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Review Article

EPIDEMIOLOGY OF LOW BACK PAIN IN INDIAN POPULATION: A REVIEW

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ABSTRACT
Low back pain (LBP) is a major health and socioeconomic problem in modern society. There is little information about LBP in general or working population in developing and low income countries. This review aims at describing the epidemiology of LBP on the basis of studies in Indian population. LBP prevalence has been found to range from 6.2% to 92% with increase of prevalence with age and female preponderance. Low socioeconomic status, poor education, previous history of LBP, physical factors such as lifting heavy loads, repetitive job, prolonged static posture and awkward posture, psychosocial factors such as anxiety, depression, job dissatisfaction, lack of job control and mental stress, working hours and obesity have been found to be associated with LBP. A large number of subjects with LBP took no consultation, and a majority preferred traditional treatment. Regardless of the findings, the literature on LBP in Indian population is inconclusive, reason being sample size of the studies investigated, lack of uniformity in defining LBP, heterogenecity of the populations under study, lack of epidemiological studies in general population, deficient risk factor analysis as a result of which the findings cannot be generalized. Thus well designed epidemiological studies in terms of case control studies with robust statistical analysis for determining the influence of various factors in LBP are the need of the day.

Keywords: *Low Back Pain, Prevalence, Indian Population, Risk Factors*

INTRODUCTION
Low back pain (LBP) is an important clinical, social, economic, and public health problem affecting the population indiscriminately. It is a disorder with many possible etiologies, occurring in many groups of the population, and with many definitions. Consequently, the vast literature available on LBP is not only heterogeneous but also contradictory (Manchikanti, 2000). In accordance with the report of World Health Organization in 2002, LBP constituted 37% of all occupational risk factors which occupies first rank among the disease complications caused by work. Such high prevalence of complications at international levels has made the World Health Organization to name the first decade of the third millennium as the "decade of campaign against musculoskeletal disorders (as the silent epidemic)" (WHO, 2005).
In western countries like USA, back pain is considered to be a leading cause of disability. The one year prevalence of LBP has been found to be 10-56%, whereas point prevalence of chronic LBP is 15% (Manchikanti, 2000).
In a review Volinn, 1997 has highlighted lower prevalence rates of LBP amongst low-income countries compared with Western countries, especially amongst rural populations. Volinn (1997) also highlighted the fact that the 22 high-income countries, on which the research attention has largely focused, comprise less than 15% of the world's population.
However, more recent reports from Tibet (Hoy *et al.*, 2003), Turkey (Cakmak *et al.*, 2004; Gilgil *et al.*, 2005), China (Barrero *et al.*, 2006) and Africa (Louw *et al.*, 2007) suggest that prevalence rates are not that dissimilar from Western countries with one year prevalence in adults in these studies between 36% and 64%. This would suggest that back pain is likely to be an increasing health problem in non-Western countries as well. Unfortunately LBP is not considered as a cause of disability and there is scarcity of data available on this burgeoning epidemic in developing countries such as India. Thus this review aims at describing the epidemiology of LBP in terms of prevalence, demographic features, risk factors, impact and health care service utilization for LBP in Indian context.

MATERIALS AND METHODS

Methodology

An extensive search of available literature was made for epidemiological studies on back pain in Indian population from January 2001 to December 2013. Searches were carried out on computer based bibliographic databases such as Pub med, Research gate and Google scholar. The initial selection criterion was the articles that reported the prevalence, risk factors and impact of back pain in India either in general population or in different occupational groups. Therefore the following words were employed in the search: back pain, low back pain, backache, spinal pain, epidemiology of back pain, prevalence, risk factors, impact, India, Indian population. The cross references of the articles was searched for relevant articles.

The exclusion criterion was used to limit the selection to studies that reported epidemiological features of back pain. Therefore the randomized controlled trials or studies of experimental nature were excluded.

RESULTS AND DISCUSSION

Results

On the basis of selection criteria, fourty two studies were included for the review. The results of which are given below:

I. Prevalence

Table 1 provides an overview of studies on prevalence of back pain in Indian population. Thirty one studies have reported the prevalence of back pain. The prevalence of back pain has been found to range from as low as 6.2% to high as 92% depending upon the population under study.

