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Research Article

Knowledge, practices, and psychological motives of Lebanese adults towards influenza A (H1N1) vaccination

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ABSTRACT

Objectives: Influenza A (H1N1) virus can provoke severe illness or even death in people with underlying medical conditions. This study is particularly important in Lebanon due to suboptimal influenza vaccination rates, especially among high-risk groups and individuals with low income. We conducted this study to investigate influenza vaccine acceptance and its associated factors, primarily psychological motives, in addition to influenza knowledge and practices among a group of Lebanese adults.

Study Design: A cross-sectional study enrolled 441 participants from various districts and governorates across Lebanon.

Methods: Participants answered an online self-administered questionnaire with closed-ended questions written in Arabic. The questionnaire included elements related to influenza knowledge and practices. Additionally, the validated 5C scale (confidence, complacency, convenience, calculation, and collective responsibility) was used to assess the psychological determinants of vaccine acceptance. The 5C scale helps evaluate the psychological factors affecting an individual's hesitance or acceptance of vaccination, which can contribute to designing targeted interventions.

Results: A total of 441 adults completed the survey, with a mean age of 31.52 ± 9.48 years, and 57.6% were female. Using the 75th percentile as a cutoff point, the results showed that 119 (27.0%) participants had good knowledge, and 171 (38.8%) had good practices regarding influenza. Having a university level of education and greater convenience were significantly associated with higher odds of possessing high knowledge, while being married was significantly associated with lower odds. Increased levels of knowledge and greater convenience were significantly correlated with higher odds of adopting better practices regarding influenza.

Conclusion: An improvement in public health strategies and the promotion of awareness are needed nationally to support an adequate community response before any influenza season.

Introduction

Influenza, characterized by its high contagiousness and respiratory impact, stands globally as a prominent public health issue, especially since some strains like influenza A (H1N1) have the potential to trigger seasonal epidemics (1). The H1N1 virus spreads primarily through coughing, sneezing, and inhaling contaminated droplets reaching the lungs or through live viruses from a contaminated surface to the eyes, nose, or mouth (2). When otherwise healthy individuals contract H1N1 infections, they experience a mild illness typical for seasonal influenza, marked by symptoms such as a fever, along with respiratory and systemic manifestations like headache, fatigue, and myalgia (1,2). However, in high-risk groups with underlying health conditions such as chronic lung, cardiovascular, or neurologic diseases, diabetes, and even pregnancy, H1N1 infections can lead to severe illnesses necessitating hospitalization and sometimes admission to the intensive care unit (3), where higher morbidity and mortality rates are observed (1). Therefore, better dissemination of health information and safety measures is crucial to promote further awareness regarding influenza A pandemics, particularly relevant information related to the availability of vaccination as a preventive tool (4).

The prevalence of influenza and the vaccination vary significantly worldwide, where in many countries, vaccination coverage remains suboptimal especially among vulnerable groups such as the elderly, young children, and individuals with chronic illnesses (5). According to the evidence gathered for a review from the literature published by 16 countries between the years 2012 and 2022, a lack of knowledge about influenza vaccines and unfavorable attitudes toward healthcare services are the primary obstacles to vaccination uptake (5). In countries with different reimbursement strategies, costs were not listed as one of the top barriers; however, in countries with less support, costs may be a more significant issue (5).

Another review including 522 studies from 68 countries showed that vaccination rates against influenza were low worldwide, particularly among the general public (6). Also, in contrast to high-income countries, it was lower in middle-income ones (6). Additionally, it was higher during the COVID-19 pandemic and when vaccination programs were free (6). Understanding the current situation of influenza vaccination compared to the global trends is crucial in Lebanon, a country that is facing years of economic crises, geopolitical conflicts, and other challenges that might threaten the healthcare services, especially after the COVID-19 pandemic.

