Research Square

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Effectiveness and safety of inactivated SARS-CoV2 vaccine (BBIBP-CorV) among healthcare workers: A seven-month follow-up study at fifteen hospitals

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Research Article

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Abstract

OBJECTIVE

Health care workers_ the first line army in the current pandemic_ are the most vulnerable group for COVID-19 infection. Vaccination of health care workers is strongly recommended to salvage our army. However, more research is needed to determine the safest and most effective vaccine. In our study, we assessed the safety and effectiveness of the first approved vaccine in Egypt_ the Sinopharm vaccine.

DESIGN, SETTING:

An ambispective cohort study was conducted in fifteen triage and isolation hospitals, from the 1st of March till the end of September 2021. Participants are either fully vaccinated or unvaccinated.

OUTCOMES AND MEASURES:

Efficacy outcome to assess vaccine effectiveness, severity outcome to assess incidence rate of hospitalized cases (severe to critically ill) or the COVID-19 related mortality, in addition to the safety of the vaccine.

INTERPRETATION:

From the selected hospitals, we included 1228 of 1364 interviewed healthcare workers. Vaccine effectiveness was 67% to protect against symptomatic PCR confirmed cases and 46% for total COVID-19 infection after adjusting hazard ratio. Incidence rate ratios of vaccinated to unvaccinated group were 0.39 (95%CI, 0.24–0.65) for PCR confirmed symptomatic case, 0.63 (95%CI, 0.46–0.86) for total COVID-19 infection, 0.45 (95% CI, 0.15–1.31) for hospitalization, 0.71 (95% CI, 0.07– 6.39) for mechanical ventilation and only one COVID-19 death among unvaccinated group. Most adverse events are mild and well-tolerated. Pregnant and lactating vaccinated mothers did not report any sentinel adverse events.

CONCLUSION

Sinopharm was effective in protecting health care workers from the highly transmissible COVID-19 infection when the predominant Delta variant was ambient.

Introduction

Since March 2020, The World Health Organization (WHO) announced that a novel coronavirus (SARS-CoV2) associated disease (COVID-19) is a pandemic that raises global concerns(1). This is due to the rapid spread of the disease and incredible increase in the number of cases and deaths due to SARS-CoV2 respiratory symptoms and multi-organ damage, in addition to septic shock; as the number of cases reached 323 million cases with 5.5 million confirmed deaths globally till January 2022(2). From the onset of the disease, members of the medical team have assumed the duty to defend and address this terrible disease for humanity in all hospitals worldwide. As a result, many healthcare workers (HCWs) turn into COVID-19 victims. From January 2020 to May 2021, WHO estimates the number of deaths among HCWs)from COVID-19 was between 80 000 and 180 000 (3). Therefore, The Centers for

Disease Prevention and Control (CDC) recommended for vaccination of HCWs to prevent morbidity and mortality of global frontline defenders(4). Moreover, HCWs are exposed daily to a very high viral load from their work environment that leads to increasing their susceptibility to getting sick easily, and the loss of workdays that has a critical influence during the pandemic. Furthermore, they can transmit the infection to their family, necessitating the vaccination of HCWs(5).

Grievously, till now there are conflicting data about the safest and most effective treatment for COVID-19 disease. Therefore, many pharmaceutical companies tried to develop a SARS-CoV2 vaccine from the beginning of this disaster. Till 24 January 2022, twenty-six vaccines are granted emergency use authorization, or made available for use outside clinical trials. Nine vaccines are approved for use in Egypt of which four are in clinical trials(6). Egyptian Ministry of Health and Population (MoHP) participated with Sinopharm pharmaceutical company in phase 3 trial, and after interim analysis, the vaccine proved its safety, efficacy, and suitable storage conditions(7). Thus, influence the government to receive successive batches from the inactivated BBIBP-CorV (Sinopharm) vaccine in January 2021, which was the first type of vaccine that reached Egypt, and they started vaccination to HCWs who met daily COVID-19 patients in the chest, fever (triage), and isolation hospitals.

But due to the rush to request vaccination, the long-term follow-up in real-life is not well established yet(8). Consequently, we aimed to assess the effectiveness and safety of this new vaccine in legitimate healthcare workers' life. Till now there are insufficient studies to detect the effectiveness of the Sinopharm vaccine.

Methodology

Study design and participants:

An ambispective cohort study was conducted in fifteen isolation and triage hospitals (five isolation hospitals, five fever hospitals, five chest hospitals) scattered across Egypt. We performed a multistage sampling technique. First, we divided Egypt into five main clusters and chose the governorate with greatest population according to the latest census of Egypt(9): Middle Egypt (Cairo governorate), East Delta (El Sharika governorate), West Delta (Alexandria governorate), North Delta (Kafr El-Sheikh governorate), and South Delta (Assuit governorate). Then stratified hospitals by specialty to select one isolation, one fever, and one chest hospital from each governorate to participate.

The study began in May 2021, after ethical approval from the MoHP Research Ethics Committee. The investigators interviewed HCWs: physicians, nurses, pharmacists, technicians, from the selected hospitals and they accepted to enroll in the study, whether they were fully vaccinated by the inactivated BBIBP-CorV vaccine or not. We excluded any HCWs vaccinated with another type of SARS-CoV2 vaccine.

