Joint Bone Spine 78 (2011) 619–624

Available online at ScienceDirect
www.sciencedirect.com

Elsevier Masson France
EM|consulte
www.em-consulte.com/en

Original article

On the quantitative relationships between individual/occupational risk factors and low back pain prevalence using nonparametric approaches

Fady Mendelek[a,*,b,c], Rania Bou Kheir[d,e], Isabelle Caby[f], André Thevenon[f,g], Patrick Pelayo[f]

[a] Sacré-Cœur Hospital, Physiotherapy Service, Brazilia road, P.O. Box 116, Baabda, Lebanon
[b] Saint-Joseph University, Faculty of Nursing Sciences, Damascus road, P.O. Box 11-5076, Beirut, Lebanon
[c] Research Center of the Lebanese Order of Physiotherapy, P.O. Box 90626, Beirut, Lebanon
[d] Lebanese University, P.O. Box 90-1065, Fanar, Lebanon
[e] Aarhus University, Blichers Allé 20, P.O. Box 50, 8830 Tjele, Denmark
[f] EA 4488, faculté des sciences du sport et de l'éducation physique, université Lille Nord de France, 59000 Lille, France
[g] Service de médicine physique et de réadaptation, CHRU de Lille, université Lille Nord de France, 59037 Lille cedex, France

ARTICLE INFO

Article history:
Accepted 26 January 2011
Available online 5 May 2011

Keywords:
Low back pain
Risk factors
Bivariate statistical correlations
Hospital environment
Predictive diagnosis

ABSTRACT

Objectives: To explore dual quantitative relationships between low back pain (LBP) prevalence and different individual and occupational risk factors, and detect the most important ones which can be used as weighted input data in LBP prediction diagnosis models, providing effective tools to help with the implementation of protection and prevention strategies among hospital staff.
Methods: Fourteen predictor individual risk factors (e.g., age, gender, body mass index BMI [kg/m^2], domestic activity, etc.) and 17 occupational risk factors (e.g., job status, standing hours/day, sufficient break time, job dissatisfaction, etc.) were collected using self-reported questionnaire among the staff of Sacré-Coeur hospital – Lebanon (used as a case study), and correlated with LBP prevalence using Kendall's tau-b bivariate nonparametric approaches.
Results: This study indicates that among the investigated occupational risk factors, job status, working hours/day, and standing hours/day are the most influencing on LBP prevalence (highly correlated with other factors at 1 and 5% confidence levels). It also shows that strong positive (between 0.25 and 0.65)/negative (from −0.38 to −0.26) statistical correlations to LBP prevalence exist between these risk occupational factors and working days/week, sitting hours/day, job stress, job dissatisfaction, children care, and car driving. The weekly hours of domestic activity, the staff height, and gender type have proven also to be the strongest individual factors in aggravating LBP disease. These individual factors are highly correlated at 1% significance level (ranging between 0.28 and 0.49 for positive correlations, and from −0.49 to −0.25 for negative ones) to children care, weight, extra professional activity, and use of handling techniques.
Conclusions: These obtained bivariate correlations can be used successfully by expert physicians in their decision making for LBP diagnosis.

1. Introduction

Common low back pain (LBP) is a very frequent affection. Approximately 80% of the general active population suffers from LBP at least temporarily [1,2]. LBP drags important socioprofessional consequences (e.g., sick leave, work station change, daily activities repercussion, early pension, etc.) and medical consumption (e.g., hospitalization, epidural infiltration, discal surgery, thermal care, physiotherapy, etc.). Common LBP is the first reason of affections limiting professional activities before 45 years and the third after respiratory and traumatic affections between 45 and 64 years [2,3]. The nature of the professional activity and especially the physical load is questioned during common LBP in about 75% of the cases [4]. Higher workers' compensation (WC) costs for companies [1] and lower quality of life [5] for individuals are a few of the reported outcomes from back injuries. Healthcare workers in particular have shown to experience higher rates of musculoskeletal symptoms (MSS) than those in construction, mining and manufacturing [6,7]. Among healthcare workers, evidence shows that nurses in particular are at risk for MSS [8–10]. Prior studies in nurses have primarily focused on determining the risk factors of MSS, but despite the findings in these studies, the risk factors of LBP and

* Corresponding author.
E-mail addresses: fadymendelek@hotmail.com (F. Mendelek), Rania.Boukheir@agrsci.dk (R.B. Kheir), I.Caby@waadoo.fr (I. Caby), athevenon@chru-lille.fr (A. Thevenon), patrick.pelayo@univ-lille2.fr (P. Pelayo).

1297-319X/$ – see front matter
doi:10.1016/j.jbspin.2011.01.014

their exact weight (relative importance expressed in %) are still not entirely clear among hospital staff [11–14]. LBP work relation is not always easy to establish because it is often difficult to separate the nonoccupational associated risk factors from the risk factors bound to work. Establishing statistical relationships between the present-LBP and the possible influencing personal/occupational risk factors is an important task in order to predict possible future LBP. A thorough understanding of the risk factors which influence LBP is in fact essential for finding increasingly efficient solutions.

