ORIGINAL ARTICLE

Effect of General Health Status on Chronicity of Low Back Pain in Industrial Workers

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Abstract- Recognizing patients at a higher risk of developing chronic low back pain (LBP) is important in industrial medicine. This study aimed to assess the power and quality of General Health Questionnaire (GHQ) for prediction of the odds of chronicity of acute LBP. This study was conducted on industrial workers. All subjects with acute LBP who met the inclusion criteria were enrolled. Demographic characteristics, occupational, physical, and mental parameters and the general health status of subjects were evaluated; they were followed up for developing chronic LBP for one year. Cigarette smoking, high body mass index, job stress, physical load and high GHQ scores were found to be the risk factors for the progression of acute LBP to chronic LBP ($P<0.05$). Standing position while working, age, work experience, exercise, level of education, weekly work hours and shift work were not the risk factors for chronic LBP ($P>0.05$).

High GHQ score can be a risk factor for progression of acute LBP to chronic LBP. The GHQ in combination with the Job Content Questionnaire can be used as a quick and simple screening tool for detection of subjects at high risk of chronic LBP when evaluating acute LBP in an occupational setting.

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Keywords: General health questionnaire; Job content questionnaire; Low back pain

Introduction

Low back pain has a high risk of chronicity. Its cumulative incidence can reach up to 70% (1). It is the main cause of limited activity and absence from work in most parts of the world (2) and imposes a significant high economic burden on patients, families, communities, industries, and governments (3,4). Time of assessment and treatment of LBP is extremely important because it has been demonstrated that 70-90% of the cases of acute LBP recover and its management is relatively easy. However, treatment of chronic LBP is very difficult, and it is a major cause of disability imposing high costs (1). In fact, the prognosis of LBP is not as good as it was previously assumed due to its high rate of recurrence and risk of chronicity (5). According to most researchers, chronic LBP is an LBP lasting for more than three months (1,6). The prevalence of chronic LBP is 10-13% among the general population (7).

It has been demonstrated that psychosocial factors play a pivotal role in the progression of one or several consecutive episodes of acute LBP to chronic LBP (8). The new LBP guidelines recommend early detection of psychological factors that may interfere with the

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recovery (9,10).

A review study indicated that psychosocial variables influenced the development of disability due to LBP more than biomechanical factors and were significantly related to the progression of acute to chronic LBP (1).

In an occupational setting, particularly for jobs associated with high prevalence of LBP, the major problem is to detect workers who are at higher risk of developing chronic LBP. Occupational interventions such as personnel transition from a high-stress job (mentally or physically) to a low-stress position have some limitations in work environments and are done based on priority. Thus, it is important to detect workers who are at higher risk of developing chronic LBP in industrial medicine. On the other hand, our experience indicates that due to the limited time for examination of workers in an occupational setting, in many cases the psychological risk factors especially the psychological non-occupational risk factors responsible for the progression of acute to chronic LBP are easily missed in workers. In this study, we evaluated whether the GHQ as a simple screening tool can help us detect subjects at higher risk of chronic LBP requiring more serious occupational interventions.

Materials and Methods

This study was conducted in a large rubber factory in 2011-2013 in the city of Yazd, Iran. All workers complaining of a new LBP in the past two weeks were primarily entered into the study. Of a total of 542 primary participants, 511 who completed the follow-up course were enrolled (dropout rate: less than 6%). The inclusion criteria were signing the consent form, a minimum of one year of work experience in the production unit of the factory and suffering from non-specific acute LBP without radiation to the legs (8). Diagnosis of non-specific acute LBP was made by two occupational medicine specialists with experience in this area. The exclusion criteria were a history of any disease that would change the course of LBP or affect general health such as the history of cancer, chronic rheumatologic disease, history of low back trauma or surgery, substance abuse, addiction to analgesics/narcotics due to medical reasons and history of psychological disorders.

A written informed consent was obtained from all participants, and they were briefed about the study. The subjects were reassured that their responses to the questions of the GHQ would have no impact on their treatment process or occupational status.

To assess patient characteristics, a questionnaire with three sections was used: demographic and occupational information, GHQ with 28 questions and Job Content Questionnaire (JCQ). History of the previous LBP was assessed by asking the following questions: “Have you experienced any LBP episode in the past? If the answer was “Yes” its frequency was asked and that if it was in the current year or before that. De Vet *et al*., defined an episode of LBP as a period of pain in the low back lasting for more than 24 hours followed by at least one month of no LBP (11). For a selection of subjects with acute LBP, we also used the definition of “a period of LBP lasting for more than 24 hours”.

