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Risk factors for chronic low back pain in adults. A case control study done in Sri Lanka

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Abstract

Introduction

Not many risk factor studies for low back pain have been done in Sri Lanka.

Objectives

To determine the association between low back pain and posture, exercise, family history, level of education, level of income, smoking, consumption of alcohol, body mass index (BMI) and consumption of animal proteins.

Methodology

A case control study was done at two main teaching hospitals in Colombo North region Sri Lanka. This study was done on adult subjects. A pretested structured interviewer administered questionnaire was used to collect data. Their weights and heights were also measured.

Results

The data were collected from 530 cases and 530 controls. Their age range was 18- 90 years. Mean age (SD) for cases was 49.4 (15) years. Mean age (SD) for controls was 47.1 (17) years. Females accounted for 67% of cases and 64% of controls.

Bad posture ($P < 0.001$), low level of physical exercise ($P < 0.001$), positive family history ($P < 0.001$), high level of income ($P < 0.001$), high BMI and low BMI ($P = 0.001$), low level of education ($P = 0.013$) and regular consumption of alcohol ($P = 0.039$) had a significant association with low back pain. Smoking and consumption of animal proteins did not have a significant association with low back pain.

Conclusion

Posture, exercise, family history, level of education, consumption of alcohol, level of income and BMI had a significant association with low back pain. Being overweight and underweight were both risk factors for low back pain.

Key words

Chronic Low Back Pain; Risk Factors; Bad Posture; Physical Exercise; Body Mass Index

Introduction

Low back pain is defined as a pain or discomfort located below the margin of the 12th rib and above the inferior gluteal fold, with or without leg pain [1]. It is estimated that, in all populations about 18% of the people will experience low back pain at any given moment [2]. The lifetime prevalence of low back pain in adults is between 65% and 80% [3]. In Australia low back pain is the second commonest symptom, after a cough, for a visit to an Australian general practitioner [4]. Back injury is the leading and most expensive cause of workers' compensation claims [5]. The low back pain that last for three months or more is known as chronic low back pain and it is the commonest cause of disability in individuals between the ages of 45 and 65 years [6]. In the majority of cases, the aetiology of back pain is unknown. Current research evidence has demonstrated that management outcomes of low back pain patients are not satisfactory [7]. This is supported by studies done by Strong ,et al. (2013) that state the current therapies used have failed to provide adequate relief to patients suffering from chronic low back pain [8]. Knowledge of underlying pathology and management outcomes has not improved very much over the years [9].

Studying about the risk factors for development of low back pain will help in reducing the occurrence of back pain and help to prevent acute back pain from progressing into chronic low back pain [10]. Many risk factor studies express different opinions with regard to risk factors for low back pain. Majority of risk factor studies mention the factors that are associated or not associated with low back pain but do not mention the possible reasons why these factors are associated or not associated with low back pain [10].

Being overweight has a significant association with the lumbar sacral radicular pain [11]. According to another study, an increase in Body Mass Index (BMI) does not have a significant association with the development of low back pain [12]. This finding is supported by another study done among Sri Lankan adult males that state the BMI does not have a significant association with low back pain [13].

Low back pain correlates with physical inactivity such as time spent on hours watching TV or video [14]. Sports activities such as swimming and soccer were associated with decreased prevalence of low back pain [14].

Intervertebral disc degeneration (IVD) and disc herniations are implicated as major causes of low back pain (LBP) and lumbo sacral radicular pains [15]. Recent research indicates that heredity may play a role in disc degeneration as well as herniation of intervertebral discs [16]. The rate of progression of disc degeneration might be controlled by genetic factors [17].

Spinal posture during activities of daily living is assessed in the management of low back pain. However, the link between spinal posture and low back pain (LBP) is not fully understood [18]. Strong associations were found between low back pains and flexed and rotated positions of the lumbar spine [19]. Compared to standing posture, sitting posture decreases lumbar lordosis and increases lower back muscle activity, disc pressure, and pressure on the ischium which is associated with the development of low back pain. A sitting device that reduces the lower back muscle activity is known to increase sitting comfort and reduce the risk of development of low back pain [20].

The individuals with a college degree or higher levels of education have a lower chance of experiencing low back pain than those with only a high school education or are college drop-outs [12].

Long history of smoking has a significant association with low back pain and lumbar sacral radicular pain [11]. However, according to some other studies, association between smoking and development of low back pain is not significant [12].

