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Research Article

Prevalence and Influencing Factors of Metabolic Syndrome Among Persons with Physical Disabilities

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ABSTRACT

Purpose: Metabolic syndrome is an important cluster of coronary heart disease risk factors. However, it remains unclear to what extent metabolic syndrome is associated with demographic and potentially modifiable lifestyle factors among Korean persons with physical disabilities. This study aimed to determine the prevalence and influencing factors of metabolic syndrome among persons with physical disabilities using the Korean National Health Insurance Service–National Sample Cohort.
Methods: The Adult Treatment Panel III criteria were used to define metabolic syndrome influencing factors and prevalence, which were evaluated in a representative sample from the 2013 Korean National Health Insurance Service–National Sample Cohort database. Characteristics were compared based on frequency using the χ^2 test. The associations between metabolic syndrome and its risk factors were estimated using logistic multivariable regression analysis.
Results: Metabolic syndrome was detected in 31.5% of the surveyed persons with physical disabilities. Female sex, age of ≥65 years, smoking, greater alcohol consumption, physical inactivity, higher body mass index, and a family history of diabetes were associated with increased risks of metabolic syndrome.
Conclusion: The major risk factors for metabolic syndrome among persons with physical disabilities were obesity and older age. Performing physical activity was associated with a lower risk of metabolic syndrome. Therefore, we recommend using a continuous obesity management program and physical activity to prevent metabolic syndrome among persons with physical disabilities.

Introduction

Accidents, disasters, and diseases have caused the number of South Korean persons with disabilities to increase from 1,449,496 in 2000 to 2,726,910 in 2014, along with an increase in the prevalence of disability from 4.5% in 2005 to 5.5% in 2014 [1]. Despite increased social interest in the health of disabled persons, their mortality rate is four times higher than that of the general population [2]. With the exception of cancer, cardiocerebrovascular diseases are the leading cause of death among these individuals (530 deaths/year), which is more than five times higher than the corresponding rate among the general population [2]. Based on these results, it may be possible to reduce the mortality rate among disabled persons by preventing or managing chronic diseases that can cause cardiocerebrovascular diseases.

Metabolic syndrome is a clustering of 3–5 medical conditions, which are abdominal obesity, decreased high-density lipoprotein cholesterol (HDL-C), increased triglycerides, high blood pressure, and high blood sugar [3]. Metabolic syndrome is the main cause of cardiocerebrovascular diseases [3,4], and its adverse effects include diabetes [3,4], chronic degenerative diseases, and cognitive impairment [3]. In the United States, approximately 23.0–27.0% of the population has been diagnosed with metabolic syndrome [4], and the prevalence of metabolic syndrome in South Koreans was 22.1–27.8% [5]. Thus, approximately one-quarter of Korean adults were diagnosed with metabolic syndrome [5].

Disabled persons have a decreased ability to move and are 1.6 times more likely to be obese than nondisabled persons [6]. In addition, disabled persons have a 2.30 times higher risk of high blood pressure, a 3.90 times higher risk of diabetes, and a 6.50 times higher risk of cardiovascular diseases [7]. Nevertheless, despite their apparently greater risk of metabolic syndrome, there

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are insufficient data regarding the prevalence of metabolic syndrome among disabled persons. Furthermore, there are limited data among the South Korean population, with only one study revealing the prevalence of metabolic syndrome (43.2% among disabled persons who were aged ≥40 years in 2005) [8]. Moreover, the prevalence of metabolic syndrome is expected to continue increasing based on the prevalence of high blood pressure and diabetes, as well as changes toward a lifestyle with high-fat diets and limited exercise [3]. Therefore, additional research is needed to better understand the effects of metabolic syndrome on disabled persons.

As metabolic syndrome is associated with an elevated risk of mortality because of its various complications (e.g., heart disease and stroke), it is necessary to accurately identify the population-level characteristics of metabolic syndrome [4]. Thus, some studies have examined this topic and revealed that the risk of metabolic syndrome is affected by social factors, such as education, occupation, and marital status [9]. In addition, this risk is affected by psychological factors, such as stress [10], and lifestyle factors, such as drinking, smoking, and exercise [11,12]. However, only a limited number of studies have investigated the factors influencing metabolic syndrome among disabled persons [13–15]. Furthermore, those studies examined visually impaired persons [13], mentally disabled persons [14], and adolescents with disabilities [15], which represent relatively small and limited groups (6.9–10.4% of the total disabled population) [1]. Moreover, those studies only revealed that a few factors influenced metabolic syndrome, such as obesity, exercise [13,15], and sex [14].