The physical work status of participants was assessed by two questions: 1. What is your working posture most of the time? Three answer choices were provided for this question: always standing, sometimes seated sometimes standing and always seated. For final data analysis, participants were divided into two groups of with and without time for sitting during their shift work. 2. Do you frequently carry heavy stuff? That could be replied with “Yes” or “No.” If the answer was “Yes”, two more questions were asked: “How much is the weight of the load you usually carry?” and “How many times, in an eight-hour shift, do you carry such heavy loads?

Designing different parts of the questionnaire for data collection was carried out by two experienced occupational medicine specialists expert in the field of musculoskeletal disorders in work environments. Considering the presence of these two specialists in the factory and their familiarity with the existing work positions, patient responses regarding the amount and process of carrying loads were re-evaluated by them.

The aspects of job stress were evaluated by the Farsi version of JCQ. The power of decision making, the psychological demands of the job, social support and occupational and physical needs were among the factors evaluated by the JCQ. The reliability and validity of the Farsi version of JCQ have been confirmed previously (12). The scoring of this questionnaire has been described in detail in our previous study (13). Based on the score gained from the questionnaire, participants were divided into two groups of high stress and low stress.

To assess the general health status of participants, GHQ with 28 questions was used. This questionnaire is used to generally evaluate mental health and assess some mental disorders; however, it is not used for diagnostic purposes (14). This questionnaire has several versions. The version with 28 questions has 4 sections

each with 7 questions and evaluates the physical health, anxiety and sleep disorders, social function disorder and depression (15). The reliability and validity of the Farsi version of this questionnaire have been previously confirmed (16). Questions are multiple-choice (never, occasionally, most of the time and always) and the scoring system is from 0 (never) to 3 (always) (16). In previous studies, the suitable cut-off point for this questionnaire was found to be 23 (14,17,18). Subjects acquiring a score of 23 or higher are suspected for general health disorders.

Exercising was assessed by asking one question: "Do you exercise?" The response choices included "Yes, regularly", "Yes, irregularly" and "No". Regular exercise was defined as exercising three times a week for a minimum of 30 minutes (each time) (19). For data analysis, the first two groups were considered as having exercise activity, and the third group was considered as having no exercise activity.

The status of LBP was assessed 3, 6, 9 month and one year later via face to face or phone call interview and by asking the question "Have you recovered from your LBP?" If the answer was "Yes", the next question was: "How long did it last?" Data collection has been done by two general practitioners and under observation of two mentioned occupational specialists. If a person had another diagnosis in this stage, he was excluded from the study, too. For data analysis, subjects were divided into two groups: group one whose LBP lasted for less than three months and group two whose LBP lasted for three months or longer.

All analyzes were performed using SPSS version 16. *Chi*-square test was used to assess the association between the chronicity of LBP and demographic, occupational and psychosocial variables of the study. Logistic regression analysis adjusted for the confounding factors was used to investigate the association of GHQ and JCQ scores with the probability of chronic LBP. Statistical significance was set at 0.05 (two-tailed) for all tests. The odds ratio (OR) was reported with 95% confidence interval (95% CI).

Results

The mean age of participants was 37.6 ± 5.8 years. Of participants, 500 were males. The mean body mass index (BMI), weekly work hours and work experience of participants were 25.2 ± 3.72 kg/m2, 47.7 ± 3.8 hours and 13.6 ± 4.85 years, respectively. Of the participants, 77 15.1% were smokers, and the mean rate of smoking was 7.35 ± 8.4 packs/year. Only 16 were single, and the remaining was married. In terms of the level of education, 427 (83.5%) had high school diploma or lower level of education. In terms of shift work, 402 (78.7%) had shifted work; out of which, 9 (1.8%) only had evening and night shifts and 393 (76.9%) had rotational shifts. Of participants, 295 (57.7%) reported regular exercising and 216 (42.3%) did not exercise at all.

In this study, 57.1% (292) of those with acute LBP reported that it lasted for more than 3 months; 407 (79%) replied "Yes" to the question "Do you carry heavy loads?" and only 104 (20.4%) answered "No" to this question. Of 407 workers who reported carrying heavy loads frequently, 78 (19.2%) reported carrying loads lighter than 10kg while 322 (79.1%) reported carrying loads heavier than 10kg. Seven subjects did not answer to this question. In terms of work posture, 261 (64.1%) reported standing, 138 sometimes seated and sometimes standing and only 6 (1.5%) reported a seated posture for most of the time.

