



Factors Affecting Vaccination Status against COVID19 among Tanta University Students Gharbia Governorate, Egypt

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ABSTRACT

Background: Understanding student's perspectives about the COVID19 vaccine is the backbone for mass immunization to achieve the goal of herd immunity. **Objectives:** To assess vaccination status, motives for acceptance and barriers of COVID19 vaccines hesitancy among Tanta university students. **Method:** A web-based cross-sectional study was carried out among Tanta university students in their final graduation years, Egypt. A convenience sampling of 785 participants successfully completed the survey during the period from May 2021 to June 2021. **Results:** Only 11.7% were already vaccinated, 27.6% intended to be vaccinated and more than half of the students were hesitant and refused to be vaccinated. Most of the participant students were knowledgeable regarding the COVID19 vaccine with statistically significant association with the students' vaccination status. Social media was the commonest source of their knowledge. Attitude among vaccinated was significantly more positive than refused students ($P < 0.05$). The main barriers were students' concerns regarding efficacy, potential adverse effects, and safety. The motives were to protect themselves against COVID19, increased morbidity and mortality and no serious side effects of vaccine. **Conclusion:** More than half of the students refused to be vaccinated and the main barriers of COVID19 vaccine were concerns regarding efficacy, potential adverse effects, and safety. Meanwhile small percent of them were already vaccinated reporting their main motives; to protect themselves against COVID 19 infection, increased morbidity and mortality and the vaccine has no serious side effects. Educational campaigns should focus on vaccine efficacy and safety and other hesitancy issues among students.

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INTRODUCTION

The World Health Assembly (WHA) announced the great role of mass immunization for preventing, containing and stopping transmission of SARS-CoV-2 as a global public health goal in May 2020.¹ Instead of this; by the end of June 2021, COVID19 morbidity increased to be more than 181 million reported cases and about 4 million reported deaths.² Worldwide, there are more than 125 vaccine nominee, 365 ongoing experimental vaccine trials, and 18 COVID19 vaccines were already approved by at least one country.³ The growing concern for any

infectious disease even before the COVID19 pandemic, is the reluctance of people to receive recommended and available vaccines, which is known as 'vaccine hesitancy'.⁴ COVID19 vaccination showed more debate and therefore more hesitancy. However, vaccine-hesitant people worry about possible future and long term effects induced by the fast development of these vaccines, especially for new vaccine technology such as mRNA and viral vector.^{5,6}

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Table (1): Relationship between participants' history of infection and their vaccination status

| Variable | Vaccinated (N=92) | | Intend (N=217) | | Hesitant (N=329) | | Refused (N=147) | | P-value |
|--|-------------------|------|----------------|------|------------------|------|-----------------|------|---------|
| | n | % | n | % | n | % | n | % | |
| Did you get infected with COVID19? | | | | | | | | | |
| Yes | 13 | 14.1 | 37 | 17.1 | 53 | 16.1 | 27 | 18.4 | 0.726 |
| No | 51 | 55.5 | 117 | 53.9 | 171 | 52.0 | 67 | 45.6 | |
| I don't know | 28 | 30.4 | 63 | 29.0 | 105 | 31.9 | 53 | 36 | |
| Has anyone of your family members been infected with COVID19? | | | | | | | | | |
| Yes | 33 | 35.8 | 92 | 42.4 | 140 | 42.6 | 61 | 41.5 | 0.604 |
| No | 40 | 43.5 | 92 | 42.4 | 128 | 38.9 | 66 | 44.9 | |
| I don't know | 19 | 20.7 | 33 | 15.2 | 61 | 18.5 | 20 | 13.6 | |
| Are you belonging to risk group for COVID19? | | | | | | | | | |
| Yes | 39 | 42.3 | 101 | 46.5 | 125 | 38.0 | 65 | 44.2 | 0.001* |
| No | 19 | 20.7 | 23 | 10.6 | 23 | 7.0 | 12 | 8.2 | |
| I don't know | 34 | 37.0 | 93 | 42.9 | 181 | 55.0 | 70 | 47.6 | |
| Complication of COVID-19 infection are serious | | | | | | | | | |
| Yes | 72 | 78.3 | 166 | 76.5 | 260 | 79.0 | 119 | 81.9 | 0.001* |
| No | 7 | 7.6 | 20 | 9.2 | 4 | 1.2 | 6 | 4.1 | |
| I don't know | 13 | 14.1 | 31 | 14.3 | 65 | 19.8 | 22 | 15.0 | |
| Has anyone of your relatives or friends taken the vaccine? | | | | | | | | | |
| Yes | 78 | 84.8 | 170 | 78.3 | 215 | 65.3 | 77 | 52.4 | <0.001* |
| No | 14 | 15.2 | 47 | 21.7 | 114 | 34.7 | 70 | 47.6 | |
| If yes, has he had any side effects | | | | | | | | | |
| Yes | 64 | 74.4 | 114 | 64.8 | 160 | 66.4 | 56 | 55.4 | 0.054* |
| No | 22 | 25.6 | 62 | 35.2 | 81 | 33.6 | 45 | 44.6 | |
| Has he recommended the vaccine for you? | | | | | | | | | |
| Yes | 64 | 81.0 | 138 | 83.1 | 128 | 57.1 | 27 | 27.0 | <0.001* |
| No | 15 | 19.0 | 28 | 16.9 | 96 | 42.9 | 73 | 73.0 | |

