> 24000€	7% (32)
<b>Physical</b>		
Pain location	LBP during last month	98% (460)
	Sciatica during last month	60% (281)
	Pain below the knee	40% (188)
Frequency	Every day	180% (85)
	Most days	54% (254)
Recurrence	LBP recurrent episodes	76% (356)
Activity limitation	LBP – limiting activities	61% (289)
	Sciatica – limiting activities	36% (11)
Investigations	Xray	34% (158)
	MRI	12% (56)
Bed rest	Bed rest (2–3 days)	17% (80)
	Bed rest (< 1 week)	11% (52)
	Bed rest (2 weeks)	7% (31)
	> 1 month bed rest	8% (38)
Recovery status	Improvement	48% (224)
	No improvement	33% (157)
	Exacerbation	15% (69)
Other problems	Other musculoskeletal problems	35% (163)
Sick leave		31% (147)
Specialist visit		70% (330)
Treatment		70% (329)
	Mean (SD)	95% confidence intervals
VAS-average pain intensity	5,26 (1,857)	5,10–5,43
VAS-pain at worst	7,99 (1,87)	7,82–8,16
Disability (Roland-Morris)	10,01 (6,14)	9,46–10,57
<b>Lifestyle</b>		
HAD (anxiety subscale)	11,24 (6,22)	10,68–11,81
HAD (depression subscale)	9,16 (6,44)	8,57–9,74
SF-12 Physical subscore	41,06 (9,67)	40,19–41,94
SF-12 Mental subscore	46,02 (10,86)	45,04–47

### 3. Results

Out of 3125 people being questioned, a total of 471 (15%) reported LBP (210 males, 261 females, mean age:  $47.04 \pm 15.03$ ) at the time of the survey. Table 1 summarises the sample's distribution according to geographical area. Amongst them, nearly 76% were suffering from recurrent LBP, 60% reported associated leg pain (sciatica), and 70% received specialist care and were already under some form of conservative treatment. Their average and worst pain intensity on a VAS score was  $5.26 \pm 1.8$  and  $7.99 \pm 1.8$ , respectively. 61% reported that their LBP was limiting their activities and function. Table 2 summarises the sample's sociodemographic, physical & lifestyle characteristics.

Table 3 presents the results of linear regression analysis using two different dependent variables; pain intensity (VAS at worst) and disability (Roland-Morris), keeping as independent variables the samples's sociodemographic, physical and lifestyle characteristics. Significant regression equations were found for pain intensity<sup>1</sup> and disability.<sup>2</sup> *Pain intensity* was associated with age from the sociodemographic factors, bed rest, activity limitation due to LBP and specialist visit from the physical factors, and anxiety and mental health from the lifestyle factors. *Disability* was associated with sex and age (sociodemographic), activity limitation due to sciatica, bed rest, pain intensity and frequency from the physical factors, and physical wellness (lifestyle factor).

Table 4 presents associations (correlations) with sociodemographic, physical and lifestyle factors across the sample. Sociodemographic characteristics (income, smoking, marital status etc.) did not yield significant associations, apart from age which correlated with disability (physical factor) and physical wellness (lifestyle factor), ( $r$  being 0.446 and  $-0.405$ , respectively, with  $p < 0.001$ ). Significant associations were yielded between pain intensity with disability (as physical factors) and QoL (SF-12 physical subscale as a lifestyle factor), ( $r$  being 0.543 and  $-0.453$ , respectively with  $p < 0.001$ ). Below knee pain was associated only with activity limitation ( $r = 0.453$ ). The other lifestyle factors (anxiety, depression and mental wellness) had only weak associations with age, education and pain intensity;  $r$  ranging between 0.301 and 0.342 ( $p < 0.001$ ). Whereas, visit to specialist had weak associations with high disability and QoL ( $r$  between 0.327 and 0.379,  $p < 0.001$ ).

<sup>1</sup>[ $F_{(22,448)} = 41.245$ ,  $p < 0.001$ , with an  $R^2$  of 0.669].

<sup>2</sup>[ $F_{(4,466)} = 19.441$ ,  $p < 0.001$ , with an  $R^2$  of 0.143].

In terms of gender, although men and women had comparable ages (men-mean age  $45.29 \pm 14.9$ , women-mean age:  $48.45 \pm 15.0$ ), significant differences amongst them were reported on several sociodemographic (education, marital status, smoking, annual income), physical (sciatica and its functionality, pain intensity, specialist visit, other musculoskeletal problems) and lifestyle factors (anxiety and depression and mental health). LBP recurrence, disability, bed rest, treatment, LBP functionality and physical health did not reveal statistically significant gender differences. Table 5 summarises gender-adjusted prevalence distributions of sociodemographic, physical and lifestyle parameters.

### 4. Discussion

The present study aimed to explore the association of sociodemographic, physical and lifestyle factors on LBP in a general population sample of central and western Greece. It was within the scope of the study to attempt to use a representative sample of the general population, encompassing a combination of rural and urban representations. The combination of the 5 cities with variable sizes across central and western mainland and the selection of two towns and villages surrounding each city was thought to be an objective way of capturing a general population sample.

