Internet-based Control Recruitment for a Case–Control Study of Major Risk Factors for Stroke in Korea: Lessons from the Experience

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Background: This study aimed to estimate the population-attributable risks (PARs) of 9 major risk factors for stroke in Korea through a case–control study and to test the feasibility and validity of internet-based control recruitment. *Methods:* From April 2008 to September 2009, controls were enrolled via internet after providing consent for participation through a web-based survey. The cases included patients who were admitted to the participating centers due to acute stroke or transient ischemic attack within 7 days of onset during the study period. Each control was age- and sex-matched with 2 cases. Adjusted odd ratios, age-standardized prevalence, and PARs were estimated for the 9 major risk factors using the prevalence of risk factors in the control group and the age and sex characteristics from Korea's national census data. *Results:* In total, 1041 controls were matched to 2082 stroke cases. Because of a shortage of elderly controls in the internet-based recruitment, 248 controls were recruited off-line. The PARs were 23.44%, 10.95%, 51.32%, and 6.35% for hypertension, diabetes, smoking, and stroke history, respectively. Hypercholesterolemia, atrial fibrillation, obesity, coronary heart disease, and a family history of stroke were not associated with stroke. Comparison with education and religion of the control group with that mentioned in the national census data showed a notable difference. *Conclusions:* The study results imply that internet-based control recruitment for a case–control study requires careful selection of risk factors with high self-awareness and effective strategies to facilitate the recruitment of elderly participants. **Key Words:** Case-control study—internet-based study—risk factors—stroke.

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Introduction

The incidence of stroke varies by race and region.[1,2] This variation may be attributed partly to the difference in the prevalence of risk factors and the magnitude of stroke risk among different populations.[3,4] The epidemiologic term to express this variation is population-attributable risks (PARs), and knowledge about the PARs of major risk factors is essential in planning public health interventions.[5] Therefore, the prevalence and the magnitude of risk of individual risk factors in specific populations should be estimated.[6] The prevalence and PAR of stroke risk factors in Korea have been previously reported[7]; however, a relative risk derived from other non-Korean populations was used to calculate the PARs.

The application of web-based surveys have become popular, especially in social sciences[8] because of the ease of reaching participants, the ability to obtain information from large numbers of geographically dispersed participants, and the relatively low cost. Recently, a case–control study for recent-onset systemic lupus erythematosus revealed the feasibility and validity of an online approach in clinical researches.[9]

After considering that internet usage is quite high in Korea (77.1% in 2008),[10] we decided to perform a nationwide multicenter case–control study through the recruitment of control subjects via the internet. This type of recruitment process, however, was quite challenging, as the feasibility and validity have rarely been tested in stroke and cardiovascular research, where study subjects may be older and have limited internet access.[11]

This study aimed to estimate the prevalence, odds ratios (ORs), and PARs of the 9 major risk factors of stroke (hypertension, diabetes, hypercholesterolemia, smoking, atrial fibrillation, coronary heart disease, history of stroke, family history of stroke, and obesity) in Korea as well as to test the feasibility and validity of internet-based control recruitment for a case–control study.

Methods

In 2006, the Clinical Research Center for Stroke (CRCS) project, sponsored by the Korean Government, began with the purpose of improving the quality of stroke care mainly through developing and implementing clinical practice guidelines in Korea. The fifth section of the CRCS project (CRCS-5) is dedicated to epidemiologic studies for characterizing the epidemiology of stroke and the status of stroke care in Korea. The clinical and laboratory data of stroke patients admitted to university hospitals or regional centers (53 centers as of December 2011) were collected using a web-based database. The database was first established in March 2007 as a prospective multicenter stroke registry.

This study is a prospective, web-based, case–control study conducted by the CRCS-5. A total of 10 nationwide hospitals, who are participating in the CRCS-5, participated in this study.

Study Subjects

All study subjects were more than 20 years of age and lived in the central region of Korea, namely, Seoul, Gyeonggi, or Chungnam province, at the time of recruitment. The subjects were recruited from April 2008 to September 2009. The control subjects (controls) were selected from among people who had consented to participate in this study during a web-based survey. Those who were hospitalized due to stroke within the past 7 days of recruitment were excluded as controls. Patients who were admitted to the participating centers due to acute stroke or transient ischemic attack within 7 days of onset and had relevant cerebral lesions on computed tomography or magnetic resonance imaging were recruited as case subjects (cases).

Methods of Web-based Recruitment

The controls were recruited in several ways. First, the OK Cashbag (http://www.okcashbag.com/) platform, one of the largest web sites in Korea with about 15 million members, that is, almost one third of the entire Korean population, was used. Anonymous members of OK Cashbag were exposed to advertisements with banners and invitations on the bulletin board for this survey. As a reward, OK Cashbag points were given to those who completed the questionnaire. Second, the largest portal in Korea, Naver (http://www.naver.com/), was also used for the recruitment. Any search for "stroke prevention" using the Naver search engine generated an invitation to the blog introducing our survey. After finishing the questionnaire (Appendix), the participants were informed of their own risk for stroke during the next 10-20 years, which was estimated using the self-reported stroke risk factors and the stroke prediction model. Hence, a new stroke prediction model, applicable specifically to Koreans, was developed based on the Gail breast cancer prediction model.[12,13]

Third, considering the underuse of internet among elderly individuals, we planned a modified snowball sampling technique.[14] All subjects who completed the web-based survey received a message to invite their parents or older relatives to participate in this study. During the study, however, we found that internet-based snowball sampling was not adequate for recruitment. To make up for the lack of elderly participants in the control group, controls more than 55 years of age were additionally recruited directly from friends or families of cases or persons who attended the public education programs for the stroke prevention campaign, which was held at the participating centers during the study period.