***Significant**

The public stance for COVID19 vaccine is still complex. As new SARS-CoV-2 strains emerge, adding further complexity especially when new vaccines become available in the markets. For the public; it deserves to be transparent in communicating what is known and acknowledging the unknown issues.⁷

Egypt began its vaccination campaigns in January 2021 and facilitated the registration system via online website to start with high-risk groups as medical teams. The Egyptian Drug Authority has started with the Sinopharm Chinese vaccine then AstraZeneca vaccine late in January as part of the COVID19 Vaccines Global Access (COVAX) Facility.⁸ On 16 August 2021 Egypt announced that vaccination will become mandatory in all public institutions with vaccination priority to university and school students.⁹

Investigating the willingness of people to be vaccinated, motives, barriers to get the vaccine, and the most trusted sources of their information is a must for promoting the vaccines uptake particularly those refusing COVID19 vaccine.¹⁰ University students are special demographic group with underlying illness experiences, media and

information utilization habits that differ from other community members especially with the wide availability of smartphones which is considered double edged sword. Although this can be a great role for self-education, which can help vaccination decision-making, it also poses several challenges in the form of misinformation including 'anti-vaxx' messaging and incomplete information, as well as inconsistent and complicated scientific information that may be difficult to be self-understood.¹¹ Barello and colleagues 2020 reported that "students are a good target for educational campaigns as they are still in their training period and are open to changing their habits".¹²

The world shares a collective responsibility in fighting this pandemic; therefore, continued research on COVID19 vaccine acceptance should be a priority. University students in their final educational years are of specific interest as they had basic knowledge level, they will soon be graduated, and they can effectively influence public opinion. So, the aim of this study was to assess vaccination status, motives, and barriers of COVID19 vaccines hesitancy among Tanta university students.

Table (2): Relationship between participants' knowledge and their vaccination status