Influenza virus was already a threat in Lebanon, even prior to the economic crises and any other burdens, in fact, during the post-pandemic seasons of 2010-2011 and 2011-2012, therapeutically challenging strains of influenza A virus were isolated with decreased antiviral susceptibility to oseltamivir and acquisition of neuraminidase (NA) resistance-conferring mutation (7). Prevention intrinsically relies on vaccination and controlling the spread of the infection from carriers to the general population (8). Although the Lebanese Ministry of Public Health (MOPH) issued memorandum No. 149 on October 6th, 2020, recommending influenza vaccination for high-risk groups annually, this vaccine remained unincluded in the national immunization program (1). Consequently, MOPH is still neither mandating nor financing it, leaving the coverage of the expenses to the individuals (1). No recent national official data on annual influenza vaccination is published (1); however, a prior study revealed that the Lebanese rates of seasonal influenza immunization were suboptimal, especially among individuals with low socio-economic status and patients with chronic diseases (9). It's interesting to note that the COVID-19 pandemic had varying effects on influenza vaccination, some favorable and some negative (10). Before the pandemic, 27.6% of Lebanese people had received an influenza vaccination. During the pandemic, it's possible that the general public in Lebanon neglected the seasonal influenza vaccinations (10).

Health education is essential to promote precaution against H1N1 infections (11); hence, the responsible authorities and communities should work on a clear and decisive strategy to educate the public about the appropriate measures to control their spread, allowing adequate knowledge and correct practices at the level of the general populace (8). Furthermore, previous findings showed a positive correlation between knowledge and practice scores, with education, income, and practice being the predictors for the knowledge score (12). In Lebanon, a higher level of knowledge regarding influenza disease and its symptomatology, severity, and risks, in addition to greater awareness regarding its vaccine, were associated with higher regular vaccination rates (9). The primary providers of information regarding this vaccine are doctors (13), while the main barrier to vaccine administration is the underestimation of its need among individuals lacking enough knowledge (9). These findings offer valuable insights that can help in health-promotion strategies, particularly given the necessity for ongoing updates on knowledge and practices following the previously witnessed COVID-19 pandemic, along with the enduring economic instability and the periods of turbulence experienced in Lebanon. Hence, such understandings and deeper investigations are crucial for optimizing planning and maximizing the benefits of any future national campaign aimed at influenza prevention and management. Along with assessing people's knowledge and practices, the authorities should also monitor the reasons preventing large groups from vaccinations, identify prevailing leanings over time, then develop strategies to address vaccine hesitancy, boost psychological motives, and increase vaccine uptake (14). The 5C scale is a proven psychometric tool for evaluating the psychological antecedents of vaccination, yet there has been no previous implementation of this tool in Lebanon regarding the influenza vaccine, neither before nor after the COVID-19 pandemic, and all the other following events witnessed in this region. Despite its significance for evaluating the present status and informing future strategies, particularly within the context of unstable countries, this absence underscores a notable gap in the exciting literature. (15-18) According to the Influenza Surveillance Bulletin published by the Lebanese Ministry of Public Health on the 16th of January 2023, for the preceding four weeks, influenza (AH3, AH1, A) rates were higher than COVID-19 rates both in in-patients and out-patients; in fact, COVID-19 had a 10% positivity rate compared to 18% for influenza in out-patients while respectively having a 5% positivity rate compared to 21% among in-patients (19). The peak of the influenza A virus was in the 46th week of 2022 (19). The literature lacks updated studies evaluating the awareness of the Lebanese community regarding this topic and contributing to the fundamentals of a public health strategy. This study addresses the overall problem of inadequate influenza vaccination by investigating the factors contributing to this issue, and provides critical data for public health initiatives, ensuring targeted strategies in Lebanon's challenging socio-economic context. Additionally, the effective community response towards the spread of H1N1 and good compliance to preventive measurements are crucial at the national level; therefore, this study, conducted among a sample of Lebanese adults, aims at investigating factors, mainly psychological motives, associated with knowledge and practices towards influenza A (H1N1).

Methods

Study Design

Between January and February 2023, a cross-sectional study was conducted, involving 441 participants. The study used an anonymous self-administered questionnaire created on Google Forms. The questionnaire link was distributed to all districts and governorates across Lebanon covering participants from Beirut, Mount Lebanon, North/Akkar, South/Nabatiyeh, and Bekaa/Baalback-Hermel. This was facilitated through the snowball technique that relied on social media platforms (WhatsApp, Facebook, Instagram). Participation was open to all Lebanese individuals above 18 years, and participants were encouraged to share the link with their circles. Those who refused to complete the questionnaire were subsequently excluded from the study.