The general health status was assessed by GHQ. The mean GHQ score gained by the participants was 20.94 ± 11.49. Assessing the correlation between the LBP and GHQ score with t-test revealed that in workers with LBP, the mean GHQ score was significantly higher than that in the group without LBP (mean GHQ score of 24.14 in the LBP and 16.73 in the no LBP group, $P<0.001$). As mentioned in the materials and methods section, workers were divided into two groups of <23 and ≥23 in terms of GHQ score. Accordingly, 432 (84.5%) workers had a score <23 and 79 (15.5%) had a score ≥23. The general health status of subjects based on the study variables is shown in (Table 1).

Table 1. GHQ score of the participants based on the study variables [N=511], 2011-2012

		GHQ score		*P*-value	OR	CI 95%
		<23 Number of participants (%)	**≥23 Number of participants (%)**			
Age (Year)	**<37**	163 (37.7)	20 (25.3)	0.041	1	--
	≥37	269 (62.3)	59 (74.7)		1.79	1.04-3.08
Sex	**Female**	9 (2.1)	2 (2.5)	0.682	1	--
	Male	422 (97.9)	77 (97.5)		0.82	0.17 -3.87

Continuance Table 1.

		GHQ score		*P*-value	OR	CI 95%
		<23 Number of participants (%)	≥23 Number of participants (%)			
Job experience (year)	**<14**	173 (40.0)	21 (26.6)	0.024	1	--
	≤14	259 (60.0)	58 (73.4)		1.84	1.08 – 3.15
Weekly work hours	**≤44**	92 (21.3)	23 (29.1)	0.143	1	--
	>44	340 (78.7)	56 (70.9)		0.66	0.38 – 1.13
Shift work	**No**	86 (20)	19 (24.1)	0.449	1	--
	Yes	345 (80)	60 (75.9)		0.79	0.45 – 1.39
Smoking	**No**	364 (84.3)	59 (74.7)	0.051	1	--
	Yes	68 (15.7)	20 (25.3)		1.81	1.03 – 3.21
Educational level	**> Diploma**	72 (16.7)	12 (15.2)	0.769	1	--
	≥Diploma	360 (83.3)	67 (84.8)		1.12	0.57 – 2.17
Body mass index	**<25**	207 (47.9)	32 (40.5)	0.270	1	--
	≥25	225 (52.1)	47 (59.5)		1.35	0.83 – 2.20
Exercise	**Yes**	250 (57.9)	45 (57.0)	0.902	1	--
	No	182 (42.1)	34 (43.0)		1.04	0.64 – 1.68
Job stress	**Low**	235 (54.4)	34 (43.0)	0.067	1	--
	High	197 (45.6)	45 (57.0)		1.58	0.97 – 2.56
Heavy physical load	**No**	92 (21.3)	12 (15.2)	0.287	1	--
	Yes	340 (78.1)	67 (84.8)		0.66	0.34 – 1.27
Standing position in Shift work	**Sometimes**	186 (43.4)	38 (48.1)	0.461	1	--
	Always	243 (56.6)	41 (51.9)		0.83	0.51 – 1.34

Abbreviations: OR, odds ratio; CI, confidence interval.

(Table 2) shows the correlation of LBP with the understudy variables using two-tailed analysis. The association of LBP with significant variables according to the two-tailed analysis using the logistic regression model is presented in Table 3. Work status is presented in Tables 1 and 2.

Table 2. Chronic low back pain status in the study participants based on study variables [N=511], 2011-2012.

