Research Article

CLINICAL INVESTIGATION

Frequency Of Undesirable Effects after Covid-19 Vaccination In Pakistani Population

Abstract

Background: Covid-19 is caused by SARS-CoV-2 which had its index case from Wuhan, China in December 2019 and rapidly took over the entire globe and was declared as a global pandemic. Due to this, millions of people succumbed to it and lost their lives. This not only had a massive toll on the healthcare system but also led to a huge setback to the economic infrastructure of not only developing but also developed countries. To reduce the risk of further outbreaks and to prevent the recession of economy Covid vaccine emerged as the greatest savior of mankind and multiple vaccines were developed by various companies all around the world in early 2020. About 11 vaccines were granted Emergency Use Listing by WHO. Governments all around the world started vaccination campaigns and billions of vaccine doses were administered globally including Pakistan. Although the vaccines were proven to be safe in clinical trials, in real world settings there were various adverse effects reported with the vaccines by many recipients along with immunity against the virus. The aim of our study was to determine the frequency of undesirable effects after vaccination.

Objectives: To determine the frequency of undesirable effects after covid-19 vaccination.

Materials and Methods

Study design: descriptive cross sectional prospective study

Settings: ayub medical college Abbottabad, Pakistan.

Study duration: 8 months

Data collection and analysis: 113 subjects aged 18 years to 59 years of either gender who are partially or fully vaccinated against Covid-19 were included in the study. A structured questionnaire was developed for data collection after reviewing of literature. Students were approached in lecture halls and hostels and data was recorded after taking informed consent. Data was analyzed by using statistical package for social sciences SPSS Version 20.

Results: In this study the participants belonged to the age group 18 year to 59 years and mean age was 23.15 ± 5.6 years among the students and faculty of Ayub Medical College. Out of the total 113 participants 85(75.2%) were males and 28(24.8%) females. Out of 85 male participants, 52 (61.17%) experienced undesirable effects after vaccination and 33(38.82%) didn't have any of these effects. Out of 28 female participants, 12(42.85%) felt undesirable effects after vaccination while 16(57.14%) didn't face any effects. The most common undesirable effect faced by the majority of the participants 46(22.7%) was fatigue. No significant association of undesirable effects was found with socio-demographic or other factors in the research.

Conclusion: The analysis showed that majority of the participants experienced undesirable effects after getting either first or second dose of Covid vaccination which mostly resolved in a day or two without use of any medication. There is still need to work on the vaccines to minimize their undesirable effects.

Keywords: COVID-19 • Vaccination • Undesirable Effects • Fatigue

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Introduction

The research is about determining the frequency of undesirable effects in students and faculty of Ayub Medical College Abbottabad, Pakistan after getting different Covid-19 vaccinations. In late 2019, a viral outbreak of queer pneumonia accompanied with fever, dry cough, fatigue and occasional gastrointestinal symptoms occurred in a seafood wholesale market, the Huanan Seafood Wholesale Market, in Wuhan, Hubei, China [1]. Within a few months, it picked up a shape of global pandemic caused by a mutated shape of Corona Virus, which was declared as Sixth Public Health Of Emergency Services (SPHEC) by World Health Organization (WHO) on January, 30 2020. The previous outbreaks of corona virus include Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) outbreak and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) outbreak. Covid-19 is the third outbreak which has affected more than 209 countries by now including Pakistan [2]. Since its discovery, the virus has spread worldwide causing thousands of deaths and badly affecting health systems and economies of the world [3]. The pandemic posed a serious threat to the nations all around the globe which demanded specific protocols to be adopted on emergency basis to prevent mass hospitalization and causalities [4]. According to WHO, 239 million cases of Covid-19 are reported with 4.8 million deaths, worldwide, so far. In Pakistan the number of reported cases of this virus is 1.26 million with 28,173 deaths till now [5].

Covid-19 can spread rapidly from person to person, in both hospital settings and social events due to its short period of incubation [6]. So, temporarily lockdown protocols and restrictions on public gatherings and implementation of SOPs were being observed in maximum countries to minimize the spread of disease but the need of time was to make a vaccine against Covid-19, on urgent basis, to permanently save the population of the world against this deadly virus [7]. The developed nations started working on it quickly and began the new vaccines' trials as soon as possible. Within a year, vaccination against Covid-19 started around the globe on emergency basis after completing the trials [8]. Different vaccines with different mechanisms of actions prepared by different countries were injected to the world population without getting enough details regarding the possible side effects of the injected vaccines. Because of shortage of time, adverse effects of these vaccines couldn't be observed like usually it happens in the formation of new vaccine trials [9]. All vaccines have their respective efficacy against virus but also have some undesirable effects on the other hand as well, as post vaccination effects were being reported by vaccinated population. People with strong immune response experienced less of these undesirable effects while immune-compromised people suffered more and even deaths are being reported due to post Covid vaccination side effects. According to a study done on the side effects of AstraZeneca, one of the Covid-19 vaccine, suggests that it was launched prematurely and scientists should develop improvements to this vaccine to enhance its safety profile [10].