| Variable | Vaccinated (N=92) | | Intend (N=217) | | Hesitant (N=329) | | Refused (N=147) | | P-value |
|---|-------------------|------|----------------|------|------------------|------|-----------------|------|---------|
| | n | % | n | % | n | % | n | % | |
| There are many vaccines to COVID 19 | | | | | | | | | |
| Yes | 72 | 78.3 | 153 | 70.5 | 182 | 55.3 | 72 | 49.0 | <0.001* |
| No | 7 | 7.6 | 8 | 3.7 | 20 | 6.1 | 11 | 7.5 | |
| I don't know | 13 | 14.1 | 56 | 25.8 | 127 | 38.6 | 64 | 43.5 | |
| Vaccine is recommended for those | | | | | | | | | |
| Less than 18ys | 2 | 2.1 | 9 | 4.1 | 7 | 2.1 | 1 | 0.7 | <0.001* |
| More than 18ys | 64 | 69.6 | 140 | 64.6 | 160 | 48.7 | 54 | 36.7 | |
| I don't know | 26 | 28.3 | 68 | 31.3 | 162 | 49.2 | 92 | 62.6 | |
| COVID 19 vaccines have side effects: | | | | | | | | | |
| Yes | 82 | 89.2 | 176 | 81.1 | 252 | 76.6 | 100 | 68.0 | <0.001* |
| No | 4 | 4.3 | 3 | 1.4 | 5 | 1.5 | 2 | 1.4 | |
| I don't know | 6 | 6.5 | 38 | 17.5 | 72 | 21.9 | 45 | 30.6 | |
| Acquired immunity is achieved after vaccination | | | | | | | | | |
| Yes: After first dose | 14 | 15.2 | 24 | 11.1 | 20 | 6.1 | 7 | 4.8 | <0.001* |
| Yes: After second dose | 52 | 56.5 | 97 | 44.7 | 103 | 31.3 | 19 | 12.9 | |
| Not achieved | 1 | 1.1 | 6 | 2.7 | 7 | 2.1 | 10 | 6.8 | |
| I don't know | 25 | 27.2 | 90 | 41.5 | 199 | 60.5 | 111 | 75.5 | |
| Effectiveness of the current vaccines | | | | | | | | | |
| High | 20 | 21.7 | 33 | 15.2 | 16 | 4.8 | 6 | 4.1 | <0.001* |
| Moderate | 47 | 51.1 | 113 | 52.1 | 142 | 43.2 | 30 | 20.4 | |
| Low | 17 | 18.5 | 61 | 28.1 | 114 | 34.7 | 76 | 51.7 | |
| I don't know | 8 | 8.7 | 10 | 4.6 | 57 | 17.3 | 35 | 23.8 | |
| Vaccine is safe for pregnant & lactating females and children less than 16ys | | | | | | | | | |
| Yes | 30 | 32.6 | 86 | 39.6 | 62 | 18.8 | 19 | 13 | <0.001* |
| No | 32 | 34.8 | 46 | 21.2 | 73 | 22.2 | 33 | 22.4 | |
| I don't know | 30 | 32.6 | 85 | 39.2 | 194 | 59.0 | 95 | 64.6 | |
| Is it necessary to wear masks after COVID 19 vaccination? | | | | | | | | | |
| Yes | 78 | 84.8 | 173 | 79.7 | 250 | 76.0 | 91 | 61.9 | <0.001* |
| No | 9 | 9.8 | 10 | 4.6 | 14 | 4.3 | 3 | 2.0 | |
| I don't know | 5 | 5.4 | 34 | 15.7 | 65 | 19.7 | 53 | 36.1 | |
| Source of your information | | | | | | | | | |
| Social media | 37 | 40.2 | 109 | 50.2 | 175 | 53.2 | 62 | 42.2 | <0.001* |
| Mass media | 7 | 7.6 | 11 | 5.1 | 25 | 7.6 | 9 | 6.1 | |
| MOHP instruction | 24 | 26.1 | 48 | 22.1 | 48 | 14.6 | 15 | 10.2 | |
| Scientific web sites | 10 | 10.9 | 7 | 3.2 | 7 | 2.1 | 11 | 7.5 | |
| Friends | 4 | 4.3 | 21 | 9.7 | 41 | 12.5 | 19 | 12.9 | |
| No source | 10 | 10.9 | 21 | 9.7 | 33 | 10.0 | 31 | 21.1 | |

*Significant

METHOD

A web-based cross-sectional study via Microsoft form distributed through official university platforms and informal students' groups on social media like Facebook.

Tanta University is a governmental university which is located in Tanta city, Gharbia governorate, Egypt.¹³ It includes 14 faculties: medical (Medicine, Pharmacy, Dentistry, and Nursing) and nonmedical (Science, Education, Commerce, Arts, Law, Engineering, Agriculture, Physical Education, Specific Education, and Computer and Information) with total number of 120748 students.

Our target population was Tanta university students of both medical and non-medical faculties who are

in their final graduation years. By using Centers for Disease and Control Epi-Info 7.2.3.0 statistical program, Atlanta, Georgia, USA and based on the expected frequency of 50%, an acceptable margin of error of 2.5% and 95% confidence level, the minimum required sample size was calculated to be equal to 384 students. However more than double of the minimum sample size were enrolled in this study to overcome any invalid questionnaires so 785 students agreed to participate and accomplished the study after exclusion of 52 sheets for invalid and incomplete data, (250 questionnaires were filled by medical students and 535 by nonmedical students). They were approached by convenience sampling during the period from May 2021 to June 2021.

