

# Promoting health behaviors for preventing and controlling noncommunicable disease among North Korean defectors: A systematic review

**Hyun-Young Shin**

Hanyang University College of Medicine

**Jung Eun Shin**

Yonsei University College of Nursing

**Seung Yon Baek**

Yonsei University College of Nursing

**Sang Hui Chu** (✉ [shchu@yuhs.ac](mailto:shchu@yuhs.ac))

Yonsei University College of Nursing <https://orcid.org/0000-0001-6877-5599>

---

## Research article

**Keywords:** North Korean defector, noncommunicable disease, health behavior

**Posted Date:** August 24th, 2020

**DOI:** <https://doi.org/10.21203/rs.3.rs-56017/v1>

**License:** © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License. [Read Full License](#)

---

## Abstract

**Background:** Recently, noncommunicable disease (NCDs) has emerged as a new major health issue in North Korea. However, studies on the prevalence of its risk factors and their related health behavior among North Koreans are lacking. The studies on North Korean defectors could help us in understating their awareness and health-promoting behavior as well as their vulnerabilities for metabolic diseases or NCDs under the current circumstances where South and North Korea have limited exchanges in the health and medical sectors. In this study, we reviewed the prevalence of risk factors or the health-promoting behavior related to NCD among North Korean defectors.

**Methods:** Search on the PubMed (MEDLINE), CINAHL, Cochrane Library, EMBASE, Korean Nursing Database, Korean Medical Database, KIHASA Repository, and RISS were performed. We included all study types reporting any type of risk factors or prevalence or health behaviors with the following inclusion criteria: (1) published in English or Korean; (2) NCD-related topic; and (3) age  $\geq 18$  years. The data were extracted independently by the 2 authors

**Results:** Finally, 22 studies were included in the analysis: 18 quantitative study and 4 qualitative studies, and among the quantitative studies, 5 studies had comparisons with South Koreans. The number of participants ranged from 8–932 participants, and 54.6%–100% of them were women. The survey using the questionnaires was the most popular research method. Data from objective measurements, such as body weight, waist circumference, blood test, and urine analysis were used in a few studies. North Korean defectors were found to have higher smoking rates, drinking rates, and increased abdominal obesity caused by the lack of awareness and management of risk factors since they moved to South Korea.

**Conclusions:** In this study, we showed that there were not enough studies related to NCDs and health behaviors among North Korean defectors. Nevertheless, North Korean defectors were found to be more vulnerable to NCDs, including metabolic syndrome. It is necessary to improve the awareness of NCD and its risk factors among North Korean defectors. Efforts for promoting North Korean defectors' health behaviors by the government and related professional organizations are needed.

## Background

Noncommunicable diseases (NCDs) have resulted in a significant public health burden. Globally, NCDs accounted for two-thirds of the total deaths, while communicable diseases and malnutrition accounted for only 25% [1]. In high-income countries, better access to services for prevention, early diagnosis, and management of individuals with NCDs or at high risk of developing NCD have reduced deaths from cardiovascular disease (CVD). On the other hand, the situation in low- and middle- income countries is quite different. NCDs have a deteriorating impact in low- and middle- income countries with limited resources [2]. Thus, the prevention and control of NCDs by promoting healthy behavior, such as physical activity, balanced nutrition, regular check-up, and treatment adherence have been a priority for most countries with aged population. North Korea seems to be no exception. Since North Korea entered the aging society in 2004, the proportion of the population aged 65 or older was expected to increase up to 9.5% in 2013, entering an aged society in the year of 2030 [3]

Currently, North Korea is experiencing a "double burden" of diseases, with the increased burden of NCDs along with the previously existing health problems, malnutrition, and communicable diseases. Previously, in the 1990s, North Korea faced food and energy crisis owing to the severe collapse of economic conditions with the loss of trade links with its longstanding economic and trading partners in the socialist alliance [4]. The economic crisis soon disrupted the operation of North Korea's public health system, which advocates "free medical care." The situation further aggravated with a series of natural calamities (floods, typhoons, and droughts), which resulted in food insecurity and caused a serious public health situation (malnutrition), particularly among women and children [4]. There was a lack of medicine supply from other socialist countries; malnutrition also led to increased communicable diseases, such as tuberculosis (TB) and malaria.

Since the 1990s, the international aid to North Korea have been focused on improving maternal and children health (MCH), immunization, and controlling communicable diseases. With the help of the international community and non-governmental organizations (NGOs), the recent updated report on MCH in North Korea indicated some improvement, and immunization services have also been improved with rates  $>90\%$  for most antigens [5, 6]. However, there is still much room to be improved in the MCH and communicable disease management.

In the midst of managing MCH and communicable diseases, NCDs have emerged as a new major health issue in North Korea [1, 7]. According to the report of the Institute for Health Metrics and Evaluation in 2015, the most common cause of death in North Korea was reported to be CVD accounting for 39% deaths, followed by the cerebrovascular disease with 21%, the rates of which have increased by 18% and 17%, respectively, compared to the last decade [8]. Tobacco usage, physical inactivity, excessive alcohol consumption, and unhealthy diets are the major risk factors for developing NCDs, thereby causing high blood pressure, hyperglycemia, elevated lipid profiles, and obesity [9]. However, studies on the prevalence of these risk factors and their related health behavior among North Koreans are still lacking. Therefore, research priorities need to be focused more on NCDs than on MCH and communicable diseases, which are currently the primary cause of morbidity and mortality in North Korea and is crucial for establishing an efficient health care policy for its prevention and control.

About 70 years of division between the two Korean countries have also led to differences in disease awareness, health behaviors, symptom expression, and an understanding of medical technology or information [10]. A higher prevalence of high blood pressure in men and low levels of high-density lipoprotein (HDL)-cholesterol in women were observed in North Korean defectors compared to those in South Koreans [11]. Although North Korean defectors were relatively more likely to have increased visceral obesity and metabolic syndrome after a short period of settlement in South Korea [11, 12], there has been not much information on their health promotion behaviors. The studies on North Korean defectors could help us in understating their awareness and health-promoting behavior as well as their vulnerabilities for metabolic diseases or NCDs under the current circumstances where South and North Korea have limited exchanges in the health and medical sectors.

