Al-Nahrain Journal of Science
ANJS, Vol. 27(5), December, 2024, pp. 85–92

Assessment of the High Incidence of COVID-19 in Vaccinated and Unvaccinated Individuals and its Relationship with Several Physical Indicators

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Article's Information

Received: 27.05.2024
Accepted: 05.09.2024
Published: 15.12.2024

Keywords:
COVID-19
Patient symptoms
Vaccination
Physical indicators

Abstract

COVID-19 vaccines have shown good efficiency in clinical routs, but some people may be infected after vaccination. The objective of the present study was to review the risk factors for COVID-19 infection after vaccination and to define the characteristics of the disease post-vaccination. her survey was conducted among 451 participants of both sexes, ranging in age from 18 to over 60 years, and also included information about COVID-19 patients, including their weight, blood type, geographic location, symptoms, diagnosis, health risk factors, and duration of infection. In our study, people vaccinated with COVID-19 vaccines (Pfizer, Sinopharm, and AstraZeneca) showed fewer symptoms compared to those who were unvaccinated, with the Pfizer vaccine being particularly effective in reducing symptoms. The degree of persistence of symptoms was reduced. There was an increase in those with chronic conditions, but by less than a month indicating that vaccination may mitigate the severity and duration of symptoms in COVID-19 patients.

http://doi.org/10.22401/ANJS.27.5.10
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1. Introduction

COVID-19, caused by the SARS-CoV-2 virus, emerged in late 2019. It spreads quickly, causing symptoms from mild to severe, especially in older adults and those with chronic illnesses. Vaccination and prevention are key to managing its spread and impact. Coronavirus disease 2019 (COVID-19) was classified as severe acute respiratory syndrome by the International Committee on Taxonomy of Viruses in February 2020 because the virus is a genetic relative of the coronavirus that causes severe acute respiratory disease1. It has been renamed coronavirus 2 [severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2)]. On January 30, 2020, the World Health Organization (WHO) declared this novel coronavirus infection a pandemic, which has expanded largely, with the number of infections exceeding 277 (million) and the death toll overriding 5 (million) [1]. According to Iraq's Ministry of Health, as of December 24, the total number of infected people was 2,091,834, and the total number of vaccinated people was 8,390,4462 [2]. Vaccine improvements began soon after the detection of SARS-CoV-2. genome [3]. Many vaccines are in the experimental stages, but a few have been proposed and confirmed under emergency authorization with reported efficacy rates as follows: Pfizer (95%), Moderna (94%), Sputnik (92%), Sinopharm (86%), and AstraZeneca (70%) [4]. Although vaccines provide a perfect protection against target pathogen, it is expecting that a few proportions of vaccinated people may be infected [5]. because protection may not be immediate. Instead, the immune system's response builds up gradually over time. Therefore, there is a small chance that some vaccinated individuals may still get infected before they achieve full immunity. Vaccine effectiveness (VE) in preventing infection four weeks after a first dose of vaccine is estimated to be 60-80% [6]. After the second dose, the VE rate increased to more than 85%. If a case of COVID-19 occurs after vaccination, there is evidence that the vaccine reduces symptomatic

infection, severity, and transmission. VE can help prevent serious outcomes such as hospitalization [7]. Therefore, the aim of this study was to characterize the symptom profile and disease duration of her SARS-CoV-2 infection after vaccination to compare her symptoms with those of unvaccinated infected individuals. The impact of SARS-CoV-2 infection and its incidence were assessed.

2. Materials and Methods

2.1. Methodology

The data collected in the current study were collected from adults (aged 18 years and older) to describe COVID-19 and symptoms related to COVID-19 by combining physical information such as sex, age, weight, geographic location, blood type, symptoms, diagnoses, health risk factors, duration of infection, hospital visits, and vaccinations related to COVID-19 were recorded.

2.2. Statistical analysis

The Statistical Analysis System-SAS (2018) program was estimated to distinguish the influence of different factors on the study parameters. In this study, the chi-square test was used to determine the significance of the differences (0.05 and 0.01) between the percentages [8].

