

Risk Perceptions of Noncommunicable Diseases among Cambodian Adults: A Cross-Sectional Study

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Purpose: In Cambodia, noncommunicable diseases (NCDs) account for 64% of all deaths. A lack of risk perception of NCDs leads to poor measures of their prevention and management. This study aimed to investigate Cambodians' risk perceptions of NCDs based on the health belief model. **Methods:** A cross-sectional design was used, and using convenience sampling, participants included 200 Cambodians aged 40 years or older. A face-to-face administered structured questionnaire was used to assess demographic characteristics, health behaviors, and risk perceptions of NCDs. **Results:** Of the constructs of NCD risk perception, perceived severity (88.2%) and benefits (86.3%) were high, but relative to these, perceived cues to action (64.1%), barriers (63.5%), and self-efficacy (58.1%) were low. **Conclusion:** It is important to improve perceived self-efficacy in government health promotion, outreach, and improvement programs and to reduce perceived barriers through medical tests either by facility-based delivery or via outreach health services in Cambodia.

Key Words: Cambodia; Health belief model; Noncommunicable diseases; Risk perception

INTRODUCTION

In 2021, noncommunicable diseases (NCDs), including heart disease, stroke, cancer, diabetes, and chronic lung disease, were responsible for almost 70% of deaths worldwide. Nearly three-quarters of all NCD deaths occur in low- and middle-income countries. The epidemic of NCDs poses devastating health consequences for individuals, families, and communities and threatens to overwhelm health systems [1].

According to the Ministry of Health in Cambodia, NCDs accounted for 64.0% of all deaths in Cambodia in 2018, and it is increasing by year along with double burden of infectious disease. About one in every four Cambodians (23.0%) dies prematurely, before the age of 70 years, from one of the four main NCDs: cardiovascular disease (24.0%), cancer (14.0%), chronic respiratory disease (4.0%), and diabetes (2.0%)[2]. The four main NCDs

share common risk factors: tobacco use, excessive alcohol use, unhealthy diet, indoor air pollution, and physical inactivity. Currently, two million Cambodians use tobacco, with 42.5% of adult males smoking cigarettes. Over 8 in 10 do not eat enough fruit and vegetables to protect them from NCDs. Moreover, 1 in 5 Cambodian adults have high cholesterol, and 1 in 10 have high blood pressure due to a diet that is too high in saturated fats and salt [3].

Reducing the major risk factors for NCDs—tobacco use, physical inactivity, unhealthy diet, and excessive use of alcohol—is the focus of the WHO's work to prevent deaths from NCDs [1]. It means that behavior change is well received in dealing with NCDs related to lifestyle. To prevent escalating the burden of NCDs as well as the treatment, the Ministry of Health in Cambodia identified the major interrelated causes or multiple causes for an individual and defined a number of multisectoral strategies: controlling tobacco and alcohol use, raising awareness of

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unhealthy food in the diet, maintaining health through physical activity, providing effective screening and treatment, and palliative care and promotion [4].

The health belief model (HBM) is one of the most effective health behavior-change models. It comprises six constructs (perceived susceptibility, severity, benefits, barriers, cues to action, and self-efficacy) explaining why an individual may or may not adopt preventive measures against the disease of interest [5]. Perceived susceptibility is the perception of the risk of acquiring an illness or disease. Perceived severity refers to a person's feelings on the seriousness of contracting an illness or disease. Perceived benefits are the perception of the effectiveness of various actions available to reduce the threat of illness or disease. Perceived barriers refer to an individual's feelings on the obstacles to performing a recommended health action. Perceived cues to action is the stimuli needed to trigger the decision-making process to accept a recommended health action. Lastly, self-efficacy is the level of a person's confidence in their own ability to perform behaviors [6]. According to the HBM, individual beliefs about health and health conditions play a role in determining health-related behaviors. Therefore, the HBM is widely applied to health-related studies that examine health behaviors and health-risk behaviors in an individual.

A previous cross-sectional study found that perceived barriers and self-efficacy showed the most significant impact on NCD-related behaviors [7]. Another study found that HBM constructs were associated with participants' exercise behavior [8]. A similar finding was reported in a study conducted in Saudi, which showed that the perception of the seriousness of obesity influenced physical activity [9].