Vaccinated group: HCWs who completed two doses of the inactivated BBIBP-CorV vaccine, twenty-one days apart, we did not meet any partial vaccinated one. **Control group**: HCWs not vaccinated or willing to be vaccinated as vaccination became a must since October 2021.

The follow-up period was started fourteen days after the date of the second dose for each vaccinated HCWs and from the 1st of March for unvaccinated HCWs, that is the calculated median time for starting to follow-up in vaccinated persons, ends on the 30th of September 2021 (nearly seven months).

Sample size calculation:

From the literature, nearly 10% from COVID-19 confirmed cases are severe to critically ill (our primary outcome) (10) (11), and we assumed that the vaccine will reduce this percentage by 50%, and by using Stata 16 software for sample

size calculation, power 80%, and 0.05 level of significance, the minimum total accepted sample size was 950 participants. Upon adjusting cluster effect using varying cluster size equation, by multiplying the total sample size with inverse minRE = 1.18; assuming the coefficient of variation (CV = 0.6) and the minimum relative efficiency (minRE = 0.847)(12). Consequently, 1125 is the adjusted sample size.

Data sources and measures:

In the first interview from participated HCWs, May 2021, we collected demographics, profession, workplace, daily contact status to COVID-19 patients, comorbidities, risk factors for severe COVID-19 infection, pregnancy, lactation, smoking status, prior COVID-19 infection, lost workdays due to COVID-19 illness and influenza vaccination at the previous year as baseline data. Dates of the Sinopharm vaccine first and second doses were collected from hospital registries. Furthermore, all participants were asked about any confirmed or suspected COVID-19 infection retrospectively started from 14 days after full vaccination or from the 1st of March for the unvaccinated group, vaccinated HCWs also asked for solicited adverse events they suffered after vaccination, the severity of their adverse events(13), frequency, duration, and the treatment used.

At the end of September 2021, we collected the dates of the study outcomes if happened, either by re-interviewing or calling of all the participants or from their hospital's data for unreached dead or critically ill persons.

Outcomes:

The primary outcomes were assessing vaccine effectiveness to prevent COVID-19 infection, severity outcome was the incidence rate of hospitalized cases (severe to critically ill) and the COVID-19 mortality rate.

The secondary outcomes were the incidence rate of confirmed polymerase chain reaction (PCR) symptomatic case or total COVID-19 infection either PCR confirmed or suspected, as defined in MoHP protocol(14), any HCWs has three or more from typical COVID-19 symptoms: fever, cough, general weakness, headache, myalgia, coryza, dyspnea, nausea/vomiting, diarrhea or altered mental status. Compare the median workdays lost due to COVID-19 infection between 2 groups. Besides, the number and proportion of solicited adverse events after vaccination either local or systemic, and reporting of any serious adverse event in the vaccinated group. Local solicited adverse events were pain, erythema, swelling, or lymphadenopathy at the site of injection. In addition to systematic adverse events were rash, fever, chills, fatigue, myalgia, arthralgia, nausea, vomiting, change in blood pressure, or headache.

Statistical analysis and statistical package:

Data were analyzed using R software 4.1.1. packages, with a 5% level of significance.

Median and interquartile range was used to describe numerical data. Number, and percentage for categorical data. All baseline data: demographics, comorbidities, risk factors, previous influenza vaccination, prior COVID-19 infection was compared in both groups by using the Chi-square test or Mann Whitney test, and variable with statistically significant difference between the two groups was adjusted either in subgroup analysis or in multivariate Cox-regression. The Chi-square test and incidence rate ratio (IRR) were used for comparing the significance of outcomes (PCR-confirmed symptomatic case, total COVID-19 infection, hospitalization, mechanical ventilation, and death). A subgroup analysis was performed for IRR. Vaccine effectiveness was calculated as 1- an adjusted hazard ratio (HR) through Cox-Hazard regression. In addition to reporting the number and percentage of the solicited adverse events classified by severity.

Results

From 1364 interviewed HCWs, 1228 were enrolled in the study (Fig. 1), the median follow-up days was 213 (IQR, 180–213), the unvaccinated persons were younger than vaccinated, their median age was 30 (IQR, 26–37), and 35(IQR 29–42) years respectively. Female sex was more predominant in the unvaccinated group, 2 females were pregnant (they got vaccinated accidently in early pregnancy) and 1 lactating mother in the vaccinated group while 19 were pregnant and 26 lactating in the unvaccinated group.

Nurses were the highest category among the unvaccinated group while pharmacists in the vaccinated one. 57.3% of unvaccinated groups work in chest hospitals and 43.0% of vaccinated group work in isolation (Supplementary, S1). The majority of both groups didn't have any risk factors for severe COVID-19 infection and weren't smokers.

There was no statistically significant difference in both groups for prior COVID-19 infection 16.7% unvaccinated, 20.3% vaccinated ($p = 0.207$), in addition to the loss of workdays due to prior COVID-19 ($p = 0.142$).

