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First-Dose of Oxford–AstraZeneca COVID-19 Vaccination to Bangladeshi Residents: A Retrospective Cross-Sectional Study

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Abstract

The ChAdOx1 nCoV-19 (Oxford–AstraZeneca) vaccine has been exhibited high effectiveness against COVID-19 in phase 3 clinical trials and are now being used in national vaccination program in Bangladesh. Studying the adverse effects of this vaccine is an urgent requirement. The intention of this survey was to explore the short-term side effects of first-dose of Oxford–AstraZeneca COVID-19 vaccination. The survey was carried out from 16 February 2021 to 14 May 2021. People who took the first dose of COVID-19 vaccine were invited via phone or WhatsApp to answer the self-administrated questionnaires. People from different professions were participated in this survey. A total of four hundred (400) answers were collected. The data was analyzed by Microsoft excel and SPSS statistical software. Side effects of first dose of Oxford–AstraZeneca COVID-19 vaccine were reported by 225 (58.29%) participants with or without long term health conditions including diabetes, high blood pressure, and kidney disease. Vaccine receivers reported mild side effects such as fever (34.72 %), chill (2.07 %), nausea (0.52 %), tiredness (17.88 %), allergy (0.52 %), headache (9.59 %), injection site pain (26.94 %), swelling on the arm (1.55 %) and bodyache (10.36 %). The results of survey study showed that women (57, 65.52 % of 87) were more likely to report side effects than men (168, 56.19 % of 299). Participants aged 60 years or younger (200, 58.48 % of 342) reported more side-effects than participants older than 60 years (25, 56.82 % of 44). The ChAdOx1 nCoV-19 vaccine-associated side effects reported in this prospective survey were mild in severity. Females experienced vaccine-associated side effects more frequently.

Keywords: Oxford–AstraZeneca COVID-19 vaccine, side effects, fever, tiredness, online survey.

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1. Introduction

Coronavirus disease 2019 (COVID-19), an extremely infectious viral disease triggered by a new severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has been damaged the global public health and the economy [1]. The virus was first identified in Wuhan, Hubei, China in December 2019 [2]. The virulence, severity, and casualties of coronavirus-2 (SARS-CoV-2) have been overwhelmed the previously identified coronaviruses, like SARS CoV and MERS CoV [3]. As of 19 February 2021, there have been 2.4 million deaths and 110.3 million confirmed cases of COVID-19 around the world [4]. The world health organization (WHO) announced the epidemic of COVID-19 as a public health emergency of international concern (PHEIC) in January 2020 [5]. On 11 March 2020, the COVID-19 was stated a pandemic by the WHO [6]. It is a matter of great concern that the extent of the COVID-19 still cannot be effectively managed. There is an urgent need for developing safe and effective vaccines to end the COVID-19 pandemic. As of 18 February 2021, seven different coronavirus vaccine candidates across three platforms have been rolled out in countries. More than two hundred additional vaccine agents are in development, of which more than sixty are in clinical development [7].

A viral vector vaccine, ChAdOx1 nCoV-19, produced by Oxford University and AstraZeneca has been reported to be efficacious against COVID-19 [8]. A two-dose regimen of ChAdOx1 nCoV-19 vaccine showed 90% efficacy in preventing coronavirus disease [8,9]. Another viral vector vaccine, Johnson & Johnson COVID-19 vaccine, is reported to be 66% effective in a single dose regiment in preventing symptomatic COVID-19 [10,11]. Moderna COVID-19 vaccine was produced by the United States National Institute of Allergy and Infectious Diseases (NIAID) and the biomedical advanced research and development authority (BARDA), which conferred 94.1% protection against Covid-19 [12]. BioNTech and Pfizer developed a RNA-based vaccine BNT162b2, which showed 95% efficacy against coronavirus 2 infection [13].