About two decades ago, emerging global health issues may have shaped the current focus on communicable diseases, but the global burden of disease has changed to NCDs. Changing the patterns of personal health behaviors is the best way to prevent NCDs; the change can arise through education, advertisement, or advocacy activities. Society and governments also have a responsibility to create environments wherein individuals are made aware of, and can practically make, life choices that protect their health [10].

Risk perception is defined as interpretations and other subjective judgments about risks [11]. Risk perceptions are critical determinants of health with regards to making decisions such as practicing healthy behaviors [12]. NCD risk perception is important for promoting the adoption of healthy lifestyle and NCD prevention. Low level of perceived risk lead to risky behavior [13]. Despite the im-

portance of NCD risk perception in lifestyle changes, studies related to the relationship among personal perceptions of NCDs based on the HBM are rare. One study conducted in South Africa found differences in the risk perceptions of NCDs by age groups such that young adult groups had poorer risk perceptions than middle-aged and older-aged adults, resulting in poor practices in regard to following NCD health recommendations [5]. Moreover, few studies related to the personal perceptions of NCDs have been conducted in the Asian regions.

Therefore, the purpose of this study is to (i) examine the relationships between the general characteristics of individuals and the risk perceptions of NCDs and (ii) assess the distribution of risk perceptions of NCDs according to the general characteristics of individuals. The findings of this study could inform the Cambodian government and aid in its decision-making process on public health policy and plans to prevent and manage NCDs.

METHODS

1. Study Design

A cross-sectional design was used in this study.

2. Participants and Data Collection

The study participants comprised 200 Cambodian adults 40 years or older who currently resided in communities in Kandal, a province located about 27 miles from Phnom Penh. G*Power version 3.1.9.7 estimated the sample size at 185, considering a maximum of 5 number of groups, a level of significance of .05, statistical power of .80, and a small effect size of .26 [14]. They were recruited using convenience sampling between December 2020 and January 2021. A pilot study among 30 adults in Kandal Province was carried out to examine the extent of understanding of each question, measure the time to answer all questions, and test the appropriateness of the translation into the local language, Khmer. Participants in the preliminary survey understood all questions well and did not report any discomfort, and the survey took about 30 minutes.

Four local senior college students conducted the data collection under a local survey supervisor who understood the purpose of the study. Training workshops were held by the primary investigator to provide local survey supervisor and each interviewer with one-on-one practical training via an online meeting. Before the survey, the local survey supervisor provided details of the study aims and methods to each village leader and obtained permis-

sion to survey the village. The interviewers visited house by house and introduced the study; the survey was initiated once the written consent was obtained. In cases for which the participant had difficulty answering the questions on their own because of illiteracy, the interviewers helped with reading questions but did not provide explanations. The interviews followed social distancing and the national guidelines for Covid-19 prevention. All survey personnel wore masks and used hand sanitizer prior to home visits. If any survey personnel had respiratory symptoms such as cough or fever, they were not allowed to participate in the survey.

3. Measurements

The study used a structured questionnaire composed of information about general characteristics (sex, age, marital status, education, occupation, perceived health status, medical check-ups, and diagnosed disease), health behaviors (drinking alcohol, smoking, exercising, eating fruits and vegetables, drinking energy drinks, and consuming salts), and the risk perception of NCDs.

The risk perceptions of NCDs were assessed based on a previous study by Kaba and et al. [5]. In their study, perceived susceptibility was measured by 5 items (e.g., Obese /overweight will lead me to getting NCDs), perceived severity by 5 items (e.g., Having an NCD will have major effects on my life and family), perceived benefits by 7 items (e.g., Not having an NCD is beneficial), perceived barriers by 7 items (e.g., Very little can be done to prevent NCDs), perceived cues to action by 6 items (e.g., I eat a well-balanced diet), and perceived self-efficacy by 5 items (e.g., I am confident about how to prevent chronic diseases). Each item was checked by using a 5-point Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree), and the answers were integrated: “agree” and “strongly agree” were integrated as “agree,” and “disagree,” “strongly disagree,” and “neutral” were integrated as “disagree” among each item response. The validity of the risk perception of NCD items was confirmed in their study, evidencing that the questions were suitable within the constructs of the HBM, and Cronbach’s α coefficient for all constructs was recorded between .78 and .89 [5]. In this study, the Cronbach’s α coefficient ranged from .58 to .84 for each construct of the HBM (susceptibility: .58, severity: .65, benefit: .69, barriers: .60, cues to action: .58, efficacy: .84).

