**Vaccine hesitancy among students in Israel: Exploring the relationships between vaccination history, knowledge, and attitudes towards influenza vaccines**

**Abstract**

Influenza vaccination is a highly effective strategy for mitigating the health, societal, and economic repercussions of influenza infections. Despite the potential severity of influenza and the availability of safe vaccines, global influenza vaccination rates remain insufficient, particularly among students. This study examines the correlative relationships between flu vaccine history, knowledge, attitudes toward flu vaccines, and vaccine hesitancy among college students. To that end, we used an online questionnaire to conduct a cross-sectional study encompassing 610 students. A significant majority of participants reported prior experiences with influenza (82%), with slightly more than half having received influenza vaccinations in the past (57%). With respect to the current research year, Health Sciences students exhibited a higher likelihood of either having been vaccinated or intending to receive the vaccine than did their counterparts. Among students who had been vaccinated previously, approximately one-fifth opted for vaccination in the present year (21%). Similarly, 22% of the students whose parents were vaccinated chose to get vaccinated this year. Notable disparities in knowledge about influenza vaccines were observed across various faculties, with Health Sciences students demonstrating the highest levels of awareness. Moreover, a negative relationship was found between knowledge, attitudes, and vaccine hesitancy. Targeted lectures by professionals emphasizing vaccine safety and university-hosted events addressing this subject in collaboration with the Ministry of Health, incorporating influenza vaccination stations, could be instrumental in bolstering the vaccination rate.

**1. Introduction**

Influenza represents a significant public health concern, contributing to approximately 3–5 million severe cases and 290,000–650,000 respiratory-related deaths worldwide each year (Doyon-Plourde et al., 2019; Kim et al., 2022). Over the past year, the infection rate in Israel was 53.9 cases per 100,000 individuals. In contrast, in other Western countries, the incidence of illness is significantly lower. For example, the incidence rates in the United States, France, Germany, and Italy are 20.45, 15.13, 3.75, and 0.62 per 100 individuals, respectively (Corporate Value Associates, 2022). The influenza vaccine is one of the most efficient tools to for mitigating the health-related, social, and economic impacts of influenza (Cassini et al., 2018). The World Health Organization (WHO) recommends getting an annual influenza vaccination due to continuous genomic changes in the influenza virus (WHO, 2019). Despite the severity of influenza infections and the availability of safe vaccines, vaccination rates are low globally, contributing to the burden that this disease imposes on healthcare systems worldwide (Chotpitayasunondh et al., 2021). Influenza vaccination coverage among students lags behind other age groups and remains well below the target (CDC, 2020). Reported vaccination rates range from 9–30%, and annual influenza virus outbreaks cause severe disease that can be fatal even among students (Ratnapradipa et al., 2017; Schlenker et al., 2013).

The Israeli Ministry of Health recommends that the entire population over six months of age be vaccinated against influenza every year before the onset of winter at no cost. However, during the 2019–2020 influenza season, approximately 25% of the Israeli population was vaccinated (Israel Center for Disease Control, 2020). Studies have shown that seasonal influenza vaccination rates among the student population are low, ranging from 12–30% (Benjamin & Bahr, 2016). A study conducted by the National Foundation for Infectious Diseases (NFID) among students in the United States revealed that although 70% of students believed in vaccinating against influenza, only about 46% reported getting vaccinated (NFID, 2016). Influenza can quickly spread on campuses due to crowded living quarters and frequent social activities, with illness adversely affecting students’ academic performance and class attendance, while contributing to increased use of health services and prescription drug use (Hayward et al., 2014). Students interact with family members and the community through their work, presence in fitness centers, and social events, and can thus be a source of community outbreaks (Nichol et al., 2008). Investigations of outbreaks among subgroups of students revealed high infection rates of up to 73% (Benjamin & Bahr, 2016). While influenza-related hospitalization is relatively rare among students, the potential burden that this virus imposes on the student population is significant (Benjamin & Bahr, 2016).