Bangladesh, a country of more than 160 million people, was first identified COVID-19 on 8 March 2020 [14]. Since then, the pandemic has rapidly spread throughout the country. As of 28 February 2021, there have been 8,408 deaths and 546,216 confirmed cases of COVID-19 around the country

[15]. To fight against COVID-19 pandemic, Bangladesh has started vaccination program on the 7 February 2021. However, people have queries about the protection and effectiveness of vaccines [16]. As of 25 February 2021, 2.85 million people (1.8% of total population) have been vaccinated in Bangladesh [17]. To develop hard immunity against COVID-19, at least 55% of the population would need to be vaccinated [18]. Insufficient information about the side effects of COVID-19 vaccine is a potential barrier for achieving the goal of hard immunity. To the best of our information, no formerly published work has been assessed the side effects of Oxford–AstraZeneca COVID-19 vaccine on Bangladeshi people when a vaccine became obtainable. In present study, we investigated the short-term side effects of first dose of Oxford–AstraZeneca COVID-19 vaccination to Bangladeshi residents.

2. Methods

2.1. Study Design

A cross-sectional online survey was carried out in different regions of Bangladesh from 16 February 2021 to 14 May 2021. Participants were invited via phone or WhatsApp to answer the self-administrated questionnaire. The research objective was clearly explained to each participant prior to participate in the survey. The link of questionnaire, designed on Google Forms, was distributed to participants via social media (Facebook, Messenger and WhatsApp). Each participant took part in this survey voluntarily. The questionnaire covers the background data of the survey (name, age, occupation, infection with COVID-19, previous health issue) and COVID-19 vaccine-related data. The survey study asks what type of COVID-19 vaccine the respondent taken and what side effects are related with administering the COVID-19 vaccine. The participants were requested to select any symptoms including fever, chill, nausea, tiredness, allergy, headache, injection site pain, swelling, body ache and any other symptoms that they suffered following the vaccination. Responds of participants who had received a vaccine other than Oxford–AstraZeneca COVID-19 vaccine were excluded. The survey data was analyzed using Microsoft excel and SPSS statistical software.

2.2. Sample Size

The minimum sample size for carrying out this survey was calculated to be 384 with a 5% margin of error and a 95% confidence level [19]. The sample size was calculated using the following equation,

$$n = \frac{z^2 pq}{d^2} \quad (1)$$

Where n is a number of samples, z is 1.96 (95% confidence level), p is estimated prevalence (50% or 0.5 as no study found), q is (1-p) and d is precision limit or proportion of sampling error (0.05). In this survey, 400 participants responded the questionnaires of COVID-19 vaccination to Bangladeshi residents. Participants who had taken other than Oxford–AstraZeneca COVID-19 vaccine were excluded from this study. The total number of respondents that who satisfied the exclusion criteria was 386.

2.3. Study Variables

The age and sex of the respondents were considered as independent variables. The various adverse effects following a vaccination were explored as the dependent variable.

2.4. Statistical Analysis

Descriptive statistics were executed for the analysis of reported data. The responses were presented as frequency (counts and percentage). A chi-squared test was applied for statistical analysis. The collected data were analyzed using SPSS statistical software (IBM SPSS Statistics 22). The level of significance was set at $p \leq 0.05$.

3. Results

3.1. Demographic Analysis

A total of 386 persons, who received the first dose of the Oxford–AstraZeneca COVID-19 vaccine, were taken into account in this study. Men constituted the majority of the participants (299, 77.46%), while women were the minority of participants (87, 22.54%). It is noticed that the study population was made up of people from different professions

including teacher (17.62%), medical doctor (3.89%), banker (2.59%), student (10.10%), businessman (12.18%), farmer (1.81%), security guard (5.18%), housewife (13.47%), and other (33.16%) (Table 1). Overall,

Table 1. Demographic characteristics, previous health issue, and COVID-19 past infection of the study population.

Characteristics	**Participants**		**Participants reported side effects**	
Gender	Frequency		Frequency	
	n	%	*n*	%
Men	299	77.46	168	43.52
Women	87	22.54	57	14.77
Age				
≤ 60 year	342	88.60	200	51.81
> 60 year	44	11.40	25	6.48
Occupation				
Teacher	68	17.62	31	8.03
Medical doctor	15	3.89	7	1.81
Banker	10	2.59	8	2.07
Student	39	10.10	36	9.33
Businessman	47	12.18	22	5.70
Farmer	7	1.81	2	0.52
Security Guard	20	5.18	4	1.04
Housewife	52	13.47	34	8.81
Others	128	33.16	81	20.98
Previous Health Issue				
Diabetes	65	16.84	35	9.07
High blood pressure	87	22.54	46	11.92
Kidney disease	8	2.07	5	1.30
Respiratory disease	7	1.81	6	1.55
Allergy	12	3.11	7	1.81
Cancer	1	0.26	1	0.26
Other diseases	21	5.44	11	2.85
Previous Infection with COVID-19				
Infected	29	7.51	14	3.63
Not infected	357	92.49	211	54.66