The questionnaire was translated from English into Khmer (the Cambodian language), and the Khmer version of the questionnaire included all questions and was pilot-tested among 30 Cambodians who were later excluded

from the main study based on the guidelines “translating from one language to another” [15] to improve reliability and validity.

4. Statistical Analysis

Data analysis was carried out using SPSS version 21 (IBM Corp.). Descriptive statistics (n, %) were used for general characteristics, health behaviors, and the risk perception of NCDs. Differences in the NCD perceptions of susceptibility, severity, benefits, barriers, cues to action, and self-efficacy according to general characteristics were analyzed according to participants’ general characteristics using a t-test, a Welch test in the case of unequal variance, and a Scheffé test for post-hoc.

5. Ethical Consideration

The study was approved by the IRB of Jeonbuk National University (IRB No. 2020-12-003-001).

RESULTS

1. Descriptive Characteristics of Study Participants

Table 1 presents the descriptive characteristics of study participants. A total of 200 respondents participated in the study. There were 58 male respondents and 142 female respondents. The age of the participants ranged from 40~49 to 70~85 years old, and the mean age was 56.96 (SD 11.86) years. Respondents were mostly married (74.0%), and a few participants had been married before (18.5%) or were never married (7.5%). Most of the respondents were likely to have a lower level of education; 15.5% were uneducated and 35.5% completed only elementary school. More than half of the participants were farmers (30.0%) or sellers/operators of small business (28.0%). Only 20% of respondents perceived their health status as good, while 64.5% and 15.0% perceived their health status as fair and poor, respectively. Seventy percent of all participants (70.5%) received medical check-ups for at least one item of blood sugar, blood pressure, or lipids within the last year. In addition, 52.5% of them were diagnosed with one or more diseases of hypertension, diabetes, or dyslipidemia by a doctor.

2. Health Behaviors of Study Participants

Table 2 shows the reported health behaviors of all study participants. A third (35.0%) of them reported drinking al-

Table 1. Descriptive Characteristics of Study Participants

(N=200)

Variables	Categories	n (%) or M±SD
Sex	Female	142 (71.0)
	Male	58 (29.0)
Age (year)	40~49	56 (28.0)
	50~59	56 (28.0)
	60~69	54 (27.0)
	70~85	34 (17.0)
		56.96±11.86
Marital status	Single	15 (7.5)
	Married/Living as married	148 (74.0)
	Divorced/Separated/Widowed	37 (18.5)
Education	Uneducated	31 (15.5)
	Elementary school	71 (35.5)
	Middle school	51 (25.5)
	High school	26 (13.0)
	University/College	21 (10.5)
Occupation	None	28 (14.0)
	Farmer	60 (30.0)
	Seller/Operators of small business	56 (28.0)
	Civil servant	16 (8.0)
	Housewife (Housekeeping)	24 (12.0)
	Other occupations	16 (8.0)
Perceived health status	Good	40 (20.0)
	Fair	129 (64.5)
	Poor	30 (15.0)
	Missing	1 (0.5)
Experienced medical check-ups within the last year	Yes (If any among blood glucose, Blood pressure or Lipid test is applicable)	141 (70.5)
	No	58 (29.0)
	Missing	1 (0.5)
Diagnosed disease by a doctor	Yes (If any among Hypertension, Diabetes or Dyslipidemia is applicable)	105 (52.5)
	No	87 (43.5)
	Missing	8 (4.0)

cohol once or more than twice per month. Nine percent of the study participants reported that they smoked. However, only males reported a high use of alcohol and tobacco, 67.2% and 29.3%, respectively. Regarding eating habits, over 50% of participants reported they eat fruits one to three days a week or eat vegetables every day. Most of the participants reported they take energy drinks (65.0%), and 57.0% of them have three to five energy drinks a week. Participants have been drinking energy drinks for a long time, from two years to more than five years (data not shown). Lastly, 42.0% of participants added salt or salty sauce while preparing a meal at home. Twenty-three percent (23.5%) of the participants always eat (10.0%) or sometimes eat (13.5%) salty processed food. A few participants perceived that they consume too much salt (12.0%).

