FRIEND OR FOE? THE APPROACH TOWARDS COVID-19 VACCINE IN A DEVELOPING COUNTRY: A TERTIARY HEALTHCARE CASE STUDY

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ABSTRACT

Background: The COVID-19 virus wreaked a havoc throughout the world, leading to rapid development of its vaccines. Regardless, vaccine hesitancy remains a major public health issue in Pakistan.

Objective: To investigate whether COVID-19 vaccine was treated any differently in a region with a high prevalence of hesitancy towards vaccination i.e. Khyber Pakhtunkhwa (KP), Pakistan and vaccine coverage.

Methods: Questionnaires were filled by participants visiting an outpatient neurology clinic in a tertiary care hospital in Peshawar (North West General Hospital and Research Center (NWGH)).

Results: Statistical analysis of the collected data revealed that only 31% of the study population was vaccinated. Unavailability of the vaccines and fear of side effects were reported as the key reasons by 0-19 and 40-49 age groups, respectively (p-value<0.00001). Furthermore, side effects of vaccination were more prevalent in age group 30-39 as compared to older age groups (p-value<0.00001). The frequency of side effects was also significantly higher in individuals who had received 2 doses of vaccine. No significant relationship was established between a previous diagnosis of COVID-19 infection and vaccination status.

Conclusions: The fear of side effects and unavailability of COVID-19 vaccines were revealed as the leading causes of lower coverage among the study population. Side effects of vaccination were more frequent among the younger population (30-39 years) as well as those who had received a second dosage of vaccinate. Moreover, a higher number of males has been vaccinated as compared to females.

Keywords: COVID-19, vaccination, side effects, Hesitancy, Tertiary care hospital

INTRODUCTION

The first case of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection was reported in December, 2019 in China. It was not until March, 2020 that the Corovirus disease was declared as a pandemic by the World Health Organization (WHO), when the total cases amounted to 118,000 and a death toll of 4921, globally.[1]The infection has proven to be life-threatening lethal for certain populations, resulting in worst outcomes and millions of deaths globally.[2]

Pfizer was the first COVID-19 vaccine authorized for emergency use by WHO within a year i.e. by 31 December, 2020.[3] Further COVID-19 vaccines were given a go ahead eventually; these included AstraZeneca, Janssen, Moderna and Sinopharm among others.

The short time span over which these vaccines were developed drew skepticism about their safety. The situation was worsened by the reported side effects of the vaccine recipients, lasting up to 6 days, discouraging individuals from getting vaccinated. Surveys have been carried out to determine the hesitancy towards getting vaccinated in various countries. Data from developing nations i.e. India, Bangladesh, Afghanistan and Pakistan revealed that a large portion of the population was reluctant toward vaccination. [4–6]

This hesitancy has been partially attributed to the fear of side effects, reported as flu like symptoms, including body aches and headaches. In developing countries like Pakistan, hesitancy towards vaccination in

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general, such as polio vaccine, has prevailed over the years. [7] This is especially true for its provinces with lack of resources and education. It is one of the least developed regions of the country.[8] Data regarding attitude of KP's communities towards COVID-19 vaccine is limited. Furthermore, no large-scale study in the region has been previously carried out.

The current study addresses whether the attitude of individuals in KP has changed over the years, given the high number of deaths resulting from COVID-19. This study will add considerable detail to the existing literature related to the history of COVID-19 vaccination in Pakistan.

MATERIALS AND METHODS

The ethical committee of North West General Hospital (NWGH) provided the approval for this research. NWGH is a 500+ bedded tertiary care hospital located in Peshawar, Khyber Pakhtunkhwa (KP), Pakistan. On average, it receives 1000 out-patients per day from KP as well as Afghanistan.

The study population consisted of out-patients visiting neurology clinic in NWGH from 14 June, 2021 to 5 August 2021 i.e. over a period of 1 month and 21 days. A questionnaire was prepared and data was collected regarding demographic parameters, vaccination status and whether the participants had a history of COVID-19 infection. Moreover, vaccinated individuals were asked to report any side effects experienced following administration of a single or two doses.

A total of 6034 patients participated in this research. The statistical analysis of the acquired data was carried out using IBM Statistical Product and Service Solutions (SPSS) Statistics 22. Chi square test of independence was applied to the data to in order to assess its statistical significance, with a p-value less than 0.05 considered as significant.