All of the baseline characteristics at the 1st interview are discussed in Table 1 and Supplementary (S1).

Table 1
Baseline characteristics at the first interview.

Characteristics, No. (%)	Unvaccinated (N = 898)	Vaccinated (N = 330)	Total (N = 1228)	P-value
Age category				**0.003**
< 50 years	841 (93.9%)	295 (89.3%)	1136 (92.5%)	
≥ 50 years	55 (6.1%)	37 (11.2%)	92 (7.5%)	
Gender				**< 0.001**
Female	777 (86.5%)	228 (69.1%)	1005 (81.8%)	
Male	121 (13.5%)	102 (30.9%)	223 (18.2%)	
Healthcare Profession				**< 0.001**
Dentist	15 (1.7%)	1 (0.3%)	16 (1.3%)	
Nurse	569 (63.4%)	71 (21.5%)	640 (52.1%)	
Pharmacist	117 (13.0%)	132 (40.0%)	249 (20.3%)	
Physician	127 (14.1%)	79 (23.9%)	206 (16.8%)	
Technician	70 (7.8%)	47 (14.2%)	117 (9.5%)	
Contac status to COVID-19 patients				**< 0.001**
Direct contact	728 (81.1%)	159 (48.2%)	887 (72.2%)	
Indirect contact	170 (18.9%)	171 (51.8%)	341 (27.8%)	
Influenza vaccination in 2020				**< 0.001**
No	685 (76.3%)	193 (58.5%)	878 (71.5%)	
Yes	213 (23.7%)	137 (41.5%)	350 (28.5%)	
Number of risk factors for severe COVID-19				**< 0.001**
0	718 (80.0%)	227 (68.8%)	945 (77.0%)	
1	135 (15.0%)	70 (21.2%)	205 (16.7%)	
≥2	45 (5.0%)	33 (10.0%)	78 (63%)	
Smoking status				**0.108**
No	865 (96.3%)	311 (94.2%)	1176 (95.8%)	
Yes	33 (3.7%)	19 (5.8%)	52 (4.2%)	
Pregnancy				**0.07**
No	879 (97.9%)	328 (99.4%)	1207 (98.3%)	
Yes	19 (2.1%)	2 (0.6%)	21 (1.7%)	
Lactation				**0.006**

Characteristics, No. (%)	Unvaccinated (N = 898)	Vaccinated (N = 330)	Total (N = 1228)	P-value
No	872 (97.1%)	329 (99.7%)	1201 (97.8%)	
Yes	26 (2.9%)	1 (0.3%)	27 (2.2%)	
Previous COVID-19 infection before vaccination				**0.207**
No	748 (83.3%)	263 (79.7%)	1011 (82.3%)	
Yes	150 (16.7%)	67 (20.3%)	217 (17.6%)	
Previous hospitalization due to COVID-19				**0.924**
No	861 (95.9%)	316 (95.8%)	1177 (95.8%)	
Yes	37 (4.1%)	14 (4.2%)	51 (4.2%)	
Number of workdays lost due to previous COVID-19				**0.142**
Median (IQR)	14 (10–15)	14 (10–15)	14 (10–15)	
Total days lost	2034	1037	3071	
Risk factors for severe COVID-19: chronic lung disease, cardiovascular disease, diabetes, hypertension, BMI > 35, chronic kidney disease, chronic liver disease, Autoimmune diseases.				

Effectiveness estimation against COVID-19 infection

During the study follow-up period which ended in September 2021, the proportion of PCR confirmed cases was statistically significant between unvaccinated and vaccinated groups respectively 14.4%, 5.5% ($p < 0.001$). Among 25 hospitalized unvaccinated HCWS 4 were admitted to ICU and mechanically ventilated (MV), whereas one was MV from 4 hospitalized vaccinated HCWs. However, the hospitalization and MV by COVID-19 infection between two groups were statistically insignificant, ($p = 0.108$), ($p = 0.728$) respectively, only 1 death occurred among the unvaccinated ones.

Vaccine effectiveness was 67% to protect against symptomatic PCR confirmed cases and 46% for total COVID-19 infection after adjusting HR for age, gender, hospital type, contact to COVID-19 patients, workplace, prior COVID-19 infection, and influenza vaccination (Table 2).

Crude incidence rate ratios (IRR) of vaccinated to unvaccinated group were 0.39 (95%CI, 0.24–0.65) for PCR confirmed symptomatic case, 0.63 (95%CI, 0.46–0.86) for total COVID-19 infection, 0.45 (95% CI, 0.15–1.31) for hospitalization, 0.71 (95% CI, 0.07– 6.39) for MV, and couldn't be calculated for death.

Also, we noticed a statically significant difference between the 2 groups in the number of workdays lost due to COVID-19 infection as being greater in the unvaccinated group (median 14, IQR 10–15) than in the vaccinated group (10 days, IQR 6.5–15) days (Table 2).