The reporting of undesirable side effects after vaccination is still going on as people are getting vaccinated on daily basis and more and more side effects are coming to the surface with the passage of time. Also these are all the short-term side effects of the vaccination and the long-term side effects will come in debate within next few years from now. Undesirable side effects after having Covid-19 vaccination are one of the main fears due to which people are avoiding vaccination these days. Different conspiracies about side effects of vaccines and trust of public on the effectiveness of these vaccines are the major factors affecting the vaccination program.

In this research, frequency of these effects in students and faculty of Ayub Medical College Abbottabad, Pakistan was studied to evaluate the truth of this issue and spread awareness about the positive and negative effects of Covid-19 vaccines.

Background

In 1965, the first human corona virus was identified causing upper respiratory tract infections in children by Tyrrell and Bynoe and it was found in human embryonic tracheal organ culture obtained from the respiratory tract of an adult with a common cold [11]. In the coming decades, it was found out by epidemiologic and volunteer inoculation studies that these viruses were causing variety of respiratory illnesses but pathogenicity was low [12]. In 2002-03, severe acute respiratory syndrome, also called as SARS corona virus was emerged from the southern China and was reported in 29 countries in North America, South America, Europe and Asia, after spreading [13]. Data from epidemiologic studies conducted among the food markets in Southern China suggested that 40% of wild animal traders and 20% of people who slaughter animals were seropositive for SARS, although none of them had history of SARS-like symptoms. This SARS epidemic gave the world of coronaviruses a huge amount of energy and activity that contributed to the enormous amount already known about the virology and pathogenesis of these coronavirus infections from the expanding area of veterinary virology [14]. About 41 cases of pneumonia of unknown etiology were reported in Wuhan city, Hubei province, China in December 2019. Yi-Wei Tang suggested that the common thing about the initial patients was that they worked at or lived around the local Huanan Seafood Wholesale Market [15]. This virus was named as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by World Health Organization (WHO), on 11th February 2020 [16]. Since then COVID-19 has been a global hazard and continues to infect and kill people. Phylogenetic analysis suggests that bats might be the original host to SARS-CoV-2, which are commonly sold in Wuhan market [17]. WHO, on 30th January, 2020 declared it as a disease of international concern and was considered as global pandemic on 11 March 2020 [18]. As of April 18 2020, the WHO reported

that outbreak infected about 21,64,111 people and killed over 1,46,198 people around the world in more than 200 countries [19].

SARS-Cov-2 is an enveloped Beta-coronavirus family with similar genetics sequence as SARS-CoV-19 [20]. This family comprises positive-sense, single stranded, enveloped RNA viruses with wide range of natural roots [21]. Viral envelope is coated by a spike glycoprotein, envelope and membrane proteins. First step in infections is virus binding to host cell through the target receptor. The S1 subunit of spike glycoprotein contains the receptor binding domain that binds to peptidase domain of ACE2. The S2 subunit is highly preserved and considered as a potential antiviral target [22]. The incubation period of SARS-CoV-2 was thought to be 0 day to 14 day by WHO and around 2 day to 12 days by ECDC [23]. The primary mechanism of transmission of this virus is via infected respiratory droplets, with viral infection occurring by direct or indirect contact with nasal, conjunctival or oral mucosa, when respiratory droplets are inhaled or deposited on these mucosal membranes [24]. Similar to the transmission of SARS and MERS, researchers focused on the role of bats in origin of Covid-19 pandemic and in animal to human transmission. There is also unconfirmed involvement of intermediate hosts such as snakes, pangolins, turtles and some other animals [25].