Ethics Approval and Consent to Participate

The study protocol (2023RC-004-LIUSOP) was approved by the Lebanese International University Ethics and Research Committee. Upon submitting the online form, a written informed consent was considered obtained from each participant. Additionally, all procedures were conducted with loyalty to the relevant guidelines and regulations.

Minimal Sample Size Calculation

The G*Power software was employed to define the sample size required for our study. Based on our parameters, the minimum necessary sample size was 371 participants. This calculation considered a power of 80%, an alpha error of 5%, a minimal model R-square of 5%, and the inclusion of 15 predictors in the model.

Questionnaire

The questionnaire adopted a self-administration approach with closed-ended questions in Arabic, the native language of the Lebanese targeted population. Divided into two main parts, it required approximately fifteen minutes to complete. Participants were instructed to complete it independently to minimize potential social pressure or undesirable bias.

The first section focused on assessing socio-demographic variables such as age, sex, education, marital status, residency area (governorate), employment status (categorized into part-time job, full -time, and unemployment), and socioeconomic status, which was estimated using the household crowding index. This index quantifies the ratio of family members living in the participant's household (including themselves) to the number of rooms in the household (kitchen and bathrooms being excluded). A higher obtained ratio indicates a lower economic status (20). Participants were also asked to rate their financial burden by responding to the question: "How much pressure do you feel with regard to your personal financial situation in general?" The answer was obtained on a scale ranging from 1 (no pressure) to 10 (overwhelming pressure). Additionally, questions about flu-related aspects, including personal and family history of flu within the previous six months, were included.

The second part of the questionnaire incorporated the Knowledge and Practices on Influenza scales and the 5C scale which are designed to effectively assess our variables of interest.

Knowledge and Practices on Influenza

had its framework influenced by Wan-Arfah et al. (2012) (11). The Knowledge segment comprised 50 statements in "yes", "no", and "I do not know" format, covering various features of H1N1, such as its etiology, key signs and symptoms, complications, transmission modes, risk factors, prevention, and therapeutic approach. Examples of such questions are: "*Influenza A (H1N1) originates from swine, avian and human*"; "*Influenza A (H1N1) is a contagious disease*".

Positive answers were allocated a score of 2, "I do not know" received 1 mark, and negative answers received 0.

The highest potential score for the Knowledge domain was 100 with a McDonald's omega of 0.82.

The Practices section included ten statements addressing handwashing, mouth and nose protection, home quarantine, social distancing, restrictions of travel, and administration of vitamins and other substitution supplements throughout the epidemic. Some examples of the statements are: *"Take vitamins to increase the body's immune system"; "Wash hands with water and soap after coughing or sneezing".* The maximum reached score for the Practices section was 48 with a McDonald's omega of 0.65. Participants could answer back with "always", "occasionally", and "never". A score of 3 was attributed to an "always" answer, 2 for "occasionally", and 1 for "never".

The 5C proves to be a valuable tool for examining the psychological backgrounds influencing vaccination decisions and facilitating diagnosis, intervention design, and assessment (14). The 5C subscales consist of various concepts drawn from different psychological schemes that envisage preventive behavior (14). (14)It has ten questions spread across the five sub-scales and five domains, rated using a 7 points Likert-scale that ranges from 1 (strongly disagree), to 7 (strongly agree) _ where 2 represents moderately disagree, 3 slightly disagree, 4 neutral (neither disagree nor agree), 5 slightly agree, and 6 moderately agree _ the internal consistency expressed by a McDonald's omega of 0.71. The first sub-scale, confidence, evaluates the degree to which the authorities, decision-makers, and healthcare professionals engaged are confident regarding the effectiveness and safety of the vaccinations. The second subscale measures complacency related to risk perceptions for the diseases that can be prevented by vaccination and whether or not immunization is an unnecessary preventive measure. The third subscale (named convenience) considers obstacles related to geographic accessibility, health literacy attitudes toward immunization service and the capability to comprehend (language and health literacy), affordability and readiness to pay, physical availability and logistic suitability, and appeal of immunization service. The fourth sub-scale evaluates calculation by evaluating the involvement of individuals in in-depth research on disease and vaccine risks. The last sub-scale, which is collective responsibility, sheds light on the readiness of an individual to defend others through mass vaccination and herd immunity. An earlier study team from many Arab nations validated the questionnaire in Arabic and was able to establish the threshold score for each domain to forecast acceptance or resistance to the COVID-19 vaccine (14,21). This tool has been widely used across diverse vaccination scenarios worldwide, including the famous COVID-19 vaccination and even the influenza vaccine. For instance, in Japan in 2021, factors such as constraints, calculation, and collective responsibility were found to have shaped individuals' intent to receive the COVID-19 vaccine (15). Shifting the focus to the Arab region, a study involving healthcare workers in Kuwait revealed that better collective responsibility and confidence along with reduced constraints and calculation were the primary psychological predictors of COVID-19 vaccine acceptance (16). Additionally, this scale facilitated a comparison between COVID-19 and influenza vaccination in Hong Kong: while influenza vaccination correlated with all 5C constructs (increased confidence, collective responsibility, and reduced complacency, constraints, and calculation), intention for COVID-19 vaccination was only associated with increased confidence, collective responsibility, and reduced complacency (17); which proves the importance of this tool and role in targeted assessments. On the other hand, in the context of influenza vaccine acceptance during the COVID-19 pandemic in the Arab Region, a Jordanian study conducted among healthcare workers demonstrated that all the psychological determinants of this scale appeared to be significant factors influencing influenza vaccine acceptance and uptake during this critical period; in fact, higher acceptance of this vaccine was significantly associated with higher confidence and collective responsibility; and lower complacency, constraints, and calculation (18).