Table 2: Outcomes at the end of September 2021

The outcome, No. (%)	Unvaccinated (N = 898)	Vaccinated (N = 330)	Total (N = 1228)	P-value	IRR (95%CI)	Unadjusted HR (95%CI)	Adjusted HR (95%CI)	VE
Current COVID-19 infection				< 0.001				
No	677 (75.4%)	282 (85.5%)	959 (78.1%)		Reference	Reference	Reference	
PCR confirmed	129 (14.4%)	18 (5.5%)	147 (12.0%)		0.39 (0.24–0.65)	0.42 P = 0.0007	0.33[a] (0.2–0.57)	67%
Total COVID	221 (24.6%)	48 (14.5%)	246 (21.9%)		0.63 (0.46–0.86)	0.64 P = 0.004	0.54[a] (0.38–0.76)	46%
Hospitalization due to COVID-19				0.108				
No	873 (97.2%)	326 (98.8%)	1199 (97.6%)		Reference	Reference	Reference	
Yes	25 (2.8%)	4 (1.2%)	29 (2.4%)		0.45 (0.15–1.31)	0.48 P = 0.14	0.35[b] (0.12–1.08)	65%
Admission place				0.326				
ICU	4 (0.4%)	1 (0.3%)	5 (0.4%)		—	—	—	
Intermediate care unit	2 (0.2%)	1 (0.3%)	3 (0.2%)		—	—	—	
Ward	19 (2.1%)	2 (0.6%)	21 (1.7%)		—	—	—	
Mechanically ventilated				0.728				
No	894 (99.6%)	329 (99.7%)	1223 (99.6%)		Reference	Reference	Reference	
Yes	4 (0.4%)	1 (0.3%)	5 (0.4%)		0.71 (0.07–6.39)	0.95 P = 0.96	1.26[c] (0.13–12.2)	–
Still alive				0.544				
No	1 (0.1%)	0 (0.0%)	1 (0.1%)		—	—	—	

Table 2: Outcomes at the end of September 2021							
Yes	897 (99.9%)	330 (100.0%)	1227 (99.9%)		----	----	----
Workdays lost due to current COVID-19				0.007			
Median (IQR)	14 (10–15)	10 (6.5–15)	14 (19 – 15)		----	----	----
Total	2824	557	3381		----	----	----

IRR: incidence rate ratio of vaccinated to unvaccinated per person-days, HR: crude hazard ratio vaccinated / unvaccinated HCWs, adjusted HR: adjusted hazard ratio, VE: vaccine efficacy = (1- adjusted HR) %

[a]Adjusted for age, gender, contact to COVID-19 patients, hospital type, workplace, previous COVID-19 infection, influenza vaccination.

[b] Adjusted for age, gender, contact to COVID-19 patients, previous COVID-19 infection, number of risk factors, pregnancy, smoking.

[c] Adjusted for age, gender.

Adjusting variables:

Upon subgrouping of incidence rate ratio (IRR) for PCR confirmed cases of vaccinated to unvaccinated, statistically significant variables were age less than 50 [IRR = 0.38, 95% CI 0.23–0.65], direct contact to COVID-19 patients [IRR = 0.2, 95% CI 0.09–0.43], chest hospitals [IRR = 0.31, 95% CI 0.12–0.78], and no prior COVID-19 infection [IRR = 0.4, 95% CI 0.24–0.67] (Fig. 2).

Another subgrouping of incidence rate ratio (IRR) for total COVID-19 and hospitalized COVID-19 cases was shown in supplementary (S2, S3).

Safety measures:

Mostly, the adverse events (AEs) were mild (grade 1). Regarding local adverse events (AEs) which reported: Half of the vaccinated suffered from local pain (the most prevalent local AEs) contributed to 52.5% following both the 1st and the 2nd dose, swelling appeared around 3.3% following the 1st dose. No local pain associated with erythema and swelling, numbness, or lymphadenopathy appeared following the administration of the 2nd dose only.

Systemic AEs which reported: Fever was mainly following the first dose 34.2% (temperature range, 37.3–39˚C), the largest duration was for 3 days, the fluctuation in blood pressure appeared following the administration of both doses as following: 6 vaccinated HCWs suffered from an increase in their blood pressure (150/90mmHg was the highest among them) while decreasing blood pressure in one vaccinated (80/50mmHg) with a maximum 3 days duration, other AEs and their severity shown in (Fig. 3). Besides this, unsolicited AEs were reported as follows; mild edema occurred in one vaccinee at face and hands following the administration of the 1st vaccine dose, and hyperpigmentation was reported from one vaccinee and lasted for 4 months, pregnant and lactating mothers did not report any sentinel AEs (S8).

About treatment medications for these adverse effects were ACEIs, CCBs, and BB for increased blood pressure, Paracetamol for pain or fever the most commonly used drug for adverse events management followed by other

NSAIDs, antihistaminic injection for edema.

Discussion

This ambispective cohort study announces infection rates with confirmed COVID-19 among a large Egyptian health care workers (HCWs) cohort (n = 1228) for 7 months follow up (March 2021, to September 2021). We identified 18 cases of COVID-19 (5.5%) among vaccinated HCWs with an incidence rate ratio of 0.39 (95%CI, 0.24–0.65). We observed that inactivated BBIBP-CorV vaccine (Sinopharm) had an efficacy of 67% among healthcare workers calculated as a percentage of (1- adjusted HR).