#### 4.1. Prevalence

The prevalence of LBP (15%) found in the present study is in agreement with an older systematic review by Walker [6] on LBP point prevalence (ranging between 12–33%), as well as a more recent systematic review by Hoy et al. [7] on the global prevalence of LBP, which showed the point prevalence of activity-limiting LBP was estimated to be  $12 \pm 2\%$ , and the 1-month prevalence was estimated to be  $23 \pm 2.9\%$ . However, a number of epidemiological studies have yielded higher prevalence rates in developing (56% in Qatar [39], 32% in Africa [18], 34% in Tibet [40]) and developed countries (19% [41] and 15–22% [11] in UK with a trend of an increased prevalence over time [42], 26% in Australia [2], 26.9% in the Netherlands [14], 29% in Canada [43], and between 32% and 48% in Germany [11,35]).

Similar to international studies, previous Greek studies have yielded considerable variability in prevalence rates. Point prevalence range between 11% in a

Table 3

Linear regression analysis between sociodemographic, physical and lifestyle factors as independent variables and pain intensity & physical disability as dependent ones

Factors		Worst pain intensity <sup>†</sup>	Disability <sup>‡</sup>
Sociodemographic	Sex	0.914	0.006*
	Age	0.000**	0.013*
	area	0.744	0.354
	education	0.278	0.545
	maritalstatus	0.353	0.083
	Annual income	0.074	0.492
	Smoking	0.709	0.660
Physical	VAS-average pain intensity	0.000**	0.095
	VAS-pain at best	0.952	0.003*
	LBP during last month	0.000**	0.711
	LBP which is limiting activities	0.017*	0.079
	Sciatica during last month	0.122	0.876
	Sciatica which is limiting activities	0.137	0.026*
	Pain below the knee	0.270	0.658
	LBP recurrent episodes	0.358	0.057
	Other musculoskeletal problems	0.122	0.466
	Specialist visit	0.000**	0.521
	Pain frequency	0.504	0.000**
Lifestyle	Pain status	0.838	0.028*
	Bed rest	0.021*	0.014*
	HAD-Anxiety subscale	0.031*	0.684
	HAD-Depression subscale	0.375	0.424
	SF-12 Physical subscore	0.234	0.000**
	SF-12 Mental subscore	0.007*	0.652

<sup>†</sup> Measured with a visual analogue scale (VAS); <sup>‡</sup> Measured with the Roland-Morris Disability Questionnaire; \* $p < 0.05$ ; \*\* $p < 0.001$ .

Table 4  
Associations between sociodemographic, physical & lifestyle factors

Factors	Physical factors			Lifestyle factors			
	LBP – limiting activities	Sciatica – limiting activities	Roland-Morris	HAD (Anxiety)	HAD (Depression)	SF-12 physical subscore	SF-12 mental subscore
Sociodemographic							
Sex	-0.040	-0.018	0.078	0.094*	0.064	-0.206**	-0.176**
Age	-0.128**	-0.168**	0.446**	0.261**	0.342**	-0.405**	-0.199**
Area	0.001	-0.191**	-0.082	0.055	0.033	0.107*	0.076
Education	0.098*	0.105*	-0.339**	-0.308**	-0.332**	0.350**	0.202**
Marital status	-0.073	-0.086	0.304**	0.163**	0.216**	-0.254**	-0.237**
Annual income	0.029	0.007	-0.030	-0.099*	-0.059	0.075	0.174**
Smoking	-0.025	-0.035	-0.033	0.071	0.005	0.058	-0.003
Physical							
LBP (last month)	-0.140**	0.021	-0.098*	-0.057	-0.071	0.082	-0.030
Sciatica (last month)	0.230**	-0.066	-0.395**	-0.003	-0.039	0.361**	0.201**
Pain below the knee	-0.072	0.453**	-0.077	-0.210**	-0.196**	-0.020	0.055
Pain frequency	-0.174**	0.012	0.363**	0.075	0.113*	-0.334**	-0.184**
VAS – average pain	-0.226**	-0.048	0.456**	0.315**	0.301**	-0.396**	-0.161**
VAS – pain at best	-0.176**	-0.028	0.294**	0.117*	0.144**	-0.370**	-0.221**
VAS – pain at worst	-0.273**	-0.071	0.543**	0.302**	0.302**	-0.453**	-0.121**
Recurrent episodes	0.081	0.043	-0.226**	0.140**	0.095*	0.182**	0.166**
Other musculoskeletal	0.012	0.003	-0.119**	0.043	0.052	0.208**	0.094*
Specialist visit	0.192**	-0.027	-0.363**	-0.046	-0.039	0.327**	0.086
Days of bed rest	-0.135**	-0.021	0.394**	0.082	0.117*	-0.286**	-0.086
Investigations	0.073	0.102*	0.000	0.171**	0.181**	-0.024	-0.055

\* Pearson's correlation is significant at the 0.05 level (2-tailed); \*\* Pearson's correlation is significant at the 0.01 level (2-tailed).