RESULTS

Approximately 50% (3015) of the study population were females, while the other 50% (3019) were males. Patients came from 71 different region. The gender-based age distribution of the study population has been shown in **Table 1.** Age groups 30-39 and 40-49 years made the largest proportion among the females, while 30-39 among males.

Table 1. Gender-based age distribution (in years) of the study population as well as vaccinated and non-vaccinated individuals.

Age Groups (years)									
	under 20	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**80-89**	**90-99**
Females	131(4.3)	557(18.4)	578(19.1)	579(19.1)	546(18.1)	415(13.7)	143(4.7)	48(1.6)	10(0.33)
Male	132(4.3)	526(17.4)	650(21.5)	531(17.5)	446(14.7)	433(14.3)	225(7.4)	64(2.1)	8(0.2)
Vaccinated									
Females	8 (1.05)	70 (9.2)	133 (17.5)	158 (20.8)	175 (23.1)	137 (18.1)	54 (7.1)	20 (2.6)	1 (0.13)
Male	8 (0.69)	144 (12.4)	246 (21.2)	216 (18.7)	216 (18.7)	189 (16.3)	102 (8.8)	30 (2.5)	4 (0.34)
Not Vaccinated									
Females	123 (5.4)	487 (21.6)	445 (19.7)	421 (18.7)	371 (16.4)	278 (12.3)	89 (3.9)	27 (1.2)	9 (0.4)
Male	124 (7.1)	382 (22)	404 (23.2)	315 (18.1)	230 (13.2)	244 (14)	123 (7)	35 (2)	4 (0.2)

Participants belonged to 71 different regions/districts in KP while some had come from Afghanistan. The majority i.e. 51% belonged to Peshawar and few were from the Punjab province of Pakistan.

Vaccinated participants made only 31% of the study population, while majority i.e. 4120 (69%) patients were not vaccinated, 2258 (37%) and 1862 (31%) females and males, respectively (**Table 1**).

Only 757 females (25%) vaccinated while 1157 (38%) males were. Furthermore, 1190 (31%) subjects had 2 doses while 724 (12%) had a single dose. Among the vaccinated participants, 1491 (78%) had no history of COVID-19 infection while 423 (22%) had. On the other hand, 3691 (90%) of unvaccinated patients didn't have a COVID history while 429 (10%) did.

According to 1138 (28%) participants, fear of side effects was the key reason behind not getting vaccinated, followed by 'unavailability' of the vaccines, as stated by 644 participants (16%) (**Figure 1a**).

Moreover, 567 (15%) patients were of the belief that the vaccines might cause harm. Majority of the patient i.e. 1796 (44%) stated 'other' reasons to not get vaccinated, while 228 (5%) chose not to respond at all. Participants who were under 20 years of age reported unavailability of vaccine as a reason for not getting vaccinated (**Table 2**), while age group 40-49 attributed it to fear of side effects (p-value<0.00001).

Furthermore, the fear of side effect was also significantly linked to the female gender (p-value<0.000001). No significant relationship was found between a previous diagnosis of COVID-19 infection and vaccination status.