Translation Procedure

A forward and backward translation process was employed. Initially, a single bilingual translator, native to Lebanon and proficient in English, conducted the forward translation. This version was examined and approved by a panel of medical and linguistic specialists. Subsequently, a native English speaker proficient in Arabic, but unfamiliar with the scale concepts, performed the backward translation from Arabic to English. The expert panel then compared this back-translated version with the original English version. Repetition of the forward-back translation procedure took place until solving all possible disagreements and inconsistencies. A pilot study on 30 participants was conducted to ensure all questions are clear; no changes were made.

Statistical Analysis

The statistical analysis was conducted via SPSS software v.22. The internal reliability of the scales was evaluated for each by evaluating McDonald's omega values. The knowledge and practice scores, along with their log transformation, exhibited non-normal distributions with skewness and kurtosis values falling outside the interval of |1.96|. Hence, both scores were dichotomized into low (below the 75th percentile) and good (above the 75th percentile) categories. To compare the two categories, the Chi-square test was employed, while for the comparison of two means the Student t-test was applied. Two logistic regression analyses were performed, with the dichotomized knowledge and practice scores taken respectively as dependent variables. Independent variables exhibiting a p <.25 in the bivariate analysis were included in the regression models. Statistical significance was deemed at a level of P <.05.

Results

Sociodemographic and Other Characteristics of the Participants

The survey was completed by 441 adult participants with a mean age of 31.52 ± 9.48 years. In terms of sex distribution, females formed 57.6% of the total sample. Using the 75th percentile as a benchmark, the 119 (27.0%) participants showed good knowledge (scores ≥36), while 171 (38.8%) had good practice about Influenza (scores ≥15). Table 1 contains further information about the sample. Additionally, Supplementary Tables 1, 2 and 3 describe each item's response, in sequential order, for the knowledge, psychological motives for vaccination, and practice scales.

Table 1. Sociodemographic and other characteristics of the participants (n= 441).

	n (%)
Sex	
Male	187 (42.4%)
Female	254 (57.6%)
Education	
Secondary or less	160 (36.3%)
University	281 (63.7%)
Marital status	
Single	181 (41.0%)
Married	260 (59.0%)
Governorate	
Beirut	63 (14.3%)
Mount Lebanon	100 (22.7%)
North/Akkar	62 (14.1%)
South/Nabatieh	74 (16.8%)
Bekaa	142 (32.2%)
Employment status	
Unemployed	121 (27.4%)
Part-time job	103 (23.4%)
Full-time job	217 (49.2%)
Had the flu in the last 6 months	
No	198 (44.9%)
Yes	243 (55.1%)
Family member had the flu in the last 6 months	
No	162 (36.7%)
Yes	279 (63.3%)
	Mean ± SD
Age, years	31.52 ± 9.48
Household crowding index (person/room)	1.07 ± 1.36
Financial satisfaction	5.24 ± 2.02
Knowledge score	31.40 ± 7.72
Practice score	13.88 ± 2.09
Psychological motives score	37.97 ± 6.04

Numbers are shown as frequency (percentage) or mean ± standard deviation.