Vaccine hesitancy is defined as a combination of beliefs, attitudes, and behaviors exhibited by the general population and healthcare professionals regarding their children’s vaccinations, resulting in reduced vaccine coverage and an increased risk of preventable disease outbreaks (Dubé et al., 2013). In 2019, the WHO classified vaccine hesitancy as one of the top ten global health threats (WHO, 2019). It is believed that vaccine hesitancy is responsible for diminishing vaccine coverage and the growing risk of outbreaks of diseases that can be prevented through immunizations (Majid & Ahmad, 2020). As vaccine hesitancy and refusal rates continue to rise worldwide, the protection against vaccine-preventable diseases provided by immunizations continues to decline (Vrdelja et al., 2018). Vaccine hesitancy is a complex phenomenon influenced by a combination of scientific, economic, socio-cultural, psychological, and political factors (MacDonald et al., 2015). The threat of vaccine hesitancy persists despite significant clinical evidence supporting the benefits and importance of vaccines in preventing the spread of diseases (Koslap-Petraco, 2019).

The reasons for delaying or refusing vaccinations are complex and highly variable. The rapid development of vaccines and the pharmaceutical industry’s commercial interests have heightened public concerns and may influence decision-making (Al-Mulla et al., 2021). Studies of healthcare system employees have revealed high levels of vaccine hesitancy, even among doctors (Al-Mulla et al., 2021). Doctors from Belgium, Austria, and other countries have voiced their reservations publicly regarding the vaccine. Similarly, surveys have shown high levels of vaccine hesitancy among academics. A recent study among medical students revealed that 23% of the participants were unwilling to take a COVID-19 vaccine even with FDA approval (Lucia et al., 2021).

The reasons for influenza vaccine hesitancy among students have not been sufficiently researched. Documented barriers include vaccine inaccessibility, a perceived lack of necessity, low motivation to vaccinate, and a lack of knowledge about the vaccine (Logan et al., 2018). Casting doubt on vaccine efficacy and beliefs that the vaccine may have dangerous side effects reinforces the perception that it is possible to contract influenza from the vaccine (Berg & Wicker, 2021). A large public university study in the United States detected a higher rate of vaccine acceptance among students with a history of childhood vaccinations. Additionally, when unvaccinated students learned how the influenza vaccine protects healthy young individuals, most expressed increased willingness to get vaccinated (Ryan et al., 2019).

While vaccine hesitancy has been extensively researched in the general adult population, young adults have not been a strategic focus of vaccination encouragement and public health communication. Motivating students to receive the influenza vaccine is challenging (Cornally et al., 2013; NFID, 2017). Generally, students perceive themselves as healthy and at low risk of illness, even though the influenza virus spreads rapidly in areas near campuses. In fact, low seasonal influenza vaccination rates among students are a global phenomenon (Lee et al., 2018). Students with influenza immunity also play an essential role in protecting their peers, family members, high-risk population groups, and others in the community. Therefore, increasing vaccination rates among students in universities will help enhance overall coverage and contribute to achieving herd immunity against seasonal influenza (Plans-Rubió, 2012).

Students represent an interesting group for research focused on investigating vaccine hesitancy, as they are considered educated, broad-minded, and aware of the perceived threat to humans from infectious diseases, constituting a special category of the young population who are open-minded and capable of responding quickly to public health issues (Harrison et al., 2020). Therefore, understanding the factors that contribute to vaccine hesitancy among students may enable the development of a tailored plan to increase influenza vaccination rates. As such, this study aimed to determine whether there are correlations between influenza vaccination history, knowledge, attitudes towards influenza vaccination, and influenza vaccine hesitancy among students.

### 2. Materials and Methods

#### 2.1. Research Procedure

A cross-sectional analysis was conducted among the approximately 4,200 students from Ashkelon Academic College. Approval for the study was obtained from the Ashkelon Academic College Ethics Committee (approval #42-2023). The survey questionnaires were developed using Qualtrics (Qualtrics, Provo, UT, USA) and were distributed to the students via email on 2 April 2023. A reminder prompting the completion of the questionnaire was sent using the same method after three weeks. On 12 May 2023, the questionnaire was closed to further participation, coinciding with the end of the vaccination season in Israel. On average, participants took 5 ± 1.44 minutes to complete the questionnaire. The introductory page of the questionnaire explained the questionnaire’s objectives and purpose. Submitting the completed questionnaire signified the students’ informed consent to participate in the survey. Students could halt their responses at any time, and no questions were mandated. A total of 703 responded to the questionnaire, with 610 students, 15% of the research population, completing at least 90% of the questionnaire, resulting in a response rate of 87% among respondents.