Factors	Male	Female	p values	
Numbers (Percentages)				
Sociodemographic	Education		0.002**	
	Primary	33 (16%)	66 (25%)	
	High school	92 (44%)	132 (51%)	
	Higher	82 (39%)	63 (24%)	
	Marital status			< 0.001**
	Unmarried	66 (31%)	53 (20%)	
	Married	134 (64%)	166 (64%)	
	Divorced/widowed	9 (4%)	42 (16%)	
	Annual Income			0.004**
	< 7200 euro	50 (24%)	90 (35%)	
	7200–14400 euro	80 (38%)	94 (36%)	
	14400–24000 euro	53 (25%)	54 (21%)	
	> 24000 euro	22 (11%)	10 (4%)	
Smoking			0.01**	
Non-smoker	114 (54%)	171 (66%)		
Light smoker (1–2 p/week)	38 (18%)	49 (19%)		
Heavy smoker (> 1–2 p/day)	58 (28%)	41 (16%)		
Physical	LBP limiting activities	126 (60%)	163 (63%)	0.63**
	Sciatica (last month)	105 (50%)	176 (67%)	< 0.001**
	Sciatica limiting activities	58 (28%)	113 (43%)	0.002**
	Pain below the knee	64 (31%)	124 (48%)	0.001**
	Pain frequency			0.083**
	Most days	49 (23%)	81 (31%)	
	Every day	33 (16%)	52 (20%)	
	Specialist visit	133 (63%)	197 (76%)	0.024**
	Under treatment	137 (67%)	192 (74%)	0.147**
	Bed rest	83 (40%)	114 (44%)	0.331**
	LBP recurrence	152 (72%)	204 (78%)	0.317**
	Other musculoskeletal problems	48 (23%)	115 (44%)	< 0.001**
		<i>Mean (SD)</i>		
Average pain intensity	5.05 (1.9)	5.44 (1.7)	0.03*	
Worst pain intensity	7.75 (2.1)	8.19 (1.7)	0.002*	
Roland-Morris	9.48 (6.4)	10.44 (5.9)	0.32*	
Lifestyle	HAD (anxiety)	10.60 (6.6)	11.77 (5.8)	0.003*
	HAD (depression)	8.70 (6.9)	9.52 (5.9)	0.04*
	SF-12 Physical	39.28 (9.5)	43.28 (9.4)	0.85*
	SF-12 Mental	48.15 (9.7)	44.31 (11.4)	0.01*

\*For independent sample's t test, \*\*For  $\chi^2$  test.

large scale study encompassing rural and urban representation from 8547 people [25] to 57% from a smaller scale study in primary care conducted in a rural part of Greece [26]. Two urban based studies reported 1-month and 6-month prevalence rates of 31% [15] and 40% [27], respectively. Whereas, occupational LBP prevalence rates are somewhat higher, too, ranging from 37–38% in public office workers [31] and shipyards [30] to 46% in dentists [29] and 75% in Greek nursing personnel [28]. What is interesting in the presenting study is the variability in prevalence rates across the 5 urban testing sites (ranging from 7% to 25%). The reason for this low prevalence in the area of Athens is not known, although within-country fluctuations have been reported in previous studies [11,20].

Future studies should further explore LBP point prevalence around Athens.

This variability across the present study and previous ones apart from differences in the methodological design, such as differences in the sample size, application of randomization as opposed to convenience sampling methods in a number of other studies, utilization of rural versus urban versus mixed populations etc. could also be attributed to differences in the definition of LBP. Whereas, a number of studies have either not clearly defined how they were reporting LBP in their study [13,25] or used the one day limit for LBP and utilized a location of pain between the last ribs and the gluteal folds [2,7,44], the presenting study utilized a 7-day limit for LBP and location of pain was restricted to the lumbar (low back) region only. Defining dura-



tion for point prevalence and location of pain in LBP epidemiological studies has been a subject of great debate in the past [44–46]. In this study, the presenting pain location was selected in order to distinguish true back pain from other referred pain (i.e. back-associated leg pain, gluteal pain etc.). Anatomical referral pain patterns were already recorded in the survey. The 7-day duration has been used in previous epidemiological studies [35,47] and was also thought to be more ‘realistic’ in terms of true ‘bothersomeness’; it was felt that a longer day duration would better distinguish LBP from any incidental ache experienced. Thus, this definition of duration and location in the present study could partly explain the differences in the lower point prevalence rates between this and other epidemiological reports. However, further work should take place in this area in order to confirm this.

#### 4.2. Physical factors

Regarding self-reported leg-associated back pain, 60% of the LBP sample reported sciatica and 40% reported having below knee pain. Although these numbers are comparable with previous studies, both internationally [41–48] and in Greece [15], there is large variability in self-reported sciatica [27,49]. Again, this could be attributed to the lack of a gold and reporting sciatica [50]. Pain below the knee in this study has also been associated with activity limitation, indicating restricted functionality with below knee pain (Table 4), thus, justifying Hider et al.’s [48] recent distinction between below and above knee sciatica.

Over two thirds of the sample (76%) were suffering from recurrent LBP episodes and over half of the sample (54%) had LBP most of the days. 70% received specialist care and were already under some form of conservative treatment whereas, nearly a third of them (27%) underwent bed rest for up to a week. Although most of these rates are comparable with several other studies regarding pain frequency, recurrence and bed rest [15,51], it is interesting to note the high percentage of the sample receiving specialist care (secondary care). This number is much higher than most studies investigating healthcare seeking (primary or secondary) patterns [48,51–53]. This percentage is however comparable with a Greek study by Korovessis et al. [27] and is in agreement with previous report regarding healthcare utilisation within Greece [54–56]. It could therefore be suggested that within Greece there is an overwhelming percentage of healthcare utilisation amongst LBP patients. It would be interesting to

follow through this sample and perhaps further explore their natural course and the medical options offered to them.

