

Physicians as well as nonphysician health care professionals in Taiwan have higher risk for lumbar herniated intervertebral disc than general population

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Abstract

Physicians in Taiwan have long working hours and are at risk for inappropriate posture when handling patients, which may contribute to lumbar herniated intervertebral disc (L-HIVD). This study was conducted to delineate this issue, which is still unknown. This nationwide population-based cohort study was based on Taiwan National Health Insurance Research Database. We identified 25,428 physicians, 32,316 nonphysician health care professionals (HCPs), and an identical number of age- and sex-matched individuals from the general population. All individuals who had L-HIVD before 2007 were excluded. We compared the L-HIVD risk between physicians and general population, nonphysician HCPs and general population, and physicians and nonphysician HCPs by tracing their medical histories between 2007 and 2011. A comparison among physician specialties was also performed. Physicians and nonphysician HCPs had higher L-HIVD risk than the general population [odds ratio (OR): 1.149; 95% confidence interval (CI): 1.011–1.307 and OR: 1.220; 95% CI: 1.080–1.378, respectively]. Physicians did not have higher L-HIVD risk than nonphysician HCPs [adjusted OR (AOR): 0.912; 95% CI: 0.795–1.046]. Physician specialties of orthopedics and obstetrics and gynecology had a trend of higher L-HIVD risk than other specialties (AOR: 1.538; 95% CI: 0.805–2.939, and AOR: 1.306; 95% CI: 0.967–1.764, respectively). Physicians as well as nonphysician health care professionals in Taiwan have higher L-HIVD risk than the general population, which could be attributed to a probable role of long working hours. This result provides an important reference for the government to promote occupational health in health care professionals; however, further studies are warranted for the underlying mechanisms.

Abbreviations: AOR = adjusted odds ratio, CI = confidence interval, DM = diabetes mellitus, HCPs = health care professionals, HTN = hypertension, ICD-9-CM = International Classification of Diseases, Ninth Revision, Clinical Modification, LHID 2000 = Longitudinal Health Insurance Database 2000, L-HIVD = lumbar herniated intervertebral disc, NHIRD = National Health Insurance Research Database, OR = odds ratio.

Keywords: health care professional, lumbar herniated intervertebral disc, physician

1. Introduction

It is estimated that 84% of people suffer from lumbago at least once in their lifetime.^[1,2] Lumbago accounts for approximately 2.3% of all physician visits.^[1,2] Lumbar herniated intervertebral disc (L-HIVD) is one of the most serious causes of lumbago,

which is referred to as displacement of cartilage, fluid, or bone of an intervertebral disc outside the borders of the disc space or its joints.^[3] The affected patients always suffer for more than 6 weeks.^[1,2] The herniations can be focal or large displacements and are often classified into subtypes such as protruding,

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FKC, CCH, and SFW designed the study and wrote the manuscript. SFW performed the data analysis and wrote the manuscript. CCH, HJL, HRG, SBS, and JJW provided clinical experience and wrote the manuscript. CCH and SFW supervised the whole study. All authors read and approved the final manuscript.

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extruding, and bulging.^[3] L-HIVD may have a serious impact on the quality of life and may result in work restriction, absenteeism, or even the need to change jobs.^[4–6]

The risk factors of L-HIVD include male sex,^[7] older age,^[7] strenuous physical activity (e.g., repeated heavy lifting, twisting, or bending),^[7,8] family history, cigarette smoking, poor nutrition, obesity, pregnancy, and sedentary lifestyle.^[8] Health care professionals (HCPs) are at a high risk for L-HIVD due to their involvement in patient handling procedures such as lifting and moving patients.^[9–11] Most previous studies were conducted on nurses and rehabilitation professionals^[5,6,9–11] and covered all types of musculoskeletal diseases and not just L-HIVD. A specific study on HIVD showed that nurses had 2.48 times of L-HIVD risk than the general population.^[12] However, there is no report of L-HIVD in physicians in the literature. Therefore, we conducted a nationwide population-based study based on the National Health Insurance Research Database (NHIRD) to clarify this issue.

