LOW BACK PAIN ASSOCIATED WITH SOCIODEMOGRAPHIC FACTORS, LIFESTYLE AND OSTEOPOROSIS: A POPULATION-BASED STUDY

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Objective: To investigate the prevalence and factors associated with low back pain among adults in Taiwan.

Methods: The National Health Interview Survey, a cross-sectional study, was conducted from October 2002 to March 2003 to gather data from 24,435 adults aged 20 years and older selected randomly from Taiwan’s general population. Participants with history of low back pain were assessed using a comprehensive questionnaire. Additional assessment of osteoporosis diagnosed by physician was also evaluated.

Results: Among the 24,435 adults, 25.7% had reported low back pain within the past 3 months. Factors associated with low back pain included female gender (odds ratio (OR) = 1.67, 95% confidence interval (CI) = 1.43–1.95), low education (OR = 1.38, 95% CI = 1.23–1.55), and blue-collar work (OR = 1.16, 95% CI = 1.07–1.26). Patients with osteoporosis were more likely than those without osteoporosis to have low back pain (OR = 2.55, 95% CI = 2.33–2.78) or frequent low back pain (OR = 4.15, 95% CI = 3.66–4.70). The ORs of frequent low back pain in association with osteoporosis in men and women were 5.77 (95% CI = 4.66–7.15) and 3.49 (95% CI = 2.99–4.07), respectively.

Conclusion: Low back pain is prevalent among Taiwanese adults and is associated with osteoporosis.

Key words: low back pain; osteoporosis; prevalence; risk factors.

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INTRODUCTION

Low back pain (LBP) is a common health problem across all age groups, and its high prevalence rate has provoked concern worldwide (1–5). It has been estimated that the prevalence of LBP for lifetime, 1-year, 6-month and 3-month periods is as high as 11–84% (6–8), 22–65% (8–10), 40–64.6% (7–11), and 26.4% (12), respectively. LBP is also the most-reported work-related disorder in many countries. Most people experience one or more episodes of LBP in their lifetime; this causes high healthcare costs, work absenteeism, and disability (13). Quality of life becomes the major concern for people with LBP (13).

Generally speaking, females and elderly people report more LBP. The association between low socioeconomic status and low back pain was noted in a previous study (14). Occupations such as nurses, cooks, drivers, school employees, office workers, and industrial employees have been reported as vulnerable to LBP because of standing for long periods, lifting heavy goods, and inadequate rest (3–5). As symptoms of LBP often persist, the majority of patients have reported symptoms recurring more than once a year (1, 15).

Osteoporosis is a skeletal disease marked by low bone mass and micro-architectural deterioration of bone tissues, leading to bone fragility and consequent increase in the risk of fractures (16, 17). However, few studies have focused on links between osteoporosis and LBP.

This study investigates the association of sociodemographic factors and chronic diseases, especially osteoporosis, with increased risk of LBP, using retrospective data from Taiwan’s National Health Interview Survey.

METHODS

Data sources
From October 2002 to March 2003, Taiwan’s National Health Research Institutes and the Bureau of Health Promotion conducted an island-wide National Health Interview Survey (NHIS) using face-to-face questionnaire interviews. The researchers used multi-stage stratified systematic sampling methods to collect a representative sample of 32,660 non-institutionalized subjects aged 15 years and over living in Taiwan. Approximately 323 interviewers were trained to conduct these interviews. The interviewer explained the study purpose first. If the interviewee was in the eligible age group, the interview was then initiated or scheduled. This 2002 NHIS Survey was a cross-sectional study whose detailed sampling and measurement were described elsewhere (18, 19). Written consent was obtained from participants during interviews. Parental or guardian consent was obtained for minors, and the NHIS was approved by Taiwan’s Bureau of Health Promotion.
**Study subjects**

In the current study, participants aged 20 years and older were included as eligible subjects. The 2002 NHIS included questions on sociodemographic factors, health status, knowledge about chronic diseases, history of diseases, health behaviours and use of medical services. The questions relating to LBP were as follows: "(1) In the past 3 months, have you complained of LBP? (2) Within past 3 months, how often have you complained of LBP: occasionally or always?" People always complaining of LBP are defined as having frequent LBP. We considered as the case group people who had complained of LBP (ever, sometimes or always) in the past 3 months. Those who had not complained of LBP were considered as the comparison group. Osteoporosis was self-reported by persons who had an osteoporosis diagnosis from a physician. Two criteria for osteoporosis diagnosis were: (i) a history of fragility fracture (fracture at sites typically associated with low bone mineral density (BMD) in hip, pelvis, wrist, or spine); and (ii) dual-energy X-ray absorptiometry (DEXA) applied to sites of biological relevance, including hip, spine, and forearm. If patient’s BMD decreased more than 2.5 standard deviations (SD) compared with the general population in the same age group, then he or she was defined as having osteoporosis (17).

