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Review Article

Dietary Issues and Challenges on Cardiometabolic Health in Korea: From a Viewpoint of a National Nutrition Surveillance System

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ABSTRACT

A national nutrition surveillance system is an essential instrument for the detection of nutrition and nutrition-related health problems that can assist on policy implementation. The role of nutritional surveillance in detecting trends of nutritional problems and predicting their risks has become more important as its strong scientifically based method and evidences may provide insights on chronic disease risks. In this review, we attempted to identify dietary issues of Korean cardiometabolic disease (CMD) based on the national nutrition surveillance system and addressed gaps and limitations in the system. In addition, an alternative way on how the system can overcome these problems with the view of ultimately improving public health in Korea was discussed.

Keywords: Nutrition surveillance; Cardiometabolic disease; Dietary risk; Policy; Nutrition policy

Nutrition surveillance system is an essential instrument for detection of nutrition and nutrition-related problems that can assist policy implementation [1]. It is defined as a regular and timely collection, analysis and reporting of data on nutrition risk factors, status and related diseases in a given population. In the process, it is able to provide information that indicates probable nutritional problems within subgroups, helping not only monitoring the effectiveness of existing nutritional policies, but also serving as guidance for new ones [2,3]. Since numerous studies have verified the relationship between nutritional factors and risk of chronic diseases [4-7], nutritional surveillance to detect trends on nutrition challenges and predicting their accompanying risks has become more important. It is clear that effective national intervention is vital for substantial public health improvement. In this regard, evaluation of policy and program's effectiveness is performed to provide necessary feedback to find ways on how it can be continuously improved. In this review, we attempted to identify dietary issues of Korean cardiometabolic diseases (CMDs), which includes hypertension (HTN), diabetes mellitus (DM), and dyslipidemia, based on the country's nutrition

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surveillance system, and addressed gaps and limitations in the system. Finally, we also suggested a possible plans on how the system can overcome these problems with the view of ultimately improving public health and nutritional issues in Korea.

NUTRITION SURVEILLANCE AND NUTRITION POLICY IN KOREA

Since nutrition policies and programs aim to improve public health, they require good measure of outcomes which show strong evidence of success in the policies or programs are required and achieved primarily through a nutrition surveillance system. As chronic diseases become public health issues worldwide, a number of governments have started utilize nutrition surveillance systems to generate empirical evidence for health policy and promotion models. For example, in 1978, National Nutrition Council of Finland made a first recommendation for sodium intake reduction. This resulted in the legislation in 1993 that labels sodium content in food [8]. Consequently, Finland's systematic approach resulted in a lower average intake of sodium nationwide by over 40%. Average blood pressure also decreased, and risk of dying of stroke also went down by 80% [9]. The similar measure was taken by Canada against trans fat, implementing a food-labelling regulation first for packaged goods in 2003, then was later on expanded to those in retail in 2005 [10]. According to a 2006 study, total trans fat in human breast milk decreased from 4 g per person a day in 1998 to 2.2 g per person a day in 2005, which meant significant decrease of trans fat intake for lactating women and infants [11]. These national policies can be established and monitored through a nutrition surveillance system, which does not only provide current health and nutritional status of population, but also evaluates the over-all health care system and health behavior of entire population. In Korea, similar policies to reduce sodium and trans fat intake were also implemented. For the former, policies formed part of the “National Nutrition Care/Management in Korea,” implemented in various sectors such as education in school meals, manufacturing in processed foods and hotel and restaurant for their own menus. In 2012, the Korea Center for Less Sodium Campaign was launched with a target of reducing sodium intake by 20% by 2020 [12]. According to Korea Health Statistics, average sodium intake decreased from 4,516.9 mg in 1998 to 4,027.5 mg in 2013 [13], which reflects the policy's effectiveness to some extent. For trans fat, Korea Food and Drug Administration (KFDA) amended regulations to include trans fat on nutrition labeling of processed foods in 2006, before becoming mandatory after 2007. According to a report of the Ministry of Food and Drug Safety, the average amount of trans fat per serving was substantially decreased from 0.7 g in 2005 to 0.05 g in 2012 in 147 snacks [14]. Recently, action plan for sugars reduction was established in 2016. Even though the average sugar intake statistics were 72.1 g among Koreans in 2013, which may not be a critical level for health. However the intake level of sugar has been continuously increasing [15]. As a periodical measure of Korea's nutrition surveillance system, Korea National Health and Nutrition Examination Survey (KNHANES), has been established and operating since 1998. Results of the survey are used in goal-setting, assessment of national health plans, and developing strategies for public health programs [16]. KNHANES provides information on health determinants, risks of diseases, and nutritional trends to support Korea's health promotion model. It is critical that scientific evidence is used in the national level since any policy implemented would affect not only one's lifestyle and health-related behavior, but those of an entire population. Thus, it is essential to comprehensively assess what kind of factors influenced nutrition and health conditions in the past which ables to identify methods to further improve them in the future. Nutrition surveillance carry out a series of monitoring, guidance and assessment taken together.