Persons with physical disabilities are defined as individuals with physical function disabilities in the external body structure as a result of congenital and acquired causes. These persons account for 52.4% of the total disabled population in South Korea [1], and 97.9% are persons with acquired physical disabilities [1]. These persons face physical challenges, negative emotions, social maladjustment, severed relationships, and physical function decline as a result of their sudden disability [16]. Moreover, these physical, psychological, and social problems ultimately have negative effects on health [16], with 75.5% of disabled persons having chronic diseases, such as high blood pressure and diabetes [1], which are associated with the risk of metabolic syndrome. Therefore, this study aimed to investigate the prevalence and influencing factors of metabolic syndrome among persons with physical disabilities. The results will provide basic data that are required to establish metabolic syndrome education and intervention programs for disabled persons.

Methods

Study design

This secondary data analysis study investigated the prevalence and influencing factors of metabolic syndrome among persons with physical disabilities using Korean National Health Insurance Service (NHIS) data [17].

Setting and sample

The data were used in accordance with the data provision and processing procedures of the NHIS. The NHIS sample cohort was created in 2002 to support academic studies of national health, medical treatments, and diseases. The database includes 1,025,340 persons, who represented 2.2% of the 46,605,433 eligible persons in 2002 and were extracted using proportional distributions. The database includes information regarding eligibility, health-care utilization, national health screening results, and health-care providers. The present study evaluated the eligibility data, which include demographic characteristics, and the national health screening data, which include the results of health behavior surveys and the main results of health screenings for individuals who were eligible for health insurance and medical care. In 2013, 234,428 of the 1,014,730 eligible persons had available national health screening data. Among the 234,428 persons, 13,181 persons were disabled, including 8,246 persons with physical disabilities. The present study evaluated data from 8,237 persons with disabilities, after excluding nine persons with missing data that were required to estimate the metabolic syndrome index.

Ethical considerations

This study's protocol was approved by the Institutional Review Board of D University (201704-HR-012-02). Q1

Measurements

Demographic characteristics

The demographic data included sex, age, income level, and severity of disability. Age was categorized as 20–44 years, 45–64 years, and ≥65 years. Income level was categorized into eleven groups, which were subsequently reclassified as levels 0–2, 3–7, and 8–10. Severity of disability was divided into severe disabilities (grades 1–2) and mild disabilities (grades 3–7).

Metabolic syndrome

The metabolic syndrome criteria were based on the outcomes of a meeting between several major organizations attempting to unify their criteria [18]. However, a World Health Organization report ("Asia-Pacific Perspective: Redefining Obesity and its Treatment") recommends using waist circumference values of ≥90 cm for Asian men and ≥80 cm for Asian women [19]. Thus, for the present study, the criteria for diagnosing metabolic syndrome were (1) waist circumference of ≥90 cm for men and ≥80 cm for women, (2) triglyceride levels of ≥150 mg/dL, (3) HDL-C levels of <40 mg/dL for men and <50 mg/dL for women, (4) blood pressure of ≥130/85 mmHg, and (5) fasting blood glucose levels of ≥100 mg/L.

Health behaviors and characteristics

Health behaviors and characteristics were defined as smoking habits, drinking habits, physical activity habits, body mass index (BMI), and a family history of cardiovascular disease. Smoking was evaluated based on total pack-years (PYs), and was categorized as 0 PYs, 0–15 PYs, 15–30 PYs, and >30 PYs. Drinking was calculated by multiplying the number of drinking days per week and the amount of alcohol consumed per day, based on the amount of alcohol contained in one serving of Soju (50 mL, 250 g of alcohol per liter of Soju) [11]. Drinking amounts per week were categorized as 0 g, 0–200 g, 200–400 g, and >400 g. Physical activity was calculated and classified in accordance with the criteria of the International Physical Activity Questionnaire [20], which assigns weights of 8.0 metabolic equivalents of task (MET) per minute for intense activities, 4.0 MET per minute for moderate activities, and 3.3 MET per minute for light activities, such as walking. The number of activities per week was multiplied by the activity time (minute) and MET weight to calculate the total weekly value, which was categorized as Category 1 (inactive), Category 2 (minimally active, at least 600 MET-minute/week through intense physical activity for >20 minute on 3 days/week or moderately/light physical activity for ≥30 minute on 5 days/week), or Category 3 [health-enhancing physical activity (HEPA), at least 3,000 MET-minute/week through physical activity on all 7 days]. BMI was categorized as underweight (<18.5 kg/m^2), normal weight (18.5–22.9 kg/m^2), and obese (≥23 kg/m^2) [19]. A family history of cardiovascular disease was

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