Table 2 outlines the outcomes of the bivariate analysis. A significantly higher percentage of participants with high knowledge were females, had a university level of education, were single, were unemployed, and had a family member who contracted the flu within the last 6 months. Furthermore, a lower mean age, lower mean confidence and collective responsibility scores, and a higher mean complacency, convenience, and calculation scores were found in participants with high knowledge.

Furthermore, a significantly higher percentage of participants with high knowledge were females, with a university level education, single, unemployed, and had a high knowledge about flu. Moreover, a lower mean age, lower mean confidence score, as well as a higher mean complacency, convenience, and calculation score were significantly associated with high practice.

Multivariable Analysis

Holding a university level of education (aOR= 3.39) and more convenience (aOR= 1.30) were significantly associated with greater odds of possessing high knowledge; however, being married (aOR= .41) and lower odds of having high knowledge were significantly associated (Table 3, Model 1).

Having higher knowledge (aOR= 2.29) and high convenience (aOR= 1.17) were significantly associated with higher odds of exhibiting better practice (Table 3, Model 2).

Table 2. Bivariate analysis of factors associated with the knowledge and practice scores.

	Knowledge		*p*	Practice		*p*
	Low	High		Low	High	
Sex			.007			.038
Male	149 (79.7%)	38 (20.3%)		125 (66.8%)	62 (33.2%)	
Female	173 (68.1%)	81 (31.9%)		145 (57.1%)	109 (42.9%)	
Education			<.001			.041
Secondary or less	145 (90.6%)	15 (9.4%)		108 (67.5%)	52 (32.5%)	
University	177 (63.0%)	104 (37.0%)		162 (57.7%)	119 (42.3%)	
Marital status			<.001			<.001
Single	101 (55.8%)	80 (44.2%)		92 (50.8%)	89 (49.2%)	
Married	221 (85.0%)	39 (15.0%)		178 (68.5%)	82 (31.5%)	
Employment status			<.001			.001
Unemployed	66 (54.5%)	55 (45.5%)		61 (50.4%)	60 (49.6%)	
Part-time job	80 (77.7%)	23 (22.3%)		57 (55.3%)	46 (44.7%)	
Full-time job	176 (81.1%)	41 (18.9%)		152 (70.0%)	65 (30.0%)	
Had the flu in the last 6 months			.242			.727
No	150 (75.8%)	48 (24.2%)		123 (62.1%)	75 (37.9%)	
Yes	172 (70.8%)	71 (29.2%)		147 (60.5%)	96 (39.5%)	
Family member had the flu in the last 6 months			.031			.329
No	128 (79.0%)	34 (21.0%)		104 (64.2%)	58 (35.8%)	
Yes	194 (69.5%)	85 (30.5%)		166 (59.5%)	113 (40.5%)	
Knowledge						<.001
Low				223 (69.3%)	99 (30.7%)	
High				47 (39.5%)	72 (60.5%)	
Age	32.99 ± 9.30	27.54 ± 8.85	<.001	32.43 ± 9.05	30.09 ± 10.00	.011
Household crowding index	1.01 ± 1.21	1.22 ± 1.68	.159	1.00 ± 1.26	1.18 ± 1.49	.162
Financial satisfaction	5.17 ± 1.91	5.41 ± 2.30	.315	5.35 ± 1.91	5.06 ± 2.18	.151
Confidence	12.13 ± 2.18	10.42 ± 2.78	<.001	11.93 ± 2.35	11.26 ± 2.60	.006
Complacency	4.00 ± 2.40	7.24 ± 3.41	<.001	4.36 ± 2.78	5.68 ± 3.32	<.001
Convenience	3.98 ± 2.68	8.25 ± 3.77	<.001	4.39 ± 3.08	6.32 ± 3.93	<.001
Calculation	3.73 ± 2.20	6.13 ± 3.01	<.001	4.06 ± 2.50	4.87 ± 2.85	.003
Collective responsibility	12.29 ± 2.23	10.89 ± 2.91	<.001	12.08 ± 2.46	11.64 ± 2.57	.077

Numbers are shown as frequency (percentage) or mean ± standard deviation. Numbers with significant *p* values were shown in bold.

Table 3. Multivariable analyses.