Table 1: Studies reporting prevalence of low back pain in India

Authors	Study Population	LBP definition for the study	Population size (n)	Prevalence
Chopra *et al.*, (2001)	Rural population in Western India	Not defined	746	17.3% in females
Tiwari *et al.*, (2003)	Textile workers of Wardha	Defined as a non specific condition that refers to complaints of acute or chronic pain and discomfort in or near the spine which can be caused by inflammatory, degenerative, neoplastic, gynecological, traumatic, metabolic and other type of disorders	730	11.1%
Mahajan *et al.*, (2003)	General population in Jammu	Not defined	1014	34.7%
Sharma *et al.*, (2003)	Workage adults of rural North India	Not defined	11234	23.09%
Kar and Dhara (2007)	Farmers in West Bengal	Not defined	400	48.8%
Chopra and Pandey (2007)	Dental surgeons of Indian Navy	Not defined	18	70.6%
Metgud *et al.*, (2008)	Women workers of Woolen Textile factory in Belgaum	Not defined	100	47%

	district, Karnatka			
Haldiya *et al.*, (2010)	General population in Jodhpur district	Not defined	10015	6.2%
Ghosh *et al.*, (2010)	Goldsmiths from the Davangere district of Karnataka		120	75%
Goon *et al.*, (2010)	Long distance Truck drivers of mountainous terrain	Not defined	200	73.52%
Singh *et al.*, (2010)	Indian nursing students	Not defined	317	58.7%
Paldikhar *et al.*, (2012)	Dentists of Pune	Not defined	256	62.10%
Bodhare *et al.*, (2011)	Construction workers in Karimnagar, Andhra Pradesh	Not defined	211	92%
Bihari *et al.*, (2011)	Residents of national capital region	Not defined	2086	More than 50%
Gianchandani and Ganvir (2011)	Male Underground Miners of Maharashtra	Not defined	100	67%
Amod *et al.*, (2012)	Truck drivers of Nagpur city	LBP defined as pain or discomfort localized below the costal margin and above the inferior gluteal folds, with or without leg pain	256	62.10%
Mehta (2012)	Workers of Garment manufacturing units of Jaipur	Not defined	210	28.5% in cutting section, 27.2% in stitching section and 33% in finishing section
Tiwari and Saha (2012)	Oil drilling workers in Gujarat	Not defined	71	29.6%
Bandyopadhyay *et al.*, (2012)	Workers of small scale Garment industry from an urban slum of Kolkata	Not defined	172	31.1%
Bandhopadhyay *et al.*, (2012)	Coal miners of Eastern coalfields of India	Not defined	55	58.18%
Banerjee *et al.*, (2012)	General population in Pimpri, Pune	History of long standing pain in lumbosacral region with no history of trauma	2633	34.21%

Jadhav (2012)	Bus drivers of Latur, Maharashtra	Not defined	616	Point prevalence of 64%
Kumar Dhanesh *et al.*, (2012)	School children of adolescent group	Not defined	1500	One month period prevalence 22.7%
Dayakar *et al.*, (2013)	Dental practitioners of Karnataka	Not defined	49	67.34%
Dutta *et al.*, (2013)	General population in eastern part of India	Not defined	476	32.98%
Anap *et al.*, (2013)	Nurses in rural Maharashtra	Not defined	250	48.2%
Sharma and Mahajan (2013)	Zari workers of urban slum of Mumbai	Not defined	800	76.3%
Kumar *et al.*, (2013)	Dental professionals in India	Not defined	646	72.01%
Hameed (2013)	Information technology professionals of Tamilnadu	Symptoms such as ache, pain, and discomfort in the low back region which arise mainly due to work activities	400	51%
Gupta and Tarique (2013)	Farmers of Kanpur	Not defined	301	60%
Ikhar *et al.*, (2013)	Cotton spinning workers of Wardha	Not defined	40	Lifetime prevalence of 65% and one week prevalence of 57.5%

II. Risk Factors

Twenty four studies have reported risk factors of back pain. Table 2 presents the risk factors of back pain identified in different study populations. The results are presented in following sections.

1. Age

Age ≥35 years was found to have 9 times more risk as compared to <35 years (OR=9.45; 95% CI = 5.24-17.01) (Tiwari *et al.*, 2003). Koley *et al.*, (2008) in their study found a gradual increase of pain score with the increase of age in both the sexes, the increment of pain score was more in females. In a study on long distance truck drivers of mountainous terrain (Goon *et al.*, 2010), 44% of the population which suffered LBP was above 40 years old. The prevalence of musculoskeletal disorders was found to increase significantly with age in coal miners of eastern coalfields of India (Bandhopadhyay *et al.*, 2012). Sidhu *et al.*, (2012) in their study of LBP in workers of Saharanpur found that 47% of workers fell in the age

group of 41-50 years. Age was not found to be a statistically significant factor contributing to LBP in IT professionals of Tamilnadu (Hameed, 2013).