		Chronic Low Back Pain				
		No (%)	(%) Yes	*P*-value	OR	CI 95%
Age (Year)	**<37**	94 (42.9)	89 (30.5)	0.004	1	--
	≥37	125 (57.1)	203 (69.5)		1.71	1.19 – 2.47
Sex	**Female**	5 (2.3)	6 (2.1)	0.86	1	--
	Male	214 (97.7)	285 (97.9)		1.11	0.33 – 3.68
Job experience (year)	**<14**	101 (46.1)	93 (31.8)	0.001	1	--
	≤14	118 (53.9)	199 (68.2)		1.83	1.27 – 2.63
Weekly work hours	**≤44**	41 (18.7)	74 (25.3)	0.087	1	--
	>44	178 (81.3)	218 (74.7)		0.68	0.44 – 1.04
Shift work	**No**	53 (24.2)	52 (17.9)	0.097	1	--
	Yes	166 (75.8)	239 (82.1)		1.47	0.95 – 2.26
Smoking	**No**	196 (89.5)	227 (77.7)	0.001	1	--
	Yes	23 (10.5)	65 (22.3)		2.44	1.46 – 4.07
Educational level	**> Diploma**	49 (22.4)	35 (12.0)	0.002	1	--
	≥Diploma	170 (77.6)	257 (88.0)		2.11	1.32 – 3.40
Body mass index	**<25**	123 (56.2)	116 (39.7)	0.000	1	--
	≥25	96 (43.8)	176 (60.3)		1.94	1.36 – 2.77
Exercise	**Yes**	132 (60.3)	163 (55.8)	0.321	1	--
	No	87 (39.7)	129 (44.2)		1.20	0.84 – 1.71

Continuance Table 2.

		Chronic Low Back Pain				
		No (%)	**(%) Yes**	***P*-value**	**OR**	**CI 95%**
Job stress	**Low**	133 (60.7)	136 (46.6)	0.002	1	--
	High	86 (39.3)	156 (53.4)		1.77	1.24 – 2.53
Heavy physical load	**No**	62 (28.3)	42 (14.4)	0.000	1	--
	Yes	157 (71.7)	250 (85.6)		2.35	1.51 – 3.64
GHQ score	**<23**	202 (92.2)	230 (78.8)	0.000	1	--
	≥23	17 (7.8)	62 (21.2)		3.20	1.81 – 5.66
Standing position in Shift work	**Sometimes**	103 (47.2)	121 (41.7)	0.241	1	--
	Always	115 (52.8)	169 (58.3)		1.25	0.88 – 1.78

Abbreviations: OR, odds ratio; CI, confidence interval.

Table 3. Association between chronic low back pain and study variables with logistic regression analysis [N=511], 2011-2012

		***P*-value**	**OR**	**CI 95%**
Age (Year)	**<37**	0.592	1	--
	≥37		1.15	0.69 – 1.92
Job experience (year)	**<14**	0.078	1	--
	≥14		1.57	0.95 – 2.60
Smoking	**No**	0.008	1	--
	Yes		2.08	1.21 – 3.59
Educational level	**< Diploma**	0.241	1	--
	≥Diploma		1.37	0.81 – 2.34
Body mass index	**<25**	0.001	1	--
	≥25		1.87	1.27 – 2.74
Job stress	**Low**	0.010	1	--
	High		1.67	1.13 – 2.46
Heavy physical load	**No**	0.001	1	--
	Yes		2.26	2.39 – 3.69
GHQ score	**<23**	0.002	1	--
	≥23		2.61	1.44 – 4.72

Abbreviations: OR, odds ratio; CI, confidence interval.

Discussion

In the occupational settings, especially for jobs associated with high prevalence of LBP, occupational interventions such as personnel transition from a high-stress job (mentally or physically) to a low-stress position have some limitations in work environments and are done based on priority. Thus, in industrial medicine, it is very important to detect workers at higher risk of developing chronic LBP. Recognizing factors that are responsible for the progression of acute LBP to a chronic state is pivotal for designing interventions and coping strategies. From a therapeutic point of view, treatment plans concentrated on physical therapy alone or in combination with psychological therapy such as cognitive-behavioral treatments alone will not be able to prevent the progression of acute LBP to a chronic state. Clearly, the vertebral column and the mind must be treated simultaneously (1).

In this study, 57.1% (292) of workers who had acute LBP at the onset of the study reported that their LBP lasted for more than 3 months at the one year follow-up. This rate was reported to be 33% at one year follow up by Koleck *et al*., (1). The higher rate of chronic LBP in the present study may be due to the fact that our patients were selected among workers of the production unit of a factory. Such work environment barely gives the workers a chance to recover and such high rate of chronicity following acute LBP seems logical considering the work setting. Another point must also be considered when interpreting such high rate. Recurrent pain and chronic LBP are often mistaken for one another. A review study

on 15 different prospective studies revealed that 73% of patients with acute LBP would have at least one episode of acute LBP in the upcoming year (20). Other studies with methodologies similar to ours have estimated the recurrence rate of an LBP episode to be 25% (21). The recurring nature and considerable clinical variations of the disease may complicate the judgment regarding the onset of pain (20).