#### 2.2. Tools

A professional translator translated the anonymous, closed, self-completed questionnaire from English into Hebrew (Appendix A). After it was translated into Hebrew, it was administered to 10 students who did not attend the College to ensure the questions were comprehensible. The questionnaire was then revised according to their comments. In addition, one expert in public health and epidemiology and one expert in infectious diseases validated the questionnaire using the content validity method. The sections of the questionnaire were as follows:

1. Demographic information: Gender, age, marital status, religion, department, and year of study.
2. Vaccination and vaccination history: This included questions drawn from Ryan et al. (2019): “Have you ever had the flu?” “Have you ever been vaccinated against the flu?” “Do your parents usually get vaccinated against the flu?” “Have you been vaccinated against the flu this year?”
3. Vaccine hesitancy: This included six questions drawn from Silva et al. (2021). The respondents were asked to indicate their degree of agreement with each statement in the questionnaire on a Likert scale ranging from 1 (not at all) to 5 (strongly agree) with the option to answer “I don’t know.” The average of the answers was calculated for each participant after reversing the scales for questions 1 and 6 and dropping the “I don’t know” answers. A higher score is indicative of greater vaccine hesitancy. Cronbach’s α for reliability was α=0.77.
4. Attitudes regarding influenza vaccines: This included five questions drawn from Silva et al. (2021) asking respondents to indicate to what extent they agreed with the given statements using a Likert scale ranging from 1 (not at all) to 5 (strongly agree) with the option to answer “I don’t know.” The average of the answers was calculated for each participant. A higher score indicates more positive attitudes towards influenza vaccines. Cronbach’s α for reliability was α=0.74.
5. Knowledge about influenza and influenza vaccines: This included10 questions drawn from Ryan et al. (2019) in which respondents were asked to indicate whether, in their opinion, the statement was correct or incorrect or whether they did not know. The number of correct responses to each statement was totaled to calculate the knowledge score.

#### 2.3. Data Analysis

The data were analyzed using SPSS 29.0 (IBM, Armonk, NY, USA). Relationships between the variables were examined using Pearson correlation analyses. Differences between groups of students were analyzed using χ2 tests, t-tests for independent samples, and one-way analyses of variance (ANOVAs) as appropriate. A linear regression model was used to test the prediction of the level of vaccination hesitancy. All reported *p*-values were based on two-sided tests and were considered significant when the values were below 0.05.

**3. Results**

#### 3.1. Participant characteristics

In total, 610 individuals participated in the study, of whom 60% were women, 53% were in relationships, and 21% had children. Most participants were Jewish (83%). Nearly half studied in the Faculty of Social Sciences (46%), 35% in Health Sciences, and 19% in Computer Science and Management. The mean age of the respondents was 27.64 ± 7.20 years. Participant characteristics are summarized in Table 1.

**Table 1.** Participant characteristics.

|  |  |  |
| --- | --- | --- |
| **Characteristics** | ***n*** | **%** |
| Gender  Male  Female | 243  367 | 40  60 |
| In relationship | 324 | 53 |
| Have children | 128 | 21 |
| Jewish | 509 | 83 |
| Faculty  Health Sciences  Social Sciences  Computers & Management | 202  262  106 | 35  46  19 |
| Year of studies  1st  2nd  3rd & 4th | 310  198  102 | 51  32  17 |

#### 3.2. Influenza vaccination

Participants were asked about their history of influenza vaccination, whether they intended to get vaccinated this year, and the vaccination status of their parents and children. As shown in Table 2, most participants had experienced influenza infections at some point (82%; 89% when excluding participants who could not remember). More than half had been vaccinated in the past (57%; 61% when excluding participants who could not remember), and a similar percentage reported at least one parent having been vaccinated to the best of their knowledge. Over one-third of respondents who were parents reported vaccinating their children (38%). Among study participants, 12% were vaccinated, 44% intended to get vaccinated, 8% were undecided, and 36% did not intend to get vaccinated.