Despite the high percentage of people seeking medical care, the sample presented with mild to moderate disability, as indicated by the Roland-Morris. Significant associations were yielded between below knee pain with disability and QoL (SF-12 physical subscale only), indicating more severe disability deficits with radiating pain. However, their ‘worst’ pain intensity was high and 61% reported that their LBP was limiting their activities and function. This moderate intensity-low disability amongst the LBP sample is quite common in several studies [2,11,41,43]. Furthermore, disability has yielded moderate to strong associations with pain intensity and age (the older the people the higher the reported disability). Such associations are also familiar in other studies [57]. Disability was also found on the regression model to be suggestive of age (from the sociodemographic factors), bed rest, pain intensity, sciatica limited activity, pain status and frequency (from the other physical factors) and physical health (on SF-12 physical subscale) from the lifestyle factors.

More severe functional limitations with sciatica and more extensive pain were noted amongst women, especially for those with reported sciatica and its functionality. Amongst other physical factors, women reported higher pain frequency & intensity, more visits to specialists and other musculoskeletal problems (i.e. neck pain). Women also reported higher ratings on lifestyle factors, more anxiety and depression and poorer self-reported mental wellness (than men). Such findings are in line with previous research indicating a more ‘severe’ physical and lifestyle impact of LBP amongst women, for which causal relationship is unclear [3,4,27,35]. However, in view of the differences in methodologies across studies, conclusions or generalisations cannot be made. Interestingly, a number of factors, LBP recurrence, self-reported disability, bed rest, treatment, and self-reported physical health did not reveal statistically significant gender differences.

#### 4.3. Sociodemographic factors

As regards to the sociodemographic factors, the regression analysis model did not reveal any associations of inhabitancy area, marital status, education, income or smoking history with either disability or pain intensity. Sex has been associated with physical disability and age has been the only factor associated

with both, pain intensity and disability on the linear regression models. Age was also correlated with self-reported disability (as a physical factor) and QoL (as a lifestyle factor), which has been found to be the case in most LBP epidemiological studies [4]. Correlations of the remaining sociodemographic factors with other physical (disability, physical limitations, pain location) and lifestyle factors (mental wellness, anxiety, depression) were also weak. Interestingly, this contrasts previous research findings, which support stronger associations with similar sociodemographic parameters [3,20,58,59]. Further research on a more extensive list of sociodemographic features would be of interest to explore.

#### 4.4. Lifestyle factors

Anxiety and depression were low to moderate, with a statistical significance difference amongst men and women (women scoring higher in both scales). Weak associations were yielded for both, anxiety and depression with sociodemographic and physical parameters. Anxiety was found predictive of pain intensity on the regression model. Although anxiety and depression have been suggested as risk factors for LBP in several studies [64–67], strong associations were not found in this study. It could be argued that the low disability-low severity profile of the sample could explain such findings.

QoL as measured by the SF-12 Health Survey also demonstrated a mildly affected profile with a more significant overlay amongst women in self-reported mental wellness. Stronger associations were yielded between SF-12 physical subscale with one sociodemographic and one physical factor; age and pain intensity, respectively. Physical and mental wellness were predictive of disability and pain intensity, respectively. This relatively good QoL picture of the sample has also been reported amongst musculoskeletal conditions (including LBP) [26,38,68] and across general population samples [69]. This could partly be explained by our low severity sample profile. It could also partly be the result of a culturally-driven issue as indicated in Antonopoulou et al.'s study [26]; they believe that, LBP is perceived as a low severity symptom (especially amongst rural samples), and thus do not feel that lifestyle is strongly affected by it.

It appears that *pain intensity* was one of the factors which, in the present study was found to be associated with gender, age, bed rest, activity limitation due to LBP, specialist visit, anxiety and self-reported men-

tal wellness. Significant correlations were also yielded between pain intensity with disability and QoL, indicating strong associations between them. In this study and, as opposed to previous studies, three levels of pain intensity were measured; average pain, pain at its worst and pain at its best. This three-level pain measure was chosen in order to better 'capture' the impact of pain in demographic, physical and lifestyle factors. Indeed, it was noted that pain at its worst and to a lesser extent average pain intensity was the most indicative pain factor. Pain intensity is probably one of the most useful and commonly utilised LBP outcome measures [60–62] without always consistent findings [63]. Perhaps distinction and utilisation of a multi-level pain intensity measure (as ours) could lead to more accurate and consistent predictive findings. It is therefore, suggested that future studies should encompass, along with current pain, worst pain intensity as an independent self-reported measure.

One of the major strengths of the current study is the sampling method; which was of a random nature, addressing a general population sample with both urban and rural representation in the Greek mainland, thus enhancing the study's external validity. We also tried to report a variety of sociodemographic, physical and lifestyle factors, which in previous LBP literature were deemed important. Unfortunately, the cross-sectional nature of the study limited further exploration of causal relationships between the factors investigated. This must be implemented in future studies as there is a scarcity of longitudinal ones within Greece. Also, the lack of exploring similar factors (sociodemographic, physical and lifestyle) in the asymptomatic population approached for recruitment, could have precluded further interpretation of the study's findings.