2. Gender

LBP was found to be more common among females than males in geriatric patients attending a railway hospital in Uttar Pradesh (Mohapatra *et al.*, 2011); among females (17%) than ($p<0.001$) males (11.1%) in residents of national capital region (Bihari *et al.*, 2011); among females (34.21%) in Pimpri, Pune (Banerjee *et al.*, 2012). On the contrary, Sidhu *et al.*, (2012) in their study on LBP in workers of Saharanpur *et al.*, (2013) in study on dentists found higher prevalence in men than women. LBP had no association with gender in construction workers in Karimnagar, Andhra Pradesh (Bodhare *et al.*, 2011).

3. Socioeconomic Status

Kar and Dhara (2007) found that a large number of farmers with LBP could not complete their primary education and remained below poverty line. Haldiya *et al.*, (2010) found that complaints of back pain were higher in rural area than urban area (7.5%; 5.5%). Sidhu *et al.*, (2012) found that 68% of the sufferers with LBP belonged to low socioeconomic status. The study on workers of small scale garment industry from an urban slum of Kolkata (Bandyopadhyay *et al.*, 2012) revealed that musculoskeletal problems were significantly more among the illiterate workers and who had primary or middle level education (OR= 2.93, P=0.003). Similarly workers having PCI of <Rs. 2000- per month were suffering from musculoskeletal problems more commonly (91.9%) than the workers of higher income (8.1%) and this difference was found to be statistically significant (OR=6.11, P=0.000). Bodhare *et al.*, (2011) found no significant association between musculoskeletal disorders with educational status, in construction workers of Andhra Pradesh.

4. Previous History of LBP

Present episode of LBP was found to be associated with previous history of LBP in truck drivers of Nagpur city (Amod et al., 2012) and in dentists of Pune region (Paldikhar *et al.*, 2012). Past history of injury was not found to be associated with LBP in oil drilling workers of Gujarat (Tiwari and Saha, 2012).

5. Physical Factors

Sharma (1999) reported the maximum frequency (50%) of LBP in people involved in jobs requiring handling of heavy loads, followed by people with sitting jobs (19.09%), with standing jobs (16.36%) and with prolonged standing (14.54%) from the northern parts of India. Joshi *et al.*, 2001 observed that lumbar pain was more common in buffing, operators working on presses, those using hand and power tools and those lifting heavy manual loads. Sharma *et al.*, 2003 found that 57% subjects with LBP were in blue collar jobs (heavy manual laborers).

Ghosh *et al.*, (2010), concluded that health of the goldsmiths were highly affected improper body posture and workload. Twisting, bending, and over-reaching were the result of poorly designed workstation. These actions forced them into a non-neutral position that increased the overall discomfort and pain at the lower back, neck, and shoulders. Gianchandani and Ganvir (2011) in a study on male underground miners perceived their work as heavy and pain if present was worsened by physical activities such as bending and lifting.

Significant interrelationship was found ($p<0.001$) between professional categories and LBP in workers of Saharanpur with wood carving (25%), textile industry (30%), and manual laborer (22%). 45% perceived heavy work, followed by prolonged sitting or standing (24%) to be a cause of their LBP (Sidhu *et al.*, 2012). Awkward posture followed by force exertion was found to be significantly associated with LBP in construction workers of Karimnagar, Andhra Pradesh (Bodhare *et al.*, 2011). Awkward posture was found to be associated with high prevalence of LBP ($p<0.01$) in oil drilling workers. However exposure to vibration and lifting of weights was not found to be associated with LBP which can be partly attributed to the small sample size (71 workers) of the study (Tiwari and Saha, 2012).

Repetitive operation of moving heavy substances and stooping postures were found to be significantly related with LBP coalminers of eastern India (Bandhopadhyay *et al.*, 2012). Prolonged sitting in one posture, less number of breaks, night shifts and awkward postures were significantly high in drivers. But

night shifts were not found to be associated with LBP. Less number of breaks (suggesting prolonged sitting) was associated with LBP in bivariate analysis but not in multivariate analysis (Jadhav, 2012).