3. The Perceptions of NCDs

The average of each item shows that perceived severity (88.2%) was the highest, followed by perceived benefits (86.3%), perceived cues to action (64.2%), perceived barriers (63.5%), and perceived self-efficacy (58.15%)(Table 3).

In the perceived susceptibility, most of the participants recognized that being obese/overweight (70.6%), having unhealthy eating habits (80.0%), and physical inactivity (70.0%) were risk factors of NCDs. A few participants only considered family medical history (22.5%) as a risk factor of NCDs. In the perceived severity, the participants responded that having NCDs could make them crippled (93.0%) as well as scared (85.5%). They responded that NCDs also could impact their work and income (91.0%), and their life and family (85.5%), and could change their

Table 2. Health Behaviors of the Study Population (N=200)

Variables	Categories	n(%)
Frequency of drinking alcohol in the last year	Never	130 (65.0)
	Less than once a month	27 (13.5)
	Once a month	18 (9.0)
	About 2~4 times a month	12 (6.0)
	More than 4 times a week	13 (6.5)
Smoking	Smoking	18 (9.0)
	None	182 (91.0)
Exercise	Never	94 (47.0)
	1~3 days per week	50 (25.0)
	4~6 days per week	16 (8.0)
	Every day	40 (20.0)
Eating fruits	Never	4 (2.0)
	1~3 days per week	99 (49.5)
	4~6 days per week	58 (29.0)
	Every day	38 (19.0)
	Missing	1 (0.5)
Eating vegetables [†]	Never	5 (2.5)
	1~3 days per week	28 (14.0)
	4~6 days per week	64 (32.0)
	Every day	101 (50.5)
	Missing	2 (1.0)
Current energy or soft drinks consumption	Regularly	130 (65.0)
	Occasionally	68 (34.0)
	Missing	2 (1.0)
Frequency of energy or soft drinks consumption	3~5 times per week	114 (57.0)
	1~2 times per week	27 (13.5)
	2~4 times per month	22 (11.0)
	1 time per month	33 (16.5)
	Missing	4 (2.0)
Onset of energy or soft drinks consumption	Never	47 (23.5)
	Within 1 year	44 (22.0)
	Within 2 years	16 (8.0)
	Within 3 years	17 (8.5)
	Within 4 years	7 (3.5)
	More than 5 years ago	64 (32.0)
Missing	5 (2.5)	
Adding salt [‡] during the preparation of food	Always	84 (42.0)
	Often	27 (13.5)
	Sometimes	35 (17.5)
	Rarely	49 (24.5)
	Never	1 (0.5)
Missing	4 (2.0)	
Frequency of intaking processed foods high in salt	Always	20 (10.0)
	Often	27 (13.5)
	Sometimes	50 (25.0)
	Rarely	88 (44.0)
	Never	12 (6.0)
	Missing	3 (1.5)
Consuming salt [‡]	Very salty	24 (12.0)
	Just the right amount	129 (64.5)
	Not salty	44 (22.0)
	Missing	3 (1.5)

[†]Vegetables included potatoes; [‡]Salt, salty seasoning, or salty sauce.

outlook (76.0%). In the perceived benefits, over 85.0% of participants agreed that not having NCDs is beneficial. They also agreed that physical activities (81.5%), a healthy lifestyle (84.0%), and managing body weight (81.0%) could prevent NCDs. Regarding health check-ups, 97.0% of participants agreed that health check-ups were beneficial and that NCDs could be detected early (82.0%). However, only 64.0% of participants agreed that not smoking prevents NCDs. Sixty-three percent (63.5%) of participants agreed that barriers to preventatives such as medical check-ups and healthy foods can make NCD prevention difficult to achieve. About 75.0% of them agreed that health check-ups are high-priced, and are time-consuming as well. Some of the participants responded that going for health check-ups was embarrassing (32.0%). Sixty-six percent of them also agreed that healthy food is costly, and that cooking healthy food is time-consuming. Regarding perceived cues to action such as prevention and treatment, about 60% of the participants agreed that very little can be done to prevent NCDs, and that no treatment will be effective in curing NCDs. To improve their health, most of the participants followed medical orders (80.5%). They also changed their eating habits, such as eating a well-balanced diet (64.5%), avoiding fatty foods (62.5%), and eating small-portion meals (41.0%). About half of the participants perceived self-efficacy to the risks of NCDs. Sixty percent of them responded that they were able to work on a healthy lifestyle activity; however, they did not have information on the means for preventing NCDs (51.5%).