Human to human transmission can be of different types. There is high incidence of COVID-19 infections due to silent transmission from the pre-symptomatic stage and asymptomatic infections [26]. Another one is aerosol transmission. Immediate environment contaminated by aerosols expired from coughs and sneezes of the COVID-19 patients, symptomatic and asymptomatic, is the main cause of virus spread [27]. Virus-containing aerosols may persist in the air for long periods in indoor and close environments and at high concentrations, hence increasing the rate of transmission [28]. Also direct contact with objects or surfaces contaminated with virus and parts of the body of infected individuals i.e. mouth, eyes, nose etc., may be responsible for direct contact transmission [29]. Doctors and healthcare professionals are at high risk for getting infected with COVID-19. Among them Otolaryngologists and Head and Neck surgeons are at high risk of getting infected [30].

SARS-CoV-2 virus binds to host target cell receptor i.e., ACE2 [31]. The distribution of ACE2 receptors in different body tissue may explain the sites of infection and patient symptoms. In lungs, active replication and release of virus lead to symptoms such as fever, myalgia, headache and respiratory symptoms [32]. A distinctive feature of Covid-19 is presence of mucus plug in respiratory tract with fibrous exudate, which may explain the severity of Covid-19.This is caused by overproduction of pro-inflammatory cytokines that accumulates in lungs and eventually damage lung parenchyma [33]. Death is due to pneumonia and possibly hyper inflammation associated with cytokine storm syndrome [34]. In people with severe illness, increased plasma concentration of inflammatory cytokines and biomarkers were observed compared with people with non-severe illness [35].

A study related immune response to Covid-19 suggests that adaptive immune response is important in defining the clinical outcome as older age and male sex is associated with increased risk of severe disease and mortality [36].

Other risk factors associated with the development of severe disease, hospitalization and mortality include older age, immunosuppression,obesity, smoking, hypertension, cardiovascular diseases, chronic obstructive pulmonary diseases, diabetes and any underlying malignancy [37]. As of March 3, 3.4% mortality rate was reported by WHO [38]. Till the end of August 2021, 4.53 million people have died out of 218 million reported cases worldwide. In Pakistan, 25,889 deaths have been reported out of total 1.16 million cases in the end of August, 2021 [39].

In February 2020, WHO said that it didn't expect a vaccine against Covid-19 in less than 18 months but rapid growing infection rate forced the nations to urgently prepare vaccines which happened and now various COVID vaccines, almost 13 different types of vaccines, are available which are aimed at preventing the COVID infection [40]. Some of the different vaccines being used are Sinopharm, Sinovac, Cansino, BioNTech (Pfizer), AstraZeneca, Moderna, Janssen, Sputnik V etc. Figure 1 shows different types of vaccines administered to the participants of this study. It shows that out of total 113 participants, 55(48.7%) got vaccinated with Sinopharm, 50(44.2%) got vaccinated with Sinovac, 5(4.4%) got vaccinated with Moderna, 2(1.8%) got vaccinated with Astra Zeneca and 1(0.9%) got vaccinated with Pfizer vaccine.

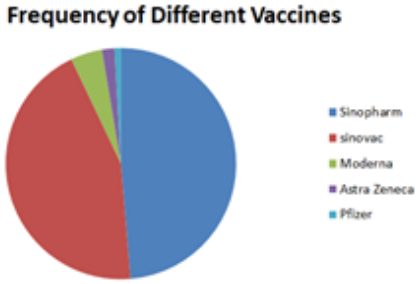

Figure1. Frequency of Different Vaccines

The mechanism of action of these vaccines varies according to their type, for example, BioNTic and Moderna are mRNA vaccines, AstraZeneca, Janssen and Sputnik V are Adenovirus vector vaccines while Sinopharm And Sinovac are inactivated virus vaccines [41]. These vaccines might cause some side effects either at the time of vaccination or few days later. It usually resolves on its own or might

require some medications. They usually do not last for more than a week [42].