Working in same position for long time, bending, twisting, lifting and treating excessive number of patients were perceived job risk factors for work related musculoskeletal disorders in nurses of rural Maharashtra (Anap *et al.,* 2013). Significant associations were found between time spent forward bent posture and low back symptoms (OR= 2.77, P= 0.00); time spent rotated /side bent trunk posture and LBP symptoms (OR= 2.46, P=0.02; OR=2.85, P=0.00) in tractor driving farmers of Delhi (Kumar *et al.,* 2013).

6. Psychosocial Factors

Joshi *et al.,* (2001) reported fewer musculoskeletal disorders in workers experiencing more job satisfaction. Contract workers had less musculoskeletal morbidity than regular and temporary workers. Skilled workers also had less morbidity. Sharma *et al.,* 2003 found that 67% subjects with LBP had psychosocial issues, 26% had to change/leave their profession and 38% did not enjoy their present job.

Pande (2004) in his study on psychological disturbance in Indian LBP population found high prevalence of anxiety (71.7%) and depression (64.8%) in LBP population. There was modest but significant correlation between reported disability and levels of anxiety ($r=0.31$; $p<0.05$) and depression ($r=0.34$; $p<0.05$).

Job dissatisfaction followed by lack of job control showed the strongest relationship with musculoskeletal disorder in construction workers of Karimnagar, Andhra Pradesh (Bodhare *et al.,* 2011). Khatua *et al.,* (2011) found that psychiatric morbidity was higher among females than male in both cases and controls. The patients with chronic LBP were 2.8 times more likely to have General Health Questionnaire (GHQ) caseness (unadjusted OR= 2.83; 95% CI 2.16-3.70) and 4.1 times more likely to have psychiatric disorders (unadjusted OR= 4.14; 95% CI 2.85-6.01) compared to their controls. Patients with chronic LBP were almost 32 times more likely to have somatoform disorders (95% CI 10.9-98.4), 95 times more likely to have depression (95% CI 21.4-494.0), 20 times more likely to have generalized anxiety disorder (95% CI 6.3-71.1) and 17 times more likely to have other psychiatric disorders (95% CI 1.1-542.1) than their controls.

Statistically significant relationship was observed between LBP and mental stress due to conflicts with management in truck drivers of Nagpur (Amod *et al.,* 2012). The survey on workers of Saharanpur revealed that respondents who experienced higher levels of stress in their work and who had poor job satisfaction demonstrated significant ($p<0.001$) association with complaints of LBP (Sidhu *et al.,* 2012).

Statistically significant relationship was observed between LBP and mental stress due to conflicts with management in dentists of Pune region (Paldikhar *et al.,* 2012). Focus group discussions in small scale garment industry of Kolkata (Bandyopadhyay *et al.,* 2012) revealed that lack of time to take rest, to attend to personal health problems, social programs, less time for relaxation, low wage, poor attitude of employer contributed to the work stress and job dissatisfaction in the workers.

Psychological factors such as fear avoidance belief for physical activity ($r=0.25$, $p=0.0467$) and fear avoidance belief for work ($r= 0.31$, $p=0.0140$) were found to be one of the major factors for increasing disability in non specific LBP (Monga *et al.,* 2013). High prevalence of depression (78.75%) was found in patients with chronic LBP of any origin and there was strong relation between pain severity and depression ($r=0.86$) (Anap *et al.,* 2013). Out of 476 chronic pain patients attending pain clinic in eastern part of India, 146 (30.67%) were found to suffer from major depressive syndrome (MDS). Women were more prone (F: M = 3:2) to develop MDS. Prevalence of suicidal thought was 22.69%. The depression severity was found to be strongly associated with intensity of pain ($P=0.005<0.05$) but not associated with duration of pain ($P= 0.159>0.05$) and age of the patient ($P=0.24>0.05$) (Dutta *et al.,* 2013).

7. Work Parameters

Duration of exposure > 10 years (OR= 3.44; 95% CI = 1.85-6.39) and working position requiring prolonged sitting (OR= 1.93; 95% CI = 1.05-3.56) were found to be significantly associated with LBP in textile workers of Wardha (Tiwari *et al.,* 2003). Metgud *et al.,* (2008) found highly significant association between the pain score and the length of occupational exposure ($p<0.001$) except for subjects with less than one year job exposure.

Ghosh *et al.,* (2010) observed LBP prevalence to be as high as 75% and that the goldsmiths worked 6 days in a week. The average duration of work per day was 12 h that varied on the demand of work and they work for 6 days in a week. Statistically significant relationship was observed between LBP and duration of driving >48hrs/week, daily average driving >200 km, feeling of vibrations in the seat (Amod *et al.*, 2012).