In this study, we reviewed the prevalence of risk factors or the health-promoting behavior related to NCDs among North Korean defectors.

## Methods

In accordance with good practice for systematic reviews, the study was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guideline. Literature search on the PubMed (MEDLINE), CINAHL, Cochrane Library, EMBASE, Korean Nursing Database, Korean Medical Database, KIHASA Repository, and RISS were performed. Considering that there were not many studies conducted on North Korean defectors and no restrictions were imposed with regard to the year of publication at the initial search. Using the following key search terms (“North Korea\* Refugee\*” OR “Democratic people’s republic of Korea” OR “North Korea\* defector\*”), we looked at all of the research done on North Korean defectors for finding out as much as possible

We included all study types reporting any type of risk factors or prevalence or health behaviors with the following inclusion criteria: (1) published in English or Korean; (2) NCD-related topic; and (3) age  $\geq 18$  years. Dissertations, reviews, editorials, commentaries or unpublished articles were excluded. Study on psychology or psychiatry-related problems were also excluded. If multiple articles were published based on the same cohort study, the study containing the most complete or new information was selected.

Two authors (JES and SYB) screened all the articles by title and then by the abstract. Selected studies were then evaluated in greater depth based on the full text for the assessment of eligibility. If the reviewers disagreed, conflicts were resolved in consensus meetings with a third experienced researcher (SHC). Data were extracted independently by the 2 authors (JES and SYB) using a standard data extract form. We used a structured form for extracting standard information from each article, including general characteristics of participants, research purpose, comparators, measurements, and outcomes after several pre-testing, adjustments, and verifying the process for the appropriateness of the items contained and the consistency between the 2 different researchers. If different information were observed on the standard data extract form between the 2 researchers, consensus meetings with a third researcher were held repeatedly for confirming them. During the consensus meetings, individual observations were discussed, and the consensus was reached.

## Results

The systematic literature search process is illustrated in figure 1. Our initial search yielded 820 studies. After removal of duplications, 493 studies were reviewed by title and then by the abstract. From this review process, 50 studies were included for a full-text review for the eligibility assessment. Twenty-eight articles were excluded owing to following reasons: not relevant study ( $n = 14$ ), age  $< 18$  years ( $n = 10$ ), no information on age ( $n = 2$ ), participants were foreign immigrants ( $n = 1$ ), unavailability of full-text ( $n = 1$ ). Finally, 22 studies were included in our study for the final in-depth analysis.

The summary of the characteristics of selected studies is presented in Table 1. It includes 18 quantitative studies [10-27] and 4 qualitative studies [28-31]; among the quantitative studies, 5 studies report comparisons with South Korean people [11, 13-15, 22]. The number of participants in these studies varied from 8 to 932 participants, and 54.6%–100% of them were women. The survey using questionnaires was the most popular research method. Data from objective measurement such as body weight, waist circumference, blood test, and urine analysis were used in a few studies [12-14, 19]

**Table 1.** Summary of the selected studies

Selected studies	Study subject	Study design	Purpose	Measures
Quantitative studies				
Kim et al. (2018) [13]	NKD n = 932 M, 192; W, 740 Age, 43.8 ± 12.6 years SKN, n = 1834	Cross-sectional survey	To investigate and compare changes in mean BMI, WC and prevalence of general and central obesity among NKR in SK with SKN  To investigate factors associated with general and central obesity among NK	Health-related lifestyle factors: smoking, alcohol consumption, exercise WC, body weight
Song & Choi (2018)[14]	NKD n = 18 Age, 41.0 ± 10.0 years SKN, n = 472	Descriptive study	To compare the prevalence of NCD and CVD risk factors between NKR and SK	Questionnaires: Smoking status, alcohol intake, physical activity, history of medications for diabetes, hypertension, hyperlipidemia, weight gain, length of residence Weight, blood pressure, fasting blood glucose levels, kidney function
Kim et al. (2016) [11]	NKR, n = 708 M,161; W,547 Age; 46.9 ± 12.1years (M); 44.1 ± 11.0 years (W) SKN, n = 1,416	Cross-sectional survey	To determine the prevalence of metabolic syndrome and its related factors among NKR in SK population  To compare the prevalence with that in the general SK population	Disease history Health-related lifestyle factors: smoking, alcohol, exercise
Park et al. (2016) [15]	North Korean women who received a Pap smear within the last 2 years n = 385 Age, 42.92 ± 8.78 years SKN, n = 770	Cross-sectional survey	To identify the rate of cervical cancer screening of NKD and compare the rates with South Korean natives  To examine factors associated with cervical cancer screening among NKD	Cervical cancer screening questions
Hyun et al. (2015) [16]	North Korean immigrant women n = 103 Age, 36.4 ± 11.4 years	Cross-sectional survey	To identify the practice of BSE  To examine predictors related to the practice of BSE among NK female immigrants	BSE practice Education about BSE and breast cancer screening
Wang et al. (2014) [17]	NKD n = 498 M, 101; W, 397 Age, 35.8 ± 8.3 years	Cross-sectional survey	To investigate the self-rated health status of NKD who have lived in SK for a specific period of time  To identify the factors related to their self-rated health status	Special characteristics: duration of residence in South Korea, satisfaction with support from South Korea government, satisfaction with current life, traumatic experiences in North Korea/during escape Health-related factors: disability status, chronic diseases, drinking habits
Kang et al. (2012) [18]	NKI n = 96 M, 16; W, 80	Cross-sectional survey	To identify the relationships between health status including objective health status and subjective health perception HPLP II	Subjective health perception HPLP-II: responsibility for health, exercise, diet, spiritual growth, interpersonal relationship, stress management
Kim (2009) [19]	NKR n = 61 M, 20; W, 41 Age, 38.5 years	Descriptive study	To identify subjectively perceived health status, health problem, food intake, exercise, smoking, drinking, stress and social support	Questionnaires developed by authors: health status, cancer screening, diet, exercise, smoking, drinking, stress, social support Nicotine dependency [18] Alcohol addiction Stress checklist Interpersonal support evaluation
Choe et al. (2012) [20]	NKD n = 410 M, 104; W, 306 Age, 50.8 ± 0.79 years	Descriptive study	To identify health knowledge, health-promoting behavior and factors influencing health-promoting behavior	Health knowledge HPLP-II Perceived health status Perceived barriers to health-promoting behavior Self-efficacy: responsibility for health, exercise, diet, self-belief, interpersonal relationship, stress management Social support: professionals, family, friends
Jeon & Park (2012) [21]	NKR n = 304 M, 99; W, 205 Age, 38 years	Descriptive study	To identify health beliefs and health behavior  To identify factors associated with health behavior	Health belief HPLP
Yoon & Kim (2005) [22]	NKD who have lived in South Korea for more than 6 months n = 306 M, 139; W, 167 SKN, n = 7919	Descriptive survey	To examine the health condition, disease morbidity, and medical service utilization in SK	Perceived health status Disease morbidity Medical service utilization
Kim et al. (2016) [23]	Male NKR n = 272 Age, 35.9 ± 11.3 years	Retrospective & descriptive study	To evaluate the smoking pattern and nicotine dependence  To identify psychological and psychosocial states associated smoking	Smoking history Smoking cessation history Nicotine dependence (Fagerström test) Social nicotine dependence (Kano test, KTSND)
Jeong et al. (2017) [12]	NKR n = 149 M, 26; W, 123 Age, 48.5 ± 12.1 years	Cohort study	To understand changes in body weight and food security over relocation, and current food and nutrient consumption in SK	Body weight Food security Diet: dietary habits, food consumption, energy and nutrient intake
Jeon et al. (2018) [24]	Female NKD n = 131 Age, 37.86 ± 10.18 years	Cross-sectional survey	To examine sexual knowledge, sexual attitude, stress coping and resilience, and their related factors	Sexual knowledge Sexual attitude Stress coping Resilience
Lee & Shin (2018)[25]	Female NKD n = 61 Age, 25.7 ± 4.0 years	One group pre/post design	To evaluate the impact of a mobile video program on NKD women's health behavioral change	Knowledge of vaginitis and cervical cancer Behavioral confidence on prevention and management for vaginitis and cervical cancer
Jeon& Lee (2018)[26]	NKD n = 129 M, 40; W, 89	Nonequivalent control-group pre-post test design	To evaluate the customized oral health promotion program	PRECEDE-PROCEED model
Song et al. (2018) [10]	NKD n = 399 Age, 41.0 ± 10.0 years	Cross-sectional survey	To determine the association between health literacy and use of preventive healthcare services	Health literacy Influenza vaccination coverage Medical check-up rates
Um et al. (2018)	NKR	Cross-sectional	To investigate the determinants of NKR'	Basic communication