4. Differences in the Perceptions of NCDs According to General Characteristics

In perceived susceptibility, participants diagnosed with one or more diseases of hypertension, diabetes, or dyslipidemia had higher mean percent (66.6 ± 25.6) than other participants who were not diagnosed with any diseases by a doctor, and the difference was statistically significant ($p = .024$). There were statistically significant differences in perceived barriers depending on the experience of medical check-ups ($p = .007$). The participants who were examined with at least one item of blood glucose, blood pressure, or lipids within a year had a lower mean percent (60.5 ± 27.7) than other participants who were not examined with medical check-ups. A statistically significant difference was determined between the general character of individual occupation and "perceived benefits." The seller or small business participants had the highest mean percent (90.6 ± 17.2), followed by the farmer, civil servant, participant with no occupation, housekeeper, and others

Table 3. Distribution of Risk Perceptions of Non-communicable Disease (NCDs)

(N=200)

Variables	Questions	Agree	Average of agree (%)
		n (%)	M±SD
Perceived susceptibility	1. Being obese/Overweight will lead me to getting NCDs	127 (70.6)	62.0±28.9
	2. My family medical history makes it likely to get NCDs	45 (22.5)	
	3. Smoking makes it likely to get NCDs	99 (49.5)	
	4. Unhealthy eating habits can make me get NCDs	160 (80.0)	
	5. Physical inactivity can make me get NCDs	146 (73.0)	
Perceived severity	6. Having an NCD will have major effects on my life and family	171 (85.5)	88.2±21.0
	7. Having an NCD will have major effects on my work and income	182 (91.0)	
	8. Having an NCD will cripple me	186 (93.0)	
	9. Having an NCD will change my outlook	152 (76.0)	
	10. Thoughts of having NCDs scares me	171 (85.5)	
Perceived benefits	11. Not having an NCD is beneficial	196 (98.0)	86.3±19.2
	12. Physical activities prevent NCDs	163 (81.5)	
	13. Healthy lifestyle prevents NCDs	168 (84.0)	
	14. Managing weight prevents NCDs	162 (81.0)	
	15. Not smoking prevents NCDs	128 (64.0)	
	16. Regular health check-ups will detect NCDs early	164 (82.0)	
	17. Regular health check-ups are beneficial	194 (97.0)	
Perceived barriers	18. Very little can be done to prevent NCDs	119 (59.5)	63.5±26.6
	19. No treatment will be effective in curing NCDs	126 (63.0)	
	20. Healthy foods are expensive	133 (66.5)	
	21. Health check-ups are expensive	147 (73.5)	
	22. Preparing healthy foods is time-consuming	132 (66.0)	
	23. Health check-ups are time-consuming	154 (77.0)	
	24. It is embarrassing to go for health check-ups	64 (32.0)	
Perceived cues to action	25. I eat a well-balanced diet	129 (64.5)	64.1±26.3
	26. I always follow medical orders to benefit my health	161 (80.5)	
	27. I frequently make efforts to improve my health	154 (77.0)	
	28. I exercise regularly, at least 3 times per week	109 (54.5)	
	29. I avoid fatty foods	125 (62.5)	
	30. I eat small-portion meals	82 (41.0)	
Perceived self-efficacy	31. I am confident about how to prevent NCDs	107 (53.5)	58.1±38.8
	32. I am able to actively work on a healthy lifestyle to prevent NCDs	120 (60.0)	
	33. I attend health assessments to prevent NCDs	131 (65.5)	
	34. I have information on how to prevent NCDs	103 (51.5)	
	35. There is a lot I can do to reduce my chances of getting an NCD-related illness	109 (54.5)	

NCD=Non-communicable disease.

($F=2.75, p=.020$). A statistically significant difference was determined between the educational status and “perceived self-efficacy” ($F=2.46, p=.047$). The mean percent of the farmer was 70.3 ± 38.4 , and it was found to be higher than other occupations ($F=3.46, p=.005$). However, the percent scores for perception of severity and cues to action were not statistically significant (Table 4).