Our study has at least three main strengths. First, it was conducted across multi-centers distributed all over Egypt; fifteen hospitals were included chosen by multistage sampling technique_ the highest infection rate areas. Second, we targeted health care workers as they are the theater of war in this pandemic disease, exposed to high viral load. Third, we also handled a subgroup analysis for all variables for our outcomes.

The Emergency authorization handed out the inactivated whole virion vaccine (BBIBP-CorV), it was the initial launch of a vaccination program against COVID-19 for HCWs that began on January 16, 2021. The Sinopharm vaccine was not as effective against variants of SARS-CoV-2 as the original virus(15). However, our timeline study could ensure its efficacy against Delta variant_ the second surge linked to highly transmissible Delta variant. On the 28th of July 2021, appears in 132 countries globally. Moreover, WHO Eastern Mediterranean Region Office reported detection of Delta variants in 15 countries including Egypt(16). The Egyptian Ministers of Health announced the first Delta variant case in Egypt in July(17). This variant is a predominant one till now in Egypt(18). Consequently, the first detection of this variant in India from March 2021(19), did not block its appearance before in Egypt. Hence, our targeted population in their hospitals deals with all COVID-19 patients, they may be infected by existing variants during the follow-up period.

Moreover, there was a statically significant difference between the 2 groups in the number of workdays lost due to COVID-19 infection, days were greater in the unvaccinated group that certainly will impact the provision of health services and consequently economically effective. Also, the vaccine effectiveness (VE) for hospitalization or mechanically ventilation due to COVID-19 infection was insignificantly between two arms, that is maybe due to the good planning and innovation in public health to control the infection outbreak _Egyptian protocol management, less severe new variants of the virus, our median age groups.

The VE in our study are similar to estimates that have been reported in New Delhi, India for SARS-CoV-2 reinfection rate and estimated effectiveness of the inactivated Whole Virion Vaccine BBV152 among Health Care Workers, Fully vaccinated HCWs had a lower risk of reinfection (HR = 0.14, 95%CI 0.08–0.23)(20). Despite their higher VE, and that is maybe due to their larger sample size or different vaccine type, their study was conducted at only one large hospital. In addition, a randomized double-blind phase 3 trial in the United Arab Emirates (UAE) and Bahrain to evaluate the efficacy and adverse events of 2 inactivated COVID-19 vaccines interpreted significantly decreases symptomatic COVID-19 risk, and sentinel AEs were rare(21). However, the limitations of this study: it was conducted in a healthy population and the efficacy among those with chronic disease, older adults, and those with previous SARS-CoV-2 infections were not sufficiently reported; also, Egypt and Jordan data were not included in the interim analysis and final analysis not reported yet.

From the previous studies, the inactivated Sinovac vaccine efficacy in Brazil was found 51% for symptomatic COVID-19 infection(22), with longer dosing intervals, while in Turkey was found 83.5% efficacy(23) and in Indonesia reported 65% efficacy(24). Although the inactivated vaccine was not as effective against variants of SARS-CoV-2 as the original virus, the vaccine effectiveness was still over 50% for fully vaccinated people(15). Till now, the available data

suggests that effectiveness is highest in RNA vaccines than viral vector ones and the least in the inactivated SARS-CoV-2 vaccines. However, Israel recently reported a breakthrough infection of SARS-CoV-2, dominated by variant B.1.1.7 in a small number of fully vaccinated health care workers, raising concerns about the effectiveness of the original vaccine against those variants(25). Whereas, another study in Egypt shows that the Sinopharm vaccine cannot trigger sufficient antibodies as an immune response in most vaccinated cases(15). The UAE solved this problem by a third booster dose of the Sinopharm vaccine to improve antibody response. Subsequently, more studies are needed in those who receive three doses of the Sinopharm vaccine to determine the vaccine's effectiveness among them. On the other hand, we adjusted for previous COVID-19 infection _ before 14 days after fully vaccinated in the vaccinated group and before 1st March for the unvaccinated group_ to encompass high titers of immune antibodies and we did not find any difference. Indeed, another study examined one of COVID-19 vaccine effectiveness with influenza vaccine to assess immunogenicity(26). So, we adjust this variable in our study, and no difference between the two groups.

The vaccine works by using killed viral particles to expose the body's immune system to the virus without risking a serious disease response(15). In our study, the post-vaccine symptoms after the first and second doses are commonly mild, as classified by the participants. About half of the participants developed local mild reactions and local pain. Fever was also mild and was the highest following the 1st dose only- 34.2% - with the highest temperature 39°C- with a maximum of 3 days. Similar to the findings of an earlier study, it is noticeable that a higher percentage of participants did not feel any side effects after the second dose of vaccination than after the first dose(27), which may be attributed to the immune system response (increase cytokines). Other adverse events were variable and mostly occurred in one patient, mild Edema face hand, hypertension, and hypotension.

After all that, there is hesitancy in accepting vaccination among people, accepted mainly by young HCWs with fewer comorbidities and risk factors for admission. Our study supports the governmental efforts to improve vaccination coverage and impose it for people in many sectors. Finally, the vaccination against SARS-CoV-2 is the solution to overcome this disaster infection.