3. Results and Discussion

From October 1 to November 30, 2022, data from 451 participants were analyzed. Of these, 266 (59%) were infected with COVID-19, while 185 (41%) were not. Among the 266 infected participants, 244 (91.7%) had contracted COVID-19 either before vaccination (142) or while being unvaccinated (102). In contrast, 22 (8.3%) were infected after receiving the vaccine (Figure 1). Of the 274 participants who were vaccinated, 171 (62.4%) received the Pfizer vaccine, 56 (20.4%) received AstraZeneca, and 47 (17.2%) received Sinopharm (Figure 2). For comparing the pathogenic profile of COVID-19 infection after and before vaccination, the results are illustrated in Table 1. The collection of data were through questionnaires from (244) patients who had recovered from COVID-19. The female proportion was greater than male in all categories. The group of age with a weight of (60-79) kg (56.5%) was the most common group aged (18-29) years (53.7%), and the proportion of male participants aged (80-99) kg (52.3%) was significant. Most of participants were born in Baghdad (85.7%). The O+ blood group had the highest proportion 33.2%, and the B and AB groups had the less proportion (0.8%). Therefore, these results are inconsistent with those of [10]. In men, it was noticed that there was association between blood type A and an increasing risk of contracting COVID-19. However, the prevalence was greater in nonsmokers 91.8%. Outright, 36.5% of participants suffered from chronic disease, with the most commonly reported comorbidities being allergic rhinitis (9.6%) and asthma (7.3%), while (63.5%) of participants had no chronic illnesses. Nasopharyngeal swabs confirmed the infection diagnosis, and a positive test was obtained for approximately (45.7%) of patients. Our results were consistent with those of researchers who reported that vaccination (comparing with non-vaccination) was linked with a decreased likelihood of hospitalization [9]. Overall, all symptoms showed lower frequently in vaccinated infected individuals than with unvaccinated individuals. Especially if you are over (60) years old, you are more likely to be completely asymptomatic even if you are hospitalized. Furthermore reference [11] reported that Kentuckians who were previously infected with SARS-CoV-2 in 2020 but who had not received the coronavirus vaccine were at increased risk of becoming re-infected in May and June 2021. It was said to be significantly higher.

The study's finding upholds the CDC's recommendation that all desirable individuals receive vaccination of COVID-19, regardless of their prior infection status of SARS-C0V-2. The symptoms and clinical needs of patients with COVID-19 vary; as a result, 99.1% of participants experienced symptoms of COVID-19, while 10 (0.9%) experienced symptoms of COVID-19. There were no symptoms associated with the infection. Fever (17.4%) represents the most acute symptom, then myalgia (16.2%), smell and taste losing (15.6), hypoxia (2.9%). Among unvaccinated people, 18 (7.4%) were hospitalized due to COVID-19. Among the participants, the longest duration of acute symptoms was 7 to 14 days (48%), and the shortest duration was 30 days or more (3.3%). The symptoms of all patients were consistent with those reported by Larijani *et al.*, who reported that they agreed in Iran [12].