No significant differences were found between faculties with respect to vaccination history, parental vaccination, or children’s vaccination rates. However, significant differences were detected between faculties in terms of vaccination in the research period year (χ2=24.66, p<0.001), with more students in the Health Sciences faculty having been vaccinated or intending to get vaccinated (16% and 47%, respectively), compared to Computer Science and Management students (14% and 52%, respectively), and Social Sciences students (11% and 35%, respectively).

**Table 2**. Influenza vaccination responses (n=610).

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Responses | n | % |
| Ever had influenza | Yes  No  Don’t remember | 501  59  50 | 82  10  8 |
| Vaccinated against influenza | Yes  No  Don’t remember | 351  223  36 | 57  37  6 |
| Parents vaccinated against influenza | Yes, both  Yes, one of them  Do not know | 197  152  261 | 32  25  43 |
| Participants vaccinated this year against influenza | Yes  Intend to vaccinate  Do not intend to vaccinate Undecided | 76  269  217  48 | 12  44  36  8 |
| Are their children vaccinated (n=128) | Yes  Some of them  No | 32  17  79 | 25  13  62 |

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#### 3.3. Relationships between vaccination history, parental vaccination, and current vaccination status

The associations between the history of influenza vaccination, parental vaccination, and influenza vaccination in the current year were examined using chi-square tests after excluding participants who responded “do not remember.” Significant differences were found between students who had been vaccinated in the past and those who had not been vaccinated against influenza in the current year (χ2=55.81, p<0.001). Among those students who had been vaccinated in the past, 21% were vaccinated in the current year, while 30% indicated that they did not intend to get vaccinates, compared to students who had not been vaccinated against influenza in the past, among whom only 1% were vaccinated this year, with 38% declaring that they had no intention of getting the vaccine.

Significant differences were also detected between students whose parents were vaccinated and those with only one vaccinated parent with respect to the influenza vaccination rate for respondents during the current year (χ2=15.55, p=0.001). Among students for whom both parents were vaccinated, 22% were vaccinated this year, compared to just 11% of students with only one vaccinated parent.

#### 3.4. Levels of knowledge, attitudes, and vaccine hesitancy

Table 3 presents the levels of knowledge and attitudes toward influenza vaccines and vaccine hesitancy. Overall, the knowledge about and attitudes toward influenza vaccines among study respondents were relatively low, while the level of vaccine hesitancy was moderate.

**Table 3.** Levels of knowledge, attitudes, and vaccine hesitancy.

|  |  |  |  |
| --- | --- | --- | --- |
| **Variables** | **Maximum**  **Obtainable Score** | **Range Obtained by Respondents** | **Mean** ± **SD\*** |
| Knowledge about influenza vaccines | 9 | 0–10 | 4.04 ± 2.39 |
| Attitudes toward influenza vaccines | 5 | 1.00–5.00 | 2.82 ± 0.97 |
| Vaccination hesitancy | 5 | 1.00–5.00 | 3.11 ± 0.70 |

\* SD = Standard Deviation

#### 3.5. Relationships among knowledge, attitudes, and vaccine hesitancy

Relationships among variables were evaluated through Pearson correlation analyses. We detected significant negative associations between the level of knowledge, attitudes, and vaccination hesitancy (rp=-0.35, p>0.001; rp=-0.43, p>0.001 respectively). This indicates that a higher level of knowledge and more positive attitudes towards influenza vaccines are associated with lower levels of vaccine hesitancy.

#### 3.6. The relationship between vaccination history and the study variables

The differences between students who had and had not been vaccinated in the past in relation to the study variables were tested using independent sample t-tests. Significant differences were found between these groups with respect to their levels of knowledge (t=6.50, p<0.001), attitudes (t=3.24, p<0.001), and vaccination hesitancy (t=6.69, p<0.001). Specifically, students who had been vaccinated in the past exhibited a higher level of knowledge (4.62 vs. 3.32), more positive attitudes (2.96 vs. 2.69), and a lower level of vaccination hesitancy (2.95 vs. 3.23) relative to unvaccinated students.