Study limitations:

This study is observational so the causal relationship between adverse events and vaccine administration could not be well defined. We need further studies for other categories of populations like children, pregnant and lactating women to check for efficacy and safety of this vaccine among them and for a longer duration. In addition, we may miss some asymptomatic patients during the follow-up period.

Declarations

Conflict of interest:

All authors declared no conflict of interest.

Funding:

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Declarations:

-Ethical considerations: Review and approval of the protocol were obtained by the Ministry of Health and Population (MoHP) research ethics committee (Com.No/Dec.No:10-2021/10) on 5th May 2021.

-Consent for publication: Not applicable

-**Availability of data and material:** Data will be available upon request from the first or corresponding authors.

-Author's contributions:

"RA: conceptualization, methodology, data analysis, a major contributor in writing the manuscript", " EK: conceptualization, supervision, medical consultation, review of the final manuscript", "SS: material and data preparation, writing the discussion section", "SK: material and data preparation, technical support, call center, share in writing the discussion section", "NS: material and data preparation, share in writing introduction", "OF: pharmacovigilance specialist, share in writing results", "AA, EH, HA, MN, MA: data management, proofreading", "MI, RF, SA: literature review and editing of the manuscript", "WA: supervision, medical consultation, review of the final manuscript". All authors read and approve the final manuscript

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Abbreviations

ACEIs
Angiotensin Converting Enzyme Inhibitors
AEs
Adverse events
BB
Beta-blockers
COVID-19
Coronavirus associated disease 2019
CCBs
Calcium Channel Blockers
HCWs
Health care workers
HR
Hazard ratio
ICU
Intensive care unit
Inactivated BBIBP-CorV vaccine
Sinopharm vaccine
IRR
Incidence rate ratio
MoHP
Egyptian ministry of health and population
MV
Mechanical ventilation
NSAIDS
Non-Steroidal Anti-Inflammatory Drugs

OR
Odds ratio
PCR
Polymerase chain reaction
SARS-CoV2
The severe acute respiratory syndrome coronavirus
VE
vaccine effectiveness
WHO
World Health Organization

References

1. Cucinotta D, Vanelli M. WHO declares COVID-19 a pandemic. Acta Biomed. 2020;91(1):157–60.
2. World Health Organization (WHO). COVID-19 weekly epidemiological update. World Heal Organ. 2021;(58):1–23.
3. World Health Organization (WHO). Health and Care Worker Deaths during COVID-19.
4. CDC. The Importance of COVID-19 Vaccination for Healthcare Personnel. 15 December. 2020.
5. Cevik M, Tate M, Lloyd O, Maraolo AE, Schafers J, Ho A. SARS-CoV-2, SARS-CoV, and MERS-CoV viral load dynamics, duration of viral shedding, and infectiousness: a systematic review and meta-analysis. The Lancet Microbe. 2020;5247(20):1–10.
6. VIPER Group COVID-19 vaccine tracker. Egypt – COVID19 Vaccine Tracker.
7. Isakova-Sivak I, Rudenko L. A promising inactivated whole-virion SARS-CoV-2 vaccine. Lancet Infect Dis. 2020;3099(20):30831–2.
8. Ghazy RM, Ashmawy R, Hamdy NA, Elhadi YAM, Reyad OA, Elmalawany D, et al. Efficacy and Effectiveness of SARS-CoV-2 Vaccines: A Systematic Review and Meta-Analysis. Vaccines 2022, Vol 10, Page 350 [Internet]. 2022 Feb 23 [cited 2022 Mar 8];10(3):350. Available from: https://www.mdpi.com/2076-393X/10/3/350/htm
9. CAMPAS. No Title. february. 2020.
10. Shang Y, Pan C, Yang X, Zhong M, Shang X, Wu Z, et al. Management of critically ill patients with COVID-19 in ICU: statement from front-line intensive care experts in Wuhan, China. Ann Intensive Care. 2020;10:73.
11. Oliveira Id E, Parikh A, Lopez-Ruiz A, Carrilo M, Goldberg J, Cearras M, et al. ICU outcomes and survival in patients with severe COVID-19 in the largest health care system in central Florida. 2021;
12. Van Breukelen GJP, Candel MJJM. Calculating sample sizes for cluster randomized trials: We can keep it simple and efficient! J Clin Epidemiol. 2012;65(11):1212–8.
13. Kluetz PG, Chingos DT, Basch EM, Mitchell SA. Patient-Reported Outcomes in Cancer Clinical Trials: Measuring Symptomatic Adverse Events With the National Cancer Institute's Patient-Reported Outcomes Version of the Common Terminology Criteria for Adverse Events (PRO-CTCAE). Am Soc Clin Oncol Educ B. 2016 May;(36):67–73.
14. Masoud HH, Zaky S, Baki AA, Hepatology N, Amin W. MOHP COVID-19 Management Protocol, November 2020. 2020;(May).
15. Liu Q, Qin C, Liu M, Liu J. Effectiveness and safety of SARS-CoV-2 vaccine in real-world studies: a systematic review and meta-analysis. Infect Dis Poverty [Internet]. 2021;10(1):1–15. Available from: https://doi.org/10.1186/s40249-021-00915-3