88.60% (342 individuals) of the participants were under 60 years of age and 11.40% (44 individuals) were above 60 years of age. The past medical history of study population reveal that many of the participants had previous health issue such as diabetes (16.84 %), high blood pressure (22.54 %), kidney diseases (2.07 %), respiratory disease (1.81%), allergy (3.11%), cancer (0.26 %) and other diseases (5.44%). A minority of participants (29, 7.51%) had previously been infected with COVID-19, while most participants (357, 92.49%) had never been infected.

3.2. Adverse reactions of Oxford–AstraZeneca COVID-19 vaccine

In the 386 individuals who had received the first dose of Oxford–AstraZeneca COVID-19 vaccine, 225 (58.29 %) reported at least one mild side effect. One hundred thirty-four (34.72%) individuals reported fever, eight (2.07%) individuals reported chill, two (0.52%) individuals reported nausea, sixty-nine (17.88%) individuals reported tiredness, two (0.52%) individuals reported allergy, thirty-seven (9.59%) individuals reported headache, and forty (10.36 %) individuals reported bodyache after receiving the first dose of COVID-19 vaccine (Table 2) (Figure 1). One hundred four (26.94 %) individuals reported pain while six (1.55 %) individuals reported swelling on the arm where the Oxford–AstraZeneca COVID-19 vaccine was injected.

Table 2. The reported side effects of Oxford–AstraZeneca COVID-19 vaccine

	Frequency	
	n	%
Symptoms		
Presence	225	58.29
Absence	161	41.71
Side Effects		
Fever	134	34.72
Chill	8	2.07
Nausea	2	0.52
Tiredness	69	17.88
Allergy	2	0.52
Headache	37	9.59
Injection site pain	104	26.94
Swelling on the arm	6	1.55
Bodyache	40	10.36

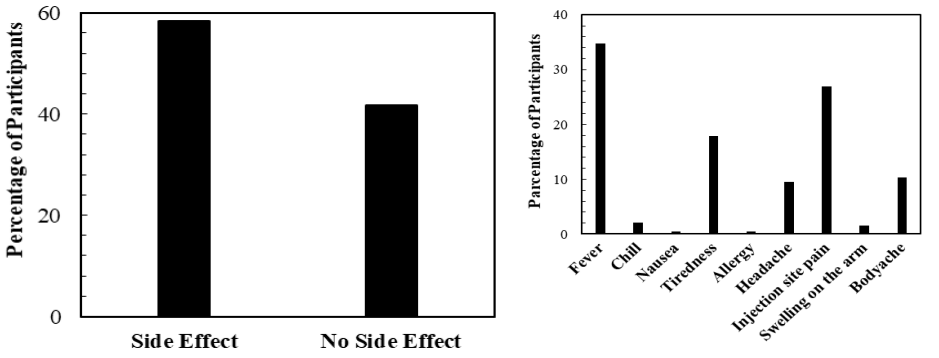

Figure 1. The effects observed in participants after taking their first dose of Oxford–AstraZeneca COVID-19 vaccine.

3.3. Relationship between the adverse effects of Oxford–AstraZeneca COVID-19 vaccine and the sex of participants

The results of survey showed that women (57, 65.52% of 87) were more likely to report vaccine side effects than men (168, 56.19 % of 299) [20-22]. Injection site pain, tiredness, and nausea were frequently reported in women compared to men. Figure 2 exhibits the adverse effects observed in participants who received the first dose of Oxford–AstraZeneca COVID-19 vaccine.