[27]	n = 168 M, 49; W, 115	survey	trust in SK health service	Health communication Experience of health service
Qualitative studies				
Kim et al. (2017) [28]	NKR who had lived in South Korea for more than 1 year n = 8 All women Age, 49.8 ± 11.9 years	Qualitative study	To understand factors influencing Pap test use	Semi-conducted interview
Hong(2015) [29]	NKD n = 17 M, 4; W, 13 South medical providers, n = 12	Qualitative study	To investigate the differences between the views of NKD and their medical providers in regard to the prescription non-adherence and the causes of those differences	Three group interviews Individual interview
Choi & Choi (2009) [30]	Saetomins who have visited a hospital with at least one chronic disease in South Korea n = 11 M, 3; W, 8 Age, 60.1 ± 8.1 years	Qualitative study	To explore treatment-seeking behavior	Semi-conducted interview
Chung et al. (2018)[31]	Women NKD n = 10 Age, 55-73 years	Qualitative study	To explore and describe the health-seeking experience of women NKD	In-depth, unstructured interview

*Abbreviation:* NKD, North Korean defectors; M, Men; W, Women; SKN, South Korea natives; NK, North Korea; BMI, body mass index; WC, waist circumference; NKR, North Korean refugees; SK, South Korea; NCD, noncommunicable disease; CVD, cardiovascular disease; BSE, breast self-examination; NKI, North Korean immigrants; HPLP, Health Promoting Lifestyle Profile; KTSND, Kano test for social nicotine dependence

Table 2 shows the variables that were investigated in the selected studies by classifying them into 4 categories: non-communicable disease, health promotional lifestyle, self-rated health status, and others.