16. Statement on COVID-19 in the Eastern Mediterranean Region (2 August 202) [EN/AR] - World | ReliefWeb [Internet]. [cited 2022 Feb 4]. Available from: https://reliefweb.int/report/world/statement-covid-19-eastern-mediterranean-region-2-august-202-enar
17. Egypt virus cases rise amid Delta variant, fewer restrictions | The Times of Israel [Internet]. [cited 2022 Feb 4]. Available from: https://www.timesofisrael.com/liveblog_entry/egypt-virus-cases-rise-amid-delta-variant-fewer-restrictions/
18. • SARS-CoV-2 Delta variant cases worldwide 2022 | Statista [Internet]. [cited 2022 Feb 4]. Available from: https://www.statista.com/statistics/1245971/number-delta-variant-worldwide-by-country/
19. Tracking SARS-CoV-2 variants [Internet]. [cited 2022 Feb 4]. Available from: https://www.who.int/en/activities/tracking-SARS-CoV-2-variants/
20. Malhotra S, Mani K, Lodha R, Bakhshi S, Mathur VP, Gupta P, et al. SARS-CoV-2 Reinfection Rate and Estimated Effectiveness of the Inactivated Whole Virion Vaccine BBV152 Against Reinfection Among Health Care Workers in New Delhi, India. JAMA Netw Open. 2022;5(1):e2142210.
21. Al Kaabi N, Zhang Y, Xia S, Yang Y, Al Qahtani MM, Abdulrazzaq N, et al. Effect of 2 Inactivated SARS-CoV-2 Vaccines on Symptomatic COVID-19 Infection in Adults: A Randomized Clinical Trial. JAMA - J Am Med Assoc. 2021;326(1):35–45.
22. The Sinovac-CoronaVac COVID-19 vaccine: What you need to know.
23. Turkish study revises down Sinovac COVID-19 vaccine efficacy to 83.5% | Reuters [Internet]. [cited 2022 Jan 25]. Available from: https://www.reuters.com/article/health-coronavirus-turkey-sinovac-int-idUSKBN2AV18P
24. Indonesia study finds China's Sinovac COVID-19 vaccine effective in medical staff | Reuters [Internet]. [cited 2022 Jan 25]. Available from: https://www.reuters.com/business/healthcare-pharmaceuticals/indonesia-study-finds-chinas-sinovac-covid-19-vaccine-effective-medical-staff-2021-05-12/
25. Bergwerk M, Gonen T, Lustig Y, Amit S, Lipsitch M, Cohen C, et al. Covid-19 Breakthrough Infections in Vaccinated Health Care Workers. N Engl J Med [Internet]. 2021 Oct 14 [cited 2022 Jan 25];385(16):1474–84. Available from: https://pubmed.ncbi.nlm.nih.gov/34320281/
26. Toback S, Galiza E, Cosgrove C, Galloway J, Goodman AL, Swift PA, et al. Safety, immunogenicity, and efficacy of a COVID-19 vaccine (NVX-CoV2373) co-administered with seasonal influenza vaccines: an exploratory substudy of a randomised, observer-blinded, placebo-controlled, phase 3 trial. Lancet Respir Med [Internet]. 2021 [cited 2022 Jan 27];0(0). Available from: http://www.thelancet.com/article/S2213260021004094/fulltext
27. Repurposing Drugs for COVID-19: An Approach for Treatment in the Pandemic - PubMed [Internet]. [cited 2022 Jan 25]. Available from: https://pubmed.ncbi.nlm.nih.gov/32827400/