	P	aOR	95% CI
Model 1: Linear regression taking the knowledge score (high vs low*) as the dependent variable (ENTER method) (R= .412)			
Age	.893	1.003	.97; 1.04
Gender (females vs males*)	.651	1.14	.65; 1.98
Household crowding index	.891	.98	.76; 1.27
Education (university vs secondary or less*)	**.001**	3.39	1.68; 6.81
Marital status (married vs single*)	**.013**	.41	.20; .83
Employment status	.724		
Unemployed		1	
Part-time job	.423	.73	.34; 1.57
Full-time job	.615	.83	.41; 1.70
Had flu in the last 6 months (yes vs no*)	.105	1.55	.91; 2.65
Family member had flu in the last months (yes vs no*)	.107	1.57	.91; 2.71
Confidence	.889	1.01	.84; 1.22
Complacency	.831	1.02	.84; 1.25
Convenience	**.002**	1.30	1.10; 1.52
Calculation	.759	1.04	.83; 1.29
Collective responsibility	.237	1.14	.92; 1.40

Model 2: Linear regression taking the practice score (high vs low*) as the dependent variable (ENTER method) (R= .163)			
Age	.755	1.00	.98; 1.03
Gender (females vs males*)	.435	1.19	.77; 1.83
Household crowding index	.585	1.05	.89; 1.23
Education (university vs secondary or less*)	.734	1.09	.67; 1.77
Marital status (married vs single*)	.188	.69	.39; 1.20
Employment status	.195		
Unemployed		1	
Part-time job	.452	1.27	.68; 2.35
Full-time job	.416	.78	.44; 1.41
Financial satisfaction	.087	.91	.82; 1.01
Knowledge (high vs low*)	**.002**	2.29	1.34; 3.90
Confidence	.950	1.01	.85; 1.20
Complacency	.934	.99	.83; 1.18
Convenience	**.034**	1.17	1.01; 1.35
Calculation	.174	.88	.73; 1.06
Collective responsibility	.968	1.00	.84; 1.20

*Reference group; numbers with significant *p* values were indicated in bold. aOR = adjusted odds ration; CI = Confidence Interval.

Discussion

This research aimed at examining the factors, particularly psychological motives, associated with knowledge and practices regarding influenza A (H1N1) within a Lebanese sample of adults. A significant association was found between greater convenience and better knowledge. Moreover, greater knowledge and convenience were substantially associated with better practice.

Knowledge about H1N1 Vaccination

Our results suggest that among Lebanese adults, a noteworthy association was found between holding a university-level education and higher odds of having better knowledge. This aligns with the conclusions drawn from a 2019 Turkish study on pregnant women (22). Notably, the study highlighted a correlation between higher educational levels, particularly at the secondary and university levels, and greater knowledge about influenza vaccines, as well as an increased likelihood of vaccine administration (22). Furthermore, a high level of education emerged as a statistically significant factor contributing to higher knowledge of Saudi parents regarding the vaccination of their children against influenza (23). The consistency of these findings across the different studies can be elucidated by the fact that individuals with advanced educational backgrounds are likely to have enhanced capabilities for comprehending the information they receive regarding health and scientific subjects, discerning misinformation, and fostering a trusting relationship with experts and vaccines which can diminish vaccine hesitancy (24). Therefore, we propose that individuals with a university education, and generally higher educational backgrounds, are better positioned to access scientifically accurate information about the influenza virus, thereby mitigating their apprehensions regarding its vaccine.

In terms of convenience, our study uncovered a significant positive correlation between convenience and knowledge levels. To elucidate, certain elements of the convenience concept are influenced by socioeconomic status, leading to reduced convenience among individuals with lower economic status, who may also encounter misinformation and lack of awareness, thereby limiting their knowledge about the virus and its vaccine (9). Our findings resonate with a prior study conducted in Lebanon in 2015, which showed a lack of awareness concerning influenza infection, its symptomatology and risks, and its vaccine's efficacy, availability, and safety among participants with low socioeconomic status, potentially contributing to decreased convenience (9). We suggest that the financial constraints stemming from the economic crises experienced in Lebanon between 2020 and the time of our study served as primary exacerbators of the diminished convenience and acted as barriers to addressing the knowledge gap within our target population. Moreover, the total cost of the vaccine in Lebanon ranges from 15 to 20 USD, which is a significant expense for many, especially vulnerable groups, and the government does not currently subsidize or cover these costs, leaving individuals to bear the financial burden (10). This lack of financial support exacerbates issues of accessibility and convenience, particularly for low-income populations. Further subsequent studies are needed to investigate the possible consequences and potential solutions as the country's circumstances evolve.