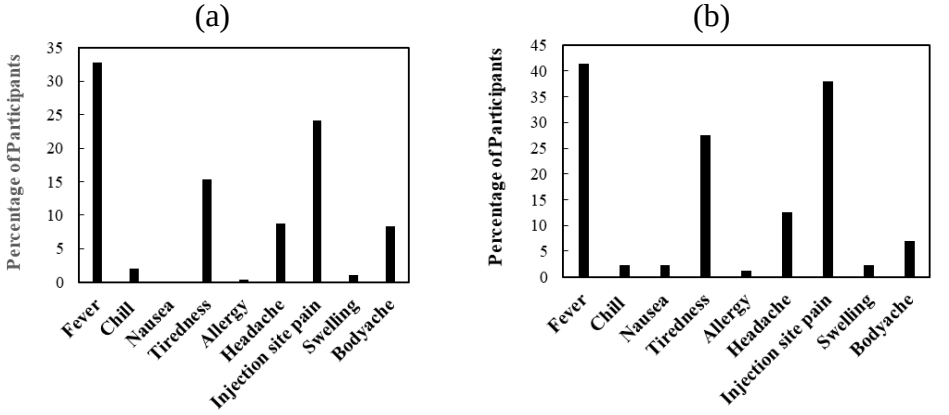

Figure 2. The adverse effects distribution observed in men (a) and women (b) participants after taking their first dose of Oxford–AstraZeneca COVID-19 vaccine. Results were given in percent (%).

Table 3. Correlation among the adverse effects observed in participants depending on their ages and sexes after taking first dose of Oxford–AstraZeneca COVID-19 vaccine.

	Frequency (*n* and %)					
	Men	Women	Chi-Square	Age ≤ 60 (year)	Age > 60 (year)	Chi-Square
	(*n* = 299)	(*n* = 87)	*p* value	(*n* = 342)	(*n* = 44)	*p* value
Fever	98 (32.78%)	36 (41.38%)	0.138	123 (35.96%)	10 (22.73%)	0.082
Chill	6 (2.0%)	2 (2.29%)	0.866	7 (2.05%)	1 (2.27%)	0.921
Nausea	0	2 (2.29%)	0.009	2 (0.58%)	0 (0%)	0.611
Tiredness	46 (15.38%)	24 (27.59%)	0.009	60 (17.54%)	9 (20.45%)	0.212
Allergy	1 (0.33%)	1 (1.15%)	0.351	2 (0.58%)	0 (0%)	0.611
Headache	26 (8.70%)	11 (12.64%)	0.271	34 (9.94%)	3 (6.82%)	0.508
Injection site pain	72 (24.08%)	33 (37.93%)	0.011	88 (25.73%)	16 (36.36%)	0.135
Swelling	3 (1.0%)	2 (2.30%)	0.347	2 (0.58%)	1 (2.27%)	0.230
Bodyache	25 (8.36%)	6 (6.90%)	0.658	26 (7.60%)	5 (11.36%)	0.388

3.4. Correlation between adverse effects of the first dose of Oxford–AstraZeneca COVID-19 vaccine and participants' age

The study results show that there were no significant differences in the frequency of vaccine side effects according to participants' age (Table 3). Figure 3 shows the side effects of first dose Oxford–AstraZeneca COVID-19 vaccine observed in the participants. Fever and headache were more common side effects in participants aged 60 years or younger (Figure 3a) where tiredness, injection site pain and bodyache were more common in participants older than 60 years (Figure 3b). Overall, participants aged 60 years or younger (200, 58.48% of 342) reported more side-effects than participants older than 60 years (25, 56.82 % of 44).

3.5. Relationship between adverse effects of the first dose of Oxford–AstraZeneca COVID-19 vaccine and participants' occupation

In the 225 individuals who reported at least one side-effect after taking the first dose of Oxford–AstraZeneca COVID-19 vaccine, thirty one individuals (8.03%) were teacher, seven individuals (1.81%) were medical doctor, eight individuals (2.07%) were banker, thirty six individuals (9.33%) were student, twenty-two individuals (5.70%) were businessman, two individuals (0.52 %) were farmer, four individuals (1.04%) were

security guard, thirty four individuals (8.81 %) were housewives, and eighty one individuals (20.98%) were engaged in other services (Table 1; Figure 4).