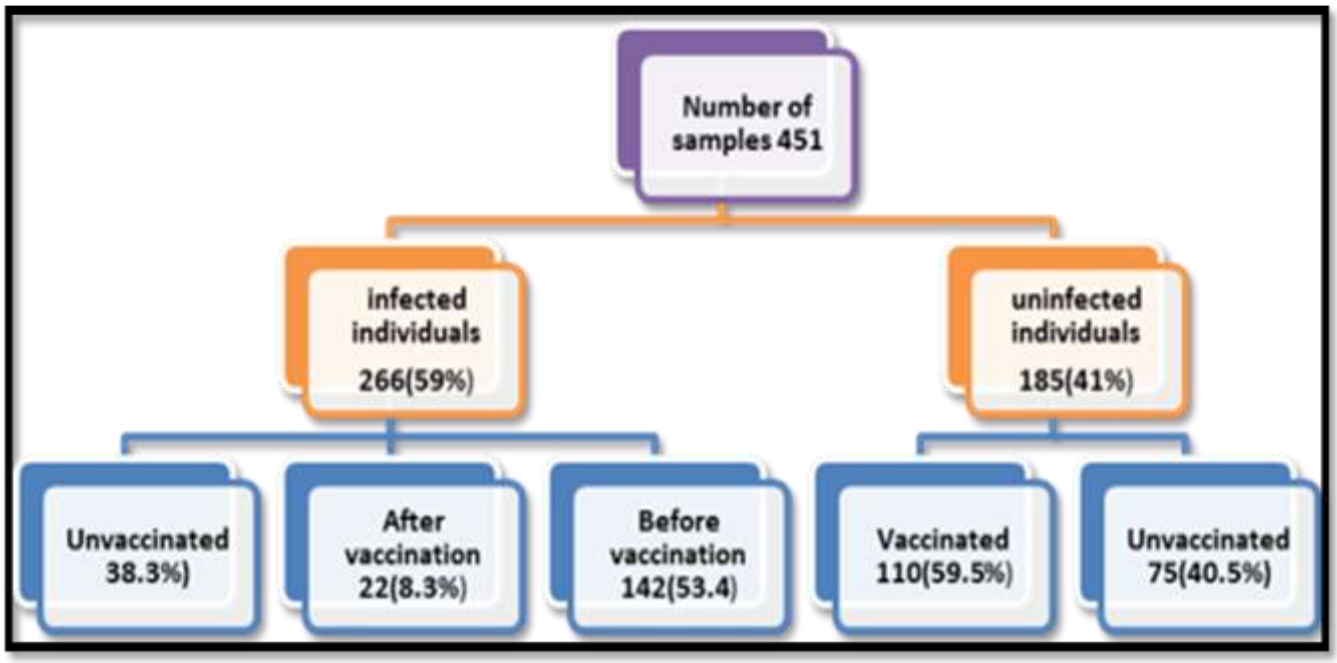

Figure 1. Distribution of study members according to infection status and vaccination status with any one of vaccines.

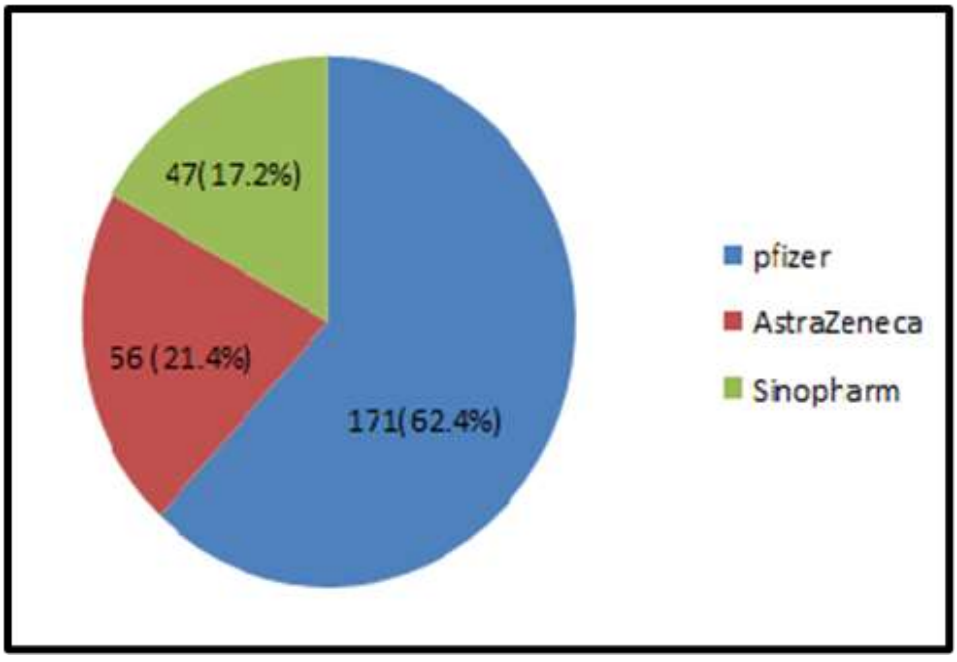

Figure 2. Patient percentages who received one of the vaccines.

Table 1: Percentage of people showing symptoms of COVID-19.