On the other hand, our study revealed that married participants exhibited lower odds of having higher knowledge, a finding divergent from previous outcomes observed in other countries such as China (25) and Northern Nigeria (26). We propose that in Lebanon, cultural norms and family dynamics might influence how information is shared and discussed within married household. Often, health information dissemination can be influenced by malpractices and traditional misconceptions from the surrounding individuals and not from professionals, while on the other hand it can also be influenced by traditional gender roles, where one partner might take primary responsibility for health decisions, potentially limiting the accuracy of information that reaches the entire household. Married couples might also prioritize family obligations over health education, leading to lower knowledge about specific health issues like influenza. This unique cultural context justifies further exploration for deeper insights. This difference also exists in comparison with a prior study conducted in Lebanon regarding knowledge, attitude, and practices, but within the context of the COVID-19 vaccine. This study showed increased levels of knowledge and good practices among individuals who were ever married (8). We suggest that broader media awareness campaigns during the COVID-19 pandemic have effectively disseminated adequate scientific information about this virus and its vaccine. However, a similar strategy has not been implemented for influenza, resulting in a limitation of knowledge about the H1N1 virus, perpetuation of traditional malpractices, and underestimation among married couples.

Practice and H1N1 Vaccination

In terms of practice, our results demonstrated a significant association between higher knowledge levels and better practice outcomes. This finding not only aligns with the results of a previous study conducted in Lebanon, which targeted healthcare workers (27), but also suggests the potential generalization of its conclusions. The previous study supports a strong positive correlation between increased knowledge about influenza and its vaccine and the willingness of healthcare workers to receive and recommend the vaccination (27). One possible explanation for this sequence of findings can be that individuals with greater knowledge are more likely to understand the importance of this topic and benefit from preventive measures. Additionally, healthcare professionals play a crucial, trusted role in health education; in fact, their recommendations were among the most effective influencers in raising awareness and improving practices among Lebanese adults (13). This suggests that refining knowledge levels among healthcare professionals can serve as a catalyst for improving knowledge and promoting better practices among the general population, particularly in terms of influenza vaccination.

Furthermore, our findings demonstrate a significant correlation between high convenience and improved vaccination practices. In fact, understanding the cost is one of the crucial factors influencing the individual's practices within our population, as it can discourage vaccine uptake; hence, a lack of financial convenience may contribute

to vaccination hesitancy (28). Moreover, it is challenging in low- and middle-income countries to combat misinformation about vaccines and eventually win community support for immunization campaigns due to limited communication resources (29) Hence, we believe that the Lebanese economic crisis and the absence of a third-party procurer exacerbate vaccination hesitancy caused by associated costs. Additionally, the country's circumstances diminish the impact of underfunded vaccination campaigns, making convenience a critical factor for promoting good practices within our community. Similar results were observed in Saudi Arabia, another Arab country yet with different circumstances; nevertheless, the study suggested that this correlation is intended to reflect an association with decreased vaccination behavior, but not necessarily vaccination willingness, as vaccination constraints could hinder individuals from translating their intentions into actions and adopting good practices (30). Therefore, further investigations are needed to assess the compliance of our general population towards potential free nationwide vaccination campaigns and whether the effect of constraints could be mitigated through national initiatives led by public health policymakers.

