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# Psychiatric disorders after occupational injury among National Health Insurance enrollees in Taiwan



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## ABSTRACT

This study aimed to determine the incidence rates of psychiatric disorders within 1 year after occupational injury and to examine the association between occupational injury and the incidence of psychiatric disorders using National Health Insurance Research Database (NHIRD). We used cohort approach in this investigation. All eligible subjects were from the NHIRD, and aged 18–65 years old. A total of 542,208 patients were enrolled in this study. Among them, 1038 patients sustained occupational injury, 6891 patients sustained non-occupational injury. The reference group in this study was 534,279 patients who ever used the NHI for any medical condition in 2001. The incidence rates of any psychiatric disorders within 1 year after occupational injury (inpatient), occupational injury (outpatient), non-occupational injury (inpatient), non-occupational injury (outpatient), and any disease were 9.5%, 2.5%, 7.4%, 1.5%, and 1.1%, respectively. Occupational injury was found as a significant factor for developing psychiatric disorders within 1 year after the target injury. The incidence rate of any psychiatric disorders was higher in patients after occupational injury than those after non-occupational injury and any medical condition.

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## 1. Introduction

A number of studies have addressed that traumatic events or natural disasters may increase the prevalence rate of psychiatric disorders, for example, post-traumatic stress disorder (PTSD), major depression, anxiety, and phobia (Rubonis and Bickman, 1991; Garrison et al., 1995; Goenjian et al., 2000). Among abundant psychiatric disorders, PTSD is the most common psychiatric disorder being studied after traumatic events or injury (North et al., 1999; Norris et al., 2002). Other than PTSD, depression is also commonly observed following injury (Franche and Krause, 2002).

Only few studies examined the rates of psychiatric disorders after occupational injuries (Asmundson et al., 1998; MacDonald et al., 2003). In Taiwan, the previous study found that at 3 months after occupational injuries, a significant proportion of workers suffered from psychiatric disorders; however, the diagnosis of psychiatric

disorders was obtained by phone interview and not by face-to-face evaluation by a psychiatrist. Hence, the observed morbidity was only based on epidemiological criteria (Lin et al., 2012).

Therefore, we conducted a nationwide population-based study to determine the incidence rates of psychiatric disorders within 1 year after occupational injury and to examine the association between occupational injury and the incidence of psychiatric disorders by using the Taiwan National Health Insurance database.

## 2. Methods

The National Health Insurance (NHI) program in Taiwan has operated since 1995 and enrolls nearly all the inhabitants of Taiwan (21,869,478 beneficiaries among 22,520,776 inhabitants at the end of 2002) (Bureau of National Health Insurance, 2002). Currently, the National Health Insurance Research Database (NHIRD) at the National Health Research Institutes (NHRI) in Miaoli, Taiwan, takes charge of the complete National Health Insurance claims database, which is one of the largest nationwide population-based databases in the world. The NHRI has released a cohort dataset made of 1 million randomly sampled individuals who were alive in 2000 and collected all records on these individuals from 1995 onward. These random samples have been confirmed by the National Health Research Institutes to be representative of the Taiwanese population (Bureau of National Health Insurance, 2002). In this cohort dataset, each patient's original identification

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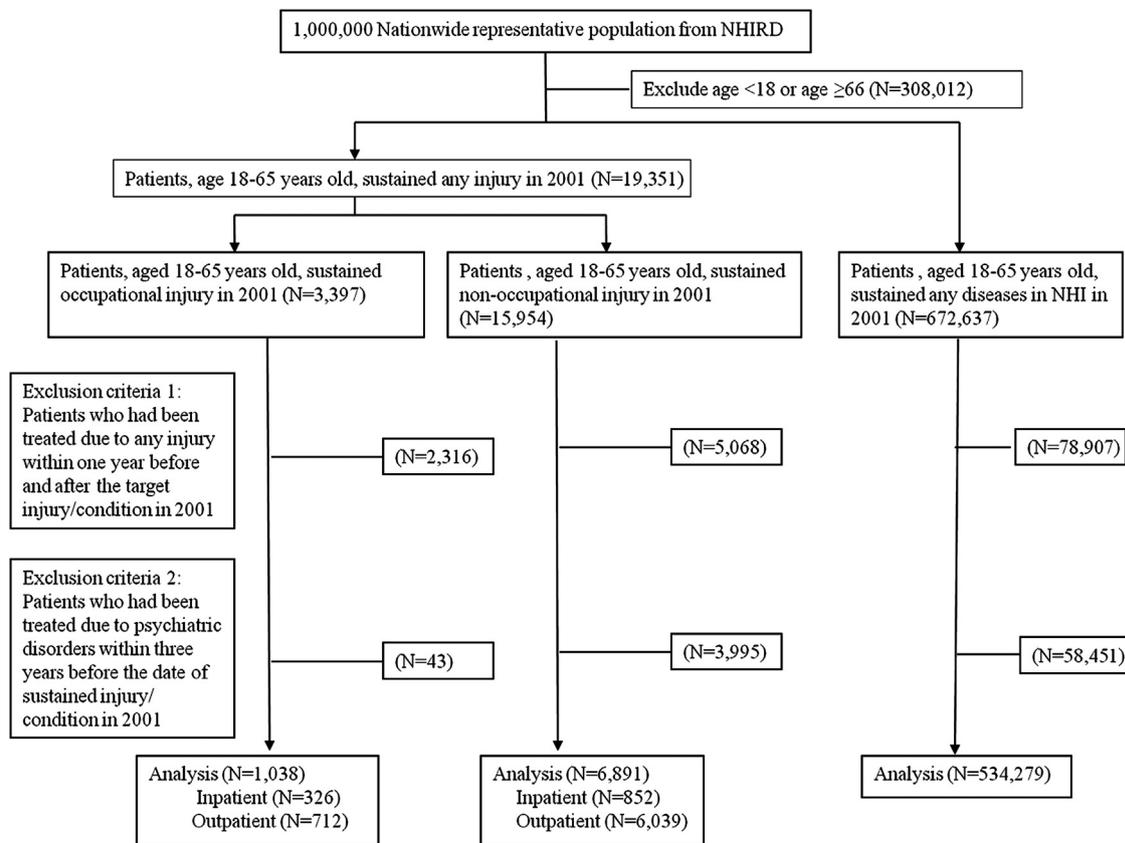