2. Methods

2.1. Data sources

We used the 2009 registry for medical personnel and the Longitudinal Health Insurance Database 2000 (LHID 2000) from Taiwan National Health Research Database (NHIRD) for this study. Taiwan launched a single-payer National Health Insurance program on March 1, 1995. As of 2014, 99.9% of Taiwan's population had been enrolled.^[13] The database of this program contains registration files and original claim data for reimbursement.^[13] Large computerized databases derived from this system by the National Health Insurance Administration, Ministry of Health and Welfare, Taiwan, and maintained by the National Health Research Institutes, Taiwan, are provided to scientists in Taiwan for research purposes.^[13]

2.2. Identification of study cohorts [physicians and nonphysician health care professionals (HCPs)] and comparison cohort (general population)

We identified all the physicians and nonphysician HCPs from the 2009 registry for medical personnel and general population from the LHID 2000 (Fig. 1). Nonphysician HCPs included pharmacists, medical technicians, audiologists, consultant experts, clinical experts, dieticians, social workers, and language experts who normally have “regular” or “less” working hours than physicians. Participants who had L-HIVD (International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM] code: 722.10, 722.52, 722.73, 722.93) before 2007 were excluded. Dual specialties (e.g., a physician having both boards of emergency medicine and internal medicine) were excluded due to the difficulty in assigning them into an individual specialty. The residents were excluded because the exposure time in the individual specialty was too short. Finally, we identified 25,428 physicians, 32,316 nonphysician HCPs, and an identical number of general population after matching HCPs and the general population with age and sex by a 1:1 ratio.

2.3. Comparison of the L-HIVD risk between HCPs and general population, physicians and nonphysician HCPs, and among physician specialties

After tracing their medical histories between 2007 and 2011, a comparison of L-HIVD risk between HCPs (physicians and

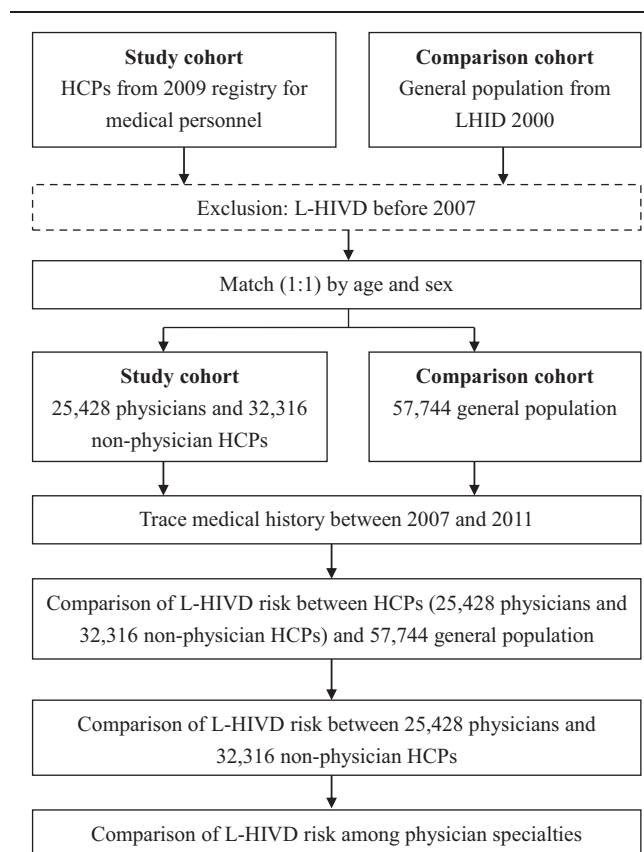


Figure 1. Flowchart of this study. HCPs=professionals, LHID=Longitudinal Health Insurance Database, L-HIVD=lumbar herniated intervertebral disc.

nonphysician HCPs) and general population was performed (Fig. 1). Comorbidities such as diabetes mellitus (DM) (ICD-9-CM code 250), hypertension (HTN) (ICD-9-CM code 401-405), and hyperlipidemia (ICD-9-CM code 272) were recorded in both cohorts. We also compared the L-HIVD risk between physicians and nonphysician HCPs and among physician specialties after excluding dual specialists and residents. Physician specialties were divided into internal medicine, pediatrics, obstetrics and gynecology (ob/gyn), emergency medicine, orthopedics, surgery, and other specialties.