Physical appearance	Sex (No.and %)		Total(No.and%)	P- value
	Females	Males		
	n=200; 82%	n=44;18%	N=244,100%	(0.0001 **)
Age groups, years				
18- 29,	119; 59.5%	12; 27.27%	131;53.68%	
30.-39,	39; 19.5%	7; 15.90%	46;18.9%	(0.0001 **)
40.-49,	26; 13%	11; 25%	37;15.2%	
50.-59,	11; 5.5%	8; 18.18%	19 ;7.8%	
≥ 60.	5; 2.5%	6; 13.63%	11 ;4.5%	
Weightiness (kg)				
40.-59,	61 (30.5%)	3 (6.8%)	64 (26.2%)	(0.0001 **)
60.-79,	113(56.5%)	11 (25%)	124(50.8%)	
80.-99,	23 (11.5%)	23 (52.3%)	46 (18.8%)	
≥ 60	3 (1.5%)	7 (15.9%)	10 (4.1%)	
Groups of blood				
AB^+	23;11.5%	4; 9.1%	27; 11.1%	
AB^-	2; 1%	0; 0%	2; 0.8%	
A^+	49; 24.5%	10; 22.72%	59; 24.18%	(0.0001 **)
A^-	7; 3.5%	1; 2.27%	8; 3.27%	
O^-	70; 35%	11; 25%	81; 33.19%	
O^+	7; 3.5%	1; 2.27%	8; 3.27%	
B^+	42; 21%	15; 34.09%	57; 23.36%	
B^-	0; 0%	2; 4.54%	2; 0.81%	
Location Baghdad	177; 88.5%	32; 72.72%	209; 85.65%	(0.0001 **)
Outside of Baghdad	23;11.50%	12; 27.27%	35; 13.34%	
Smoking,				
No	195; 97.5%	29; 65.90%	224; 91.8%	(0.0001 **)
Yes	5; 2.5%	15; 34.09%	20; 8.1%	
Chronic illnesses				
Diabetic	7;3.3%	5;9.43%)	12;4.61%	
Hypertension	3; 1.4%	1;1.88%)	4;1.5%	
Kidney illness	9;4.34%	1;1.88%	10;3.84%	
Heart illness	6;2.8%	3;5.66%)	9;3.46%	(0.0037 **)
Allergic rhinitis	22;10.62%	3;5.66%)	25; 9.61%	
Asthma	9;4.34%)	10;18.9%	19;7.30%	
Thyroid disorders	10;4.83%)	0;0%	10;3.84%	
Immune illness	62.8%)	0;0%	6;2.30%	
Without chronic disease	135;65.21%	30;56.60%	165; 63.5%	
Diagnostic methods				
Swab of nasopharyngea	121; 46.9%	24(40.7%)	145(45.7%)	
X-ray	10;3.9%	3(5.1%)	13(4.1%)	(0.0001 **)
Computed tomography	25;9.7%	10(16.9%)	35(11%)	
Blood tests	62; 40%	15(25.4%)	77(24.3%)	
Doctors' diagnosis	40;15.5%	7(11.9%)	47(14.8%)	

Symptoms of disease				
Headache	113; 12.07%	16;8.16	129; 11.4%	
Diarrhea	59; 6.30%	10; 5.1%	69; 6.11%	
Loss of smell & taste	156;16.6%	22; 11.22%	178; 15.6%	
Hypoxia	23; 2.4%	10; 5.10%	33 ;2.9%	(0.0001 **)
Fever	167;17.7%	31; 15.8%	198; 17.4%	
Cough	98; 10.4%	17; 8.7%	115; 10.1%	
Myalgia	146; 15.5%	39;19.9%	185; 16.2%	
Runny nose	70;7.47%	16;8.2%	86; 7.6%	
Sore throat	104; 11%	32; 16.3%	136; 11.9%	
Asymptomatic	6; 0.64%	4; 2%	10; 0.9%	
Duration of Illness (days)				
less than 7,	40; 20%	10; 22.72%	50; 20.49%	(0.0001 **)
7-14,	96; 48%	21; 47.72%	117; 48%	
15-29,	57; 28.5%	12; 27.2%	69; 28.27%	
≥ 30	7; 3.5%	1;2.27%	8; 3.27%	
Admission of Hospital				
Yes.	15; 7.5%	3; 6.81%	18; 7.37%	(0.0001 **)
No.	185; 92.5%	41; 93.18%	226; 92.62%	
**** (P≤0.01)**				