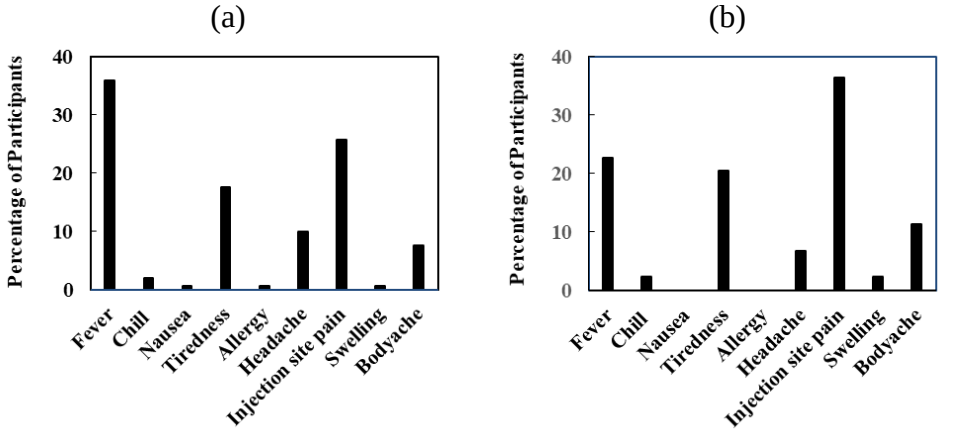

Figure 3. The side effects distribution of the first dose of Oxford–AstraZeneca COVID-19 vaccine observed in the participants aged ≤60 years (a) and >60 years (b). Results were presented in percent (%).

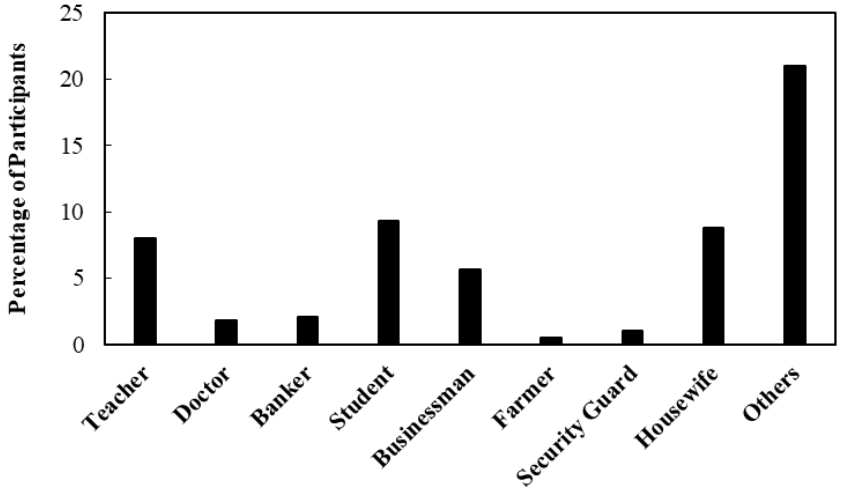

Figure 4. The side effects distribution observed in the participants of various occupation after taking their first dose of Oxford–AstraZeneca COVID-19 vaccine. Results were given in percent (%).

Relationship between adverse effects observed in participants after receiving the first dose of Oxford–AstraZeneca COVID-19 vaccine and their past medical history

Among the participants who experienced mild adverse effects after taking the first dose of Oxford–AstraZeneca COVID-19 vaccine, thirty five (9.07 %) individuals were previously suffered from diabetes, forty six (11.92%) individuals were previously suffered from high blood pressure, five (1.30%) individuals were previously suffered from kidney disease, six (1.55%) individuals were previously suffered from respiratory disease, seven (1.81%) individuals were previously suffered from allergy, and eleven (2.85 %) individuals were suffered from other diseases. A mild side effect of vaccine was reported by a cancer patient. Fourteen (3.63%) individuals who had earlier been infected with Corona virus experienced some mild side effects including fever, nausea, and injection site pain (Figure 5).