**Table 2.** Results of selected quantitative studies

Selected Quantitative studies (years)	Non-communicable disease/ cancer related	Health promotional lifestyle				Self-rated health status	Others	Outcomes
		Smoking	Drinking	Exercise	Nutrition			
Kim et al. (2018)[13]	<p>□ Mean BMI: men NKRs with &lt;5 years after defection, 22.6; men SKN, 25.2 (p&lt;0.001); the trend in the change in mean BMI by duration after defection in males (5-10 years, 23.0; years ≥10 years, 24.1, p = 0.012)</p> <p>□ Obesity prevalence (≥10 years after defection): men, 34% vs. 39% (NKR vs. SKN, p = 0.690); women, 23% vs. 27% (NKR vs. SKN, p = 0.794)</p> <p>□ Mean WC: men NKRs with &lt; 5 years after defection, 80.1 cm; SKN, 84.8 cm (p &lt;0.001); the trend of the change in mean WC by duration after defection in males (5-10 years, 81.0 cm; ≥10 years, 84.0 cm, p = 0.032)</p> <p>□ Central obesity prevalence (≥10 years after defection): men, 21% vs. 24% (NKR vs. SKN, p = 0.642); women, 22% vs. 20% (NKR vs. SKN, p = 0.382)</p>	Current smoker: men, 48.0%; women, 1.1%	Frequent alcohol consumption: men, 70.8%; women, 61.0%	Regular exercise: men, 58.2%; women, 48.8%			□ Positively associated factors: male, age, long duration after defection (≥ years); central obesity, age	
Song & Choi (2018)[14]	<p>□ General obesity: NKR, 36.8%; SKN, 26.7% (p = 0.031)</p> <p>□ Abdominal obesity: NKR, 7.7%; SKN, 18.4% (p = 0.005)</p> <p>□ non-communicable disease (HTN, DM, hyperlipidemia or albuminuria): no group difference</p> <p>□ A low estimated glomerular filtration rate (eGFR): NKR, 52.1%; SKN, 29.9% (p = 0.001)</p>	Smoking 11.9%	Alcohol intake 72.1%	Physically active 6.8%			□ The prevalence of low eGFR was associated with length of residence in SK (OR, 2.84; 1.02-7.89)	
Kim et al. (2016) [11]	□ Metabolic syndrome: men NKR, 19.7%; women NKR, 17.2% (No difference between NKR and SKN)	Current smoker: men, 44.6%; women, 1.4%	Current alcohol consumption: men, 87%; women, 61.5%	Regular exercise: men, 35.3%; women, 24%			□ Excess weight gain (≥5%) in SK was significantly associated with metabolic syndrome among NKRs.	
Park et al. (2016) [15]	Cervical cancer screening rate: NKD, 42.44%; SKN, 70.22% (p < 0.001)						□ NKD aged 30 years (p < 0.0 or married (p < 0.001) were likely to receive appropriate cervical cancer screening compared to SKN	
Hyun et al. (2015) [16]	BSE performance: 17.6%					Bad perceived health status: 80.2%	□ Bad perceived health status (OR 5.3; CI, 1.74-16. and no education about breast cancer screening/the breast examination (OR 10.5; CI: 2. 43.96) was associated with BSE practice.	
Wang et al.			Drinking			Self-rated	□ Lower health status	

(2014) [17]				pattern: once or less/m, 25.5%; twice or more/m, 31.3%			health: 2.78 ± 1.14 out of 5	was related v women (p < 0.001), elderly (p < 0.001) or had low annual household income (p = 0.017), chronic diseases < 0.001). Higher self-rated health status v associated v settlement in for 18 months more (p = 0.001), satisfaction v government support (p = 0.001) or their current (p = 0.001), more traumatic events experienced in North Korea (0.039) (R <sup>2</sup> = 0.001).
Kang et al. (2012) [18]				Physical activity, 1.71 (1-4)	Nutrition, 2.25 (1-4)	Current poor health status, 40%	HPLP-II: 1.78 ± 0.35 (1-4)	Women (p = 0.001) normal weight overweight (p = 0.006) habitation over 1 year South Korea (p = 0.026) were related to the lower score of HPLP II.
Kim(2009) [19]	Early screenings rate of the major 5 cancer: gastric cancer, 31.1%; hepatoma, 27.9%; colorectal cancer, 13.1%; cervical cancer, 36.6%; breast cancer, 12.2%	Current smoking status, 26.2%; nicotine dependency, 21.3%	Current drinking status, 37.7%	Regular exercise status, 32.8%	Regular food intake status, 55.7%	Current poor health status: 42.7%	Stress: 8.56 ± 5.08 (0-24) Social support: 24.20 ± 14.90 (0-54)	
Choe et al. (2012) [20]				Exercise, 2.23 (1-4)	Diet, 2.44 (1-4)	Perceived health status: mean, 4.16 (1-10)	Health knowledge: 0.43 ± 0.22 (0-1) HPLP-II: 2.38 ± 0.57 (1-4)	Factors influencing health-promoting behavior of participants were found to be self-efficacy (p = 0.001), social support (p < 0.001) and perceived barrier health-promoting behavior (p = 0.001) (R <sup>2</sup> = 0.001).
Jeon& Park (2012) [21]		Non-smoking, 2.9 ± 0.72 (1-4)	Reducing alcohol, 2.8 ± 0.66 (1-4)	Exercise, 2.6 ± 0.68 (1-4)	Dietary habit, 3.0 ± 0.5 (1-4)		Health beliefs: 2.8 ± 0.29 (1-4) HPLP: 2.9 ± 0.38 (1-4)	The factors influencing health behavior of NK refugees: perceived benefits (p = 0.001), self-efficacy (p = 0.001), the perceived health status in the target country (p = 0.031) and experience in being expelled to NK (p = 0.010)
Yoon & Kim(2005) [22]						Subjective health condition: NKD, 35.2%; SKN, 12.6%	Disease morbidity: NKD, 75.5%; SKN, 46% Medical service utilization: NKD, 64.8%; SKN, 87.6%	
Kim et al. (2016) [23]		Current smokers, 84.2%	Smoking initiation age, 18.2 ± 4.7 years	Fagerström test, 3.35 ± 2.26 (0-10);				

KTSND,  
13.76 ± 4.87  
(-30)

Jeong et al.  
(2017) [12]

▣Food security status:  
from 12.1% to  
61.7%  
▣Less food security in  
SK appeared in the  
body weight loss  
group than the  
other two  
(maintenance/gain)  
groups (p = 0.02).  
▣The body weight loss  
group showed the  
most irregular meal  
consumption  
pattern (p < 0.05).

Jeon et al.  
(2018) [24]

▣Sexual  
knowledge, 0.58  
± 0.11 (0-1)  
▣Sexual attitude,  
2.88 ± 0.36 (1-  
5)  
▣Stress coping,  
1.41 ± 0.50 (0-  
3)  
▣Resilience, 3.81  
± 0.72 (1-5)

The related factor:  
sexual knowledg  
the number  
countries bef  
entering So  
Korea (p = 0.00  
presence of  
member of  
lobar Party in tl  
family (p = 0.00  
perceived need  
sexual educati  
= 0.00  
experience of  
education in NK  
= 0.006), percei  
need for  
education at hc  
(p = 0.006)

Lee & Shin  
(2018) [25]

Perceived  
health  
status,  
3.66 ±  
0.66 (1-5)

▣Knowledge:  
total  
(pre/post),  
0.42 ±  
0.40/0.76 ±  
0.40 (0-1);  
vaginitis,  
0.29 ±  
0.48/0.68 ±  
0.45 (t = 6.84,  
p = 0.006);  
cervical  
cancer, 0.56 ±  
0.37/0.85 ±  
0.36 (t = 3.13,  
p = 0.015)