A person who consumes alcohol daily had a twice the chance of developing low back pain compared to a person who does not consume alcohol [13].

Not many risk factor studies for low back pain have been done in Sri Lanka and other South East Asian Countries. Therefore this study was carried out.

Objectives

To determine the association between low back pain and posture, physical exercise, family history, level of education, level of income, smoking, consumption of alcohol, body Mass index (BMI) and consumption of animal proteins.

Methodology

A case control study was done at the two main teaching hospitals (Teaching Hospital Ragama and the Rehabilitation Hospital Ragama) in the Colombo North region of Sri Lanka. This study was done on adult subjects from medical, surgical, and orthopedic wards and clinics of these two hospitals. The subjects who had a continuous low back pain for more than three months duration and those who were aged 18 years and above were selected as cases. Patients who had back pain due to causes such as spinal tumours, infections and due to a direct blow to the spine were excluded.

People who did not suffer from low back pain at the time of questioning or a past history of chronic low back pain but who had visited the hospital to obtain treatment for other conditions other than back pain were included as controls. Acutely ill cases and controls were not selected for the study. The cases and controls were frequency matched for age and sex. Ethical approval to conduct the study was obtained from the Ethics Committee of the Faculty of Medicine, University of Kelaniya, Sri Lanka.

A pretested structured interviewer administered questionnaire was used for collecting the information. The final questionnaire was prepared after two pretests. This questionnaire included questions relating to personal data, character of pain, and details of risk factors. Thirty seven subjects were interviewed twice to assess the repeatability of information obtained during the interview. A weighing scale and a metal tape measure were used to measure the weights and heights of people. The accuracy of the weighing scale was regularly checked with standard weights.

Activities such as walking, running and swimming were considered under the category of physical exercise. This variable was graded into three groups according to the duration of the continuous activity per day and frequency per week. Level of exercise was graded as grade 3 or regular (frequency of at least 3 days per week for a minimum period of 30 minutes each day), grade 1 or rare (frequency less than once a week and grade 2 or occasional (all other levels of exercise) [21].

Harmful physical activities (bad posture) with regard to low back pain like washing clothes, working in the vegetable beds and indulging in mechanical work in a stooping position, pulling water from a well without using a pulley, lifting heavy objects, sitting for long hours in one place in an uncomfortable position (i.e., back unsupported) were considered under posture. This variable was graded into three groups according to the duration of the continuous activity per day and frequency per week. Bad posture was graded as grade 3 or regular (frequency of at least 5 days per week for a minimum period of 60 minutes each day), grade 1 or rare (frequency less than once a week) and grade 2 or occasional (all other levels of harmful physical activities) [21]. The above mentioned physical activities were measured according to international measurements. However these measurements had to be modified to categorize into groups due to cultural and social differences in our study population.

Animal proteins consumption was graded into three groups according to the frequency of animal protein consumption per week as grade 3 or regular (every day of the week), grade 2 or occasional (at least once a week but less than daily) and grade 1 or rarely(not even once a week). Under animal proteins fish, meat, egg, milk, etc, were considered [21].

Level of consumption of alcohol was graded into three groups according to the frequency of indulgence per week as grade 3 or

regular (every day of the week), grade 2 or occasional(at least once a week but less than daily) and grade 1 or rarely (less than once a week) [13].

Level of smoking was graded into three groups according to the frequency of indulgence per week as grade 3 or regular (every day of the week), grade 2 or occasional (at least once a week but less than daily) and grade 1 or rarely– (less than once a week) [13].

The heights and weights were measured and BMI was calculated and grouped according to internationally accepted standards. Body Mass Index was graded into the following categories: Grade 3 (High) – > 25. Grade 2 (normal) - 20.1 –25. Grade 1 (low) – < 20.1 [21].

Family history was categorized as positive when any of the first-degree relatives (mother, father, brothers and sisters) had a history of chronic low back pain [21].

Level of income was graded into three groups according to the monthly income. Grade 1 (low income) - less than Rs.10000 (< 76 $). Grade 2 (moderate income) - Rs.10000 – 20000 (76 – 152 $). Grade 3 (high income) - more than Rs.20000 (> 152 $) (21).

Level of education was graded into three groups according to the school education and higher education. Grade 1(Low) - not attended school or attended less than the 5th standard. Grade 2 (moderate) - 6th standard to 12th standard. Grade 3 (high) - education more than 12th standard [21].