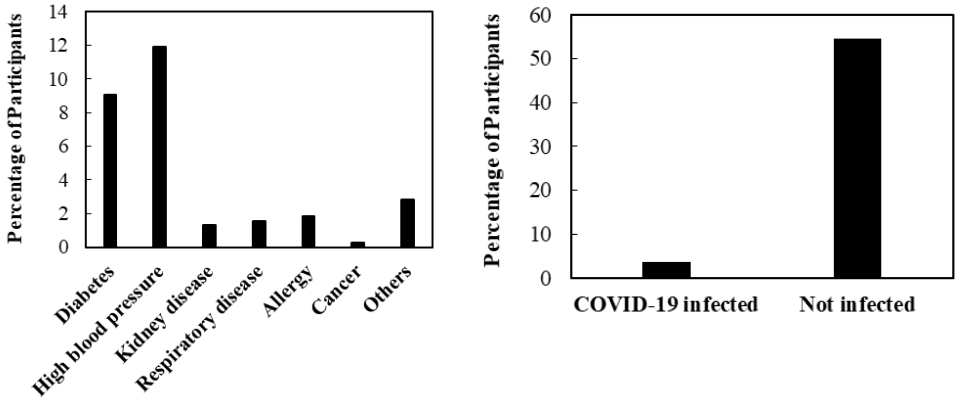

Figure 5. The adverse effects distribution observed in participants after taking their first dose of Oxford–AstraZeneca COVID-19 vaccine and they had previous medical history. Results were given in percent (%).

4. Discussion

In this survey, we have investigated the adverse effects observed in Bangladeshi participants followed by the administration of first dose of Oxford–AstraZeneca COVID-19 vaccine. The rate of overall adverse effects associated with ChAdOx1 nCoV-19 (Oxford–AstraZeneca) vaccine

against COVID-19 was 58.29%. The overall frequency of side effects in this survey were similar to those reported in the clinical trials of ChAdOx1 vaccine. In the clinical trials, 61–88% of participants experienced adverse reactions following the first dose of the ChAdOx1 vaccine [23]. The adverse reactions may be due to the robust innate immune response activated by the adenoviral vector of the ChAdOx1 vaccine [24].

In this study, the most common reported adverse effects are fever, tiredness and injection site pain. Less common side effects are headache, chill, nausea, allergy and bodyache. It is found that adverse reactions after the first dose of ChAdOx1 vaccine were more frequent in women than in men. Possible explanations for this occurrence include the more common reporting of adverse reactions in women and some undiscovered immunologic difference between the two sexes [25]. It is noteworthy that the phenomenon of adverse effects after the first dose of Oxford–AstraZeneca COVID-19 vaccine was more frequent in participants aged 60 years or younger than participants older than 60 years. Adverse reactions were more common in participants suffered from respiratory diseases. Out of seven study participants who are suffered from respiratory diseases, six (out of 7) individuals reported adverse effects after the first dose of Oxford–AstraZeneca COVID-19 vaccine. Of the participants (29 individuals) who had previously been infected with the coronavirus, fourteen individuals (48.28% of 29) reported vaccine side effects.

5. Limitations and Strengths

The present study focuses on the adverse effects of the Oxford–AstraZeneca COVID-19 vaccine. Few or no studies have reported the vaccine's side effects on Bangladeshi residents. The limitation of the present study is that it monitored the short-term adverse effects of vaccine. In contrast, long-term adverse effects of the ChAdOx1vaccine are still unknown. In addition, the survey was carried out only on Bangladeshi residents, thus excluding other races. We reported only short-term adverse reactions and long-term adverse effects in the general people will be needed to evaluate possible future effects.

6. Conclusions

In this study the short-term side effects of Oxford–AstraZeneca COVID-19 vaccine was monitored on Bangladeshi residents. The post vaccination effect is mild in severity. Overall side effects are more frequent in participants aged 60 years or youngers, women, and among those who previously had respiratory diseases. Fever, tiredness and injection site pain were common symptoms after receiving the first dose of vaccine. Fever was the most common adverse effect in participants aged 60 years or younger. Further studies are needed to evaluate the long-term adverse effects.

List of Abbreviation

COVID19: Coronavirus Disease 2019; WHO: World Health Organization; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2; PHEIC: Public Health Emergency of International Concern; NIAID: National Institute of Allergy and Infectious Diseases; BARDA: Biomedical Advanced Research and Development Authority.

DECLEARATION

Ethics Approval and Consent to participate

Study design and data analysis have been reviewed and approved by the Biosafety, Biosecurity and Ethical Clearance Committee of Jahangirnagar University (Ref No: BBEC, JU/M 2021/COVID-19/6 (1) Dated 27 June 2021).

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