Jeon & Lee  
(2018) [26]

▣Program  
satisfaction:  
2.89 ± 0.29 (0-  
3)

▣Oral health belief  
= 0.004) and ora  
health knowledg  
were significantl  
improved (p =  
0.003) in  
experimental gr  
▣Oral health  
behaviors in  
experimental gr  
was significantly  
improved compa  
with controls (p  
0.05)

Song et al.  
(2018) [10]

▣Influenza  
vaccination  
coverage,  
31.1%  
▣Medical check-  
up, 58.5%  
(within 2  
years)

▣Better hea  
literacy sco  
were more likely  
have vaccinal  
(adjusted OR=2  
95%CI, 1.19-5.00)  
▣In subgroup  
analysis, NKD w  
lived alone (p =  
0.032), longer ti  
in other countrie  
before entering  
= 0.007)

Um et al.  
(2018) [27]

Self-rated  
health:  
poor,  
74.2%;  
good,  
42.3%

The determinants  
trust in SK hea  
services: durat  
of residence (p  
0.01), be  
communication  
skills (p < 0.00  
health  
communication  
skills (p < 0.00

*Abbreviation:* BMI, body mass index; NKR, North Korean refugees; SKN, South Korea natives; eGFR, estimated glomerular filtration rate; SK, South Korea; OR, odds ratio; CI, confidence interval; NKD, North Korean defectors; BSE, breast self-examination; HPLP, Health Promoting Lifestyle Profile; NK, North Korea; KTSND, Kano test for social nicotine dependence

### NCD-related studies

Three studies reported the prevalence of obesity and metabolic diseases. In comparison with South Korean natives (SKN), one study showed that the obesity and central obesity prevalence rate in North Korean refugee (NKR) men increased by duration after defection, and all the prevalence rates were comparable to those of SKN for both the genders after >10 years of defection (obesity prevalence NKR vs. SKN: men, 34% vs. 39%,  $p = 0.690$ ; women, 23% vs. 27%,  $p = 0.794$ ; central obesity, 21% vs. 24%,  $p = 0.642$ ; and women, 22% vs. 20%,  $p = 0.382$ , respectively) [13]. Our results are similar with another study wherein the excess weight gain after defection was associated with metabolic syndrome with similar prevalence rate of metabolic syndrome between NKR and SKN (men, 19.7% vs. 26.2%,  $p = 0.134$ ; and women, 17.2% vs. 16.6%,  $p = 0.757$ , respectively) [11]. Another study showed no group difference in the prevalence of NCDs, such as hypertension, diabetes mellitus, and hyperlipidemia; however, general obesity of NKR was higher (NKR vs. SKN, 36.8% vs. 26.7%,  $p = 0.031$ , respectively) and abdominal obesity of NKR was lower than that of South Korean counterparts (NKR vs. SKN, 7.7% vs. 18.4%,  $p = 0.005$ , respectively) [14].

### Health promotional lifestyle studies

The health behaviors of North Korean defectors are summarized in terms of smoking, drinking, exercise, and nutrition in Table 2. The rate of current smokers among NKR was 11.9% [14], 26.2% [19], and 84.2% [23]. The rate of current smokers in men was 48.0% [13] and 44.6% [11]. One study reported that 21.3% of the smokers were nicotine dependent [19], and the other study demonstrated low to moderate dependent status on nicotine with a score of 3.35 out of 10 (Fagerström test for nicotine dependence) [23]. Moreover, the scores of health behavior for non-smoking and preventive behavior for smoking were 2.9 out of 4 (health-promoting lifestyle profile, HPLP) [21].

The current drinkers comprised of 72.1% [14] and 37.7% [19]. Two studies reported that the current drinkers among men were 70.8% [13] and 87% [11]. The rate of alcohol consumption more than once a month was 56.8% [17]. The score of health behavior for reducing alcohol consumption was 2.8 (HPLP, range 1–4) [21].

For exercise, 6.8% [14], 32.8% [19], and 58.2% [13] of the North Korea defectors were reported to exercise regularly, and 35.3% [11] in men were also reported to do regular exercise. The score of health behavior for exercise was 1.71 (HPLP-II, range 1–4) [18], 2.23 (HPLP-II, range 1–4) [20], and 2.6 (HPLP, range 1–4) [21].

In case of nutrition, 55.7% had regular meals [19], and food security status, which includes food consumption with sufficient amount and various kinds of food, improved from 12.1% when staying in North Korea to 61.7% while staying in South Korea [12]. Less food security status was shown in terms of the body weight loss group, which includes the most irregular meal consumption pattern, than the body weight maintenance or gain group ( $p < 0.05$ ) [12]. The scores of health behavior for dietary habit were 2.25 (HPLP-II, range 1–4) [18], 2.44 (HPLP-II, range 1–4) [20], and 3.0 (HPLP, range 1–4) [21].

For cancer screening rate, 42.44% [15] or 36.6% [19] of NKR had a cervical cancer checkup and other major cancers were also screened [19]; gastric cancer, 31.3%; hepatoma, 27.9%; colorectal cancer, 13.1%; and breast cancer, 12.2%.

### Self-rated health status studies

Subjectively reported health conditions were found in 8 studies (Table 2). Among North Korean defectors, 40% [18], 42.7% [19], and 74.2% [27] rated their subjective health status as poor. Even 80.2% North Korean women reported their health status as poor [16]. Compared with 12.6% of South Korean natives, 35.2% of NKR had poor health status [22]. It is also reported that the mean scores of perceived health status were 2.78 (range 1–5) [17], 4.16 (range 1–10) [20], and 3.66 [25].

### Others

This category included a variety of variables, including sub or total score of HPLP [18, 20, 21], medical service utilization [22], health-related [20] or sex-related knowledge and attitude [24, 25], and vaccination coverage [10].