The infected people have a variety of symptoms after vaccination. The results are outlined in Table 2. Survey data were collected from 22 people who notified receiving the vaccine. Of the 22 people who were fully vaccinated, 10 (45.5%) experienced infection after receiving the AstraZeneca vaccine, nine (40.9%) after receiving the Pfizer vaccine and three (13.6%) after receiving the Sinopharm vaccine. The patient experienced an infection after receiving the product**.** The results showed that the proportions of male and female participants were the same in all groups. The wide age range was 18–29 years (45.5%), the largest weight range was (60–79) kg or (80–99) kg 36.5%, and the majority of participants lived in Baghdad 95.5%. Blood type B^+ had the highest proportion (31.8%), while the O^- and B^- groups had the lowest proportion (0%), with a higher incidence in nonsmokers (81.8%). Outright, 38.1% of members had a chronic disease. The most commonly reported comorbidities were diabetes (14.3%), hypertension, and allergic rhinitis (9.5%), while 61.9% of participants had no chronic conditions. The researchers found that 4,444 people infected with the new coronavirus had various symptoms, and all 99.1% had symptoms. The majority acute symptoms were fever and myalgia 15.5%, then loss of smell and taste and cough 14.3%, while few numbers1.2% of people suffered from hypoxia. The hospitalization rate due to COVID-19 among vaccinated persons was 0 (0%). The duration was 30 days (0%). These results were consistent with those of Notarte *et al.* regarding the types associated with COVID-19 [13].

The results reported that approximately 99% of unvaccinated people or who had recovered from COVID-19 after vaccination had at least one symptom, the most common of which included fever, muscle pain, loss of taste, and a sense of loss. There is anosmia, and approximately 1% of patients are asymptomatic. The symptom profile of people with COVID-19 infections showed that some people who had not been vaccinated against COVID-19 had a long illness (more than 30 people (3.3%), so-called long-term coronavirus infections).

Table 2: Percentage of infected people infected after full vaccination.

Physical appearance	No. and % of Vaccinated people			Total (No. and %)	*P -value*
	Pfizer	Sinopharm	AstraZeneca		
	9; 40.9%	3; 13.63%	10; 45.45%	22	(0.049 *)
Sex					
Females,	4; 44.44%	2;66.7%.	5;50%	11;50%.	(0.0464 *)
Males,	5; 55.6%	1;33.3%.	5;50%	11;50%.	
Age groups; years					
18-29,	5;55.6%.	1; 33.3%.	4; 40%	10; 45.5%.	
30.-39,	4 ;44.4%.	1; 33.3%.	2 ;20%.	7; 31.8%	(0.0086 **)
40-49,	0 ;0%	0; 0%.	0 ;0%.	0; 0%.	
50-59,	0 ;0%.	1; 33.3%.	2 ;20%.	3 ;13.6%.	
≥ 60	0 ;0%.	0; 0%.	2 ;20%.	2 ;9.1%.	
Weight, (kg)					
40-59,	0; 0%	1; 33.3%	3 ;30%.	4; 18.1%.	
60-79,	3; 33.3%	2; 66.7%	3 ;30%.	8; 36.4%.	(0.0091 **)
80-99,	4; 44.4%.	0; 0%.	4 ;40%.	8 ;36.4%.	
≥ 100	2 ;22.2%.	0; 0%	0 ;0%.	2 ;9.1%.	
Groups of Blood					
A^+	4; 44.4%	0; 0%	2 ;20%	6; 27.3%	
A^-	0 ;0%	0; 0%	0; 0%	0; 0%	
B^+	3 ;33.3%	1; 33.3%	3;30%	7; 31.8%	(0.038 *)
B^-	0; 0%	0; 0%	0; 0%	0; 0%	
AB^+	1; 11.1%	0; 0%	2; 20%	4; 18.1%	
AB^-	0; 0%	1;33.3%	0; 0%	0; 0%	
O^+	1; 11.1%	1; 33.3%	3; 30%	5; 22.7%	
O^-	0; 0%	0; 0%	0; 0%	0; 0%	
location					
Baghdad	9; 100%	3; 100%	9; 90%	21; 95.5%	(0.0063 **)
Outside of Baghdad	0; 0%	0; 0%	1; 10%	1; 4.5%	
Smoking					
Yes	1; 11.1%.	0; 0%.	3; 30%.	4; 18.2%.	(0.0077 **)
No	8; 88.9%.	3; 100%.	7; 70%.	18; 81.8%.	
Chronic. illnesses					
Diabetes,	1 ;11.1%.	1;33.3%.	1; 11.1%.	3; 14.3%.	
Hypertension,	1; 11.1%	0;0%.	1;11.1%.	2; 9.1%.	
Heart diseases,	0; 11.1%.	0; 0%	0; 0%	0; 0%	(0.0082 **)
Kidney diseases,	0; 0%.	0; 0%	0; 0%	0; 0%	
Asthma,	1; 11.1%	0; 0%	0; 0%.	1; 4.8%	
Allergic rhinitis,	1; 11.1%	0; 0%	1; 11.9%.	2; 9.5%.	
Thyroid diseases	0; 0%	0; 0%	0; 0%.	0; 0%.	
Immune diseases	0(0%)	0(0%)	0(0%)	0(0%)	
Withoutchronic diseases	5(55.6%)	2(66.6%)	6(66.7. %)	13 (61.9%)	
Symptoms of disease					
Headache	4 ;12.1%	2; 11.8%.	5; 14.7%.	11; 13.1%.	
Diarrhea	0; 0%	1; 5.9%.	2; 5.9%.	3; 3.6%.	