Most side-effects of COVID vaccines include local, allergic and systemic side-effects [43]. It was noted that the side effects were generally more common in people who had contacted the infection in the past. It has been noted that the side-effects were more common in females as compared to males [42]. Similarly, obese people and people with co-morbidities are also likely to notice side-effects. Side-effects after second dose might be more intense than the first one. But it is advised to get the second shot of vaccine irrespective of the side-effects after the first shot of the vaccine [44]. Local after-effects include pain, tenderness, redness, swelling at the site of injection, itching, swollen armpit glands, warmth, bruising. Among those tenderness and pain are most common. Allergic side-effects includes rash, skin burning, red welts on face and arms. Allergic reaction are more common in younger adults after 1st dose. Allergic reactions after 2nd dose are lesser than that of 1st dose [43]. Systemic side-effects include diarrhea, fever, body rash, joints pain, headache, lethargy, abdominal pain, chills, muscle pain, joint pain and shivers. Fatigue and headache are the most common side effects after vaccination [44]. Table 1 shows the frequency of undesirable effects faced by the participants of this study. According to it, sore throat is experienced by 10(4.9%) participants, congestion is experienced by 2 (1.0%) participants, chest pain is experienced by 1(0.5%) participant, palpitations are experienced by 5(2.5%) participants, headache is experienced by 24(11.8%) participants, fever is felt by 31 (15.3%) participants, fatigue is experienced by 46(22.7%) participants, weakness is experienced by 24 (11.8%) participants, loss of taste and smell is experienced by 4(2.0%) participants, voice change is experienced by 2(1.0%) participants, nausea is felt by 10(4.9%) participants, diarrhea is experienced by 4(2.0%) participants, muscle aches are experienced by 38 (18.7%) participants and allergic reactions are experienced by 2(1.0%) participants.

Table 1: Frequency of undesirable effects after vaccination

Side effects	Responses	
	N	Percent
Sore throat	10	4.90%
Congestion	2	1.00%
Chest pain	1	0.50%
Palpitations	5	2.50%
Headache	24	11.80%
Fever	31	15.30%
Fatigue	46	22.70%
Weakness	24	11.80%
Loss of taste and smell	4	2.00%
Voice change	2	1.00%
Nausea	10	4.90%
Diarrhea	4	2.00%
Muscles aches	38	18.70%
Allergic reactions	2	1.00%
Total	203	100.00%

Methods

A descriptive cross sectional study was conducted on the students and faculty of Ayub Medical College Abbottabad, Pakistan from 1st March 2021 to 31 October 2021. Sample size of 113 subjects aged 18 year to 59 years of either gender who are partially or fully vaccinated against Covid-19 were included in the study. All the students and faculty who got their Covid-19 vaccination (1st or 2nd dose) within the previous 7 days were included in the study. The students who did not give informed consent were excluded from the study.

A structured questionnaire was developed after reviewing of literature. The students were approached in the lecture halls and courtyards. Data was collected by asking questions verbally from the students who had got their Covid-19 vaccination, after obtaining informed verbal consent. The questionnaire contained two portions, first portion contained basic demographic data (age, gender, course of study) and the second portion contained questions regarding any previous medical problem before vaccination and the undesirable effects faced after getting 1st or 2nd dose of Covid-19 vaccination. The data were entered into the computer using SPSS version 20.0. Descriptive data analysis was done both for continuous and categorical variables. Mean and standard deviation was calculated for continuous variables like age of the students. Frequencies and percentages were calculated for the categorical variables like gender, type of vaccines and various undesirable effects being faced after vaccination.

Figure 2 shows the vaccination status of the participants in this study. It shows that out of total

121 participants, 105(92.9%) are fully vaccinated and 8(7.1%) are unvaccinated or partially vaccinated.
Data was presented in the form of tables, bar graphs and pie charts.

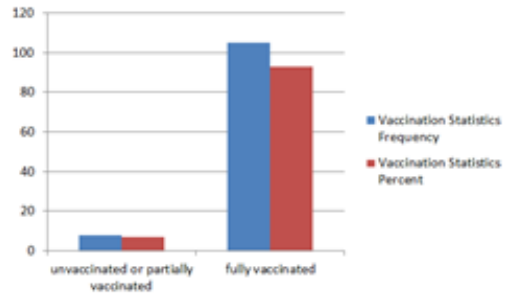

Figure 2: Vaccination Status

Inferential data analysis was conducted for determining association of students and faculty members who faced undesirable effects after Covid-19 vaccination with socio-demographic variables and other factors which might be the cause of these effects. Chi square test of association was employed to determine the association. P value of ≤0.05 was considered significant. Figure 3 shows the frequency of any past illness in the participants of this study. It shows that out of total 113 participants, 104(92.1%) do not have any past illness, 1(0.9%) has allergy, 1(0.9%) has depression, 1(0.9%) has Diabetes Mellitus, 1(0.9%) has Hypertension, 1(0.9%) has Migraine, 1(0.9%) has mild fever, 1(0.9%) has sinusitis and dry eye syndrome, 1(0.9%) has TB.

Table 3 shows the gender of the participants of this study. According to it, out of total 113 participants, 85(75.2%) are male and 28(24.8%) are female.