84% of the LBP sufferers developed symptoms with started with work, 62% perceived their back pain to be work related (Sidhu *et al.*, 2012). The study on musculoskeletal disorders in small scale garment industry of Kolkata revealed that these disorders had a significant association (P<0.05) among those who had worked for more number of years (>10 years), worked for longer hours (>10 hours/ day) and engaged in cutting and sewing (Bandyopadhyay *et al.*, 2012).

Kumar *et al.,* (2013) observed that dentists with clinical experience between 6 and 10 years had greater prevalence of LBP. Sharma and Mahajan (2013) found that the subjects with more than 30 years of job had LBP problems ($\chi 2 = 190.530$, P<0.001) while 53.8% of those with less than 10 years of job had such problem. Working hours, with mean work hours/week of 46.4 hrs was found to be a statistically significant (at 5%) risk factor for LBP in IT professionals of Tamilnadu (Hameed, 2013). However no significant association was found between the years of work experience and LBP in multivariate analysis (Jadhav, 2012).

8. Lifestyle Factors

Tiwari *et al.,* (2003) in their study found obese subjects to be at risk of developing LBP (OR= 9.14; 95% CI = 4.95-16.87). High BMI was found to be associated (p<0.001) with work related musculoskeletal discomfort and occupational psychosocial stress (Sethi *et al.,* 2011). BMI of ≥25 kg/m^2 was found to be associated with LBP in truck drivers of Nagpur city (Amod *et al.,* 2012). Statistically significant relationship was observed between LBP and BMI ≥25 in dentists of Pune region (Paldikhar *et al.,* 2012). Body mass index > 25 and mean waist hip ratio of 0.91 was found to be a significant risk factor (5%) for LBP in IT professionals of Tamilnadu (Hameed, 2013). On the other hand, Bihari *et al.,* (2011) and Bodhare *et al.,* (2011) did not find any association of LBP and BMI.

Tiwari *et al.,* (2003) found smokers to be at higher risk for development of LBP than non smokers (OR= 2.19; 95% CI = 1.23-3.89). Prevalence of LBP was found to be higher among current smokers and ex smokers than in non smokers (Sidhu *et al.,* 2012).Tobacco consumption was found to be significantly associated with LBP (P<0.001) (Sidhu *et al.,* 2012).

On the other hand, alcohol consumption, smoking, tobacco use was not found to be associated with LBP (Bodhare *et al.,* 2011; Jadhav, 2012).

The individuals with good health status and habit of regular physical exercise are less prone to develop LBP as compared to those with poor health status and those not doing any regular physical exercise (Tomita *et al.,* 2010). Only one study revealed that lack of exercise was significantly associated with LBP in truck drivers of Latur (Jadhav, 2012). Statistically significant relationship was observed between LBP and not enough time to relax at home, sleeplessness in dentists of Pune region (Paldikhar *et al.,* 2012).

9. Biological Risk Indicators

Koley *et al.,* (2010) in their study on biological risk indicators for non specific LBP in young adults of Amritsar found statistically significant differences (p<0.05) in abdominal muscle endurance (t=2.58) between non specific LBP boys and controls and in weight (t=3.22), biceps skinfold (t=3.04), height (t=2.67), triceps skinfold (t=2.83), subscapular skinfold (t=2.32) and in percent lean body mass (t=2.80) between nonspecific LBP girls and controls. Both in boys and girls with non specific LBP, back strength has positively significant correlation (p<0.05) with height (r=0.487 and 0.360), weight (r=0.495 and 0.213 respectively), BMI (r=0.299 and 0.461 respectively) and flexibility measure (r=0.386 and 0.388 respectively) and negatively significant correlation (r=0.417 only in non specific LBP girls) with percent body fat.

