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Impact of change in job status on mortality for newly onset type II diabetes patients: 7 years follow-up using cohort data of National Health Insurance, Korea

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SUMMARY

Objective: This study investigates the relationship between change in job status and mortality of newly diagnosed type II diabetes patients by gender.
Methods: Newly onset of individuals diagnosed with type II diabetes in the years 2003 and 2004, had 7 years follow-up using National Health Insurance Corporation (NHIC) sample cohort data. The individuals diagnosed with type II diabetes within this period were 14,861. After adjusting for age, initial income group, insulin treatment and medical service utilization, hazard ratio was analyzed using Cox's proportional hazard model.
Results: Mortality hazard ratio of continuously unemployed individuals is 3.78 times higher in males and 9.78 times higher in females than in those who keep their jobs. Also, individuals with a change in job status (e.g. from industrial worker to unemployed or self-employed), the mortality hazard ratio is 2.24 times higher in males and 5.23 times higher in females than in those who keep their jobs. The impact of change in job status change is largest for the middle class males. The middle class males has the higher mortality hazard ratio, 6.14 times in maintain unemployed and 4.12 times in change his job (industrial worker to unemployed or self-employer) than maintain one's job.
Conclusions: The continuous unemployment and the loss of job are related to risk of death in diabetic patients. The impact of unemployed is stronger than job change (loss or change). The impact of job status change is largest for the middle class man.

1. Introduction

The rapidly changing lifestyle and aging population are associated with increasing prevalence of chronic diseases, which has a negative impact on the quality of life and increases the burden on the medical care [1]. Diabetes has increased significantly since the 1990s in many countries in Asia including Korea. It is among the leading causes of death in Korea with a prevalence rate of about 5% and ranked as the fifth major causes of death within the population in recent years [2]. The healthcare cost associated with diabetes lead to considerable economic burden for individuals, society, and the nation [3,4]. Therefore, it has important implications for the health of the Korean people. In chronic diseases, such as diabetes, lifestyle management is very important as it may have a direct/indirect impact on individual's socio-economic status and occupation. In particular, individuals with diabetes turn to put in less working hours relatively to those without the disease [5]. Several studies suggest negative relationships between diabetes and employment [6–8]. Diabetes and its complications may have a direct effect on employment and job sustainability as it may leads to increase in absenteeism and low productivity at work, as well as discrimination during employment [6,9,10]. Also, people with diabetes may be physically and mentally challenged at work, coupled with their multiple sick leaves and in some cases early retirement which has a negative impact on productivity and the national economic growth [11]. By considering that unemployment is strongly associated with mortality on

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individual [12], the understanding that mortality and work productivity loss by job status and changes of people with diabetes, as well as empirical analysis is needed to prepare and minimize related health problems.

In this study, 7 years follow-up was performed for newly diagnosed type II diabetic patients using the sampled cohort data of National Health Insurance Corporation (NHIC) data. The purpose of this study was to verify the effects of a career change according to the risk of death by gender.

2. Methods

2.1. Data sources

Data used in this study is the 'sample cohort data' of NHIC, released in 2014. It is based on 2.2% sampling from subscribers of national health insurance and medical aid in 2002. It contains 1,025,340 individuals from the beginning, and there were some dropout due to death or some other reasons. To maintain consistency with the data, NHIC added some newborn cases to comprehend with it is loss/dropout by death. This is a dynamic retrospective cohort data. The NHIC claim data collected until 2010 for each sampled subject was release to the public in anonymity.

National Health Insurance (NHI) is the single insurer managed by the government in Korea. About 97% of Korean population is the mandatory subscribers of it and the remaining 3% is the Medical Aid subjects. NHI subscribers would be classified as industrial worker or self-employed. Premiums for the industrial worker are based on monthly income and for the self-employed are based on; income, property value, living standards, and economic activity rate. Both plans cover subscriber's dependent family members including spouses, direct ascendants and descendants of both the subscriber and spouse.