DISCUSSION

We examined the Cambodians’ health behaviors and

the risk perceptions of NCDs, and also examined this risk perception of NCDs according to demographics and health-related variables among Cambodians. We used the risk perception based on the HBM with six constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived cues to action, and perceived self-efficacy). Several variables were related to these constructs. In Asian regions, few studies have assessed the risk perception of NCDs. This study contributes to finding evidence for significant factors related to the risk perception of NCDs. The risk perception of NCDs has been found

Table 4. Differences in the Non-Communicable Disease (NCD) Perceptions According to General Characteristics (N=200)

Variables [†]	Perceived susceptibility		Perceived severity		Perceived benefits		Perceived barriers		Perceived cues to action		Perceived self-efficacy	
	Average of agree (%)	t or F (p)	Average of agree (%)	t or F (p)	Average of agree (%)	t or F (p)	Average of agree (%)	t or F (p)	Average of agree (%)	t or F (p)	Average of agree (%)	t or F (p)
Sex	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
Male	65.3±26.1	1.01 (.315)	85.1±23.4	1.80 (.181)	83.5±23.0	1.30 [†] (.257)	63.0±27.8	0.02 (.884)	64.3±30.0	0.01 (.943)	63.1±38.0	1.38 (.242)
Female	60.7±29.9		89.5±19.9		87.4±17.4		63.6±26.3		64.0±24.7		56.0±39.1	
Age (year)	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
40~49	64.8±25.4	0.36 [†] (.697)	90.2±18.8	0.13 (.882)	86.3±21.0	0.93 (.397)	58.1±27.6	1.53 (.219)	58.2±29.0	2.01 (.138)	50.8±39.2	2.34 [†] (.101)
50~59	62.2±26.6		90.1±17.3		89.1±16.0		64.9±24.9		66.5±26.9		66.0±35.1	
60~69	60.1±33.0		89.3±19.5		84.2±19.7		66.2±25.7		67.7±23.9		56.8±40.6	
70~85	60.2±31.6		80.3±29.6		84.8±21.7		65.7±29.2		64.2±23.3		59.0±40.4	
Marital status	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
Single	57.8±27.2	0.66 (.520)	86.7±20.9	0.04 (.956)	75.2±23.3	2.77 (.065)	70.0±22.5	1.83 (.163)	55.6±27.9	0.88 (.416)	40.4±37.3	1.74 (.179)
Married /Living as married	61.3±27.9		88.4±20.4		87.1±18.5		61.3±27.4		65.0±26.6		59.0±39.2	
Divorced/Seperated/Widowed	66.5±33.4		88.4±23.7		87.6±19.5		69.3±24.1		64.0±24.1		61.4±37.0	
Education	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
Uneducated	55.4±31.0	1.38 (.242)	84.5±22.0	0.62 (.646)	84.5±22.6	0.87 (.486)	61.0±25.6	2.12 (.080)	65.1±18.5	2.35 [†] * (.063)	46.9±37.6	2.46 (.047)*
Elementary	60.0±31.9		90.0±20.1		86.5±18.1		69.7±26.0		68.7±24.5		62.8±38.6	
Middle	68.5±26.1		87.5±23.0		87.6±18.9		63.0±27.0		67.9±23.5		67.4±36.5	
High	66.0±22.4		90.8±16.2		89.8±16.3		58.8±28.1		56.4±29.1		50.0±38.9	
University/ College	57.9±27.3		87.6±23.2		80.3±21.4		52.8±24.6		47.2±36.3		46.3±41.5	
Occupation [†]	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
None	49.8±30.7	2.19 (.057)	89.3±17.7	1.70 [†] * (.149)	83.3±18.6	2.75 (.020)*	57.7±29.6	1.89 (.097)	57.7±23.3	1.01 (.413)	58.4±35.6	3.46 [†] (.005)
Farmer	64.7±30.6		91.8±14.2		88.8±18.2		70.7±23.9		68.4±25.5		70.3±38.4	
Seller/Own small business	67.4±23.8		90.4±19.9		90.6±17.2		64.3±26.7		66.0±25.3		55.4±40.9	
Civil servant	68.8±29.2		92.5±14.4		84.8±19.8		62.5±31.7		64.6±32.7		63.8±40.8	
House-keeping	55.2±30.5		80.8±28.6		81.8±18.0		53.6±23.6		59.0±25.1		33.8±31.4	
Others	54.3±26.4		70.4±33.9		73.0±26.2		60.6±26.4		58.9±32.7		51.4±32.1	
Perceived health status	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
Good	55.9±26.2	1.28 (.281)	86.4±21.6	0.48 (.619)	86.1±19.2	0.30 (.744)	57.5±24.3	1.27 (.283)	58.8±28.0	1.18 (.308)	47.7±36.3	1.85 (.161)
Fair	64.2±29.4		88.0±21.4		85.7±19.8		65.2±27.7		64.7±26.6		59.8±39.7	
Poor	61.0±30.4		91.3±18.7		88.7±17.0		63.3±24.8		67.9±22.3		63.3±36.9	
Medical test within the last year	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
Yes [§]	62.4±28.2	0.21 (.644)	89.2±19.3	1.24 (.267)	86.6±18.4	0.07 (.794)	60.5±27.7	7.45 [†] * (.007)*	64.1±24.9	0.00 (.985)	61.4±37.1	3.56 (.061)
No	60.3±30.6		85.6±24.8		85.8±21.2		70.8±22.7		64.2±29.6		50.0±42.1	
Diagnosed disease by a doctor	M±SD		M±SD		M±SD		M±SD		M±SD		M±SD	
Yes	66.6±25.6	5.14 (.024)*	87.3±21.2	0.47 (.494)	86.7±20.1	0.02 (.876)	64.6±25.3	0.24 (.626)	65.0±26.7	0.02 (.889)	63.7±36.1	2.95 [†] (.087)
No	57.3±31.1		89.4±21.1		87.2±17.0		62.8±27.1		64.5±26.0		54.1±40.8	