## 5. Conclusion

LBP point prevalence was found 15% in a general population sample across western and central Greece. Functional limitations, moderately high intensity pain, associated leg pain and recurrence were amongst the highly prevalent physical symptoms in the sample. Despite the sample's mild disability level, perceived physical disability and quality of life were correlated with age (as a sociodemographic factor) and two physical factors, pain intensity and below knee pain (sciatica). Especially the three-level pain intensity (average, 'best' and 'worst' pain intensity) utilised in the study appeared to be one of the most predictive and

associative factors for age, as well as several physical and lifestyle parameters. Thus, LBP management and clinical research could benefit from the utilisation of a multi-level pain intensity measure. Unlike previous literature, most sociodemographic characteristics (annual income, education, smoking, marital status etc.) were not correlated with any LBP physical or lifestyle factors, thus possibly indicating a different socioeconomic background and aetiology domain to that of the usual non-specific LBP spectrum. Further investigation into this is required. In line with previous reports, significant gender differences were reported across the sample amongst several sociodemographic (education, marital status, smoking, annual income), physical (sciatica and its functionality, pain frequency & intensity, specialist visit, other musculoskeletal problems) and lifestyle factors (anxiety, depression and mental wellness). Finally, the fact that physical parameters were amongst the most prevalent characteristics of the Greek sample could provide recommendations on what the 'rehabilitation focus' should entail (i.e. biomedically-functionally orientated rehabilitation rather than psychosocially managed).

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### Conflict of interest

The authors report no declarations of interest.

### References

- [1] Andersson GB. Epidemiology of low back pain. *Acta Orthop Scand Suppl.* 1998; 281: 28-31.
- [2] Walker BF, Muller R, Grant WD. Low back pain in Australian adults: Prevalence and associated disability. *J. Manipulative Physiol Ther.* 2004; 27: 238-244.
- [3] McBeth J, Jones K. Epidemiology of chronic musculoskeletal pain. *Best Pract Res Clin Rheumatol.* 2007; 21: 403-425.
- [4] Manchikanti L, Singh V, Flaco FJE, Benyamin RM, Hirsch JA. Epidemiology of low back pain in adults. *Neuromodulation.* 2014; 17: 3-10.
- [5] Loney PL, Stratford PW. The prevalence of low back pain in adults: A methodological review of the literature. *Phys. Ther.* 1999; 79: 384-396.
- [6] Walker BF. The prevalence of low back pain: A systematic review of the literature from 1966 to 1998. *J. Spinal Disord.* 2000; 13: 205-217.
- [7] Hoy D, Williams G, March L, Brooks P, Blyth F, Woolf A, Vos T, Buchbinder R. A systematic review of the global prevalence of low back pain. *Arthritis Rheum.* 2012; 64(6): 2028-2037.
- [8] Deyo RA, Tsui-Wu Y. Descriptive epidemiology of low-back pain and its related medical care in the United States. *Spine.* 1987; 12: 264-268.
- [9] Lawrence RC, Felson DT, Helmick CG, Arnold LM, Choi H, Deyo RA, Gabriel S, Hirsch R, Hochberg MC, Hunder GG, Jordan JM, Katz JN, Kremers HM, Wolfe F. National Arthritis Data Workgroup. Estimates of the prevalence of arthritis and other rheumatic conditions in the United States. Part II. *Arthritis Rheum.* 2008; 58(1): 26-35.
- [10] Palmer KT, Walsh K, Bendall H, Cooper C, Coggon D. Back pain in Britain: comparison of two prevalence surveys at an interval of 10 years. *BMJ.* 2000; 320: 1577-1578.
- [11] Raspe H, Matthis C, Croft P, O'Neill T. Variation in back pain between countries: the example of Britain and Germany. *Spine.* 2004; 29: 1017-1021.
- [12] Walsh K, Cruddas M, Coggon D. Low back pain in eight areas of Britain. *J. Epidemiol. Community Health.* 1992; 46: 227-230.
- [13] Skovron ML, Szpalski M, Nordin M, Melot C, Cukier D. Sociocultural factors and back pain. A population-based study in Belgian adults. *Spine.* 1994; 19: 129-137.
- [14] Picavet HS, Schouten JS. Musculoskeletal pain in the Netherlands: prevalences, consequences and risk groups, the DMC(3)-study. *Pain.* 2003; 102: 167-178.
- [15] Stranjalis G, Tsamandouraki K, Sakas DE, Alamanos Y. Low back pain in a representative sample of Greek population: analysis according to personal and socioeconomic characteristics. *Spine.* 2004; 29: 1355-1360.
- [16] Palacios-Ceña D, Alonso-Blanco C, Hernández-Barrera V, Carrasco-Garrido P, Jiménez-García R, Fernández-de-las-Peñas C. Prevalence of neck and low back pain in community-dwelling adults in Spain: an updated population-based national study (2009/10-2011/12). *Eur Spine J.* 2015; 24(3): 482-92.
- [17] Volinn E. The epidemiology of low back pain in the rest of the world. A review of surveys in low- and middle-income countries. *Spine.* 1997; 22: 1747-1754.
- [18] Louw QA, Morris LD, Grimmer-Somers K. The prevalence of low back pain in Africa: A systematic review. *BMC.Musculoskelet. Disord.* 2007; 8: 105.
- [19] Farooqi A, Gibson T. Prevalence of the major rheumatic disorders in the adult population of north Pakistan. *Br. J. Rheumatol.* 1998; 37: 491-495.
- [20] Gilgil E, Kacar C, Butun B, Tuncer T, Urhan S, Yildirim C, Sunbuloglu G, Arikan V, Tekeoglu I, Oksuz MC, Dundar U. Prevalence of low back pain in a developing urban setting. *Spine.* 2005; 30: 1093-1098.
- [21] Adedoyin RA, Idowu BO, Adagunodo RE, Owoyomi AA, Idowu PA. Musculoskeletal pain associated with the use of computer systems in Nigeria. *Technol Health Care.* 2005; 13(2): 125-30.
- [22] Fabunmi AA, Aba SO, Odunaiya NA. Prevalence of low back pain among peasant farmers in a rural community in South West Nigeria. *Afr J Med Med Sci.* 2005; 34(3): 259-62.