Table 2: Risk factors of low back pain

Authors	Risk factors	Risk Factor Estimate
Tiwari *et al.*, (2003)	1.Age 2.Duration of exposure 3.Working position 4.Obesity 5. Smoking	1. Age (OR=9.45; 95% CI = 5.24-17.01)* 2. Duration of exposure > 10 years (OR= 3.44; 95% CI = 1.85-6.39)* 3.Working position requiring prolonged sitting (OR= 1.93; 95% CI = 1.05-3.56)* 4.Obesity (OR= 9.14; 95% CI = 4.95-16.87)* 5. Smoking (OR= 2.19; 95% CI = 1.23-3.89)*
Sharma *et al.*, (2003)	1.Heavy manual labour[P]	
Metgud *et al.*, (2008)	1.Length of occupation exposure	1.Length of occupation exposure ($p<0.001$)*
Haldiya, *et al.*, (2010)	1.Place of dwelling[P]	
Ghosh *et al.*, (2010)	1.Improper body posture[P] 2.Workload[P]	
Koley *et al.*, (2010)	1.Abdominal muscle endurance	1.Abdominal muscle endurance ($t=2.58$; $p<0.05$)*
Singh *et al.*, (2010)	1.Years in to occupation	1.Years in to occupation [NS]
Bodhare *et al.*, (2011)	1.Awkward posture 2.Force exertion 3.Job dissatisfaction 4. Lack of job control 5.Migration 6.Age 7.Working hours/week 8.Job tenure (years) 9.Gender 10.Educational status 11.BMI 12.Smoking 13. Alcohol consumption	1.Awkward posture (Nagelkere $R^2 = 0.771$)* 2.Force exertion (Nagelkere $R^2 = 0.771$)* 3.Job dissatisfaction (Nagelkere $R^2 = 0.699$)* 4. Lack of job control (Nagelkere $R^2 = 0.699$)* 5.Migration ($p<0.001$)* 6.Age ($p<0.001$)* 7.Working hours/week ($p<0.002$)* 8.Job tenure (years) ($p<0.002$)* 9.Gender[NS] 10.Educational status [NS] 11.BMI [NS] 12.Smoking [NS] 13. Alcohol consumption [NS]
Bihari *et al.*, (2011)	1.Gender 2.Age 3.Smoking 4.Overweight/obesity	1.Gender (more in females)($p<0.001$)* 2.Age (prevalence increased with age $p<0.001$)* 3.Smoking [NS] 4.Overweight/obesity [NS]
Gianchandani and Ganvir (2011)	1. Physical activities such as bending and lifting[P]	
Paldikhar *et al.*, (2012)	1.History of LBP 2.Mental stress due to conflicts with management 3. BMI ≥25 4.Not enough time to relax at home 5. Sleeplessness. 6. Working hours >48hrs/week 7. Diseases other than LBP 8.Length of occupation	1.History of LBP* 2.Mental stress due to conflicts with management* 3. BMI ≥25 ($p<0.001$)* 4.Not enough time to relax at home* 5. Sleeplessness* 6. Working hours >48hrs/week ($p<0.001$)* 7. Diseases other than LBP* 8.Length of occupation ($p<0.001$)*
Amod *et al.*, (2012)	1.History of LBP 2.Diseases other than LBP 3.Not enough time to relax at home	1.History of LBP ($p<0.001$)* 2.Diseases other than LBP ($p<0.001$)* 3.Not enough time to relax at home ($p<0.001$)*

