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Factors associated with alcohol drinking behavior of cancer survivors: The Korean National Health and Nutrition Examination Survey

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ABSTRACT

Background: This study aimed to evaluate the factors associated with drinking behavior of cancer survivors after cancer diagnosis.
Methods: The study subjects were 906 adult cancer survivors who had reportedly drunk alcohol before cancer diagnosis and participated in the Korean National Health and Nutrition Examination Surveys conducted from 2007 to 2013. Among them, 360 abstained from alcohol drinking after cancer diagnosis. We categorized remaining 546 persistent drinkers into high-risk drinker (consuming ≥ 7 glasses of alcohol for men and ≥ 5 glasses of alcohol for women at one sitting at the frequency of at least once a month) or moderate drinker. We used multiple logistic regression analysis to evaluate risk factors associated with drinking behavior.
Results: The high-risk drinkers occupied 27.1% (148 survivors) of the persistent alcohol drinking survivors. Age increase (OR = 0.96; 95% CI 0.93-0.99), female sex (OR = 0.15; 95% CI 0.08-0.28), and increase of time lapse (by 1-year) after cancer diagnosis (OR = 0.94; 95% CI 0.92-0.97) were associated with a lower risk of high-risk drinking as compared with moderate drinking. Meanwhile, ≤ 9 years of education (OR = 1.99; 95% CI 1.10-3.60), alcohol-related cancer (OR = 2.09; 95% CI 1.23-3.56), and current smoking (OR = 1.92; 95% CI 1.03-3.59) were associated with increased risk of high-risk drinking of cancer survivors.
Conclusions: These findings suggest that greater efforts for preventing high-risk drinking should be laid on the cancer survivors, with consideration of individual sociodemographic characteristics, especially when the survivors had been diagnosed with alcohol-related cancer.

1. Introduction

Alcohol is a major cause of cancer. In 2012, 5.5% of all cancer cases and 5.8% of all cancer deaths were attributable to the consumption of alcohol worldwide (Praud et al., 2016). Site-specifically, cancers of the oral cavity, pharynx, larynx, esophagus, liver, breast, and colon and rectum have been significantly associated with alcohol (Baan et al., 2007; Nelson et al., 2013). The risk of alcohol-related cancers is increased with increasing amount of alcohol consumption (Bagnardi et al., 2015).

Recently, the number of people living with cancer has been markedly increasing due to the advances in early detection and treatment of cancer. When cancer survivor was defined as a person with any history of cancer, the number of cancer survivors (within 5 years of diagnosis) was estimated as 32.6 million in 2012 (Ferlay et al., 2012). Recent studies revealed that alcohol played an important role not only as a causal factor in the development of primary cancer but also as a prognostic factor of cancer. Alcohol consumption has an adverse effect on cancer treatment (Paull et al., 2004; Spies et al., 1996), prognosis of primary cancer (Kwan et al., 2010; Paull et al., 2005), and the risk of second primary cancer development (Day et al., 1994; Lin et al., 2005; Tabuchi et al., 2015). Given that drinking behavior is a modifiable factor, efforts to prevent alcohol drinking of cancer survivors are essential for improving their prognosis.

Despite the hazardous effects of alcohol on health, alcohol consumption tends to be generously accepted in a society and even encouraged, especially in Korea (Lee, 2004). Some studies reported a higher prevalence of heavy drinking among cancer survivors than among non-cancer subjects (Coups and Ostroff, 2005; Eakin et al., 2007; Linsky et al., 2011; Rebholz et al., 2012). A population-based survey showed that the prevalence of high amount of alcohol consumption was higher in cancer survivors than in non-cancer

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comparisons (24.0% versus 21.4%; Eakin et al., 2007). A study on adult survivors of childhood cancer reported a significantly higher prevalence of binge drinking as compared with general population (20% versus 9%; Rebholz et al., 2012). These findings call for active efforts to prevent alcohol drinking in cancer survivors, and identification of factors that are related with alcohol drinking behavior seems indispensable. The characteristic of cancer survivors to continue drinking alcohol might be applied to define a group of cancer survivors that require extensive intervention against alcohol drinking.

Only a few studies have evaluated the factors associated with drinking behaviors of cancer survivors. Previous studies were conducted involving limited type of cancer survivors, such as survivors from head and neck cancer (Allison, 2001) and childhood cancer survivors (Lown et al., 2008). Furthermore, other previously reported studies (Chun et al., 2015; Kim et al., 2013) compared the behavioral characteristics and health status between survivors of diverse cancers and people without a history of cancer. In these studies, young age (Chun et al., 2015; Lown et al., 2008), male sex (Allison, 2001; Chun et al., 2015; Lown et al., 2008), low education level (Lown et al., 2008), high household income (Chun et al., 2015), current smoking (Chun et al., 2015), early cancer stage (Allison, 2001), longer time since treatment (Allison, 2001), and initiation of drinking at a young age (Lown et al., 2008) were associated with increased risk of drinking alcohol. On the other hand, chronic disease (Chun et al., 2015) or cancers at some specific sites, such as the stomach (Chun et al., 2015; Kim et al., 2013), colon (Chun et al., 2015), and breast (Chun et al., 2015) were associated with a lower risk of alcohol consumption among cancer survivors. However, the factors influencing persistent drinking behavior of cancer survivors after cancer diagnosis have not been extensively evaluated.