### Qualitative study

Among the 4 qualitative studies, 1 study investigated factors affecting cervical cancer screening [28], 2 studies for treatment adherence [29, 30], and 1 study for health-seeking experience [31] (Table 3). NKR commonly had poor or mistaken knowledge about cervical cancer [28] as well as symptoms associated with psychological/socio-cultural influence and the concept of staged treatments [29]. They also had incorrect awareness or mistrust that “cancer is a fatal disease” [28] or “medical environment in South Korea did not offer appropriate treatment for their physical health problems”, while they did not know that they were antibiotic-resistant [29]. The NK women defectors also reported a low level of awareness of diseases, not to have known about CVD such as hypertension, hypotension, diabetes or any other disease until their first health check-up after they entered South Korea. Furthermore, they were reported to express discomfort and uneasiness with the unfamiliar South Korean health care system and the economic burden to afford a healthy life under the act-based reimbursement system with the fees charged for diagnosis, treatment, and medication. [31].

**Table 3.** Results of selected qualitative and review studies

Selected studies (years)	Outcomes
Kim et al. (2017) [28]	<ul style="list-style-type: none"> <li>□Barrier factors               <ul style="list-style-type: none"> <li>individual level: lack of knowledge about cervical cancer and Pap test, cancer worry, unfamiliar with receiving preventive care and concerns about cost</li> <li>community level: negative health outlook such as viewing cancers as fatal diseases</li> </ul> </li> <li>□Facilitator factors               <ul style="list-style-type: none"> <li>interpersonal level: social support from family, female healthcare providers</li> <li>systemic level: free screening programs</li> </ul> </li> </ul>
Hong(2015) [29]	The cause of prescription non-adherence: <ul style="list-style-type: none"> <li>physical symptoms vs. psychological/socio-cultural influences</li> <li>trust in self-diagnosis and established beliefs vs. suspicion caused by this trust and these beliefs</li> <li>lack of medical treatments appropriate for NKD vs. the presence of tolerant bacterial strains</li> <li>slow and ineffective due to capitalism vs. lack of understanding the concept of staged treatments</li> </ul>
Choi & Choi (2009) [30]	<ul style="list-style-type: none"> <li>□New experience related to treatment: physical abnormalities that were discovered after arriving in South Korea, an unfamiliar treatment environment, the cost and the benefit of the medical treatment, and an increased concern about one's improving health</li> <li>□Types of treatment seeking behavior: being compliant with medical care, managing symptoms with self-treatment, and seeking complementary and alternative treatment</li> </ul>
Chung et al. (2018)[31]	The 4 categories of health-seeking experience: finding out about my own body, confusion regarding the medical treatment, and enjoying the health care benefits, and protecting my own health

Abbreviation: NKD, North Korean defectors

## Discussion

As far as we know, this is the first systematic review of the health-promoting behaviors of North Korean defectors, which can indirectly represent North Koreans. In this study, we showed that there were not enough studies related to NCDs and health behaviors of North Korean defectors. Nevertheless, North Korean defectors were found to be more vulnerable to NCD diseases, including metabolic syndrome, owing to higher smoking rates, drinking rates, and increased abdominal obesity caused by lack of awareness and management of risk factors since they moved to South Korea.

Owing to the nature of the closed and centrally controlled North Korean society, it is difficult to obtain secure reliable data on the health status of North Koreans or related factors. Although the rate of smoking and alcohol drinking of North Korean defectors varied among the studies [11, 13, 14], we have confirmed that there have been significant differences between the internationally reported smoking rate and drinking rate among North Koreans and those of North Korean defectors. According to a recent report on North Korean defectors in Hanawon (The Settlement Support Center for North Korean Refugees) where North Korean defectors lived for the first 3 months of settlement in South Korea, 84.2% of men were reported as current smokers, 12.5% as ex-smokers, and 3.3% as non-smokers [23], which is quite different from the North Koreans' smoking rate reported in the Tobacco Atlas in 2015 (37.3% smoking rate in men) and the World Health Organization's (WHO) report (46.1% smoking rate in men) [32, 33]. In addition, about 60%–80% of North Korean defectors reported frequent or daily alcohol consumption [11, 13, 14]. According to the WHO 2018 report, the average daily intake of pure alcohol in North Korea was 20.7 g (South Korea 34.6 g of pure alcohol), and the rates of heavy drinking episodes were 23.7% in men and 3.9% in women in North Korea, which were lower compared to 47.8% in men and 13.6% in women in South Korea [34-36].

In the comparative study about physical activity, different results for North Korea defectors and South Koreans were reported (physically active, North Korean defector 8% vs South Korean 67% [14], regular exercise in men 35.3%, women 24.0% among North Korean defector vs men 24.2%, women 18.5% among South Korean) [11]. Unbalanced nutrition intake was reported from 98.4% for North Korean defectors along with relatively low intake of protein, vitamins, and calcium [19]. Currently, with doubts regarding the reliability of health data generated in North Korea, the health data of North Korean defectors are important because the data can be indirectly represented for North Koreans.

We reviewed the best available data for demonstrating the North Korean defectors' health behaviors related to NCD in this study. North Korean defectors are reported to have a negative perception on their health status compared to South Koreans, and low literacy and knowledge of health have had a negative impact on their health behavior [10, 28, 29].

Altogether, North Korean defectors seemed to be more vulnerable to obesity and metabolic syndrome during settlement in South Korea, which are the major risk factors of CVD. Moreover, extreme stress during the process of immigration and settlement in South Korea may exacerbate North Korean defectors' unhealthy behavior [21]. These results are consistent with the results of previous studies that diabetes and cardiovascular disease are more prone to occur when defectors from poor countries move to developed countries owing to rapid lifestyle changes and more stress under the new environment [37, 38]. Overall, understanding the socio-cultural influences on North Korea defectors in advance is necessary for the development and implementation of tailored-health programs for North Korean defectors [30, 31]. It is essential to improve the awareness of health behaviors and disease status on CVD among North Koreans defectors. However, a recent review showed that the majority of NCD studies on North Korean defectors addressed mental health issue [39].