2.2. Study subjects

Subjects of this study include NHI subscribers eligible for industrial worker and their dependents who had diagnosed type II diabetes in 2003 and 2004. We regard first date of getting diabetes codes as the newly diagnosed day because the claim data has no registered date of diagnosis. The number of newly diagnosed type II diabetes patients in 2003 and 2004 was 29,395. The subjects of this study were limited to industrial workers and their dependents at one's initial point, because they have relatively clear employment status than the self-employed and the people subject to medical aid. From the total number of newly diagnosed type II diabetes patients in 2003 and 2004 (29,395), 15,337 (52.2%) people were industrial workers and their dependents. We excluded 468 patients who died within a year and 8 patients who did not receive any ambulatory care within 2 years. Finally, we have 14,861 newly diagnosed diabetic patients. And we observed death and change of job status for each case until 7 years (Fig. 1).

2.3. Economic status (Income level) and change of job status

The premium of industrial worker's is determined by their salary. Study data contains 10 levels of premium originally. In this study, the level categorized by low, middle and high in accordance with frequency and we used initial income level for each case.

Change of job status had grouped by its change between initial and last status of job. There were subscribers and their dependents in the beginning. And we may think subscribers has job and dependents has no job. Several kinds of changes were observed for each individual between two points and we categorized it by 3. The first category is maintaining unemployed status. The second one is maintaining one's job consistently or getting a job at last point who had no job at initial point. And the third one are includes the cases job status change for individuals who has job at initial point but has no job at last point and the cases job status change for individuals who has job at initial point but self-employer at last point.

2.4. Mortality

We observed where the death until 7 years for each case, respectively, even there were further follow-up data. In order to minimize the influence of the clinical characteristics, individuals who died or had no follow-up for outpatient within 2 years were excluded.

2.5. Diabetes treatments

Severity on diagnosis was controlled by adjusting insulin treatment within 6 months after diagnosis varies by oral medication, injection, both of them, and none.

2.6. Statistical analysis

Chi-square test and *t*-test were performed to determine the distribution and characteristics of the study subjects. For each male and female group, after adjusting for demographic and socio-economic status insulin doses, etc., we fitted mortality by economic status and job change to Cox's proportional hazards models using hazard ratios with 95% confidence intervals. SAS (version 9.2) was used for all procedures.

3. Results

Table 1 shows general characteristics of the study subjects. Among 7156 males and 7705 females, 695 (9.7%) males and 469 (6.1%) females died within 7 years. The numbers of deaths were elevated by increasing age. As for the deaths of men, unemployed accounted for 19.2% (n = 535) while maintain job accounted to 2.0% (n = 60). Among women, unemployed accounted for 7.5% (n = 452) while maintain job accounted to 0.2% (n = 2). There was significant difference in death for all baseline characteristic variables. In both men and women, the majority of subjects did not get insulin therapy. Also, clinics were the main attending medical institution used by subjects.

The survival probability of diabetic patients according to the employment status change were analyzed with Kaplan-Meier survival curves by sex (Figs. 2 and 3). For men, people who maintain their job has higher survival probability than those who were unemployed or who has changed employment status (Fig. 2). Women also have similar difference of survival probability among those groups, but the gap was lower in men (Fig. 3).

3.1. Risk of death by income group and change of job

Risk of death by income group and change of job status was analyzed using Cox's proportional hazard model adjusted with age, residence, insulin treatment, usage of medical service and number of diabetes complications and chronic disease. Risk of death for low income group is 1.37 times higher in men and 1.40 times higher in women than middle income group. Risk of death for high income group has no significant difference with middle income group (Table 2).

Mortality hazard ratio of continuously unemployed is 3.78 times higher in men and 9.78 times higher in women than those who keep their jobs. And if individuals changes his or her job status (industrial worker to unemployed or self-employer), the mortality hazard ratio is 2.24 times higher in men and 5.23 times higher in women than those who keep their jobs (Fig. 3).