2.4. Ethics statement

This study was approved by the Institutional Review Board at Chi-Mei Medical Center and conducted in accordance to the Declaration of Helsinki. Informed consent from the participants was waived because the NHIRD contains de-identified information. This waiver does not affect the right and welfare of the participants.

2.5. Statistical analysis

SAS 9.3.1 for Windows (SAS Institute, Cary, NC) was used for all analyses. The significance level was set at 0.05 (2 tails). For a comparison of the demographic characteristics and comorbidities, independent *t*-test and chi-square test were used for continuous variables and categorical variables, respectively. Conditional logistic regression was used to compare the L-HIVD risk between HCPs and general population. For a comparison of

Table 1
Demographic characteristics and comorbidities of physicians, nonphysician HCPs, and general population.

	Physicians (n = 25,428)	General population (n = 25,428)	P-value	Nonphysician HCPs (n = 32,316)	General population (n = 32,316)	P-value
Age, years	46.57 ± 10.70	46.57 ± 10.70	>.999	39.67 ± 11.09	39.67 ± 11.09	>.999
Age, years			>.999			>.999
0–34	3368 (13.25)	3368 (13.25)		12,904 (39.93)	12,904 (39.93)	
35–59	19,119 (75.19)	19,119 (75.19)		18,023 (55.77)	18,023 (55.77)	
≥60	2941 (11.57)	2941 (11.57)		1389 (4.30)	1389 (4.30)	
Sex			>.999			>.999
Male	21,628 (85.06)	21,628 (85.06)		11,768 (36.42)	11,768 (36.42)	
Female	3800 (14.94)	3800 (14.94)		20,548 (63.58)	20,548 (63.58)	
Comorbidity						
DM	1982 (7.79)	2258 (8.88)	<.0001	1480 (4.58)	1690 (5.23)	.0001
HTN	5840 (22.97)	4683 (18.42)	<.0001	3823 (11.83)	3517 (10.88)	.0001
Hyperlipidemia	5314 (20.90)	3134 (12.32)	<.0001	3144 (9.73)	2443 (7.56)	<.0001

Data are number (%) or mean ± standard deviation.
DM = diabetes mellitus, HCP = health care provider, HTN = hypertension.

the L-HIVD risk between physicians and nonphysician HCPs and among physician specialists, unconditional logistic regression was used after adjusting for age and sex.

3. Results

The mean ages and male ratios of physicians and nonphysician HCPs were 46.57 ± 10.70 years (mean ± standard deviation) versus 39.67 ± 11.09 years and 85.06% vs. 36.42%, respectively (Table 1). Regarding the age subgroups, a majority of participants were aged 35 to 59 years, with 75.19% physicians and 55.77% nonphysician HCPs. Both physicians and nonphysician HCPs had significantly higher cumulative incidence of HTN and hyperlipidemia but lower DM incidence than the general population.

The cumulative incidence rates of L-HIVD in physicians and nonphysician HCPs between 2007 and 2011 were 2.0% and 1.83%, respectively (Table 2). Male and female physicians had cumulative incidence rates of 2.06% and 1.68%, respectively. Conditional logistic regression revealed that physicians had a significantly higher L-HIVD risk than the general population [odds ratio (OR): 1.149; 95% confidence interval (CI): 1.011–1.307]. Nonphysician HCPs also had a significantly higher L-HIVD risk than the general population (OR: 1.220; 95% CI: 1.080–1.378).

Compared to nonphysician HCPs, physicians had no difference of L-HIVD risk in the overall analysis (OR: 0.912; 95% CI: 0.795–1.046) and in the stratified analysis according to sex after unconditional logistic regression (Table 3).