Establishing a systematic education program could dispel the misunderstandings and misperceptions related to health, which originated from cultural and social differences [10, 29]. South Korean government and the health care professionals should make efforts for preventing and intervening at an early stage of NCD diseases among North Korean defectors by sharing health data of all the North Korean defectors. However, since there were a limited number of participants (61–982) in the reviewed literature for this study, it seems necessary to disclose and share health-related data of all the North Korean defectors who were already established by the government for research purposes and for establishing an evidence-based clinical practice strategy.

There are several limitations to this study. First, the reviewed literature about North Korean defectors included mainly women and young adult group; therefore, a biased population might not be a representative sample of North Koreans, and hence, careful interpretation was needed. Second, the data from objective measurements, such as anthropometric or biochemical analysis, were included in a few studies. Third, North Korean defectors had different residence periods

in South Korea in each study. As the settlement period of migrants and the occurrence of NCD are closely associated, it is necessary to conduct large-scale cohort research on the health status of North Korean defectors to overcome these limitations.

## Conclusions

We reviewed the best available data for demonstrating North Korean defectors' health-promoting behaviors related to NCD. It is necessary to improve the awareness of NCD and its risk factors among North Korean defectors. Efforts for promoting North Korean defectors' health behaviors by the government and related professional organizations are needed. Developing a strategy for promoting North Korean defectors' health awareness and behavior, preventing or controlling NCD, and evaluating its effectiveness could further contribute to developing a healthcare delivery model, which is applicable to North Korea in the near future.

## List Of Abbreviations

NKD, North Korean defectors; M, Men; W, Women; SKN, South Korea natives; NK, North Korea; BMI, body mass index; WC, waist circumference; NKR, North Korean refugees; SK, South Korea; NCD, noncommunicable disease; CVD, cardiovascular disease; BSE, breast self-examination; NKI, North Korean immigrants; HPLP, Health Promoting Lifestyle Profile; KTSND, Kano test for social nicotine dependence; eGFR, estimated glomerular filtration rate; OR, odds ratio; CI, confidence interval; BSE, breast self-examination; KTSND, Kano test for social nicotine dependence

## Declarations

**Acknowledgments:** None

**Funding:** This work was supported by Yonsei University College of Nursing (6-2018-0135).

**Authors' contributions:** HYS contributed to the study design, analysis, and an initial draft of introduction and discussion. JES directed the study design, data collection, analysis, and contributed to an initial draft of methods and results. SYB assisted with the data collection and analysis and created a figure and tables. SHC contributed to the study design, analysis, and revisions to the article.

**Ethics approval and consent to participate:** Not required

**Consent for publication:** Not applicable

**Competing interests:** None applicable

**Data sharing statement:** No additional data are available

## References

1. Lee YH, Yoon SJ, Kim YA, Yeom JW, Oh IH. Overview of the burden of diseases in North Korea. *J Prev Med Public Health*. 2013;46(3):111-7.
2. Ezzati M, Pearson-Stuttard J, Bennett JE, Mathers CD. Acting on non-communicable diseases in low- and middle-income tropical countries. *Nature*. 2018;559(7715):507-16.
3. Choi J. An Analysis of demographic structural change in North Korea and its implications. *North Korean Stud Rev*. 2016;20(2):1-30.
4. Grundy J, Moodie R. An approach to health system strengthening in the Democratic Peoples Republic of Korea (North Korea). *Int J Health Plann Manage*. 2009;24(2):113-29.
5. Grundy J, Biggs BA, Hipgrave DB. Public Health and International Partnerships in the Democratic People's Republic of Korea. *PLoS Med*. 2015;12(12):e1001929.
6. WHO Vaccine-preventable disease: monitoring system. 2013 global summary (Democratic People's Republic of Korea). [https://apps.who.int/immunization\\_monitoring/globalsummary/countries?countrycriteria%5Bcountry%5D%5B%5D=PRK](https://apps.who.int/immunization_monitoring/globalsummary/countries?countrycriteria%5Bcountry%5D%5B%5D=PRK) Accessed 14 July 2019.
7. Hwang NM. Strategies and tasks in healthcare for Korean reunification. In: *Issue & Focus*. Korea Institute for Health and Social Affairs; 2014;240:1-8.
8. Institute for Health Metrics and Evaluation. <http://www.healthdata.org> Accessed 14 July 2019.
9. WHO. Noncommunicable disease. <http://www.who.int/mediacentre/factsheets/fs355/en> Accessed 14 July 2019.
10. Song IG, Lee H, Yi J, Kim MS, Kawachi I, Park SM. Health literacy and use of preventive health services among North Korean defectors in the Republic of Korea. *PLoS One*. 2018; 13(6):e0195964.
11. Kim YJ, Lee YH, Lee YJ, Kim KJ, An JH, Kim NH, Kim HY, Choi DS, Kim SG. Prevalence of metabolic syndrome and its related factors among North Korean refugees in South Korea: a cross-sectional study. *BMJ Open*. 2016;6(6):e010849.
12. Jeong H, Lee SK, Kim SG. Changes in body weight and food security of adult North Korean refugees living in South Korea. *Nutr Res Pract*. 2017;11(4):307-18.
13. Kim YJ, Kim SG, Lee YH. Prevalence of general and central obesity and associated factors among North Korean refugees in South Korea by duration after defection from North Korea: a cross-sectional study. *Int J Environ Res Public Health*. 2018;15(4):811.
14. Song YS, Choi SW. Low estimated glomerular filtration rate is prevalent among North Korean refugees in South Korea. *Korean J Fam Med*. 2018;39:161-67.