**Statistical analysis**

We compared differences in age, sex, educational level, occupation, marital status, and body mass index between people with and without self-reported LBP in χ² tests. The differences in osteoporosis and lifestyle, such as smoking habits, environmental tobacco smoke, daily sitting hours and regular exercise, were also compared between people with and without self-reported LBP. Those who reported frequent LBP were sub-grouped for further analysis. We performed a multiple logistic regression analysis of factors that may be associated with LBP and frequent LBP, and we calculated odds ratios with confidence intervals. We further performed a sex-stratified analysis to investigate the relationship between osteoporosis and frequent LBP in men and women in the multiple logistic regressions. All analyses were completed using the statistical package SAS version 8.1 (SAS Institute Inc., Cary, NC, USA).

**Ethical approval**

This study was conducted in accordance with the Declaration of Helsinki. To protect personal privacy, the electronic database was decoded, with patient identifications scrambled for further public access for research. According to Bureau of Health Promotion regulations, written informed consent was obtained from all participants. This study was evaluated and approved by the Bureau of Health Promotion and National Health Research Institutes review board.

**RESULTS**

Among 24,435 eligible study participants, 6,270 (25.7%) reported LBP within the previous 3 months. The prevalence of LBP was 18.8% in young adults aged 20–29 years, increasing to 34.9% in people aged 70 years and above (p < 0.0001) (Table I). Compared with males, females were more likely to have LBP (30.0% vs 21.5%, p < 0.0001). The 3-month prevalence of LBP was higher in people with low education than in people with high education (33.5% vs 18.1%, p < 0.0001). There were significant differences between people reporting LBP or not, depending on marital status (p < 0.0001), occupation (p < 0.0001), body mass index (p < 0.0001), smoking (p < 0.0001), exposure to environmental tobacco smoke (p < 0.0001), sitting hours (p < 0.0001), and regular exercise (p < 0.0001). The prevalence of LBP was higher in people with osteoporosis (48.6% vs 22.5%, p < 0.0001) than in people with no osteoporosis.

The multiple logistic regression analysis showed females had a higher risk of LBP than males (odds ratio (OR) = 1.52, 95% confidence interval (CI) = 1.40–1.65) (Table II). Less-educated (0–6 years) people were at higher risk of LBP compared with more-educated (≥13 years) people. Compared with married people, the risk of LBP was higher in single persons, and also higher in smokers than non-smokers (OR = 1.24, 95% CI = 1.14–1.35). Exposure to environmental tobacco smoke,
95% CI = 1.00–1.71). Compared with non-smokers, smokers were at higher risk of frequent LBP (OR = 1.36, 95% CI = 1.17–1.58). People with daily sitting ≥13 h had higher risk of frequent LBP compared with people with daily sitting 0–4 h (OR = 1.97, 95% CI = 1.50–2.59). People without regular exercise (OR = 1.45, 95% CI = 1.30–1.61) had increased risk of frequent LBP. The multiple logistic regression also showed that people with osteoporosis had a higher risk of frequent LBP compared with those without osteoporosis (OR = 4.15, 95% CI = 3.66–4.70).

Further stratification showed ORs of associated osteoporosis or not for frequent LBP in females and males were 3.49 (95% CI = 2.99–4.07) and 5.77 (95% CI = 4.66–7.15), respectively (Table III).

**DISCUSSION**

This population-based survey of Taiwanese people reveals a high prevalence of self-reported LBP among all age groups and both genders. We studied demographic factors, lifestyles, and osteoporosis in relation to LBP in a representative nationwide sample. The results show that osteoporosis was associated with self-reported LBP and frequent LBP. The association between osteoporosis and frequent LBP appears to be independent and more marked in men than in women after controlling for other common LBP-related factors.

Demographic factors, such as age and sex, have been associated with LBP in many studies. Age and gender, as well as certain work-related physical and psychosocial factors, influenced the prevalence of LBP (20). In our study, higher age was a significant risk factor for frequent LBP; this is consistent with the findings of Burdorf & Sorock (21). The significant association between increasing age and risk of LBP was also investigated in the previous study (22). Our results demonstrated similar findings with the previous study, which reported the gender-associated risk of LBP (1, 5, 20, 22–26).