#### 3.7. Differences between faculties

Differences between faculties were examined using one-way ANOVAs. Significant differences were found between faculties in terms of knowledge (F(551)=7.55, p<0.001). Students in the Health Sciences faculty demonstrated the highest knowledge level, followed by students in the Social Sciences and, finally, students in Computer Science and Management (averages of 4.62, 3.87, and 3.67, respectively). Scheffe post hoc tests revealed that students in the Health Sciences faculty exhibited significantly higher knowledge levels than students in either of the other faculties.

Significant differences were also detected among faculties in terms of attitudes toward influenza vaccination (F(566)=16.37, p<0.001). Students in the Health Sciences faculty showed the highest level of confidence, followed by students in Computer Science and Management, and finally, students in the Social Sciences (averages of 3.05, 2.95, and 2.56, respectively). Scheffe post hoc tests indicated that students in the Social Sciences faculty held significantly more negative attitudes than those in the Health Sciences and Computer Science and Management faculties.

Lastly, significant differences were found among the faculties with respect to levels of influenza vaccine hesitancy (F(565)=3.17, p<0.05). Computer Science and Management students had the highest hesitancy level, followed by students in the Social Sciences and, finally, Health Sciences (averages of 3.22, 3.10, and 3.00, respectively). Scheffe post hoc tests revealed that students in the Computer Science and Management faculty exhibited significantly higher hesitancy levels than Health Science students.

#### 3.8. Regression Model for the Prediction of Influenza Vaccine Hesitancy

Table 5 presents the results of hierarchical linear regression models developed to predict influenza vaccine hesitancy. In the final model, which includes all the variables found to be significant in the previous models, the predictive ability of gender, religion, year of study, prior vaccination, and knowledge level was preserved. Knowledge level, year of study, and previous immunization were all found to strongly predict vaccine hesitancy. The explained variance of the final model was approximately 28% (p<0.001).

**Table 5.** Hierarchical linear regression model results (adjusted values) for models designed to predict influenza vaccine hesitancy.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | Demographic | Education | Vaccination | Research variables | Combined model |
| β | β | β | β | β |
| Gender (0–male, 1–female)  Age  Marital status (0–yes, 1–no)  Children (0–yes, 1–no)  Religion (0–Jewish, 1–not Jewish)  Birth (0–Israel, 1–abroad) | \*\*0.13-  0.05-  \*0.09-  0.07  \*0.11  0.05 |  |  |  | \*0.09-  0.03-  \*\*0.11 |
| Year of study  Health Sciences (0–no, 1–yes) Computer Science and Management (0–no, 1–yes) |  | \*\*\*0.14-  0.04-  0.06 |  |  | \*\*\*0.15- |
| Had flu (0–no, –1–yes)  Vaccinated (0–no, 1–yes)  Parents vaccinated (0–no, 1–yes) |  |  | 0.06  -0.23\*\*\*  -0.11\* |  | -0.15\*\*\*  0.002 |
| Knowledge  Attitudes |  |  |  | \*\*\*0.26-  0.02- | -0.19\*\*\* |
| Adjusted R Square  N | 0.03\*\*\*  605 | 0.03\*\*\*  565 | 0.08\*\*\*  534 | 0.20\*\*\*  575 | 0.28\*\*\*  545 |

\*p<0.05, \*\*p<0.01, \*\*\*p<0.001

**4. Discussion**

Half of the participants in the current study had been vaccinated against the influenza virus in the past. For at least half of the participants, at least one parent had been vaccinated against the virus, and among the parents of the children, about one-third of their children had received a vaccine against the virus. Among study participants, about 10% had been vaccinated against the virus, while approximately 44% planned to get vaccinated; the remainder were undecided or did not plan to get vaccinated. Generally, students perceive themselves as healthy individuals with a lower chance of contracting infectious diseases; as a result, their vaccination rate is low. Similar findings have also been reported in studies conducted throughout the world aimed at clarifying the percentage of students who were vaccinated against influenza. In these studies, 10–30% of students were found to have been vaccinated against the virus (Benjamin & Bahr, 2016; Choucair et al., 2021).