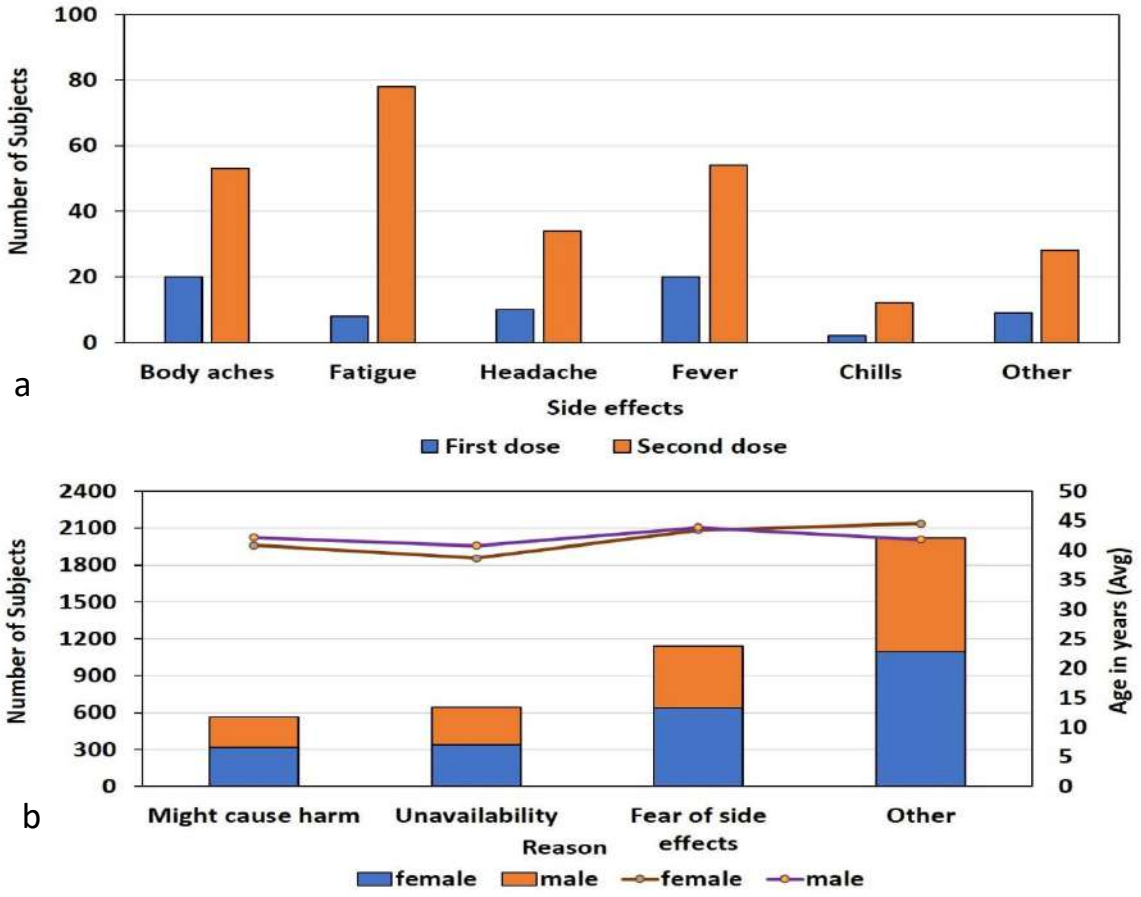

Figure 1: (a) Gender based distribution of the reasons provided by the study population. The bars represent the number of males and females while the line graphs indicate their average ages b) Side effects reported post first and second dose of the COVID-19 vaccines

A history of COVID-19 infection was significantly higher in males as compared to female (p-value<0.00001). Age groups 70-79 and 80-89 were significantly linked to being previously diagnosed with COVID-19 infection, vice versa being true for those under 20 years. Moreover, patients belonging to age groups 50-59, 60-69 and 80-89 also reported a symptomatic version of the disease (p-value<0.000001).

Table 2: Reason behind not getting vaccinated and gender-based age groups distribution of the study population

Age Groups (years)									
	under 20	**20-29**	**30-39**	**40-49**	**50-59**	**60-69**	**70-79**	**80-89**	**90-99**
Unavailability									
Females	28 (8.3)	75 (22)	75 (22)	71 (21)	43 (12.7)	35 (10.3)	2 (0.6)	4 (1.1)	2 (0.6)
Male	31 (10)	61 (19.7)	64 (20.7)	55 (17.7)	33 (10.6)	47 (15.2)	13 (4.2)	4 (1.3)	1 (0.32)
Might cause harm									
Females	11 (3.5)	57 (18.2)	51 (16.3)	60 (19.2)	54 (17.3)	63 (20.1)	9 (2.8)	5 (1.6)	2 (0.64)
Male	6 (2.3)	42 (16.4)	69 (27)	44 (17.1)	36 (14)	35 (13.6)	20 (7.8)	2 (0.78)	2 (0.78)
Fear of Side effects									
Females	21 (3.2)	105 (16.4)	116 (18.1)	143 (22.3)	116 (18.1)	90 (14)	36 (5.6)	9 (1.4)	3 (0.46)
Male	24 (4.8)	92 (18.4)	119 (23.8)	86 (17.2)	60 (12)	74 (14.8)	36 (7.2)	6 (1.2)	2 (0.4)
Other									
Females	63 (6.3)	259 (25)	216 (21)	149 (14)	153 (15)	107 (10)	41 (4.1)	10 (1)	1 (0.1)
Male	51 (6.2)	191 (23.4)	169 (20.7)	134 (16.4)	100 (12.2)	95 (11.6)	58 (7.1)	18 (2.2)	

Side effects from vaccination included fever, body ache, fatigue, chills and headache (**Figure 1 b**). Age group 50-59 was significantly associated with a single side effect, while group 30-39 reported more than one side effect. Furthermore, side effects were more prevalent in participants who had received 2 jabs of vaccine as compared to those who had taken a single (p-value<0.00001).