Up to now, both univariate and multivariate statistical approaches have been used in many areas of the world to identify intrinsic relationships between the different LBP risk factors [15–23]. A commonly used technique was the multivariate correspondence analysis (MCA) which detects the percentages of the total inertias for the uncorrelated principal axes that are linear combinations of the LBP risk factors [15,16]. A major limitation of this analysis was the unique combination of axes together defining a unique condition for a particular LBP patient. Generalized linear models (e.g., linear regression, nonlinear and logistic regression, probabilistic regression, etc.) were also established in order to define LBP risk levels (low, moderate, high), using a combination between a dependent variable which is a binary (dummy) variable representing the presence or absence of LBP and the independent variables (risk factors) which can be the principal axes of the MCA [18–20]. An important problem with these models is that we cannot evaluate the contribution to the model of each risk factor. On the other hand, and depending on some approaches like the Bayesian methods [17], the identification and weight determination of the risk factors influencing the presence of given LBP levels remain highly subjective, referring to the expertise of different expert physicians, but their overall accuracy and reliability remain largely unevaluated. Artificial Neural Networks (ANNs) have also a number of drawbacks. They do not present an easily understandable model allowing researchers and decision-makers to get the full explanation of the underlying nature of the data being analyzed. They are also criticized for their inability to identify the relative importance of potential input variables [24]. To overcome all the mentioned problems, this study was carried out depending on nonparametric binary statistical approaches (kendall's tau-b coefficients) exploring dual relationships between risk factors according to their importance in causing LBP prevalence among hospital staff [more specifically the staff of Sacré-Cœur hospital – Lebanon (used as a case study)], as well as detecting the most influencing ones which can be used as weighted input data in LBP prediction models.

2. Methods

Classifying and finding relationships among a set of LBP risk factors in the investigated hospital was realized in several steps, combining data survey collection, and applying nonparametric bivariate procedures.

2.1. Collection of individual and occupational risk factors

Data were gathered by means of a questionnaire at the Sacré-Cœur hospital located in Baabda (Lebanon). The investigation took place on one period of 2 months (from March to April 2010). In this questionnaire, the dependent (response) variable is the LBP risk level. The matched LBP risk level is driven by several personal risk factors in addition to the occupational risk factors chosen according to previous studies [14,21,23,25–28]. Personal (i.e., individual) risk factors (Table 1) refer to aspects of lifestyle and include age, gender, weight (kg), height (cm), body mass index (BMI), marital status, type of sport activity (e.g., walking for exercise, bicycling, swimming, jogging, basketball, football, etc.), smoking, number of sports hours/week, existence of relatives suffering from LBP, wearing orthopedic insoles, weekly hours of domestic (e.g., cooking, washing dishes, cleaning, doing laundry, ironing, making beds, etc.) activities, weekly hours of children care, and LBP past medical intervention (Yes/No).

Table 1
The different individual risk factors likely to influence low back pain (LBP) and their corresponding classes.

Individual risk factors	Classes
Age	20–30 years □ 30–40 years □ 40–50 years□ > 50 years□
Gender	Male □ Female □
Weight	50–60 kg □ 60–70 kg □ 70–80 kg □ > 80 kg □
Height	150–160 cm □ 160–170 cm □ 170–180 cm □ > 180 cm □
Body mass index (BMI)	< 20 kg/m^2 □ 20–30 kg/m^2 □ > 30 cm kg/m^2 □
Marital status	Single □ Married □ Divorced □ Widow □
Type of sport activity	Walking □ Bicycling □ Swimming□ Jogging□ Basketball □ Football□ Others:. . .. .
Smoking	Yes □ No □
Number of sports hours/week	0 hours □ 1–3 hours □ 3–6 hours □ > 6 hours
Existence of relatives suffering from LBP	Yes □ No □
Wearing orthopedic insoles	Yes □ No □
Weekly hours of domestic activity	0 hours □ 1–3 hours □ 3–6 hours □ > 6 hours
Weekly hours of children care	0 hours □ 1–3 hours □ 3–6 hours □ > 6 hours
LBP past medical intervention	Yes □ No □

Regarding occupational risk factors (Table 2) associated to LBP among hospital staff, several questions were asked as related to sedentary occupations (car driving from home to work), job status (administrative staff, nurse managers, registered nurses, nursing

Table 2
The different occupational risk factors likely to influence low back pain (LBP) and their corresponding classes.

Occupational risk factors	Classes
Car driving from home to work	Yes □ No □
Job status	Administrative staff □ nurse managers□ registered nurses□ nursing assistants□ medical secretaries□ technicians□ physiotherapists□ kitchen/laundry staff□
Working days/week	< 3 days□ 3–5 days□ > 5 days□
Working hours/week	< 30 hours□ 30–40 hours□ > 40 hours□
Standing hours/day	< 4 hours□ 4–8 hours□ > 8 hours□
Sitting hours/day	< 4 hours□ 4–8 hours□ > 8 hours□
Existence of sufficient break time	Yes □ No □
Job dissatisfaction	Totally dissatisfied□ Moderate satisfaction□ Totally satisfied□
Work stress	Low stress□ Moderate stress □ High stress□
Fear of LBP causing future change of work	Yes □ No □
Assisting at educational sessions	Yes □ No □
Practicing prevention measures	Yes □ No □
Using handling techniques	Yes □ No □
Sitting on ergonomic chairs	Yes □ No □
Weekly hours for extra professional activity	0 hours □ 1–3 hours □ 3–6 hours □ > 6 hours
LBP cause	Accident at work□ Work excess□ Disease□ Others:.....
LBP duration	Intermittent□ Acute□ Subacute□ Chronic□