	4.Sleeplessness 5. Duration of driving 6.Daily average driving 7.Feeling of vibrations in seat 8.Mental stress due to conflicts with management 9.BMI 10.Burden of responsibility of work 11.Smoking 12.Alcohol	4.Sleeplessness ($p<0.001$)* 5. Duration of driving >48 hrs/week ($p<0.001$)* 6.Daily average driving >200kms ($p<0.001$)* 7.Feeling of vibrations in seat ($p=0.015$)* 8.Mental stress due to conflicts with management ($p=0.032$)* 9.BMI ≥25 (0.046)* 10.Burden of responsibility of work [NS] 11.Smoking [NS] 12.Alcohol [NS]
Tiwari and Saha (2012)	1.Awkward posture 2. Age 3. Obesity 4.Duration of exposure 5.Smoking habit 6.Family history of musculoskeletal disorders 7.Exposure to vibration 8. Lifting of weights 9. Past history of injury	1.Awkward posture ($\chi^2 = 6.41$; df = 1; $p<0.01$)* 2. Age [NS] 3. Obesity[NS] 4.Duration of exposure [NS] 5.Smoking habit[NS] 6.Family history of musculoskeletal disorders [NS] 7.Exposure to vibration[NS] 8. Lifting of weights [NS] 9. Past history of injury [NS]
Bandyopadhyay *et al.*, (2012)	1.Level of Education 2. Per Capita Income (PCI) 3. Worked for more number of years 4.Worked for longer hours 5. Those engaged in cutting and sewing	1.Level of Education (OR= 2.93, P=0.003)* 2. Workers having PCI of <Rs. 2000- per month (OR=6.11, P=0.000)* 3. Worked for more number of years (>10 years), ($P<0.05$)* 4.Worked for longer hours (>10 hours/ day) ($P<0.05$)* 5. Those engaged in cutting and sewing ($P<0.05$)*
Bandhopadhyay *et al.*, (2012)	1.Age 2.Repetitive operation of moving heavy substances 3.Stooping postures	
Banerjee *et al.*, (2012)	1.Gender	1.Higher prevalence in females (OR=1.43, 95%CI=1.05 to 1.95)*
Jadhav (2012)	1.Night shifts 2.Less number of breaks 3.Job dissatisfaction 4.Alcohol consumption 5.Uncomfortable feeling at the start of work 6.Uncomfortable feeling at the end of work 7.Tobacco use	1.Night shifts [NS] 2. Less number of breaks [NS] 3.Job dissatisfaction (OR=2.389(1.065-5.361))* 4.Alcohol consumption [NS] 5.Uncomfortable feeling at the start of work (OR=2.171 (1.142-4.125))* 6.Uncomfortable feeling at the end of work (OR=2.228 (1.294-3.836))* 7.Tobacco use (OR=0.726, p = 0.190)*
Kumar *et al.*, (2012)	1.Age 2.Gender	1.11 years age group showed prevalence of LBP as 5.46% where as at 15 years it was 37.35% ($\chi2$= 0.71, P=0.05)* 2. Girls reported higher prevalence of LBP ($\chi2$ = 13.32, $p<0.05$)*
Sidhu *et al.*, (2012)	1.Bad body posture 2.Lifting objects 3.Increased levels of lifting 4.Level of job satisfaction 5.Job stress 6. Work related onset ($p<0.001$) 7.Higher levels of stress ($p<0.005$) 8.Poor job satisfaction ($p<0.005$)	1.Bad body posture ($p<0.001$)* 2.Lifting objects ($p<0.001$)* 3.Increased levels of lifting ($p<0.001$)* 4.Level of job satisfaction ($p<0.001$)* 5.Job stress ($p<0.001$)* 6.Work related onset ($p<0.001$)* 7.Higher levels of stress ($p<0.05$)* 8.Poor job satisfaction ($p<0.005$)* 9.Tobacco use ($p<0.001$)*

	9.Tobacco use (p<0.001) 10. Professional categories 11.Gender (high prevalence in men) 12.Smoking	10. 6.Professional categories (p<0.001)* (Wood carving (25%), textile industry (30%) and manual laborer (22%) 11. High prevalence in men 12. Smoking (High prevalence in current and ex smokers
Kumar *et al.,* (2012)	1.Gender[P]	
Anap *et al.,* (2013)	1.Working in same position for long time[P] 2.Bending, twisting the back in awkward way[P] 3.Lifting or transferring dependent patients[P] 4. Treating excessive number of patients[P]	
Sharma and Mahajan, 2013	1.Years of job	1.Years of job (subjects with more than 30 years of job had LBP problems ($\chi 2$ = 190.530, P<0.001)*
Kumar *et al.,* (2013)	1.Gender[P] 2. Clinical experience[P] 3.Time spent forward bent posture 4.Time spent rotated /side bent trunk posture	1.Gender (high prevalence in men) 2. Clinical experience (b/w 6-10 years had greater prevalence) 3.Time spent forward bent posture (OR= 2.77, P= 0.00)* 4.Time spent rotated /side bent trunk posture (OR= 2.46, P=0.02;OR=2.85, P=0.00) *
Hameed (2013)	1.Working hours 2. Body mass index 3.Mean waist hip ratio 4. Age	1. Working hours, with mean work hours/week of 46.4 hrs (at 5%)* 2. Body mass index > 25 (5%)* 3. Mean waist hip ratio of 0.91 (5%)* 4. Age[NS]

**Significant* [NS] *Not Significant* [P] *Probable risk factor*

III. Studies on Impact of LBP

Sharma *et al.,* (2003) found that 26% subjects had to change their profession due to LBP. Bodhare *et al.,* (2011) reported that the most severely affected body region across one year posing considerable activity limitation was LBP. The consequences of LBP on personal life and work were found to be moderate in 42% of LBP sufferers and severe in 20% (Sidhu *et al.,* 2012). 57% modified their job due to LBP. 28.7% drivers took leave due to LBP when compared to non drivers (15.8%) with p= 0.003, indicating that the burden of LBP was affecting the quality of life of drivers (Jadhav, 2012).