*p < .05; [†] Welch analysis of variance; [‡] Scheffé test; Education and Perceived cues to action: Uneducated, Secondary, Over College < Elementary, Middle; Occupation and Perceived Severity: None, Housekeeping, Others < Farmer, Seller/Own Small business, Civil servant; Occupation and Perceived self-efficacy: None, Seller/Own Small business, Civil servant, Housekeeping, Others < Farmer; [§] If yes: Any among blood glucose, blood pressure or lipid test is applicable; ^{||} If yes: Any among hypertension, diabetes or dyslipidemia is applicable; ^{††}The results are shown after excluding missing values for each variable.

to be related to preventive behaviors against NCDs [7, 8]. Thus, these factors can be used to promote the risk perception of NCDs in NCD prevention.

The prevalence of diabetes and hypertension is 9.6% and 14.2%. Because this study only included Cambodian aged 40 years or older, prevalence of self-reported disease diagnosed is relatively high (52.5%)[16]. Regarding the health behaviors of study participants, we found that there were fewer heavy episodic drinkers and fewer smokers compared to the findings of a national study in Cambodia [2]. According to the Department of Prevention Medicine of Cambodia, 22.1% of Cambodian are smokers in 2016. Among men 71.8% are current drinkers. 48.1% of Cambodian were having five or more daily servings of fruits and vegetables. Compared these numbers, participants of this study are less smoking and having more fruits and vegetables [16]. This might be because the study sample consisted of a high proportion of women. About 50% of the respondents reported that they intake processed foods high in salt, and 12% consumed very salty food. The intake of sodium of the Cambodians (5,615.9 mg) was three times higher than the WHO recommendation (2,000.0 mg), which is attributed to the additional seasonings during daily cooking, such as fish sauce, monosodium glutamate, and prahok (a locally made fish paste) [17]. In this study, the data also show the high levels of salt consumption among Cambodians. The consumption of high sodium has contributed to about 28% of deaths caused by cardiovascular disease [2]. In addition to smoking and drinking alcohol, high levels of sodium consumption need to be managed in Cambodia.

Another interesting finding is in regard to energy drinks. Sixty-five percent of the respondents reported they drink energy drinks regularly. About 22.0% started to drink energy drinks within one year previous to the study. More than half drink energy drinks 3 to 5 times a week. In Laohasiriwong et al.[18]'s study, men, those aged 31~59, those in a household of less than 5 family members, and those earning < \$300/month were more likely to consume soft drinks. In the beverage industry, they are the fastest-growing type of product [19]. A review study found that energy drinks trigger adverse events, including insomnia, stress, and depressive mood. It is recommended not to drink energy drinks frequently (no more than 5~7 energy drinks/week) and to avoid co-consumption with alcohol [19]. In Cambodia, the prevention of NCDs is focused on tobacco and alcohol use, unhealthy diet, and physical inactivity [9]. Energy drinks need to be managed because of the potential adverse events triggered by their use. Government and stakeholders can intervene on reducing the consump-

tion of energy drinks through IEC (information, education, and communication) activities such as social media, television and radio, and additional taxation of some types of drinks.