Table (3): Attitude of students towards COVID 19 vaccines in relation to their vaccination status

| Variable | Vaccinated (N=92) | | Intend (N=217) | | Hesitant (N=329) | | Refuse (N=147) | | P-value |
|---|-------------------|------|----------------|------|------------------|------|----------------|------|---------|
| | n | % | n | % | n | % | n | % | |
| Do you think immunity after COVID 19 infection is better than vaccine immunity | | | | | | | | | |
| Agree | 33 | 35.9 | 78 | 35.9 | 97 | 29.5 | 49 | 33.3 | 0.432 |
| Disagree | 22 | 23.9 | 51 | 23.5 | 71 | 21.6 | 38 | 25.9 | |
| Don't know | 37 | 40.2 | 88 | 40.6 | 161 | 48.9 | 60 | 40.8 | |
| Do you believe COVID 19 vaccine may cause infection | | | | | | | | | |
| Agree | 14 | 15.2 | 29 | 13.4 | 72 | 21.8 | 49 | 33.3 | <0.001* |
| Disagree | 58 | 63.1 | 110 | 50.7 | 90 | 27.4 | 33 | 22.4 | |
| Don't know | 20 | 21.7 | 78 | 35.9 | 167 | 50.8 | 65 | 44.3 | |
| Do you think COVID 19 vaccine will eliminate the disease | | | | | | | | | |
| Agree | 54 | 58.7 | 77 | 35.5 | 33 | 10.0 | 14 | 9.5 | <0.001* |
| Disagree | 11 | 12.0 | 28 | 12.9 | 86 | 26.1 | 74 | 50.4 | |
| Don't know | 27 | 29.3 | 112 | 51.6 | 210 | 63.9 | 59 | 40.1 | |
| Do you think COVID 19 vaccine is the best way for protection against disease | | | | | | | | | |
| Agree | 72 | 78.3 | 130 | 59.9 | 71 | 21.6 | 23 | 15.6 | <0.001* |
| Disagree | 8 | 8.7 | 22 | 10.1 | 79 | 24.0 | 66 | 44.9 | |
| Don't know | 12 | 13.0 | 65 | 30.0 | 179 | 54.4 | 58 | 39.5 | |
| Do you think COVID 19 vaccine is safe | | | | | | | | | |
| Agree | 64 | 69.6 | 115 | 53.0 | 39 | 11.9 | 15 | 10.2 | <0.001* |
| Disagree | 5 | 5.4 | 16 | 7.4 | 59 | 17.9 | 66 | 44.9 | |
| Don't know | 23 | 25.0 | 86 | 39.6 | 231 | 70.2 | 66 | 44.9 | |
| Do you believe herd immunity is enough to protect against infection | | | | | | | | | |
| Agree | 38 | 41.3 | 79 | 36.4 | 52 | 15.8 | 32 | 21.8 | <0.001* |
| Disagree | 33 | 35.9 | 60 | 27.6 | 97 | 29.5 | 50 | 34.0 | |
| Don't know | 21 | 22.8 | 78 | 36 | 180 | 54.7 | 65 | 44.2 | |
| Do you think there are another method for protection other than vaccines | | | | | | | | | |
| Agree | 22 | 23.9 | 54 | 24.9 | 86 | 26.1 | 70 | 48.0 | <0.001* |
| Disagree | 38 | 41.3 | 69 | 31.8 | 38 | 11.6 | 19 | 13.0 | |
| Don't know | 32 | 34.8 | 94 | 43.3 | 205 | 62.3 | 57 | 39.0 | |
| Encourage those around me to get the vaccine | | | | | | | | | |
| Agree | 82 | 89.1 | 174 | 80.2 | 104 | 31.6 | 24 | 16.3 | <0.001* |
| Disagree | 7 | 7.6 | 22 | 10.1 | 100 | 30.4 | 91 | 61.9 | |
| Don't know | 3 | 3.3 | 21 | 9.7 | 125 | 38.0 | 32 | 21.8 | |
| I am afraid of getting vaccinated | | | | | | | | | |
| Agree | 25 | 27.2 | 68 | 31.3 | 239 | 72.7 | 104 | 70.8 | <0.001* |
| Disagree | 62 | 67.4 | 111 | 51.2 | 37 | 11.2 | 28 | 19.0 | |
| Don't know | 5 | 5.4 | 38 | 17.5 | 53 | 16.1 | 15 | 10.2 | |

