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Determinants of the public intent to receive the seasonal influenza vaccine and protective behaviors: A population-based study in Taiwan

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ABSTRACT

Background and study aims: this study aims to identify the determinants of perceived changes in protective behaviors against seasonal influenza and the intent to receive the seasonal influenza vaccine among Taiwanese in 2011.
Methods: During the early 2011–2012 influenza season, we conducted a nationwide survey with randomly stratified samples and collected 1400 self-reported questionnaires from respondents aged 15 years and above using the computer-aided telephone interviewing software in Taiwan.
Results: One-third of the respondents intended to receive the seasonal influenza vaccine. Knowledge of protective behaviors against influenza was the most common predictor of perceived changes in different protective behaviors and the intent to receive the seasonal influenza vaccine. Older respondents were significantly more inclined to perceive changes in protective behaviors than younger respondents (adjusted odds ratio [AOR] ranging from 1.7 to 2.5). Female respondents were significantly more likely to change their behavior in wearing a face mask (AOR = 1.5; 95% CI, 1.09 to 2.07) and buying antimicrobial products (AOR = 1.45; 95% CI, 1.09 to 1.92) compared with males. Furthermore, recipients of past H1N1 (AOR = 4.45; 95% CI, 3.03 to 6.53) and seasonal influenza vaccines (AOR = 6.1; 95% CI, 3.31 to 11.23) were more likely to obtain the seasonal influenza vaccine. In contrast, individuals aged 30–49 (AOR = 0.53; 95% CI, 0.38 to 0.74) and females (AOR = 0.65; 95% CI, 0.48 to 0.87) were significantly less likely to intend to receive the seasonal influenza vaccine.
Conclusions: The findings suggest that the predictors of perceived changes in protective behaviors and intent to receive the seasonal influenza vaccine differ. We provide perspectives and suggestions for overcoming the perceived barriers and for developing targeted risk-communication campaigns.

1. Introduction

The intent to receive the seasonal influenza vaccine has varied over recent decades, and influenza vaccination rates differ across targeted groups and countries [1–3]. In Taiwan, 70% of the public expressed an intent to receive the influenza H1N1 vaccine during the early phase of the 2009–2010 pandemic [4], compared with 50% in other countries [5,6]. Later, the Taiwan Centers for Disease Control (TCDC) launched a mass campaign to provide free H1N1 influenza vaccination to the entire population in December 2009. However, the safety of the H1N1 vaccine was debated due to adverse reactions and program errors [7–9]. In August 2010, the World Health Organization (WHO) declared that H1N1 influenza had entered the post-pandemic period [10]. Therefore, the Taiwanese government implemented new preventive measures and supplied free seasonal influenza vaccinations to high-risk groups during the 2011–2012 influenza season [11,12].

In recent decades, the Health Belief Model [5,13,14], protective motivation theory [15,16] and theory of planned behavior [17,18] have been applied to the decision-making process surrounding influenza vaccinations [19]. Perceived risks (i.e., susceptibility/likelihood/vulnerability and severity/seriousness), self-efficacy, response and coping were commonly associated with non-pharmaceutical protective behaviors against influenza (i.e., avoiding public transportation, using hand-wash products and frequently washing hands [20].

After the 2009–2010 H1N1 pandemic, however, few studies have examined the intent to receive the seasonal influenza vaccine among lay people. Furthermore, these behavioral theories gave little consideration to emotional factors (i.e., fear, anxiety) [21] and past experiences [22]. Hence, this study aims to determine the pandemic effect on the intent to receive the seasonal influenza vaccine

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in the following year among healthy adults. Watching television has affected the public's perception and behavioral adjustments to H1N1 influenza, SARS in Taiwan [23–25] and avian flu [26]. However, the relationship between the time spent watching television, protective behaviors against influenza and the intent to receive the seasonal influenza vaccine is uncertain. In other words, we aimed to examine the association among influenza vaccination experiences, knowledge of protective behavior, perceived risks and television exposure, perceived fear of influenza, perceived changes in protective behaviors and intent to receive the seasonal influenza vaccine. Therefore, we posed two research questions: (1) Which predictors are associated with changes in protective behaviors (i.e., hand washing, face mask wearing, etc.) against seasonal influenza? (2) Which predictors are associated with the intent to receive the seasonal influenza vaccine?

2. Methods

2.1. Data collection and participants

The study population was aged 15 years and older. Based on the 2010 population statistics from the Ministry of the Interior in Taiwan [8,27]. Prior to the 2011–2012 vaccination season, we conducted a nationwide survey of a stratified random sample using the computer-aided telephone interviewing (CATI) software during August 15 to 27, 2011 in Taiwan. We followed the principles of proportional sampling by gender, area, educational level and 15 years-of-age and above in Taiwan. Then, we calculated the ±2.7% sampling error under a 95% confidence interval prior to conducting the survey. Individuals aged between 15 and 39 years old and working groups were frequently not able to be interviewed through the telephone survey at home between 6 pm and 10 pm during weekdays. Therefore, the investigators also extended the telephone survey period from 16:30 pm to 10 pm at weekends. This measure may have reduced some of the selection bias. The average interview was completed within 20–25 min.