Table 2
Comparison of L-HIVD risk between HCPs (physicians and nonphysician HCPs) and general population by conditional logistic regression.

	Number (%)	OR (95% CI)	P-value
Physicians (n = 25,428)	509 (2.00)	1.149 (1.011–1.307)	.0337
General population (n = 25,428)	444 (1.75)	1.00	
Nonphysician HCPs (n = 32,316)	591 (1.83)	1.220 (1.080–1.378)	.0014
General population (n = 32,316)	487 (1.51)	1.00	

CI = confidence interval, HCP = health care provider, L-HIVD = lumbar herniated intervertebral disc, OR = odds ratio.

Comparison among physician specialties showed that the specialties of orthopedics and ob/gyn had higher L-HIVD risk than other specialties, but the difference was not significant [adjusted OR (AOR): 1.538; 95% CI: 0.805–2.939 and AOR: 1.306; 95% CI: 0.967–1.764, respectively], after unconditional logistic regression (Table 4). The specialty of emergency medicine had nonsignificantly lower L-HIVD risk than other specialties (AOR: 0.461; 95% CI: 0.170–1.251).

Table 3
Comparison of L-HIVD risk between physicians and nonphysician HCPs by unconditional logistic regression.

	Number (%)	AOR (95% CI)	P-value
Physicians (n = 25,428)	509 (2.00)	0.912 (0.795–1.046)*	.1883
Nonphysician HCPs (n = 32,316)	591 (1.83)	1.00	
Male			
Physicians (n = 21,628)	445 (2.06)	0.911 (0.778–1.068)†	.2518
Nonphysician HCPs (n = 11,768)	250 (2.12)	1.00	
Female			
Physicians (n = 3800)	64 (1.68)	0.934 (0.713–1.224)†	.6212
Nonphysician HCPs (n = 20,548)	341 (1.66)	1.00	

AOR = adjusted odds ratio, CI = confidence interval, HCP = health care provider, L-HIVD = lumbar herniated intervertebral disc.

* Adjusted by age and sex.

† Adjusted by age.

Table 4
Comparison of L-HIVD risk among physician specialties by unconditional logistic regression.

	Number (%)	AOR (95% CI)*	P-value
Physician specialty			
Internal medicine (n = 6365)	133 (2.09)	1.065 (0.851–1.334)	.5804
Pediatrics (n = 2883)	48 (1.66)	0.871 (0.633–1.199)	.3961
Ob/Gyn (n = 2119)	58 (2.74)	1.306 (0.967–1.764)	.0814
Emergency medicine (n = 514)	4 (0.78)	0.461 (0.170–1.251)	.1286
Orthopedics (n = 349)	10 (2.87)	1.538 (0.805–2.939)	.1923
Surgery (n = 3249)	64 (1.97)	0.963 (0.721–1.285)	.7955
Other specialties (n = 9949)	192 (1.93)	1.00	

AOR = adjusted odds ratio, CI = confidence interval, L-HIVD = lumbar herniated intervertebral disc, Ob/Gyn = obstetrics and gynecology.

* Adjusted by age and sex.

4. Discussion

This retrospective nationwide population-based cohort study showed that physicians as well as other nonphysician HCPs in Taiwan had significantly higher L-HIVD risk than the general population. There was no significant difference of L-HIVD risk between physicians and nonphysician HCPs. Regarding the physician specialties, orthopedics and ob/gyn showed higher trends of L-HIVD risk, while emergency medicine showed a lower trend than other specialties; however, all the differences were not significant. Despite the detailed mechanisms, these observations need a further study for clarification. However, this study has provided us nationwide and epidemiological evidence that could provide an important reference for the Taiwan government to promote occupational health in physicians and other HCPs.