Fig. 1. The selection process of the study.

number has been encrypted to protect privacy. The encrypting procedure is consistent, so the linkage of claims belonging to the same patient is feasible within the datasets.

We used cohort approach in this investigation. All eligible subjects were from the NHIRD dataset, and aged 18–65 years old. First, we identified 19,351 patients who sought medical care for any injury (International Classification of Diseases, Ninth Revision, Clinical Modification codes, ICD-9-CM 800.xx to 999.xx) in 2001. These patients were divided into 2 groups according to whether the target injury was occupational (Gave Kind code 1) or not (Gave Kind code 3). In NHIRD, a column named “Gave Kind” indicated different types of conditions, including: “1” for occupational injury, “2” for occupational disease, “3” for non-occupational injury, and “4” for non-occupational disease. In addition, “occupational injury” is defined as any personal injury, disease or death resulting from an occupational accident; an occupational injury is therefore distinct from an occupational disease, which is a disease contracted as a result of an exposure over a period of time to risk factors arising from work activity (Guo, 2008). Those with “Gave Kind” of “1” and “2” received compensation from the Labor Insurance, and those with “3” and “4” from the National Health Insurance. Target injury is the very first occupational injury or non-occupational injury of 2001. Among those patients treated for any injuries, 3397 sustained occupational injury, and 15,954 non-occupational. A third cohort from the NHIRD dataset, the reference group in this study, was 672,637 patients, aged 18–65 years old, who ever used the NHI for any medical condition in 2001, and did not belong to either of the above groups. The first condition was used as the target condition. The patients who had been treated due to any injury within 1 year before and after the target injury/condition in 2001 and who had been treated due to psychiatric disorders (International Classification of Diseases, Ninth Revision, Clinical Modification codes, ICD-9-CM 290.xx to 319.xx) within 3 years before the date of target injury/condition were excluded. The selection process of the study is shown in Fig. 1. The outcome of this study was having psychiatric disorder(s) (ICD-9-CM 290.xx to 319.xx), especially the post-traumatic related psychiatric disorders, and seen in a medical care unit within 1 year after the target injury/condition. Monthly rates of psychiatric visits were also obtained by calculating the number of individuals visited psychiatric clinics in each month after occupational and non-occupational injuries.

SAS 9.1 was used for data management and computing. Statistical analysis was performed by using JMP 5.0. All data were expressed as the frequency (percentage) or mean  $\pm$  S.D. Continuous data between the different groups of patients were compared using analysis of variance (ANOVA). Categorical data between the different groups were compared using Chi-square test. The significance level was set at 0.05. Multiple logistic regression was used to determine the significant factors associated with psychiatric disorder. Moving average was used to provide

the trend of monthly rates of seeking psychiatric attention by measuring the difference between two successive data points.

### 3. Results

A total of 542,208 patients were enrolled in this study. Among them, 1038 patients belonged to the “occupational injury” group, 6891 patients belonged to the “non-occupational injury” group, and 534,279 patients in the reference group, who had ever used NHI for medical condition in 2001. In the occupational injury and non-occupational injury groups, the majority were males, and the average age was 35.6 years (S. D.=11.6) and 38.0 years (S.D.=13.5). On the other hand, the average age of the 554,959 referents was 37.7 years (S.D.=12.6), predominantly females (Table 1). The most frequent type of occupational injuries was open wound of upper extremities (25.7%), followed by fracture (25.0%), contusion (8.3%), open wound of trunk (8.3%), open wound of lower extremities (6.5%), etc. However, the most frequent type of non-occupational injury was contusion (17.3%) and open wound of upper extremities (17.3%), followed by open wound of lower extremities (12.0%), sprains and strains (9.9%), fracture (9.5%), etc. (Table 2).

The incidence rates of any psychiatric disorders within 1 year after the index events, namely, occupational injury that required inpatient treatment, occupational injury treated as outpatient, non-occupational injury that required inpatient treatment, non-occupational injury treated as outpatient, and any disease were 9.5%, 2.5%, 7.4%, 1.5%, and 1.1%, respectively. The incidence of PTSD within 1 year after occupational injury (inpatient), occupational injury (outpatient), non-occupational injury (inpatient), non-occupational injury (outpatient), and any disease was 1.8%, 0.3%, 1.1%, 0.02%, and 0.03%, respectively. In addition, the incidence of major depression within 1 year after occupational injury

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