*Significant

Study tools: A predesigned questionnaire sheet was developed by the researchers after reviewing the relevant literature.^{11,14} The questionnaire was double translated; initially structured in English then translated into Arabic and back translated into English to validate language proficiency. Before distribution, the Arabic version was further reviewed by experts. The questionnaire was comprised of 5 sections with 45 questions as follows: Section I: this section included 4 questions regarding personal characteristics: age, gender, faculty, and residence. Section II: this section included 3 questions about past vaccination history of COVID 19 among relatives and 4 questions about history of COVID19 infection and were rated as (yes/no/don't know). Section III: included 7 questions assessing knowledge about COVID19 vaccine and were rated

as (yes/no/don't know) and 1 question about sources of information. Section IV: included 9 questions assessing attitude regarding COVID19 vaccine and were rated as (agree, disagree and don't know) and 1 question about vaccination status (i am already vaccinated, intend to be vaccinated, hesitant regarding vaccination, refused to take it). Section V: included 9 questions assessing perceived barriers and 7 questions assessing motives of COVID19 vaccination and were rated as (yes/no). Three Egyptian professors from the public health and community medicine department at Tanta University assessed validity of the questionnaire. Both face and content validity were assessed and approved. The professors reviewed both the website and the questionnaire and provided us with helpful techniques about website use by the study

participants. Also recommended simplifying of some questions and proposed minor changes in three items of knowledge questions (2, 6, and 7). Experts stated that all questions were understandable, and participants can fill it out in 10 to 15 minutes. To assess reliability the questionnaire was tested in a pilot study by recruiting 20 students not included in final analysis and revealed that the questionnaire items were suitable and easy to be filled and the time needed for filling ranged from 7-15 minutes with no

Table (4): Barriers and motives for vaccination

| Barriers | N | % |
|--|-----|------|
| I don't trust the safety of the vaccine | 39 | 5.0 |
| Preparation of the vaccine was quick | 45 | 5.7 |
| I should wait for more information | 90 | 11.5 |
| The vaccine is prepared for financial gain | 3 | 0.4 |
| Companies hide information regarding its harmful effects | 14 | 1.8 |
| The vaccine affects the reproductive health | 10 | 1.3 |
| The vaccine contains abortive substances | 3 | 0.4 |
| The vaccine has side effects on long run | 32 | 4.0 |
| More than one of the above reasons | 549 | 69.9 |
| Motives | | |
| Protection against COVID 19 infection | 135 | 17.2 |
| The disease is fatal and serious | 16 | 2.0 |
| The vaccine is safe and effective | 14 | 1.8 |
| The vaccine has no serious side effects | 7 | 0.9 |
| One of my friends had been vaccinated | 17 | 2.2 |
| Increased the disease morbidity and mortality | 22 | 2.8 |
| More than one of the above reasons | 574 | 73.1 |

Reasons are mutually exclusive

technical problems. We used data to assess internal consistency using alpha Cronbach and test-retest reliability by using the intra-class correlation coefficient, (with Cronbach's alpha = 0.792 and the intra-class correlation coefficient was 0.91), which represented adequate internal consistency and reliability.

Online questionnaire hosted in Microsoft form was distributed through official university platforms and informal students' groups on social media like Facebook. The form was opened for one week from 20th to 28th May 2021 and then closed when not receiving any new responses for 24 hours. The total students who agreed to participate and accomplished the questionnaire completely were 785.

Statistical analysis: The collected data were managed by SPSS (the Statistical Package for the Social Sciences) Program, version 25. For continuous data, means and standard deviations

were calculated. While for categorical variables, frequencies were used. Monte Carlo exact test and Odds ratio with 95% CI were used as appropriate significance level was set at $p \leq 0.05$.

RESULTS

Table 1 shows relationship between participants' history of infection and their vaccination status. About forty percent (42.3%) of vaccinated belonged to risk group versus 44.2% among refused students with statistically significant relationship in between. More than three quarters (78.3%) of vaccinated said COVID19 complications are serious compared to 81.9% among refused students with statistically significant relationship in between. Relatives taken the vaccine were significantly more among vaccinated than refused students (84.8% vs. 52.4%) ($P=.000$). Vaccine side effects among relatives were significantly more reported in vaccinated than refused (74.4% vs. 55.4%). The relatives recommended the vaccine for 81% of those vaccinated compared to 27% among refused students with statistically significant relationship ($P<0.05$).