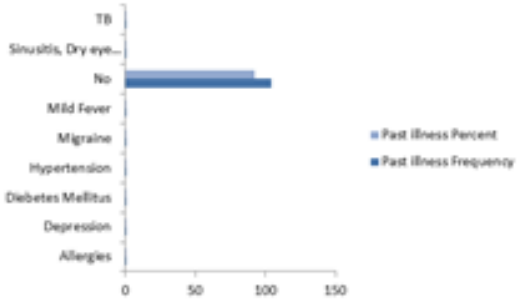

Figure 3: Frequency of Any Past Illness

Discussion

We are currently going through a global pandemic of Covid-19. Vaccination is the only way of light in these difficult times. But the undesirable effects after Covid-19 vaccination are creating resistance in public to get vaccinated. The need of time is to properly evaluate the effects of different vaccines and try to minimize these undesirable effects and to eventually get the confidence of general public in vaccination programs.Our study was conducted in the students and faculty of Ayub Medical College in which we had

Table 2: Mean age of the participants

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Age in years	113	18	59	23.15	5.67

Table 3: Gender of participants

Variable	Frequency	Percent
Male	85	75.2
Female	28	24.8
Total	113	100

Result

Out of the total 113 participants 85(75.2%) were males and 28(24.8%) females. Out of 85 male participants, 52 (61.17%) experienced undesirable effects after vaccination and 33(38.82%) didn't have any of these effects. Out of 28 female participants, 12(42.85%) felt undesirable effects after vaccination while 16(57.14%) didn't face any effects. The most common undesirable effect faced by the majority of the participants 46(22.7%) was fatigue. Table 2 shows the mean age of the participants in this study. It shows that mean age of the total 113 participants is 23.15 ± 5.6 years with minimum age of 18 years and maximum age of 59 years.

113 participants and asked them questions after having their verbal consent. In our research, the most common side effects which were experienced by the participants were fatigue (22.7%) and fever (15.3%) that appeared within 24 hours of vaccination and lasted for a day or two, which is in accordance with the research done on the users of COVID symptom study app in UK [44]. Another study done in the Poland hasanother opinion from our study and according to them, the most common side effect experienced after vaccination was soreness of injection site followed by

the limb pain [45]. This difference in opinion is may be due to our small sample size and difference of geographical region of both studies. The present study found the incidence of post-COVID-19-vaccination side effects to be more frequent in males than in females. This finding contradicts that reported by research in Saudi Arabia where they studied the short-term side effects of COVID-19 vaccines in Saudi people and found that the frequency was higher in females than males [46]. The higher frequency of side effects in males in our study may be attributed to the lower proportion of females in our study sample.

The study was not an ideal one as we can't generalize the results because it was conducted in only one medical college on a very small sample size. We also used non probability sampling technique and with it we might not have represented the population well and it is hard for us to know how well we've done. Also, only one tool was used in the collection of data. If more and better tools were used, it would have added to the credibility of the study and more insight into the side effects being faced.

Conclusion

Our study revealed that majority of the participants faced undesirable effects after Covid vaccination and the most common effects were fatigue, muscle aches and fever. The study has highlighted the common undesirable effects and it can be helpful for the scientists and researchers to work on the vaccines and reduce these effects. Also we saw that the most of the effects resolved themselves after a day or two of vaccination which can be helpful to convince the people to participate in the vaccination programs without any fear. Any association couldn't be made between the undesirable effects and the type of vaccine or the socio-demographic variables of the participants because the p value was more than 0.05, which made the results insignificant.

Recommendations

- Similar type of studies should be done on larger scales to properly calculate the undesirable effects of different vaccines.
- People should be correctly educated regarding the efficacy and side effects of the Covid Vaccines.
- This kind of research should be encouraged in all geographical regions or every country if possible, as the undesirable effects of vaccination can differ with the change in geographical are

Authors' contributions

UF, NA, SYMS, QA, RB, AF conceptualized and collected the data. UF wrote the first draft of manuscript and did the analysis. KS,IK and SA read the literature review, revised, edited and wrote the final draft of manuscript. All authors read and approved the final manuscript.

Declarations

Institutional Approval

Institutional approval was obtained in compliance with regulation of our institution and generally accepted guidelines governing such work.

Consent for publication

Informed consent was obtained from all subjects included in the study

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Conflict of interest

No conflict of interest with any institution/organization

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Availability of data and materials

The datasets used and/or analyzed during the current case report are available from the corresponding author upon reasonable request.

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