Different degrees of limitations among patients with musculoskeletal disorders in Pimpri, Pune (Banerjee *et al.,* 2012) were; dressing (9.5%), washing hair (11.6%), rising from bed (50%), feeding themselves (6%), walking (39%), taking bath (10%), toilet (37%), rising from chair (47%), rising from floor (55%), boarding bus (30%) and sleep disturbances (47%).

Monga *et al.,* (2013) in their study on impact of back muscle functions, spinal range of motion in chronic non specific LBP found decreasing trunk muscle endurance (r= -.065, p=0.0001), muscle strength (r= -0.44, p=0.0004) and back muscle flexibility (r= -0.68, p=0.0001) as significant factors leading to functional disability in LBP.

However impact of spinal range of motion on disability was not significant.

IV. Studies Reporting Health care Utilization for LBP

Among the long distance truck drivers of mountainous terrain (Goon *et al.,* 2010), 25% preferred pharmacological and 50% preferred some forms of non pharmacological therapy (rest, heat, massage).

Of the LBP sufferers 65% sought treatment for their symptom out of which 60% received traditional treatments, 27% modern treatments and 13% both. Most were never diagnosed by a health care professional and only 5% underwent surgical procedures related to their LBP (Sidhu *et al.,* 2012).

34.8% of drivers went to hospitals to seek medical help to deal with LBP compared to non drivers (19%) (p= 0.001) and 36.5% used medication for LBP when compared to non drivers (21.7%) during the last year (p=0.002), higher percentage of drivers (28.7%) took leave due to LBP when compared to non drivers (15.8%) with p= 0.003, indicating that the burden of LBP was not only affecting the quality of life but also resulted in higher expenditure by drivers on medication and hospital visits (Jadhav, 2012).

In patients attending pain clinic for chronic pain, only 10.92% were on regular medications for pain relief prescribed by the physicians and 44.54% were taking over the counter medication for pain while the rest took no medication (Dutta *et al.,* 2013).

Discussion

The prevalence of LBP in Indian population has been found to vary between 6.2% (in general population) to 92% (in construction workers). Such large variation can be attributed to the heterogenecity of the population under study as twenty three out of thirty one studies reporting prevalence were conducted in different occupational groups. This variation in data could also be based on the objectives of the study, demographic features of the study subjects and back pain definition used for the study.

The prevalence of LBP has been found to increase with age and to be more common among females. Low socioeconomic status and poor education have been found to be associated with LBP. Present episode of LBP was found to be associated with previous history of LBP. Heavy physical work in terms of lifting heavy loads, repetitive job, prolonged static posture and awkward posture have been found to be some of the risk factors of LBP. Anxiety, depression, job dissatisfaction, lack of job control and mental stress has been found to be some of the psychosocial factors related to LBP. The length of occupational exposure in terms of prolonged working hours and number of years in to present occupation have been found to be associated with LBP.

Out of lifestyle factors obesity can be a factor associated with LBP. But there is lack of studies reporting association of smoking/alcohol consumption, lack of sleep or habit of exercise with LBP. Though imbalance in muscle strength and lack of flexibility has been found to be risk factors of LBP but studies reporting this are few. At the same time, impact of LBP in terms of change/loss of job and activity limitation cannot be ignored.

Regarding utilization of health services for LBP, it has been observed that a large number of subjects with LBP took no consultation, followed by over the counter medication and a majority preferred traditional treatment over the +-allopathic system of medicine.

Regardless of the findings stated above, this review on epidemiological features of LBP in Indian population is inconclusive, one reason could be that the literature search for this study was limited to computer search. Low back pain has several definitions and only four studies in this review have defined back pain, thus this lack of uniformity in defining back pain has posed a difficulty in drawing a conclusion from the study. Other reasons could be variation in sample size of the studies investigated, heterogenecity of the populations under study, lack of epidemiological studies in general population, deficient risk factor analysis and grey literature on LBP in form of studies in libraries and unpublished research, as a result of which the findings cannot be generalized.

Conclusion

Determining the various risk factors for LBP in general population as well as in different occupational groups through well designed epidemiological studies is the need of the hour to prevent and cater this "silent epidemic" which is one of the major causes of disability, high costs, activity limitation and psychosocial co morbidity in our country.

The high prevalence of LBP in workers needs urgent attention from health and labor sectors. An ergonomic approach to prevention should be considered. The current manual load handling limits prescribed by Indian Factory Rules potentially expose workers to back stress. Research is required to determine the safe load handling limits for the Indian working population based on ergonomic principles.

Until internationally acceptable safe limits are established, back pain should be a notifiable disease in India (Joshi *et al.*, 2001).

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