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DIETARY ISSUES FOR KOREAN CMD BASED ON THE RESULTS FROM KNHANES 2008–2011 AND ANSUNG–ANSAN COHORT

CMD is a leading cause of global deaths killing one million people annually [17]. In Korea, more than 81% of deaths were recorded from non-communicable diseases [18]. Prevalence of CMD risks consisting of DM, HTN, and dyslipidemia has shown a continuously increasing trend, according to KNHANES 2013. As such, CMD is expected to increase the morbidity and mortality of cardiovascular diseases (CVDs) by 2030. Indeed, it was reported that the CMD risks are highly interrelated and associated with increased risks for CVD [19]. Besides usual contributing factors for CMD such as genetic background, age, obesity, physiological markers (blood lipid profile, blood pressure, inflammatory markers, and etc.), nutritional aspects have been considered as generally modifiable for the management of CMD. Recently, a new comprehensive literature review and data analyses, supported by the Korea Centers of Disease Control and Prevention (KCDC), were conducted on the current nutritional issues attributable to CMDs of Korean population, and furthermore to determine possible nutritional challenges that may help improve cardiometabolic health [20]. This effort can eventually assist the establishment of a national nutritional priority and policy for the prevention of CMDs.

In the process, dietary risks for cardiovascular health including HTN, DM, and dyslipidemia in Korea were first considered based on existing literature. Global dietary risks categorized as convincing and probable evidence based on World Cancer Research Fund and World Health Organization were taken into consideration. In addition, domestic nutrition data from KNHANES 2008–2011 and Ansung–Ansan cohorts were utilized and approved by the Institutional Review Board at the Korea University (KU-IRB-15-EX-256-A-1) for data analysis to identify contributing dietary factors for Korean CMD for supplementary use. The association between dietary risk factors and CMD was estimated through logistic regression in KNHANES, and the relationship was predicted by cox regression in Ansung–Ansan cohorts. Statistical analysis was performed from both KNHANES and Ansung–Ansan cohorts, thus the strong evidence may be derived from different study design. Participants included in the analysis of KNHANES and Ansung–Ansan cohorts were selected similar as possible. Age was limited 35–65 years in KNHANES and 40–65 years in Ansung–Ansan cohorts. In both data, participants who were missing value for sampling weight were excluded. Participants on a diet for the CMD, and who had implausible intake (< 500 kcal or > 5,000 kcal) were excluded from the analysis. Additional detailed information on the study description and statistical strategy can be available elsewhere [20]. Collectively, the results of both literatures review and statistical analysis revealed that low intakes of calcium and omega 3 (ω3) fatty acids were found to be associated with type 2 DM in Koreans. For HTN, low consumption of fruit, vegetable, milk, and ω3 fatty acids and high intake of kimchi, sodium, and carbonated beverage were associated with HTN. In the same statistical strategy, low intakes of fruit, whole grain, milk and high for carbonated drinks were also found as contributing factors for dyslipidemia, in addition to low calcium, ω3 and ω6 fatty acids. When considering evidence based results provided and potential risk distribution for dietary risks of interest, we concluded that low intakes of fruit, milk, and calcium and high consumption of carbonated beverages, sodium, and kimchi substantially contributed to CMD risks in Korean adults [20]. These results need to be taken into consideration when discussing public health nutrition policies. Along with dietary risks, socioeconomic