Figures

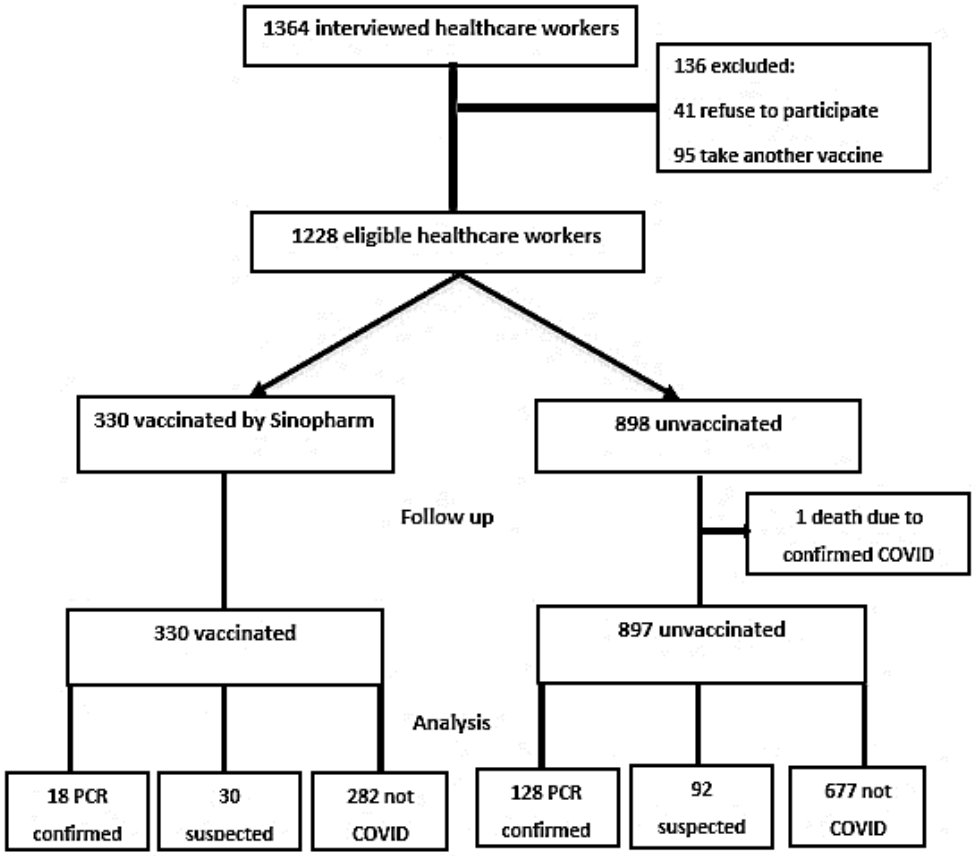

Figure 1

Consort diagram showing study participants.

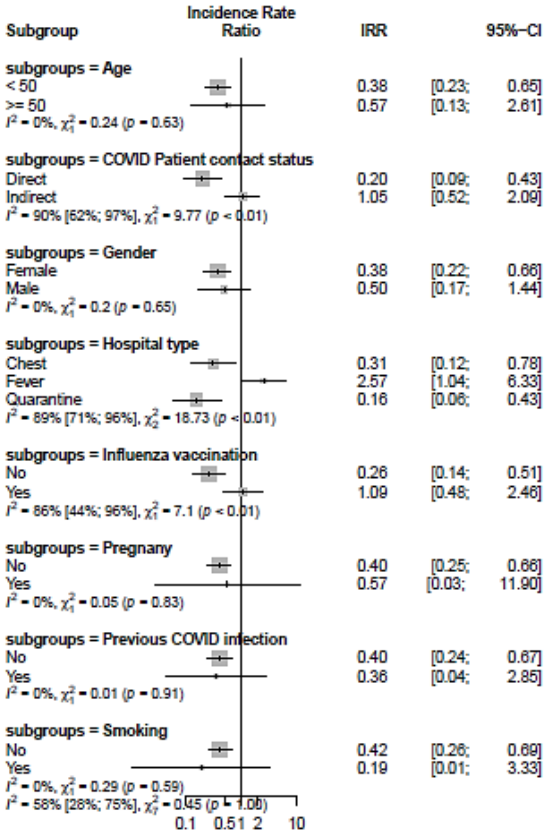

Figure 2

Incidence rate subgrouping of PCR confirmed cases

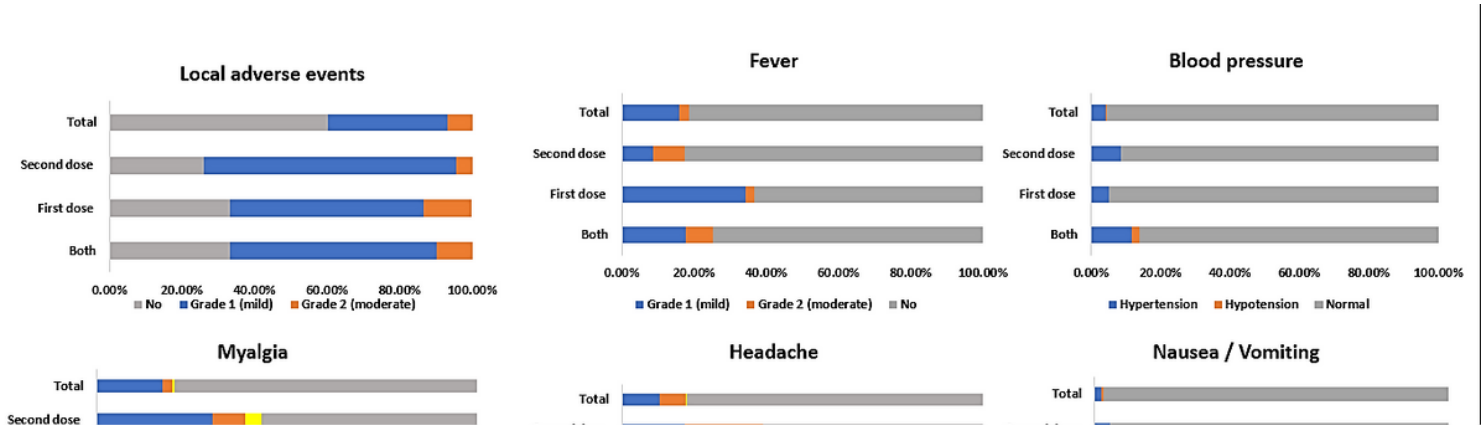

Figure 3

Solicited adverse events.