The data were entered and analysed using Epi Info 2000 (Centres for Disease Control and Prevention. Atlanta, GA, US) and SPSS version.16 (SPSS, Chicago, IL, US). The continuous data were described using means and standard deviations. The categorical data were described using percentages. Bivariate analysis was done using the Chi square test. Multivariate analysis was done using the binary logistic regression model. Odds ratios were calculated to determine the strength of association

Results

The data were collected from 530 cases and 530 controls. Their age range was 18- 90 years. Mean age (SD) for cases was 49.4 (15) years. Mean age (SD) for controls was 47.1 (17) years. Females accounted for 67% of cases and 64% of controls.

According to the results of bivariant analysis posture (P < 0.001), physical exercise (P < 0.001), family history (P < 0.001), level of income (P < 0.001), BMI (P = 0.006) and level of education (P = 0.016) had a significant association with the development of low back pain (Table 1).

Risk factor (grades)	Cases (n = 530)		Controls (n = 530)		Odds ratio (OR)	P Value
	Number	%	Number	%		
Posture						
1	8	1.6	146	27.6	1.0	< 0.001
2	9	1.7	236	44.6	0.6	
3	513	96.7	148	27.8	48.0	
Exercise						
1	106	20.3	11	2.0	1.00	< 0.001
2	173	32.7	71	13.3	0.25	
3	251	47.0	448	84.7	0.05	

Fam. History									
Yes	219	41.4	53	10.0	6.25	< 0.001			
No	311	58.6	477	90.0					
Income									
1	435	82.0	288	54.4	1.00	< 0.001			
2	76	14.4	215	40.6	0.23				
3	19	3.6	27	5.0	0.53				
BMI									
1	89	16.8	31	5.8	1.00	0.006			
2	213	40.2	332	62.7	0.22				
3	228	43.0	167	31.5	0.39				
Education									
1	179	33.8	136	25.7	1.00	0.016			
2	334	63.0	319	60.2	0.80				
3	17	3.2	75	14.1	0.16				
Alcohol consumption									
1	449	84.7	483	91.2	1.00	0.279			
2	37	7.0	34	6.4	1.25				

3	44	8.3	13	2.4	2.86			
Animal products consumption								
1	23	4.4	13	2.4	1.00	0.205		
2	249	47.0	194	36.5	0.64			
3	258	48.6	323	61.1	0.40			
Smoking								
1	441	83.2	472	89.0	1.00	0.425		
2	8	1.5	13	2.4	1.07			
3	81	15.3	45	8.6	1.79			

Table 1: Results of Bivariant analysis

According to the results of logistic regression analysis only bad posture (OR = 128.2, P < 0.001), low level of physical exercise (OR = 24.5, P < 0.001), positive family history (OR = 16.2, P < 0.001), high level of income (OR= 2.6, P < 0.001), high BMI (OR= 1.6,P = 0.001), low level of education (OR = 2.2, P = 0.013) and regular consumption of alcohol (OR = 3.4, P = 0.039) had a significant association with the development of low back pain (Table 2).

Variable	Odds ratio (OR)	P value	95% CI for OR	
			Lower	Upper
Posture				
1	1.34		0.394	4.861
2	1.00	<0.001	-	-
3	128.16		44.587	368.407

Exercise						
1	24.46				8.013	74.662
2	5.47				3.023	9.910
3	1.00		<0.001		-	-
Family History (Positive)	16.18		<0.001		8.094	32.360
Income						
1	1.00		<0.001		-	-
2	0.38				0.218	0.664
3	2.58				0.739	8.974
BMI						
1	4.10				1.866	8.991
2	1.00		0.001		-	-
3	1.55				0.957	2.515
Education						
1	2.19				0.765	6.251
2	3.47				1.285	9.363

3	1.00		0.013		-	-
Alcohol						
1	1.00		0.039		-	-
2	1.02				0.434	2.380
3	3.38				1.322	8.667

Table 2: Results of logistic regression analysis

Smoking and consumption of animal proteins did not have a significant association with the development of low back pain.