DISCUSSION

The average age of the study population was 44.02 years; 44.4 and 43.5 years for males and females, respectively.

Fear of the vaccine's side effects prevailed in majority of those who were not vaccinated, followed by presumption that they might cause harm. In Pakistan, hesitancy towards acceptance of vaccines is not limited to COVID-19 vaccine alone. Oral polio vaccines have been refused by some of those living in Northwestern areas of the country, such as Swat. Similarly, measles, Bacillus Calmette-Guérin, diphtheria, pertussis and tetanus have still not been eradicated.[7, 9]

One of the major reasons is the lack of trust in vaccines due to the belief that vaccines induce infertility by sterilizing children. Another common misconception is that all vaccines contain pork, which Muslims do not consume. [7, 9]Nonetheless, 15% of the unvaccinated individuals reported unavailability of the COVID-19 vaccines as the main reason. Like many other developing countries, Pakistan lacked the pharmaceutical infrastructures and resources to purchase vaccines, depending on its allies, such as China, for the supply.[10] The first COVID-19 vaccine was authorized for use in December, 2020 but it wasn't until February, 2021, when Sinopharm became the first COVID-19 vaccine to be introduced in Pakistan.

Given that it was available in limited quantity, the high-risk groups i.e. susceptible to contracting COVID-19 virus and suffering worse outcomes of the disease, were prioritized. These included frontline and healthcare workers, followed by those over 65 years of age.[11]

The situation was exacerbated due to a lack of coordination and disruption in vaccine supplies received from China as well as US. Vaccine shortages had been reported country wide during the time when this study was conducted

i.e. June, 2021.[12–14] Younger population was provided with the vaccine later on, as soon as the supply increased. As of January, 2022, 57% of the total population has been fully vaccinated while 67% have been administered with at least one dose. [15]

Our study revealed that a history of COVID-19 infection was associated with the older age groups. The prevalence of non-communicable diseases such as diabetes, hypertension and cardiovascular diseases is high in Pakistan, affecting 80% of the elderly population. Hence, they are more susceptible to contracting COVID-19. [16]

Moreover, older age groups i.e. 50 years and above reported a symptomatic version of the COVID-19 infection history. This could be due to the higher viral load in older people as compared to younger ones.[17]

The side effects of the vaccination, as depicted by flu-like symptoms, are considered as an effective immune response as result of stimulating the production of a cytokines, known as type I interferon (IFN-I). Cytokines can also have inflammatory effect on muscles, blood vessels and other tissue.[18, 19]

Furthermore, the exuberant generation of this protein in younger adults as compared to older individuals can be attributed to the presence of more than one side effects. [20] Our results are in agreement with the previously published literature, where the adverse effects of COVID-19 vaccination were significantly higher in younger age groups. [21, 22]

The increased frequency of symptoms was higher in patients who had a second dose of the COVID-19 vaccine as compared to those who had received a single jab. While similar results have been reported by previous studies, a conclusion has yet to be reached regarding this phenomenon. [23] The higher prevalence of side effects in those who had been previously diagnosed with COVID-19 infection can be explained by the higher antibody titers. The increased immunogenicity can in turn lead to higher reactogenicity. [24]

CONCLUSIONS

Lower COVID-19 vaccination coverage observed among the study population was attributed to the unavailability of vaccines as well as fear of vaccine's side effects in younger and older population, respectively. Furthermore, lower number of females were inoculated as compared to men. Side effect from the vaccination were more pronounced in younger age groups as well as those who has received two doses of vaccine as compared to those administered with single dose.

A shortcoming of this study is that the data is that the study population was not diverse enough since it only addressed patients visiting a neurology and other clinics in a private tertiary healthcare setting.

DECLARATIONS

Author Contributions:

Author 1: Conceptualization, data curation, supervision. Author 2: methodology (equal), software and writing- review and editing. Author 3: data curation and methodology (equal). Author 4: formal analysis and investigation. Author 5: investigation and writing- review and editing. Author 6: conceptualization and writing-review and editing, writing-original draft, software, investigation and formal analysis.

Conflicts of Interests

The authors declare no conflict of interest.

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