In contrast to these prior results, a study conducted by the NFID (National Foundation for Infectious Diseases, 2016) among students in the United States found that 46% reported having been vaccinated. Among those students who had not been vaccinated, about 77% expressed a positive intention to get vaccinated. It is possible that since the healthcare system in the United States is private and disease treatments are costly (cost of doctor visits, medications, potential hospitalization), the vaccination rate is higher compared to countries where public healthcare services are more prevalent.

With respect to vaccination during the year of the research period, significant differences were found between faculties in the present study, with more students from the Health Sciences having been vaccinated or planning to be vaccinated compared to Computer Science and Management or Social Sciences students. Similar findings were obtained in previous studies showing that influenza vaccination was more common among medical students than students in other professions (Ryan et al., 2019; Malhi et al., 2022). This may be because Health Sciences students often have clinical experience in hospitals and clinics, making them more concerned about the risk of infection. In some cases, these students are required to be vaccinated to begin their clinical work out of concern for themselves, patients, and the teams with which they interact.

When comparing students who were vaccinated in the past to those who were not, a significant difference in vaccination was also found with respect to vaccination status during the research period year. Among students who were previously vaccinated, more stated that they intended to get vaccinated this year than those who were not vaccinated. These findings align with studies that explored factors related to positive intentions to get vaccinated against influenza. In these studies, students who planned to get vaccinated in the future were mostly those who had already been vaccinated in the past (Pastorino et al., 2021). Similar findings were found in a study by Ryan et al. (2019), which saw a higher vaccination rate among students with a childhood vaccination history. Similar findings were also obtained in studies conducted in other research populations, showing that previously vaccinated participants were more likely to receive or plan to receive their future vaccinations (Lin et al., 2010; Nowalk et al., 2010).

Additionally, a significant difference was found in vaccination intentions depending on the number of vaccinated parents. Among students with two vaccinated parents, 22% had been vaccinated in the current year, as compared to just 11% of students with only one vaccinated parent. These findings align with the existing literature indicating that when children receive support from their parents regarding vaccines, or when their parents support vaccinations, in most cases, they too will receive the vaccine. This can explain the finding that the higher the vaccination rate among parents, the higher the likelihood that the child will be vaccinated (Shon et al., 2021). Another prior study also supported the notion that the higher the vaccination rate among family members and friends, the higher the likelihood that the individuals would receive it (Sunil & Zottarelli, 2011).

The present findings highlight differences between students who had previously been vaccinated and those who had never been vaccinated in relation to the study variables. Specifically, students who had previously been vaccinated exhibited higher knowledge levels, more positive attitudes, and lower hesitancy than students who had never been vaccinated. These differences can be explained using the Theory of Planned Behavior, which suggests that a person’s behavior is influenced by their attitudes toward the vaccine. According to this theory, someone with a more positive attitude toward the vaccine is more likely to choose to receive it. Additionally, someone who has already received the vaccine is expected to have positive attitudes that initially motivated them to receive the vaccine (Ajzen, 1991). Similar findings were obtained in another study conducted among students in the United States, where it was found that previously vaccinated students are more likely to get vaccinated and to have higher levels of knowledge and positive attitudes on the subject (Ryan et al., 2019).

Negative correlations were observed between knowledge and both attitudes toward influenza vaccines and vaccine hesitancy. Similar findings have been reported in studies that examined factors related to vaccine hesitancy. For example, a lack of knowledge was identified as an influencing factor in vaccination intentions among students in the United States (Logan et al., 2018). In a study by Ryan et al. (2019), the relationship between variables among students was examined, revealing significant correlations. A survey conducted among second-degree nursing students in Italy further found that as knowledge levels and attitudes became more positive, vaccine hesitancy decreased. In this study, the researchers also expanded and included students in intervention programs to promote vaccination. They found that students involved in the program had increased knowledge levels and reduced vaccine hesitancy (Mellucci et al., 2020).