Compared to a previous study conducted in South Africa [5], the levels of perceived susceptibility, perceived cues to action, and perceived self-efficacy were lower among respondents of this study. The perceived severity, perceived benefits, and perceived barriers were even higher or at least comparable to the previous study. Among these constructs, the perceived self-efficacy showed the lowest scores, quite lower than the previous study. The perceived self-efficacy is a significant contributing factor for health behaviors and preventive health practice [20, 21]. For example, an increase in self-efficacy scores was related to an increased chance of having had a Pap smear [20]. Self-efficacy was significantly associated with self-management of chemotherapy [21]. Based on the study finding, the lower levels of perceived self-efficacy need to be focused on when health promotion and improvement programs are implemented in Cambodia. Educational intervention, including providing basic information about epidemiology, risk factors, complications, signs and symptoms of a certain disease, importance of early detection, and recommended screening methods, is effective for enhancing self-efficacy [22]. Considering the low percentages for self-efficacy items (e.g., "I have information on how to prevent NCDs," "I am confident about how to prevent NCDs," and "There is a lot I can do to reduce my chances of getting an NCD-related illness") in this study, programs should focus on self-regulatory efficacy in the healthy lifestyle behavior intervention for successful prevention of NCDs [23].

Our study found that more respondents diagnosed with a disease by a doctor reported higher levels of the perceived susceptibility of NCDs than their counterparts. When respondents had medical examination, they perceived lower barriers to NCD prevention. Regular health check-ups are an effective way to screen and early detect chronic disease [5,24,25]. Those respondents who had a diagnosed disease and had experienced medical examination might have more opportunities to receive health information, increasing health literacy. This might improve the perceived susceptibility of NCDs and decrease the perceived barriers. The relationship between medical examination and perceived barriers could be operating in either direction (i.e., medical examination leading to lower perceived barriers vs. lower perceived barriers leading to medical examination). Outreach health services in a community might be an effective strategy for providing medi-

cal examination, which might reduce the perceived barriers to NCD prevention. Community outreach was proposed in guidelines addressing comprehensive primary healthcare to manage NCDs in a low-income country [26]. However, in the screening and medication for NCDs, few studies reported outreach approaches in low- and middle-income countries [27]. In Cambodia, medical examination through either facility-based delivery or outreach health services can be useful in reducing the perceived barriers to NCD recommended health actions.

Our study has several limitations. This study used a cross-sectional design, which does not allow us to draw causal inferences between participants' general characteristics and the risk perceptions of NCDs. We used non-proportional sampling, limiting the generalizability of study findings, and it is difficult to apply our study findings to other settings. A self-reported questionnaire was used to collect the data, which is subject to recall bias. Some participants might report socially desirable risk perceptions and health behaviors. There is a potential limitation related to the relatively low reliability of the HBM construct in interpreting the results. The low reliability may have been due to cultural sensitivity and the residents participating in the survey for the first time. However, given limited studies about the personal perceptions of NCDs based on the HBM, this study provides the risk perceptions of NCDs according to the HBM in a low-income country, Cambodia, which is a strength of this study.

CONCLUSION

In this study, we examined the risk perception of NCDs based on the HBM with six constructs (perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived cues to action, and perceived self-efficacy). We found health behaviors contributing to NCDs (smoking, drinking alcohol, insufficient physical exercise, and unhealthy diet). Additionally, Cambodians drink energy drinks frequently. Among the risk perceptions, the perceived self-efficacy showed the lowest score. Respondents diagnosed with disease by a doctor reported higher perceived susceptibility of NCDs than their counterparts. Medical examination was related to lower perceived barriers to NCD recommended health actions. In Asian regions, few studies have assessed the risk perception of NCDs. Based on the present study finding, it is important to improve perceived self-efficacy in health promotion and improvement programs and to reduce perceived barriers through medical tests either by facility-based delivery or the outreach health services in Cambodia.

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