- 622 [23] Polyzos NM. Striving towards efficiency in the Greek hos- 685  
 623 pitals by reviewing case mix classifications. *Health Policy.* 686  
 624 2002; 61: 305-328.
- 625 [24] Marinos G, Giannopoulos A, Vlasis K, Michail O, Katsar- 687  
 626 gyris A, Gerasimos S, Elias G, Klonaris C, Griniatsos J, Ste- 688  
 627 fanos P, Vasileiou I. Primary care in the management of com- 689  
 628 mon orthopaedic problems. *Qual. Prim. Care.* 2008; 16: 345- 690  
 629 349.
- 630 [25] Andrianakos A, Trontzas P, Christoyannis F, Dantis P, 691  
 631 Voudouris C, Georgountzos A, Kaziolas G, Vafiadou E, Pan- 692  
 632 telidou K, Karamitsos D, Kontelis L, Krachtis P, Nikolia Z, 693  
 633 Kaskani E, Tavaniotou E, Antoniadis C, Karanikolas G, Kon- 694  
 634 toyanni A. Prevalence of rheumatic diseases in Greece: A 695  
 635 cross-sectional population based epidemiological study. The 696  
 636 ESORDIG Study. *J. Rheumatol.* 2003; 30: 1589-1601.
- 637 [26] Antonopoulou MD, Alegakis AK, Hadjipavlou AG, Lionis 700  
 638 CD. Studying the association between musculoskeletal disor- 701  
 639 ders, quality of life and mental health. A primary care pil- 702  
 640 ot study in rural Crete, Greece. *BMC Musculoskelet Disord.* 703  
 641 2009; 10: 143.
- 642 [27] Korovessis P, Repantis T, Zacharatos S, Baikousis A. Low 704  
 643 back pain and sciatica prevalence and intensity reported in 705  
 644 a Mediterranean country: ordinal logistic regression analysis. 706  
 645 *Orthopedics.* 2012; 35(12): e1775-84.
- 646 [28] Alexopoulos EC, Burdorf A, Kalokerinou A. A compara- 707  
 647 tive analysis on musculoskeletal disorders between Greek and 708  
 648 Dutch nursing personnel. *Int Arch Occup Environ Health.* 709  
 649 2006; 79: 82-88.
- 650 [29] Alexopoulos EC, Tanagra D, Konstantinou E, Burdorf A. 710  
 651 Musculoskeletal disorders in shipyard industry: prevalence, 711  
 652 health care use, and absenteeism. *BMC Musculoskelet Dis- 712  
 653 ord.* 2006; 7: 88.
- 654 [30] Alexopoulos EC, Stathi IC, Charizani F. Prevalence of muscu- 713  
 655 loskeletal disorders in dentists. *BMC Musculoskelet Disord.* 714  
 656 2004; 5: 16.
- 657 [31] Spyropoulos P, Papanthasiou G, Georgoudis G, Chronopou- 715  
 658 los E, Koutis H, Koumoutsou F. Prevalence of low back pain 716  
 659 in greek public office workers. *Pain Physician.* 2007; 10: 651- 717  
 660 659.
- 661 [32] Henn L, Schier K, Brian T, Hardt J. Back pain in Poland and 718  
 662 Germany: A survey of prevalence and association with demo- 719  
 663 graphic characters. *Biomed Res Int.* 2014; 2014: 901341.
- 664 [33] Billis E, McCarthy CJ, Gliatis J, Gittins M, Papatrou M, 720  
 665 Oldham JA. Inter-tester reliability of discriminatory examina- 721  
 666 tion items for sub-classifying non-specific low back pain. *J 722  
 667 Rehabil Med.* 2012; 44(10): 851-7.
- 668 [34] Billis E, McCarthy CJ, Roberts C, Gliatis J, Papatrou M, 723  
 669 Gioftsos G, Oldham JA. Sub-grouping patients with non- 724  
 670 specific low back pain based on cluster analysis of discrimi- 725  
 671 natory clinical items. *J Rehabil Med.* 2013; 45(2): 177-85.
- 672 [35] Schneider S, Randoll D, Buchner M. Why do women have 726  
 673 back pain more than men? A representative prevalence study 727  
 674 in the federal republic of Germany. *Clin. J. Pain.* 2006; 22: 728  
 675 738-747.
- 676 [36] Georgoudis G, Oldham JA. Anxiety and depression as con- 729  
 677 founding factors in cross-cultural pain research studies: Valid- 730  
 678 ity and reliability of a Greek version of the Hospital Anxiety 731  
 679 and Depression Scale. *Physiotherapy.* 2001; 87: 92-93.
- 680 [37] Boscaiinos PJ, Sapakas G, Stilianessi E, Prouskas K, Papadakis 732  
 681 SA. Greek versions of the Oswestry and Roland-Morris Dis- 733  
 682 ability Questionnaires. *Clin Orthop Relat Res.* 2003; 40-53.
- 683 [38] Kontodimopoulos N, Moschovakis G, Aletras VH, Niakas D. 734  