LBP has been shown to be more common among women than men for occupational groups such as white-collar workers (5), industrial workers (20), hospital staff (23), and physiotherapy students (24). In general, women are more sensitive than men to a variety of noxious stimuli. However, the menstrual cycle does not exert an influence on pain sensitivity (27). The sex differences in gender role expectation for pain are complex and may be affected by culture (28). Though young females had a higher prevalence of LBP compared with young males, the association between low BMD and risk of LBP was more significant in young males than in young females (29). In
addition, postmenopausal osteoporosis that may cause LBP could explain why women had more LBP than men (30, 31).

That social and economic disadvantage associated with generally poorer physical health has been recognized for centuries. Marital status, education, occupation, and income level also specifically influence LBP (32, 33), with previous research noting the opposite association between education and LBP risk (33). Compared with less-educated people, highly educated people tend to work in jobs with a lower risk of LBP, and also may have more knowledge about coping with or preventing LBP; the unemployed also had a lower risk of LBP (33). Our study was similar to other studies investigating socioeconomic status and risk of LBP, although few studies investigated LBP and marital status. Our finding that people with no spouse or significant other faced a higher risk of LBP raises interesting issues, and further study is needed to explain this association.

Overweight and obesity are increasingly prevalent in many countries, especially in middle-aged people. Accumulating evidence associates body mass index with metabolic syndrome and cardiovascular disease (34). As body mass index is considered an indicator of body weight status, with greater weight increasing pressure on the spine, the discs and other back structures to cause LBP (35). A cohort study in Finland suggested that abdominal obesity may increase the risk of LBP (1). Using their national survey data results, Deyo & Bass (36) suggested that obesity contributes independently to the risk of LBP. Although 1 study failed to determine the relationship between excess weight, tall stature, and risk of LBP (37), a recent study with meta-analysis concluded that overweight and obesity have the strongest association with seeking care for LBP and chronic LBP (38). Our study clearly demonstrates the influence of obesity (body mass index \( \geq 27 \text{ kg/m}^2 \)) on the risk of frequent LBP.

The influence of lifestyle factors on LBP risk is crucial. Since the positive association between smoking and risk of LBP has been confirmed (36), it was not surprising that we found current smokers to be at higher risk of LBP compared with non-smokers. However, the relationship between environmental tobacco smoke and the risk of frequent LBP remains unclear. Being physically active is often suggested as important in preventing and managing LBP. Individuals with LBP often experienced more physically demanding work and lower physical activity during leisure-time (26). However, a previous study suggested a U-shaped relationship between physical activity and risk of LBP (39). Our results showed that having no regular exercise increased risk of LBP. Previous studies’ difficulties in specifying the quantity and quality of exercise with self-reported information contributed to inconsistent findings for an association between exercise and risk of LBP (26, 39). It is also reasonable to expect that people who report less time exercising may also spend more time sitting, and our study found a positive association between risk of LBP and sitting hours with a dose-response relationship. Long-term sitting may contribute to LBP, compromising quality of life and threatening eventual problems in performing paid work.

Osteoporosis-related bone fractures remain a significant public health problem, but previous studies did not emphasize osteoporosis-related pain. A recent study indicated that lumbar bone mass was associated with LBP in males (28). In contrast, Gaber et al. (40) found that patients with chronic LBP have an increased incidence of osteopaenia and osteoporosis, without determining the causal relationship between LBP and osteoporosis. Insufficient central axial skeleton support results in unbalanced bilateral paraspinal muscles, tendons and ligaments. Scoliosis or slippage of 1 vertebra onto another (spondylolisthesis) can also cause severe discomfort in the lower back. Ours is the first population-based study to investigate the positive association between osteoporosis and risk of LBP. We found that the independent association between frequent LBP and osteoporosis was more intense in men than in women. Men were more likely than women to be physical labourers, and this may increase the burden of osteoporosis contributing to increased risk of LBP.

Our study has several limitations. First, this study may be subject to recall bias due to use of self-reported information on LBP, lifestyle and medical history. Secondly, the current study’s cross-sectional design lacks a causal analysis between risk factors and self-reported LBP. Thirdly, psychological factors associated with LBP are not included in this study. Fourthly, patients with mild osteoporosis may not be included in this study because they did not seek medical care for this. Fifthly, our study did not include data on BMD, fragility fractures and medication for osteoporosis. Thus, the severity of osteoporosis and the causal relationship between osteoporosis and LBP could not be accurately assessed.

In summary, this population-based study of adults in Taiwan suggests that sociodemographic factors and lifestyles were significantly associated with risk of LBP. It also demonstrates the influence of gender on osteoporosis and risk of LBP. This knowledge can support health initiatives to educate people to reduce body weight, refrain from smoking, exercise more and avoid osteoporosis in order to prevent LBP and reduce the huge burden of injury associated with it.

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