15. Park J, Kim H, Yang W, Lee H, Park SM. Cervical cancer screening and its associated factors among North Korean defectors living in South Korea. *J Immigr Minor Health*. 2016; 20(1):66-72.
16. Hyun MY, Song HJ, Lee EJ, Hong SC, Kim SY, Lee CH. Predictors of breast self examination practice among North Korean immigrant Women. *Korean J Health Promot*. 2015;15(1):9-15.
17. Wang B, Yu S, Noh J, Kwon YD. Factors associated with self-rated health among North Korean defectors residing in South Korea. *BMC Public Health*. 2014;14:999.
18. Kang Y, Ha Y, Eun Y. Health status and health-promoting lifestyle profile II of North Korean immigrants. *J Korean Acad Community Health Nurs*. 2012;23(3):231-43.
19. Kim Y. A survey on the health status of North Korean refugees in a region. *J Korean Soc Emerg Med*. 2009;13(1):5-18.
20. Choe MA, Yi M, Choi JA, Shin G. Health knowledge, health promoting behavior and factors influencing health promoting behavior of North Korean defectors in South Korea. *J Korean Acad Nurs*. 2012;42(5):622-31.
21. Jeon JH, Park Y. The effects of individual characteristics and health beliefs on North Korean refugees' health behavior. *J Korean Acad Community Health Nurs*. 2012;23(1):82-90.
22. Yoon IJ, Kim S. Health and medical care of North Korean defectors in South Korea. *Health and Social Science*. 2005;17:149-82.
23. Kim SW, Lee JM, Ban WH, Park CK, Yoon HK, Lee SH. Smoking habits and nicotine dependence of North Korean male defectors. *Korean J Intern Med*. 2016;31(4):685-93.
24. Jeon JH, Kwon MO, Kim H, Jung Y, Hwang SM, Ha B. Sexual knowledge, sexual attitude, stress coping, and resilience of North Korean female defectors. *Journal of Military Nursing Research*. 2018;36(1):22-34.
25. Lee MK, Shin G. A mobile video intervention for women's health of North Korean defectors. *Public Health Nurs*. 2018;35:558-62.
26. Jeon K, Lee S. Evaluation of customized oral health promotion program for North Korean defector. *J Korean Acad Oral Health*. 2018;42(4):109-17.
27. Um TR, Lee TH, Lee EJ, Jin KN. Determinants of North Korean refugees' trust in South Korea health service. *Health Policy and Management*. 2018;28(1):70-6.
28. Kim K, Kim S, Chung Y. A qualitative study exploring factors associated with Pap test use among North Korean refugees. *Health Care Women Int*. 2017;38(10):1115-29.
29. Hong SJ. Not at all effective: differences in views on the causes of prescription non-adherence between North Korean defectors and medical providers in South Korea. *J Immigr Minor Health*. 2015;17(3):867-84.
30. Choe MA, Choi JA. A study on treatment-seeking behavior of middle-aged and old-age saetomins in South Korea. *Journal of peace and unification studies*. 2009;1(1):285-316.
31. Chung CH, Kang HY. Health-seeking experience of North Korean women defectors in South Korea. *Public Health Nurs*. 2018;35:192-201.
32. The tobacco atlas. <https://tobaccoatlas.org/country/dpr-korea> Accessed 14 July 2019.
33. WHO. WHO report on the global tobacco epidemic. In: Country profile Democratic People's Republic of Korea. 2019. [https://www.who.int/tobacco/surveillance/policy/country\\_profile/prk.pdf](https://www.who.int/tobacco/surveillance/policy/country_profile/prk.pdf) Accessed 14 July 2019.
34. WHO. Management of substance abuse. In: Global status report on alcohol and health 2018. [https://www.who.int/substance\\_abuse/publications/global\\_alcohol\\_report/en](https://www.who.int/substance_abuse/publications/global_alcohol_report/en) Accessed 29 July 2019
35. WHO. Alcohol consumption: levels and patterns (Democratic People's Republic of Korea) [https://www.who.int/substance\\_abuse/publications/global\\_alcohol\\_report/profiles/prk.pdf?ua=1](https://www.who.int/substance_abuse/publications/global_alcohol_report/profiles/prk.pdf?ua=1) Accessed 29 July 2019.
36. WHO. Alcohol consumption: levels and patterns (Republic of Korea) [https://www.who.int/substance\\_abuse/publications/global\\_alcohol\\_report/profiles/kor.pdf](https://www.who.int/substance_abuse/publications/global_alcohol_report/profiles/kor.pdf) Accessed 21 Aug 2019.
37. Kaplan MS, Huguet N, Newsom JT, McFarland BH. The association between length of residence and obesity among Hispanic immigrants. *Am J Prev Med*. 2004;27(4):323-6.
38. Goel MS, McCarthy EP, Phillips RS, Wee CC. Obesity among US immigrant subgroups by duration of residence. *JAMA*. 2004;292(23):2860-7.
39. Park JJ, Lim AY, Ahn HS, Kim AI, Choi S, Oh DH, Lee-Part O, Kim SY, Jung SJ, Bump JJ, Atun R, Shin HY, Part KB. Systematic review of evidence on public health in the Democratic People's Republic of Korea. *BMJ Glob Health*. 2019;4(2):e001133.

## Figures

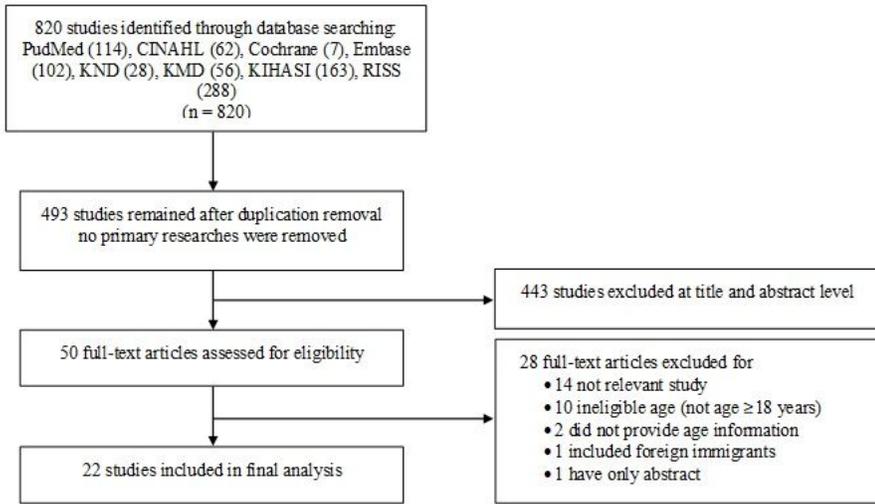


Figure 1

Literature searching flow diagram