 684 The effect of environmental factors on technical and scale ef- 735  
 685 ficiency of primary health care providers in Greece. *Cost Eff 736  
 686 Resour Alloc.* 2007; 5: 14.
- 687 [39] Bener A, Dafeeah EE, Alnaqbi K. Prevalence and correlates 737  
 688 of low back pain in primary care: What are the contributing 738  
 689 factors in a rapidly developing country. *Asian Spine J.* 2014; 739  
 690 8(3): 227-36.
- 691 [40] Hoy D, Toole MJ, Morgan D, Morgan C. Low back pain in ru- 740  
 692 ral Tibet. Functioning and disability in persons with low back 741  
 693 pain. *Lancet.* 2003; 361(9353): 225-6.
- 694 [41] Hillman M, Wright A, Rajaratnam G, Tennant A, Chamber- 742  
 695 lain MA. Prevalence of low back pain in the community: im- 743  
 696 plications for service provision in Bradford, UK. *J Epidemiol 744  
 697 Community Health.* 1996; 50: 347-352.
- 698 [42] Harkness EF, Macfarlane GJ, Silman AJ, McBeth J. Is mus- 745  
 699 culoskeletal pain more common now than 40 years ago? Two 746  
 700 population-based cross-sectional studies. *Rheumatology (Ox- 747  
 701 ford).* 2005; 44(7): 890-5.
- 702 [43] Cassidy JD, Carroll LJ, Cote P. The Saskatchewan health 748  
 703 and back pain survey. The prevalence of low back pain and 749  
 704 related disability in Saskatchewan adults. *Spine.* 1998; 23: 750  
 705 1860-1866.
- 706 [44] Garcia JB, Hernandez-Castro JJ, Nunez RG, Pazos MA, 751  
 707 Aguirre JO, Jreige A, Delgado W, Serpentegui M, Berenguel 752  
 708 M, Cantemir C. Prevalence of low back pain in Latin Amer- 753  
 709 ica: A systematic literature review. *Pain Physician.* 2014; 754  
 710 17(5): 379-91.
- 711 [45] Dionne CE, Dunn KM, Croft PR, Nachemson AL, Buch- 755  
 712 binder R, Walker BF, Wyatt M, Cassidy JD, Rossignol M, 756  
 713 Leboeuf-Yde C, Hartvigsen J, Leino-Arjas P, Latza U, Reis S, 757  
 714 Gil Del Real MT, Kovacs FM, Oberg B, Cedraschi C, Bouter 758  
 715 LM, Koes BW, Picavet HS, van Tulder MW, Burton K, Fos- 759  
 716 ter NE, Macfarlane GJ, Thomas E, Underwood M, Waddell 760  
 717 G, Shekelle P, Volinn E, Von KM. A consensus approach to- 761  
 718 ward the standardization of back pain definitions for use in 762  
 719 prevalence studies. *Spine.* 2008; 33: 95-103.
- 720 [46] Hestbaek L, Leboeuf-Yde C, Engberg M, Lauritzen T, Bruun 763  
 721 NH, Manniche C. The course of low back pain in a general 764  
 722 population. Results from a 5-year prospective study. *J. Ma- 765  
 723 nipulative Physiol Ther.* 2003; 26: 213-219.
- 724 [47] Cherkin DC. Primary care research on low back pain. The 766  
 725 state of the science. *Spine.* 1998; 23(18): 1997-2002.
- 726 [48] Hider SL, Whitehurst DG, Thomas E, Foster NE. Pain loca- 767  
 727 tion matters: The impact of leg pain on health care use, work 768  
 728 disability and quality of life in patients with low back pain. 769  
 729 *Eur Spine J.* 2015; 24(3): 444-51.
- 730 [49] Konstantinou K, Dunn KM. Sciatica: Review of epidemio- 770  
 731 logical studies and prevalence estimates. *Spine.* 2008; 33(22): 771  
 732 2464-72.
- 733 [50] Konstantinou K, Lewis M, Dunn KM. Agreement of self- 772  
 734 reported items and clinically assessed nerve root involvement 773  
 735 (or sciatica) in a primary care setting. *Eur Spine J.* 2012; 774  
 736 21(11): 2306-15.
- 737 [51] Enthoven P, Skargren E, Carstensen J, Oberg B. Predictive 775  
 738 factors for 1-year and 5-year outcome for disability in a work- 776  
 739 ing population of patients with low back pain treated in pri- 777  
 740 mary care. *Pain.* 2006; 122: 137-144.
- 741 [52] Kent PM, Keating JL. The epidemiology of low back pain in 778  
 742 primary care. *Chiropr. Osteopat.* 2005; 13: 13.
- 743 [53] Leboeuf-Yde C, Fejer R, Nielsen J, Kyvik KO, Hartvigsen J. 779  
 744 Consequences of spinal pain: do age and gender matter? A 780  
 745 Danish cross-sectional population-based study of 34,902 in- 781  
 746 dividuals 20–71 years of age. *BMC Musculoskelet Disord.* 782  
 747 2011; 12: 39.