Loss of smell & taste Fever Hypoxia Myalgia Cough Runny nose Sore throat A symptomatic	5; 15.2%. 5; 15.2%. 0; 0% 5; 15.2%. 5; 15.2%. 4; 12.1% 4; 12.1%. 1; 3%.	2; 11.8%. 2; 11.8%. 0; 0%. 3; 17.6%. 3; 17.6%. 2; 11.8%. 2; 11.8%. 0; 0%.	5; 14.7%. 6; 17.6%. 1; 2.9%. 5; 14.7%. 4; 11.8%. 2; 5.9%. 4; 11.8%. 0; 0%.	12; 14.3%. 13; 15.5%. 1; 1.2%. 13; 15.5%. 12; 14.3% 8; 9.5%. 10; 11.9%. 1; 1.2%.	(0.0075 **)
Admission of Hospital yes No	 0; 0%. 9; 100%.	 0; 0%. 3; 100%.	 0; 0%. 10; 100%.	 0; 0%. 22; 100%.	(0.0049 **)
Illness duration (days) Less than 7, 7-14, 15-29, ≥30	 6; 66.7%. 3; 33.3%. 0; 0%. 0; 0%.	 2; 66.7%. 1; 33.3%. 0; 0%. 0; 0%.	 6; 60%. 2; 20%. 2; 20%. 0; 0%.	 14; 63.6%. 6; 27.3%. 2; 9.1%. 0; 0%.	(0.0051 **)
** (P≤0.01)					

This study investigated whether vaccination reduces the risk of long-term coronavirus infection. -19 Infectious disease and whether the disease duration is zero after vaccination and 30 days or more after infection. This finding suggests that vaccinated individuals have a reduced risk of prolonged COVID-19 infection. However, the previously reported reduction in overall infection risk takes into account the following findings [14]. It is still unknown the causative long-term effects of COVID-19 but can be explained by some factors related to the patient's itself, such as age, stress, the existence of chronic diseases like diabetes and the immune system's ability to induce cells to product anti-inflammatory factors [15,16]. Furthermore, Sumantri and Renganis suggested that symptoms related with hyper-inflammation may be occurred by mast cell activation by COVID-19.

A comparable trend was observed for hospitalization, with COVID-19-related hospitalization rates being greater in unvaccinated people (7.4%) than in vaccinated people (0%) [17,18]. Thus, this study suggested that the vaccine can reduce COVID-19 transmission. About all symptom was occurred minimal frequently in vaccinated participants than in unvaccinated members. Furthermore, the analytical efficiency of polymerase chain reaction (PCR) was less accurate than that of computed tomography (CT), chest X-ray (CXR), and ultrasound in detecting COVID-19 patients at the first stage of infection [19].

4. Conclusions

Our study revealed that COVID-19 vaccines successfully reduced the rates of severe disease and hospitalization. Vaccinated individuals, especially those who received the Pfizer vaccine, experienced fewer COVID-19 symptoms, and the persistence of these symptoms was generally shorter.

Conflicts of Interest: The authors declare no conflicts of interest.

Funding

The authors declare that no funds were received during the preparation of this manuscript.

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