Therefore, this study aimed to investigate the pattern of alcohol drinking behavior among adult survivors from cancers at various sites and to evaluate factors that increase the risk of high-risk drinking behavior in cancer survivors, using the more representative data from the Korean National Health and Nutritional Examination Survey (KNHANES).

2. Methods

2.1. Study participants

The study subjects were adult participants (≥ 20 years) of KNHANES conducted from 2007 to 2013. KNHANES is a nationwide cross-sectional survey program designed to assess the health and nutritional status of adults and children in Korea, which is being conducted by the Korea Center for Disease Control since 1998. The participants of KNHANES were selected by a complex, multi-stage probability sample design to represent the total non-institutionalized civilian population of Korea (Kim, 2014). Participation rate of the initially intended samples in the survey was 79.6% (58,423 of 73,414). Written informed consent was obtained from all the participants. The Korea Center for Disease Control opened the data from KNHANES to the public for health research after deleting any identifiable personal information. We used the open data for the present study after obtaining approval from the Institutional Review Board of Samsung Medical Center (SMC 2016-03-009).

Of 58,423 participants of KNHANES from 2007 to 2013, we excluded 57,154 because they were younger than 20 years of age (n = 14,791), did not have a history of cancer (n = 42,341), were missing for information on alcohol consumption (n = 22), had never drunk alcohol (n = 307), or reported to start alcohol drinking after cancer diagnosis (n = 56). Finally, 906 participants were included in our study (Fig. 1).

2.2. Measurements

All measurements of the KNHANES and laboratory tests were conducted by well-trained medical personnel. Information on demographic characteristics, past medical history of diseases (cancer, cardiovascular disease, diabetes mellitus, and depression), subjective stress, and health behaviors (smoking, alcohol drinking, and physical activity) were collected using a structured questionnaire.

We identified cancer survivors as those who answered 'yes' to the question 'Have you ever been diagnosed with any type of cancer by a doctor?'. For a subject who was identified as a cancer survivor, information on the type of cancer and age at the time of cancer diagnosis were collected. Subjects who had an uncertain type of cancer, a benign tumor, skin cancer, carcinoma in situ, or cancer that was ill-defined (malignant or benign) were not considered as cancer survivors and were excluded from the study. We categorized cancers of the oral cavity (n = 7), pharynx (n = 5), larynx (n = 12), esophagus (n = 8), colon (n = 104), rectum (n = 17), liver (n = 36), or breast (n = 107) as alcohol-related cancers (Baan et al., 2007; Nelson et al., 2013). Cancers of the brain (n = 7), thyroid (n = 136), other head and neck (n = 4), lung (n = 37), mediastinum (n = 1), stomach (n = 214), small intestine (n = 1), pancreas (n = 7), gallbladder (n = 1), biliary tract (n = 2), kidney (n = 19), bladder (n = 20), uterine cervix (n = 109), other uterus (n = 15), ovary (n = 15), prostate cancer (n = 39), osteosarcoma (n = 3), leukemia (n = 10), lymphoma (n = 9), and other endocrine malignancies (n = 1) were categorized as alcohol unrelated cancer. If a subject had multiple primary cancers and any of them were alcohol-related cancer, we classified the subjects as having alcohol-related cancer and used the age at diagnosis of the first cancer for the calculation of the time lapse after diagnosis. The time elapsed after the diagnosis of cancer was calculated by subtracting the subject's age at diagnosis from his/or her age at the time of the survey.

We identified the longitudinal change in drinking status of cancer survivors after cancer diagnosis, using the information about 'current alcohol drinking', 'age at survey', 'age at cancer diagnosis','age at starting alcohol drinking', and 'alcohol use during the last 1-year before survey' collected for the KNHANES survey. Then, we categorized the drinking behavior into three groups: 'never drinker' (those who have never consumed alcohol), 'quitter' (those who had drunk alcohol after cancer diagnosis, but recently abstained from drinking), and 'persistent drinker' (those who continued to drink alcohol after cancer diagnosis).

We collected the information about the age at the time of starting alcohol drinking, frequency of drinking, and the amount of drinking on one occasion. Subsequently, we calculated the duration of drinking by subtracting subject's age at starting alcohol drinking from the age at the time of survey. The amount of alcohol consumption was converted into the conventional unit of Korean *soju* (a glass that contains about 8 g ethanol). Using these detailed information on alcohol drinking, we further categorized persistent drinkers into two groups: 'high-risk drinker' for those who reported to have consumed ≥ 7 glasses of alcohol for men and ≥ 5 glasses of alcohol for women on one occasion, in a frequency of at least once a month; 'moderate drinker' for the remaining others, referring to the guideline by the US Department of Agriculture and US Department of Health and Human Services (USDA and HSS, 2010).

Current smokers included those who smoke every day or intermittently. Non-smokers included ex-smokers and never smokers. We categorized subjective stress into two levels: 'minimal to mild' or 'moderate to severe'. Physical activities (Coups and Ostroff, 2005) were classified into 'active' or 'inactive' on the basis of the intensity (walking, moderate intensity, and vigorous intensity) of the physical activity and expenditure of time for the activity. Physically active persons included those who were involved in walking