- 748 [54] Athanassopoulos AC, Gounaris C, Sissouras A. A descrip- 783  
 749 tive assessment of the production and cost efficiency of gen- 784  
 750 eral hospitals in Greece. *Health Care Management Science*. 785  
 751 1999; 2: 97-106. 786
- 752 [55] Exadaktylos NM. Organisation and financing of the health 787  
 753 care systems of Bulgaria and Greece – what are the parallels? 788  
 754 *BMC Health Serv Res*. 2005; 5: 41. 789
- 755 [56] Billis EV, McCarthy CJ, Stathopoulos I, Kapreli E, Pantzou P, 790  
 756 Oldham JA. The clinical and cultural factors in classifying low 791  
 757 back pain patients within Greece: A qualitative exploration of 792  
 758 Greek health professionals. *J Eval Clin Pract*. 2007; 13: 337- 793  
 759 345. 794
- 760 [57] Kovacs FM, Abaira V, Zamora J, Teresa Gil del Real M, 795  
 761 Llobera J, Fernández C, Bauza JR, Bauza K, Coll J, Cuadri 796  
 762 M, Duro E, Gili J, Gestoso M, Gómez M, González J, Ibañez 797  
 763 P, Jover A, Lázaro P, Llinás M, Mateu C, Mufraggi N, Muriel 798  
 764 A, Nicolau C, Olivera MA, Pascual P, Perelló L, Pozo F, Re- 799  
 765 vuelta T, Reyes V, Ribot S, Ripoll J, Ripoll J, Rodríguez E. 800  
 766 Kovacs-Atención Primaria Group. Correlation between pain, 801  
 767 disability, and quality of life in patients with common low 802  
 768 back pain. *Spine*. 2004; 29(2): 206-210. 803
- 769 [58] Leboeuf-Yde C, Kyvik KO, Bruun NH. Low back pain and 804  
 770 lifestyle. Part I: Smoking. Information from a population- 805  
 771 based sample of 29,424 twins. *Spine (Phila Pa 1976)*. 1998; 806  
 772 23(20): 2207-13. 807
- 773 [59] Fujii T, Matsudaira K. Prevalence of low back pain and fac- 808  
 774 tors associated with chronic disabling back pain in Japan. *Eur 809  
 775 Spine J*. 2013; 22(2): 432-8. 810
- 776 [60] Gurcay E, Bal A, Eksioğlu E, Hasturk AE, Gurcay AG, Cakci 811  
 777 A. Acute low back pain: clinical course and prognostic fac- 812  
 778 tors. *Disabil Rehabil*. 2009; 31(10): 840-5. 813
- 779 [61] Williams CM, Hancock MJ, Maher CG, McAuley JH, Lin 814  
 780 CW, Latimer J. Predicting rapid recovery from acute low back 815  
 781 pain based on the intensity, duration and history of pain: A 816  
 782 validation study. *Eur J Pain*. 2014; 18(8): 1182-9. 817
- [62] Kim HJ, Park JH, Kim JW, Kang KT, Chang BS, Lee CK, 818  
 Yeom JS. Prediction of postoperative pain intensity after lum- 819  
 bar spinal surgery using pain sensitivity and preoperative back 820  
 pain severity. *Pain Med*. 2014; 15(12): 2037-45. 821
- [63] Axén I, Bergström G, Bodin L. Using few and scattered time 822  
 points for analysis of a variable course of pain can be mis- 823  
 leading: An example using weekly text message data. *Spine 824  
 J*. 2014; 14(8): 1454-9. 825
- [64] Croft PR, Rigby AS. Socioeconomic influences on back prob- 826  
 lems in the community in Britain. *J. Epidemiol. Community 827  
 Health*. 1994; 48: 166-170. 828
- [65] Linton SJ. A review of psychological risk factors in back and 829  
 neck pain. *Spine*. 200; 25: 1148-1156. 830
- [66] Truchon M, Côté D, Fillion L, Arsenault B, Dionne C. Low- 831  
 back-pain related disability: an integration of psychological 832  
 risk factors into the stress process model. *Pain*. 2008; 137(3): 833  
 564-73. 834
- [67] Falavigna A, de Braga GL, Monteiro GM, Marcon G, de 835  
 Castilhos I, Bossardi JB, Conzatti LP. The epidemiological 836  
 profile of a middle-aged population with low back pain in 837  
 southern Brazil. *Spine*. 2015; 40(6): E359-65. 838
- [68] Luo X, George ML, Kakouras I, Edwards CL, Pietrobon R, 839  
 Richardson W, Hey L. Reliability, validity, and responsive- 840  
 ness of the short form 12-item survey (SF-12) in patients with 841  
 back pain. *Spine*. 2003; 28(15): 1739-45. 842
- [69] Gandek B, Ware JE, Aaronson NK, Apolone G, Bjorner JB, 843  
 Brazier JE, Bullinger M, Kaasa S, Leplege A, Prieto L, Sul- 844  
 livan M. Cross-validation of item selection and scoring for 845  
 the SF-12 Health Survey in nine countries: results from the 846  
 IQOLA Project. *International Quality of Life Assessment. J 847  
 Clin Epidemiol*. 1998; 51(11): 1171-8. 848