



## A longitudinal cohort study of incidence rates of inguinal hernia repair in 0- to 6-year-old children

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Incidence rate

### Abstract

**Background/purpose:** This study provides epidemiologic data on the incidence of inguinal hernia repair in preschool children using the Taiwan National Health Insurance Research Database. We believe that the data on hernia repair in said database provide a close approximation of the true incidence of inguinal hernia in young children.

**Method:** A cohort of 1,073,891 deidentified individuals was randomly selected from an insured population of 23 million. Subjects born during the period 1997–2004 were followed from birth to 6 years. The chi-square test and logistic regression modeling were used for statistical analyses.

**Result:** A total of 92,308 individuals were born during the study period. Of these individuals, 3881 underwent hernia repairs. The cumulative incidence of hernia repair in children aged 0 to 6 years was 4.20%/7 years. The boy/girl ratio was 4.27:1 and the unilateral/bilateral ratio was 3.77:1. The incidence of hernia repair among boys was highest during the first year of life, but then decreased with age. In contrast, the incidence among girls remained stable during the first 6 years of life. Boys younger than 1 year had more bilateral repairs than boys in other age groups ( $p < 0.0001$ ) and girls had significantly more bilateral repairs than boys ( $p < 0.0001$ ). Subjects with a history of preterm birth also had a higher incidence of hernia repair than subjects who were born at full term (odds ratio = 2.34,  $p < 0.0001$ ).

**Conclusion:** Yearly incidence of hernia repair was obtained from a nationwide database. Some of the observations have not been reported elsewhere.

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Although inguinal hernia is common in children, few studies have focused on the prevalence or the incidence of this surgical problem. In most studies, the prevalence rates were investigated by estimation based on reports from physicians [1], hospital records [2], or student health surveys [3]. By definition, the incidence rate is the number of new

cases per population in a given time period, so a longitudinal observation of newly developed inguinal hernia is needed to estimate the incidence rate of the problem. In addition, to avoid bias of single institutional studies, a nationwide study will provide a better estimation of epidemiologic data on inguinal hernia.

The Taiwanese National Health Insurance (NHI) program, established in 1995, covers 99% of the population [4]. All inpatient and outpatient claims records of the NHI are recorded in the National Health Insurance Research Database (NHIRD) maintained by the Taiwan National Health Research Institute (NHRI), which provides a resource for analysis of Taiwan's population of 23 million individuals. Using this database, we were able to estimate the incidence of hernia repair in children ranging in age from 0 to 6 years in Taiwan.

## 1. Materials and methods

### 1.1. Data source

Based on the registration files and original claim data in the NHIRD, specific data subsets are constructed for research purposes. We used a subset of the NHIRD known as the Longitudinal Health Insurance Database 2005 (LHID2005), which is a sample of about 1 million beneficiaries randomly drawn from the 23 million individuals in the NHI registry of beneficiaries as of 2005 (individuals enrolled for all or any part of the year 2005) and contains all inpatient and outpatient medical claims for 1997 through 2010. There are no significant difference in gender distribution ( $\chi^2 = 0.008$ ,  $df = 1$ ,  $p = 0.931$ ) between the patients in the LHID2005 and the original NHIRD.

### 1.2. Study sample

This study focused on the incidence of first hernia surgery in 0- to 6-year-old children. We selected all subjects born from 1997 to 2004 from the LHID2005 and identified the subjects who had a hernia surgery procedure in the 7-year claims record (Fig. 1). Subjects with a diagnosis of inguinal hernia were defined as those who claimed a surgery procedure code 75607C (repair of inguinal hernia), or 88029C (repair of inguinal hernia less than 1 year old). We excluded subjects born before 1997 and those born after 2004.

Variables such as age at the time of hernia surgery, gender, history of preterm birth, and unilateral or bilateral repairs were analyzed. Preterm birth was defined as gestational age less than 37 weeks. The birth weight was obtained by ICD codes (*The International Classification of Diseases, Ninth Revision*), such as 765.11 (less than 500 g), 765.12 (500–749 g), 765.13 (750–999 g), 765.14 (1000–1249 g), 765.15 (1250–1499 g), 765.16 (1500–1749 g),

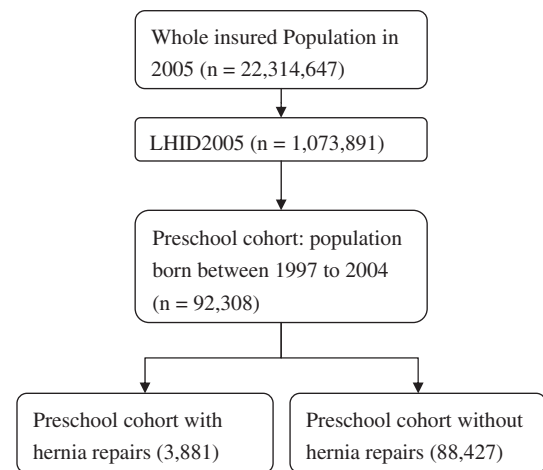


Fig. 1 Processing flow of the study cohort.

765.17 (1750–1999 g), 765.18 (2000–2449 g), and 765.19 (more than 2500 g). In this study, recurrent or subsequent contralateral hernias were not included.

### 1.3. Statistical analysis

Statistical analyses were performed using SAS® software, version 9.1 and PASW Statistics software, version 18.0. Continuous data are expressed as mean  $\pm$  SD. Two-sample *t*-test was used to compare the mean of continuous data. Percentages were calculated for categorical variables. The chi-square test or Fisher's exact test and logistic regression modeling were used to analyze categorical proportions. Magnitude and direction of trend were determined using Pearson correlation. A two-tailed *p* value of 0.05 or less was considered statistically significant. Incidence rate was calculated by dividing the number of individuals who had hernia repair by the total number of individuals.

## 2. Results

### 2.1. The study cohort

The annual numbers of newborns, from 1997 to 2004, were 13,961, 11,724, 12,442, 13,248, 11,097, 10,541, 9910, and 9385, respectively. In total, 92,308 newborns (48,304 boys and 44,004 girls) were observed from their births to the end of the sixth year (for a total of 7 years).

### 2.2. Estimated incidence rates

Of the 92,308 individuals, 3881 (3145 boys and 736 girls) underwent hernia repair. The cumulative incidence of hernia repair in the 0–6-year age group was 4.20%/7 years. The male-to-female ratio was 4.27:1. The numbers of unilateral and bilateral repairs at various ages are listed in Table 1.

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