In general, these results showed that cigarette smoking, high BMI, job stress, physical load and high GHQ score were the risk factors for progression of acute LBP to a chronic state. Old age, poor general health, increased psychological and psychosocial stress, poor communication with the coworkers, heavy physical load, worse baseline functional disability, sciatica, and compensation were responsible for worse prognosis of acute and subacute LBP in different studies (22). Ramond *et al.*, in their review study reported that among different social and socio-occupational factors, only the compensation issues were related to LBP outcome in some cases (5). Our previous study has shown that job characteristics and job satisfaction have a direct effect on return to work after low back disc herniation surgery (23).

Evidence shows that overweight and obesity increase the risk of LBP particularly the chronic type (7). Several factors have been suggested to be responsible for the higher susceptibility of obese subjects to LBP including greater pressure on intervertebral discs and aggravation of atherosclerosis and subsequently decreased blood supply to the intervertebral discs (7). On the other hand, some studies have shown that history of previous episodes of LBP and demographic factors (age, sex, cigarette smoking, weight, and level of education) do not affect the prognosis of a new LBP episode (24).

An LBP episode can be considered a stressful life event because it can lead to absence from work, indefinite diagnosis and problems with the manager, insurance, etc. (6). This stressful event can be superimposed on other stressful life events including marital problems, loss of job, etc. An LBP episode and the related events can initiate adaptive stress reactions at the biological and psychological levels (6).

Using a questionnaire for assessment of LBP has its own limitations such as difficult differentiation of mental and physical factors and the problems regarding the accurate interpretation of the questionnaire in different groups (8). On the other hand, the distinction of occupational and psychosocial factors is often not easy. For instance, job satisfaction depends on both the working environment and the individual's psychological state.

Previous studies have investigated different yellow flags including psychosocial factors, low socio-economic level, poor literacy, low job satisfaction, high occupational, physical load, poor general health status, cigarette smoking, and obesity; based on some of these factors, some tools have been developed for the assessment of the risk of chronic LBP (24). Vermont Disability Prediction Questionnaire (VDPQ), Acute Low Back Pain Screening Questionnaire (ALBPSQ) and some other questionnaires have been evaluated for this purpose each having strength and weakness points (24). When all the psychosocial factors are considered altogether for LBP prognosis, only a few factors remain significant. For example, depression, and catastrophizing fear avoidance beliefs are not significant (25).

This study showed that the JCQ and GHQ may be used as simple and relatively suitable tools for the assessment of general health status of individuals in terms of the odds of progression of acute LBP to a chronic state. Strengths and Weaknesses: The most important strengths of this study include accurate data collection, accurate follow up of patients and precise assessment of occupational factors. The low dropout rate is also a strength point of this study. Different studies have reported dropout rates of up to 20% to be acceptable (8). In this study, the researchers had easy access to the workers via the factory; thus, their follow-up was easy.

The most important weaknesses were not assessing all factors affecting the chronicity of LBP; which have been investigated in previous studies such as catastrophizing, fear-avoidance beliefs and patient expectations about recovery, compensation and disability issues and social and familial support. Since all understudy workers had one type of insurance, we could not assess different insurance policies. The authors believe that other factors related to social and familial support were indirectly covered by the GHQ. On the other hand, considering the understudy population being mostly males, assessment of gender differences was not feasible.

In this study, we tried to include all participants with acute LBP by precise follow-up of all personnel. However, there is a possibility that some workers with acute LBP have been missed. They might have recovered before going to the clinic or might have visited a physician outside the factory clinic.

In general, this study aimed to evaluate a simple and quick tool for general assessment of different risk factors in a patient with acute LBP. Comparison of this method with other tools can increase the accuracy of this method and is a good topic for further investigations.

This study showed that high GHQ score is a risk

factor for progression of acute LBP to a chronic state. This questionnaire in combination with the JCQ can be used as a simple and quick screening tool for detection of subjects at high risk of chronic LBP when assessing acute LBP. It appears that when encountering LBP in an occupational setting, a systematic approach (assessment of general health status and occupational, physical and mental loads) may be effective for selecting a suitable treatment plan and occupational intervention for workers suffering from LBP. Designing a simple scoring system can be of great help for general practitioners working in different industrial settings.

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