Discussion

In the present study, the association between low back pain and bad posture was quite significant (P<0.001) (Table -2). People who are in the regular (grade 3) bad posture group had a more than 100 times (OR = 128.2, Table -2) greater chance of developing low back pain compared to people who were in the occasional (grade 2) and rarely (grade 1) bad posture groups. The bad posture increases the intramuscular pressure in the paraspinal muscles and pressure inside the intervertebral discs [20]. Degeneration of the lumbar intervertebral disc is regarded as a common cause of chronic low back pain (CLBP). The etiology of lumbar disc degeneration (LDD) is complex and not fully explained. LDD is considered to be a multi factorial disorder involving numerous genetic and environmental factors and their interactions [22]. Heavy physical loading, trauma, bending, twisting and prolonged non-neutral work postures have been suggested to be associated with disc degeneration [23]. These may be some of the reasons why bad posture is significantly associated with the development of low back pain.

In this study regular exercise had a significant protective effect on low back pain (P<0.001).

People who fell into the group that rarely (grade1) involve in physical exercises have a twenty five times (OR= 24.5, Table 2) greater chance of developing low back pain compared to people who fell into the group that regularly take part in (grade 3) physical exercises. According to a study done in Sri Lanka taking part in exercises such as walking and running more than three times a week had a significant protective effect on low back pain [13]. Physical exercise has consistent evidence for primary prevention of low back pain compared to no activity [19]. Several low back pain (LBP) studies have emphasized the important role of paraspinal muscle morphology on the etiology, prognosis, and management of low back pain. The patients with LBP have smaller multifidus muscle cross-sectional area (CSA) compared with asymptomatic control patients who are healthy [24]. Back muscles act to support the spine and maintain the stability of the spine. The weakness of back muscles such as multifidus and Erector spinae can lead to low back pain and is known as a main cause of recurrence [25]. In patients with chronic low back pain, reflex inhibition induced by pain leads to atrophy of the back muscles and stiffness of the ligaments and joints. Patients reduce their activities due to pain and stiffness, which results in muscle weakness and strain. These eventually aggravate the pain in a vicious cycle [25]. A review for the European Guidelines for Prevention of low back pain indicated that core stabilization exercises and traditional lumbar spine exercises are equally effective in the prevention of low back pain because both types strengthen important core muscles of the spine [26]. These reasons help us to understand the usefulness of physical exercise in preventing low back pain. Although majority of studies have found that physical exercises are useful in preventing low back pain, a study has found that there is a non-significant lower risk of development of lumbar disc disease in men who are involved with high levels of body building and strength training exercises [27].

A positive family history of low back pain had a significant positive association with low back pain (P<0.001). People with a family history of low back pain had a sixteen times (OR = 16.2, Table 2) greater chance of developing low back pain compared to people without a family history of low back pain. Research studies have shown that heredity play a significant role with regard to disc degeneration [16]. Interleukin 1 (IL 1) is one of the most important cytokines that have been implicated in the process of disc degeneration. Degenerated intervertebral discs showed a ten-fold higher IL-1 receptor gene expression compared to non-degenerate intervertebral discs [16]. Strong muscles of the spine and abdomen are important in the prevention of development of low back pain [25]. Muscle fibres have different properties with respect to force, contraction speed, endurance, oxidative/glycolytic capacity etc. Although adult muscle fibres are normally post-mitotic with little turnover of cells, the physiological properties of the pre-existing fibres can be changed in the adult animal upon changes in their usage such as physical exercise. The signal to change is mainly conveyed by alterations in the patterns of nerve-evoked electrical activity, and is to a large extent due to switches in the expression of genes [28]. Above mentioned studies help us understand the association between heredity and low back pain.

In addition to genetic factors the life style of people too are important with regard to development of low back pain. The members in the same family may follow similar life styles [10]. One other reason for the significant association between low back pain and positive family history in our study could be recall bias. Patients who suffer from low back pain may remember and report about the family history of low back pain more than patients without a low back pain.

BMI had a significant association with Low back pain (P< 0.001). People with low BMI had a 4 times (OR = 4.2, Table 2) greater chance of developing low back pain compared to people with Normal BMI. People with high BMI had a 2 times (OR = 1.6, Table 2) greater chance of developing low back pain compared to people with normal BMI. Although many studies describe a significant association between low back pain and high BMI only few studies describe a significant association between low BMI and low back pain. The results of certain case-control studies have revealed a positive association between increased body mass index and lumbar disc herniation among men and women [27]. Lumbar disc herniation is an important cause of low back pain and lumbo sacral radicular pain [27]. A previous study done on Sri Lankan adult females have demonstrated that being overweight and being underweight are both risk factors for low back pain [21]. In the present study having a low BMI had a higher chance of developing low back pain compared to people with high BMI. People with Anorexia nervosa have a low body mass index. Osteoporosis is a complication of Anorexia nervosa and is associated with a two to three times increase in vertebral fracture risk [29].Vertebral compression fractures (VCFs) are an important cause of low back pain [30]. People with increase in BMI may be having strong muscles and bones compared to people with low BMI and strong muscles and bones are important in preventing low back pain [10].