The disc consists of 2 parts: the outer fibrous ring (annulus fibrosis) and the nucleus (nucleus pulposus), which is surrounded in the middle and lacks blood supply.^[14] When the body is twisted or broken (compression), the disc annulus maintains its integrity. When the spine is subjected to eccentric loading or torsional loading, microtrauma of the disc will occur.^[14] Repeated microtrauma can result in annulus cracks, dysfunction of the structure, and, finally, nucleus disc prolapse (HIVD).^[14]

L-HIVD is recognized as a type of occupational disease in several countries, including Germany, France, Denmark,^[15] some states of United States, Japan, Singapore, and Taiwan.^[14] Occupations involving frequently repeated heavy lifting and extreme bending have the highest risk, such as those of miners, stone workers, builders, garbage cleaners, porters, delivery men, butchers, HCPs (e.g., nurses and nurse assistants), farmers, and others with similar work styles.^[14] Occupations involving whole body vibration such as those of drivers and pilots also present a high risk.^[14]

Long working hours may lead to a lack of regular exercise and poor posture (e.g., standing, bending, or lifting the patient during operation), which are the risk factors for L-HIVD in physicians. A study in Taiwan^[16] reported that the total working hours (including clinical work, teaching, research, and administrative work) of attending physicians were 65.6 h/week in average, which is much higher than those in the United Kingdom (48 h/week),^[17] Norway (52.8 h/week),^[18] and the United States (53.9 h/week).^[19] The working hours of physicians were also higher than those of the general population, which are an average of 43.7 h/week in Taiwan.^[20] In the specialties of surgery (including orthopedics) and ob/gyn, the average working hours were even up to 72.8 h/week and 74.9 h/week, respectively.^[16] In contrast, physicians in the specialty of emergency medicine had lesser working hours (68.4 h/week) than those in surgery and ob/gyn.^[16] These reports may explain the higher trends of L-HIVD risk in the specialties of orthopedics and ob/gyn and the lower trends in emergency medicine in the present study. Because of the increasing prevalence of minimally invasive surgery (e.g., laparoscopic surgery), surgeons, including orthopedics and ob/gyn, have to maintain a static posture, which can contribute to more musculoskeletal disorders,^[21–23] such as L-HIVD, than those performing conventional operations. Other studies have also reported that the probable mechanism for such increased musculoskeletal disorders might be the long durations of static postures in laparoscopic surgery, which are closely associated with low-level muscle tension.^[21–23] Education for maintaining the correct posture helps surgeons prevent occupational diseases. A study among gynecology surgeons reported that correct

ergonomics is a learned and practiced behavior.^[23] Education on surgical ergonomic principles and common errors in surgical ergonomics can help gynecology surgeons counterbalance the sustained and awkward positions common during surgery that may lead to musculoskeletal disorders.^[23] Although the association between long working hours and L-HIVD risk seems reasonable, further studies for additional investigations, including work content, ergonomics, and mechanisms in physicians, are needed.

Despite the unique characteristic of this study, there were some limitations. First, we did not have detailed information on the level of work content including average hours worked per week and average years of employment, physical activity and lifestyle, family history, cigarette smoking, nutrition, and body mass index in the NHIRD, which may confound this study. It would be best to control for these variables to support the hypothesis that L-HIVD is associated with the type of work. Second, follow-up for 5 years may not be sufficient to assess the effect of occupational exposure. In addition, a short follow-up period may result in nonsignificant differences in the comparison among physician specialties (e.g., orthopedics and ob/gyn had a trend of higher L-HIVD risk than other specialties). A longer follow-up period may be needed to confirm this study in the future. Third, we did not have the data about education level, income level, and use of healthcare in this study. Comparison of type of education level, income level, and healthcare may help us realize overall health and the use of medical resources and severity of L-HIVD. Fourth, although this was a nationwide population-based cohort study, the result may not be generalized to other nations because of the different occupational workload, race, and culture.

5. Conclusions

This study showed that physicians as well nonphysician HCPs in Taiwan had significantly higher L-HIVD risk than the general population. Physician specialties of orthopedics and ob/gyn had higher trends but emergency medicine had a lower trend for L-HIVD risk. Long working hours, including possible standing, bending, and lifting during the operation, in physicians of orthopedics and ob/gyn specialties may play a role. This result provides an important reference for the government to make policies and promote occupational health for the physicians. Further study about the detailed mechanisms and longer follow-up period is warranted.

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