Clinical Implications

The findings of this study have significant implications for public health strategies in Lebanon. First, we believe that beyond the factors highlighted in this study, the role of healthcare professionals in Lebanon is pivotal in enhancing knowledge levels and subsequently improving and redirecting the practices within the general population. Therefore, the primary focus of the public health strategy against the influenza virus should prioritize enhancing knowledge levels and engagement among healthcare professionals, who serve as the primary source of health information in developing countries like Lebanon. Training programs focusing on the importance of influenza vaccination, addressing common misconceptions, and effective communication strategies should be implemented. This approach would not only foster greater awareness among the general population but also facilitate the ultimate objective of improving practices. Second, in the context of a country like Lebanon, where resources may be limited and healthcare infrastructure may face challenges, prioritizing outreach efforts and educational initiatives targeting vulnerable groups might be an essential first step in future strategic interventions. Furthermore, subsidizing the cost of influenza vaccines, particularly for this group, might reduce the economic burden on individuals. Additionally, empowering healthcare advocacy within the community can help combat misinformation and promote preventive measures effectively through targeted awareness campaigns that should be tailored to address the unique cultural and socioeconomic barriers identified in this study. Third, public health strategies should include comprehensive campaigns similar to those used during the COVID-19 pandemic, ensuring that accurate and detailed information about influenza and its vaccine reaches all segments of the population, especially families and married couples. Finally, the proactive mitigation of this situation with a multifaceted approach is needed with this country's circumstances to improve the overall public health response to influenza.

Limitations and Strengths

The limitations of this study primarily arise from its cross-sectional design, which prevents the establishment of causal relationships. Additionally, the reliance on self-reported data introduces susceptibility to the disadvantages of desirability biases, where participants might have provided responses that they believe are socially accepted rather than being completely honest. This could be combined with potential selection biases favored by the implementation of an online questionnaire, which also generates an unknown refusal rate. In fact, one of the fundamental limitations of online surveys is their selection against illiterate people and individuals lacking internet access, common in developing countries like Lebanon, which could be a significant source of bias. Hence, the use of an online questionnaire not enabling the full representation of the broader population affects the generalizability of the findings. Moreover, the time-length of the survey (15 minutes) could have influenced respondent motivation, while recall bias could have affected responses to questions about past behaviors. Finally, the lack of validation for the Arabic version of some scales used and the low reliability of the practice scale are notable limitations. While these scales were designed to measure relevant constructs, future studies are needed to validate these scales and enhance the robustness of the results. Despite these limitations, this study represents an essential contemporary investigation into the knowledge and practices of the Lebanese population regarding influenza A, paving the way for future research objectives,

and offering valuable insights for national and international health policymakers on the current status and the factors influencing the psychological motives of Lebanese adult towards influenza vaccination.

Conclusion

Concerning the level of knowledge, our findings highlight its correlation with factors such as education, marital status, and convenience. On the other hand, a significant association was found between better practices and higher levels of knowledge, as well as with better convenience. Given the public health concern posed by the spread of influenza A within communities, healthcare

professionals play an impactful role in raising awareness about this issue and promoting prevention. Hence, they should benefit from every opportunity to educate their patients about the advantages of vaccination and the potential risks of infection, while addressing misconceptions or malpractices. Additionally, to ensure an effective response during future H1N1 seasons, responsible authorities must prioritize the enhancement of national public health strategies. This involves implementing vocational training programs for healthcare professionals and launching awareness campaigns, particularly targeting vulnerable groups. Consequently, we strongly urge healthcare policymakers in Lebanon to take immediate actions based on our findings by investing in education, addressing barriers to vaccination, and fostering community engagement. In fact, given the strong correlation between knowledge and improved vaccination practices, it is crucial that national strategies include comprehensive educational initiatives that focus on increasing public awareness and knowledge about the benefits and safety of influenza vaccines. Additionally, addressing convenience factors by reducing financial and logistical barriers to vaccination can further enhance uptake. This study not only provides valuable insights for future investigations but also offers essential background information for shaping upcoming national public health decisions and leveraging the resilience of the healthcare system to mitigate future epidemics.

Ethics Approval and Consent to Participate:

This study protocol (2023RC-004-LIUSOP) received approval from the Lebanese International University Ethics and Research Committee. An electronic/digital informed consent was considered obtained from each participant upon submission of the online form. All procedures adhered to relevant guidelines and regulations (Declaration of Helsinki).

Consent for Publication

Not applicable.

Availability of Data and Materials

The datasets generated and/or analyzed in this study are not publicly accessible due to restrictions from the ethics committee; however, they are available from the corresponding author on a reasonable request.

Competing Interests

The authors have nothing to disclose.

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None.

Author Contributions

SO and SH designed the study; NM, SY, and SM collected the data; VM and DM drafted the manuscript; SH conducted the analysis and interpreted the results; RH, KI, ad MS authors reviewed the final manuscript and gave their consent. The authors declare that there are no conflicts of interest regarding the publication of this paper.

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