2.2. Instrument design and measurement

A formative-research and quantitative study design was implemented. We completed in-depth interviews of 41 key informants. Later, according to the main themes extracted from the in-depth interview, we designed a questionnaire and scale to measure the main concepts from the literature [5,13–15,17,18,28,29]. Next, expert validation of the questionnaire and a self-reported interview pre-test were implemented by sampling 110 interviewees to test the measurement reliability and validity prior to the formal investigation.

2.2.1. Outcome variables

Perceived changes in protective behaviors and the intent to receive the seasonal influenza vaccine were the outcome variables.

Perceived changes in protective behaviors were measured on a 5-point Likert scale with the following items: "During the 2010 H1N1 influenza epidemic versus the non-epidemic in 2011, did you ever (a) take your own temperature, (b) wash your hands, (c) wear a face mask in public and (d) buy antimicrobial products?" These four outcome variables were originally measured on a 5-point Likert scale from 1 (*strongly decreased*) to 5 (*strongly increased*). The responses of strongly decreased and decreased were less than 2%; therefore, we combined the other three response categories (e.g., No change, increased, strongly increased) into a binary category (*No change vs. Increases*).

Intent to receive the seasonal influenza vaccine in the 2011–2012 season was originally measured: "Do you intend to get vaccinated against seasonal influenza in the 2011–2012 flu season?" This outcome variable was originally measured on a 5-point Likert scale from 1 (*strongly unwilling*) to 5 (*strongly willing*). Then, we recoded this variable as an ordered category (*Strongly unwilling and unwilling, undecided, willing and strongly willing*).

2.2.2. Predictors

The predictors included gender, past seasonal flu and H1N1 vaccination, knowledge of 12 items measured on a three-point scale ("yes," "no" and "don't know"), risk perception, time spent watching television regarding influenza information and fear of H1N1 and seasonal influenza. Additionally, age was collapsed into three groups (15–29, 30–49, and 50 and above), and educational level was measured with four levels (primary and under, junior high school, senior high school, and college and above).

Based on a meta-analysis, reviewing 34 articles, the perceived risks were categorized as the likelihood of contracting the disease, the susceptibility or vulnerability of getting the disease and the seriousness of the illness, although the likelihood, susceptibility and vulnerability were used interchangeably [27]. Hence, *perceived risks* in this study were measured by the following: (a) what is your risk of catching seasonal influenza in the next month (likelihood); (b) what is the severity of influenza (severity/seriousness); and (c) facing the risk of contracting influenza, do you feel resistant to it or not (susceptibility/vulnerability). The likelihood and severity were individually measured on an 11-point scale ranging from zero (*lowest*) to 10 (*highest*), with a low score indicating a lower perceived likelihood and severity. The perceived susceptibility was originally measured on a 5-point Likert scale (reverse score) from 1 (*strongly resistant*) to 5 (*strongly not resistant*), with a low score indicating a high resistance (less vulnerable). Later, we divided the perceived susceptibility variable into an ordered predictor (strongly resistant and resistant, somewhat resistant, non-resistant and strongly non-resistant).

Perceived fears of influenza were measured by the following: (a) please state your level of anxiety/fear regarding influenza H1N1; (b) please state your level of anxiety/fear of regarding seasonal influenza. These two questions were measured on an 11-point scale ranging from zero (*lowest*) to 10 (*highest*), with a low score indicating a lower perceived fear.

Time spent watching television regarding influenza information was measured by "How often do you watch television programs relevant to influenza news within one week?" The ratings were "Never watched TV news", "1–29 min", "30 min to 1 h" and "Over an hour". We then pooled this variable into a binary category (Never watch TV vs. Ever watch TV).

Knowledge of protective behaviors against influenza consisted of 12 questions on social distancing and medical treatment: "In your opinion, which of the following protection measures are effective to avoid influenza infection: wearing face masks in public, taking antiviral drugs (such as *Tamiflu*), obtaining the seasonal influenza vaccine, washing hands often, avoiding public transportation, avoiding crowded places (such as fairs or concerts), keeping children at home, avoiding going to work, limiting people's movements, banning large public events, such as concerts or fairs, closing schools and nurseries and isolating sick people?" Ratings were "yes," "no" or "don't know". The number of correct answers served as the measure of an overall knowledge score, from zero (*lowest*) to 12 (*highest*), with a low score indicating lower knowledge of protective behaviors.

2.3. Statistical analysis

The Kolmogorov–Smirnov test was employed to assess the normal distribution of the analyzed variables. Most variables were not distributed normally, especially for knowledge, outcome