Table 2 explains knowledge regarding COVID19 vaccines in relation to students' vaccinating status. There were statistically significant relationships between all items of knowledge and vaccination status. The percent of students who knew that there are many vaccines to COVID 19 was the highest among vaccinated students (78.3%) compared to other groups. The percent of students who knew that vaccine is recommended for those more than 18years was the highest among vaccinated students (69.6%) compared to other groups. The percent of students who knew that COVID 19 vaccines have side effects was the highest among vaccinated students (89.2%) compared to other groups. The percent of students who knew that acquired immunity is achieved after second dose was the highest among vaccinated students (56.5%) compared to other groups. The percent of students who answered that effectiveness of the current vaccines is moderate was the highest among vaccinated students (51.1%) compared to 20.4% among refused group. The percent of students who knew that it is necessary to wear masks after COVID19 vaccination was the highest among vaccinated students (84.8%) compared to other groups. Social media was the commonest source of information for all groups.

Table (5): Multinomial logistic regression for factors associated with COVID-19 vaccine acceptance among students

| Predictor variable | Wald | p-value | Odds ratio |
|---|-------|---------|------------|
| Gender | 7.577 | 0.006* | 2.285 |
| Did you get infected with Covid 19? | 4.306 | 0.038* | 2.110 |
| Has anyone of your family members been infected with Covid 19? | 5.116 | 0.024* | .363 |
| Are complications of COVID-19 infection serious? | 4.169 | 0.041* | .241 |
| Risk perception of getting COVID-19 infection in the few coming months? | 4.982 | 0.026* | 2.706 |

*Significant

Table 3 illustrates students' attitude towards COVID 19 vaccines in relation to their vaccination status. Attitude among vaccinated was significantly more positive than refused students ($P=.000$) for all items except for immunity after COVID 19 infection is better than vaccine immunity. Only 15.2% of vaccinated believed that COVID 19 vaccine may cause infection compared to 33.3% among refused students. Attitude regarding COVID 19 vaccine will eliminate the disease among vaccinated was significantly more positive (58.7%) than refused students (9.5%) ($P=.000$). Also attitude regarding COVID 19 vaccine is the best way for protection against disease among vaccinated was significantly more positive (78.3%) than refused group (15.6%) ($P<0.05$). Regarding vaccine safety there was statistically significantly more positive attitude among vaccinated (69.6%) than refused students (10.2%) ($P=.000$). Also 41.3% of vaccinated believed that herd immunity is enough to protect against infection versus 21.8% among refused students. About one quarter (23.9%) of vaccinated thought that there another method for protection other than vaccines compared to 48% among refused group. Table 4 demonstrates that seventy percent of the students (69.9%) reported more than one reason for vaccine hesitancy and refusal like; mistrust in the safety, preparation of the vaccine was quick, waiting for more information and fearing of side effects. Table 4 also demonstrates motives for vaccination. About three quarters of the students (73.1%) reported more than one motive for vaccination like protection against COVID 19 infection, disease fatality and seriousness, increased morbidity and mortality and no serious side effects of vaccine. Table 5 shows multinomial logistic regression for factors associated with COVID19 vaccine acceptance among students. Being a female student, previous infection with COVID19, infection of anyone of

family members with COVID19, believing that complication of COVID19 infection is serious and having risk perception of getting COVID19 infection in the few coming months were the significant predictors of COVID19 vaccine acceptance among studied students ($p<0.05$).

DISCUSSION

Many vaccines were prepared in response to the COVID 19 pandemic. A number of those vaccines have been accepted by WHO and other scientific health institutions, and other vaccines are still in the clinical trial or pre-clinical stages.¹⁵ However, people generally concerned about the safety of new vaccines.¹⁶ The Egyptian authorities approved and utilized seven COVID19 vaccines, including the Sinopharm, Oxford/AstraZeneca and Sinovac vaccines. These vaccines were free of charge for all populations.¹⁵

In the current study, the percent of students who have relatives or friends had taken the vaccine were significantly more among vaccinated and the relatives recommended the vaccine for 81% of those who had taken the vaccine with statistically significant relationship (Table 1). In agreement with Mant M et al., 2021 who reported that students who encouraged by the doctor or pharmacist were more intended to take the vaccine.¹¹ Students sometimes need support and experience from those around them especially for health-related issues.