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status (SES) as measured by education level and/or income was also significantly associated with CMD risks in Koreans [20]. There is growing evidence that has indicated a rising contribution of SES to chronic diseases and related risk factors [21,22], making social disparities a concern when it comes to health outcomes. Consistent with the previously reported association between SES and metabolic syndrome (MetS) in the western population [23,24], significant association between education level as a proxy for SES and the prevalence of DM and HTN was observed in adults using a nationally representative Korean population [20]. Furthermore, gender-specific associations were also observed such that CMD was found to be more prominent in women than men. Seemingly, dietary components would mediate the correlation between SES and higher cardiovascular risk, highlighting the contribution of social dietary patterning to chronic disease conditions. It is well known that dietary choices are influenced by various factors covering individual, sociocultural, community, national, and global domains [17]. SES has profound effect on one's dietary choice, which is mostly altered by the person's social environment, not by his or her own effort [17]. As a result, significant association of individual SES with chronic diseases was consistently observed, which implies that appropriate national policy intervention is necessary.

GAPS AND LIMITATIONS IN THE NUTRITIONAL SURVEILLANCE OF CMD IN KOREANS

Based on recent statistical analysis from KNHANES and Ansung–Ansan cohort along with literature review published in Korea, the potential candidates for three major nutritional risk factors of CMD were; 1) a diet low in fruits but high in carbonated beverages, 2) high consumption of kimchi and sodium, and 3) a diet low in milk and calcium. Also in this report [20], SES, as measured by education level and/or income, was significantly associated with CMD risks, raising as well the possibility for dietary patterning in a gender-specific manner. However, there are some limitations to conclude that these risk factors were attributable to Korean CMD due to insufficient accumulation of scientific evidence conducted in this population. In addition, there is limited literature that shows the association of fiber, trans fat, and sugar content in processed foods to the disease in Korean population. Meanwhile, in contrast to observations in western societies, significant negative correlation was observed between consumption of meats including processed meat and chronic diseases in Koreans [20]. This may require further study to firmly conclude the observations. In order to collect timely information on emerging health issues, integration of data from the nutrition surveillance and third-party health surveys needs to be done to provide a comprehensive over-all assessment of the national nutrition policy. This, in turn, can lead to the discovery of potential nutrition risk factors backed with scientific evidences that may also help evaluate the efficacy of the nutritional surveillance system for public health improvement. In addition, it is critical to evaluate whether the existing nutritional program has been successful or not and be open for policy amendments with better public health as goal. Finally, it is also important to establish significant interaction and qualified infrastructure with other institutions in sustainable manner as an ongoing basis [25]. Through discussion and communication with government and institutions, it will be available to enhance the capacity of the surveillance system and take timely action.

In summary, providing scientific evidence is important on implementing a well-designed nutrition policy which may contribute to government's dietary guidelines. Along with reviewing existing literatures, we attempted to identify nutritional factors attributable to

Korean CMDs using Korean national nutritional surveillance system. In the process, we took note of several nutrition risk factors that lead to increase of CMD prevalence in Korean population. There were limitations and possible areas of improvement on the surveillance system to track better national trends and assist on policy agenda and suggestions regarding possible plans toward this, including a prescription to integrating government and third-party data for better analysis. The current findings may be applied to nutrition policy and health programs in Korea, fundamentally to improve public health in this population.

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