In addition, differences were found between Health Science students and other students in terms of the analyzed study variables. Health Science students had the highest level of knowledge, with these levels being markedly higher than those of Social Science or Computer Science and Management students. This finding is logical given that Health Science students acquire relevant knowledge about vaccines as part of their comprehensive training. Therefore, there is a strong likelihood that their knowledge levels will be higher than those of other students who do not acquire this knowledge in their studies (Mallhi et al., 2022). Social Science students had more negative attitudes toward vaccines than did Health Science or Computer Science and Management students. Similar findings were obtained in a study conducted among students in Italy, which found that attitudes and vaccination intentions varied among students from different academic disciplines. These attitudes and intentions were generally more positive among medical students (Pastorino et al., 2021). This may also be because medical and nursing students have more knowledge about vaccination topics, in large part because they deal with these subjects as part of their curriculum. Knowledge is a significant factor in this context, as has also been found in other studies conducted among students, with students who received knowledge about vaccines expressing more positive attitudes and intentions to get vaccinated after receiving relevant information (Ryan et al., 2019; Alhawsawi et al., 2020).

Finally, significant differences were found between faculties in terms of influenza vaccine hesitancy. Computer Science and Management students had the highest hesitancy rates, followed by Social Science students and Health Science students. Similar findings have been reported in other studies that included students from various fields. For example, a study conducted in Saudi Arabia found that health sciences students had more positive vaccination intentions, consistent with lower hesitancy rates compared to students from other study areas (Mallhi et al., 2022). Based on the research literature, vaccine hesitancy is ultimately reflected in the vaccination rate. Therefore, based on the vaccination rate of students from different study fields, it is also possible to learn about their hesitancy levels, assuming that higher hesitancy levels correspond to lower vaccination rates. In a study of 604 students from Hokkaido University in Japan, researchers examined the reasons related to the vaccination rate among students and found that the vaccination rate among health science students was three times higher than among students from other fields of study (Kawahara & Nishiura, 2020).

Furthermore, a hierarchical regression model was constructed based on the findings of this study in an effort to predict vaccine hesitancy among students. In a study by Shon et al. (2021), it was found that female students were vaccinated more frequently than male students, which may indicate that among students, males have higher levels of vaccine hesitancy, which is consistent with the present results. Students who had been vaccinated in the past or had vaccinated parents exhibited less vaccine hesitancy. This was also found in the research estimate and is supported by the research literature, with several explanations for this finding having been advanced (Ryan et al., 2019; Shon et al., 2021; Sunil & Zottarelli, 2011). According to the comprehensive model, the level of knowledge was the most accurate predictor of vaccine hesitancy. Similar findings were obtained in other studies conducted on this subject involving students (Betsch et al., 2015; Logan et al., 2018; Ryan et al., 2019). Vaccine willingness is essential among students and populations that are generally not at risk in order to increase vaccination rates and generate herd immunity that can help protect the entire population (Vergara et al., 2021).

#### 4.1. Study Limitations

The study was conducted among students from only one college, which may affect the generalizability of these findings to all students nationwide. Additionally, most participants were not vaccinated against influenza in the study year, and over one-third did not intend to get vaccinated. These data may indicate a selection bias where vaccine-hesitant students were more likely to respond to the questionnaire.

**5. Conclusion**

These research findings emphasize the importance of studying the factors associated with vaccine hesitancy among students and increasing knowledge about influenza vaccine safety, especially among students who do not receive this information as part of their study program. Young individuals sometimes believe that their vaccination is not essential when, in reality, their failure to be vaccinated hinders herd immunity, allowing vulnerable populations to remain susceptible to the influenza virus. Based on the present findings, it is recommended that intervention programs be developed to increase vaccination rates among all students, especially those studying non-health-related professions. Rising vaccination rates can be achieved through targeted lectures on vaccine safety by professionals and organizing campaigns within the college, which could include flu vaccination stations in collaboration with the Ministry of Health.

Further research should be conducted to thoroughly clarify the factors related to vaccine hesitancy and how to overcome such hesitancy. Developing intervention programs that can help increase vaccine coverage is important, as is the evaluation of the most effective intervention strategies. Moreover, in future studies, a representative sample of students from various colleges and universities should be included to obtain a more reliable picture of vaccine hesitancy in this population. These studies should also be expanded to other populations such as the elderly, pregnant women, and parents of young children.

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