There was statistically significant relationship between all items of knowledge and vaccination status and social media was the commonest source of information for all students' groups (Table 2). In accordance with Saied SM et al., 2021.¹⁷ Also Khatri D 2021 reported in systematic review that using social media for information seeking and sharing is a common practice among students. Social media plays an important role in conveying various types of information e.g. education, entertainment, world affairs and casual information.¹⁸

Most of the students were knowledgeable about coronavirus vaccination (Table 2). This finding is supported by Gallè F et al., who reported that more than 80% of undergraduate Italian students gave correct answers to questions about COVID19 vaccines.¹⁹ Also another Ethiopian study among university students recorded 63.1% were knowledgeable.²⁰ In contrast to our results sixty two percent of Malaysians had poor knowledge about COVID19 vaccine.²¹ This may be due to our study among university students who are more knowledgeable than the general population.

Attitude among vaccinated was significantly more positive than refused students ($P < 0.05$) for all items except for immunity after COVID 19 infection is better than vaccine immunity (Table 3). Similar findings were supported by Bai W et al., and Omar DI., 2021.^{22, 23} In the current study, 11.7% were already vaccinated, 27.6% intended to be vaccinated and more than half of our students were hesitant and refused to be vaccinated (Table 3). Higher percent of acceptance was recorded by Saudi Arabian university students (36.1% vaccinated and 50% intended to be vaccinated).²⁴ Also another study in Italy reported 86.1% of university students would choose to have a vaccination for the COVID19 and 13.9% would not or hesitant about vaccine.¹² Tam et al., 2020 reported that, 15.1% hesitated, 60.6% accepted, and 24.3% refused the vaccine among college students in South Carolina.²⁵ Our results are supported by a systematic review of COVID19, which presented wide variation in COVID19 vaccine acceptance rates in different countries with low rates in the Middle East countries.²⁶

The present study recorded seventy percent of the students reported more than one reason for vaccine hesitancy and refusal like; distrust in vaccine safety, the speed of manufacturing the vaccination, waiting for more information and fearing of side effects (table 4) in accordance with Ethiopian and Egyptian study among students.^{17, 20} Similarly, Lucia et al., 2020 demonstrated that participants concerns about the vaccine's serious side effects and lack of trusted information contributed to the hesitancy of vaccines.²⁷ Also, Tam et al. stated that long term side effects, safety issues, and mistrust of vaccines were the main reasons for vaccine hesitancy.²⁵

The current series reported that about three quarters of the students reported more than one motive for vaccination like protection against

COVID19 infection, fatality and seriousness of disease, increased disease morbidity and mortality and no serious side effects of vaccine (table 4) in accordance with Saudi Arabian study which recorded most of the students (95.8%) indicated their willingness to protect themselves and others as a motive for receiving the COVID19 vaccine.²⁴

The present study showed being female student, previous infection with COVID19, previous infection of anyone of family members, believing that complication of COVID19 infection is serious and having risk perception of getting COVID19 infection in the few coming months were the significant predictors of COVID19 vaccine acceptance among studied students ($p < 0.05$) (table 5). Other predictors were mentioned by Mondal P et al., 2021 as education, ethnicity and age.²⁸ Also Van Tap Nguyen MQN 2021 demonstrated the main determinants of acceptance of COVID19 vaccine including; the field of education, knowledge, perceived susceptibility, severity and perceived benefits.²⁹ While another study demonstrated other factors by the multivariate logistic regression model as age, female gender, being in first grades, studying sciences courses.³⁰

CONCLUSION

More than half of the students were hesitant and refused to be vaccinated and the main barriers of COVID19 vaccine acceptance were concerns regarding efficacy, potential adverse effects, and safety. Meanwhile small percent of them were already vaccinated reporting their main motives as protection against COVID 19 infection, disease fatality and seriousness, increased disease morbidity and mortality and the vaccine has no serious side effects. Students are a good target for educational campaigns as they are still in their training period and able to change their habits so health education campaigns should focus on vaccine efficacy and safety, and this could be effective for addressing any remaining hesitancy among students.

Ethical Approval

An ethical approval was obtained from the Research Ethics Committee at the Faculty of Medicine, Tanta University with code number of 35846922. Consent for participation in the study was taken from all individual respondents before being enrolled in the study.

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Conflict of Interest

All authors have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Eman Ali Younis, Abdel Aziz farouk El deep, Safynaz El Saied Shalaby and Walid Mostafa Daoud. The first draft of the manuscript was written by Eman Ali Younis and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Availability of Data and Materials

The datasets generated and analyzed during the current study are not publicly available. However, the datasets are available from the corresponding author on a reasonable request.

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