According to the results of this study level of income had a significant association with low back pain (P <0.001). People in high income group had a 3 times (OR = 2.6, Table 2) greater chance of developing low back pain compared to people in low and moderate income groups. People with high level of income may be consuming a high calorie diet and may be less involved in taking part in regular physical activities. Both these factors can contribute to development of obesity. Obesity is associated with the development of low back pain [27].

In the present study level of education had a significant association with low back pain (P=0.013). People with low education level have a double the chance (OR = 2.2, Table 2) of getting low back pain compared to people with a higher education level. Asian Indians that have a low educational, occupational and socioeconomic status have a greater prevalence of truncal obesity, low HDL cholesterol, hypertriglyceridemia, smoking or tobacco use and low physical activity [31]. Taking part in regular physical exercise is useful in the prevention of low back pain [13] and atherosclerosis of blood vessels which is an important cause of disc degeneration [32]. According to a study done in Norway higher education level was associated with lower probability of current smoking among majority of male immigrants. Never having smoked was positively associated with education level among Pakistani and Norwegian men [33]. Education improves physical functioning and self-reported health because it enhances a sense of personal control that encourages and enables a healthy life style such as regular walking, exercising, drinking moderately, avoiding being overweight and smoking [34]. Education enables people to coalesce health producing behaviors into a coherent life style. It does by enhancing the sense of control over outcomes in one's own life [34]. According to Mullahy and Robert (2008) more educated individuals find more time to engage in physical exercise than less educated individuals [35]. Above studies demonstrate that level of education has a strong association with factors such as regular physical exercise, avoiding being overweight and not smoking. All these factors are useful in the prevention of low back pain. Above description help us to understand the beneficial effect the level of education has on low back pain.

In the present study alcohol consumption had a significant association with low back pain (P= 0.039). People in regular (grade 3) alcohol consumption group had a three times (OR = 3.4, Table 2)) greater chance of developing low back pain compared to people in rarely (grade 1) alcohol consumption group. Increasing frequency and quantity of alcohol use is associated with statistically significant weight gain [36]. Compared with individuals who never drank, the prevalence of metabolic syndrome was significantly higher in men who consumed two to four drinks/day [36]. Metabolic syndrome is a disorder with increase abdominal obesity, elevated blood pressure, elevated fasting plasma glucose, high serum triglycerides, and low high-density cholesterol (HDL) levels [36]. Studies have shown being overweight has a significant association with the lumbar sacral radicular pain [11] and increase BMI is associated with increase chance of developing lumbar disc disease [27]. Atherosclerosis is known to cause obstruction to the blood flow and reduce the blood supply to the intervertebral discs. Reduce blood supply is a cause of disc degeneration and disc degeneration is an important cause of low back pain [32]. These may be some of the reasons for alcohol consumption has a significant association with low back pain.

Our study could not find an association between level of smoking and low back pain. Our study findings are similar to the study findings of Kwon, et al. (2006) with regard to smoking [12]. However studies done by Shiri, et al. (2007) found a significant association between low back pain and smoking [11]. These studies have been done on different races and different countries and these may be contributing to the different study findings.

According to our study findings consumption of animal proteins did not have a significant association with low back pain. According to another study done among Sri Lankan males found that reduced intake of animal proteins had a significant association with low back pain [13]. In the present study majority of study subjects were females. This could be a reason why the study findings in these two studies differ. The studies done to find out an association between low back pain and animal protein intake are very sparse.

Conclusions

Posture, physical exercise, family history, level of education, consumption of alcohol, level of income and BMI had a significant association with low back pain. Being overweight and underweight were both risk factors for low back pain. This large comprehensive study done on risk factors for low back pain provides details of large number of risk factors and how these risk factors can contribute to development of low back pain. These findings will be useful to doctors, therapists and other health care workers to provide low back pain prevention advice to patients.

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