



# ASEAN Journal of Science and Engineering Education



Journal homepage: <http://ejournal.upi.edu/index.php/AJSEE/>

## Predictors of COVID-19 Vaccine Hesitancy and Its Relation to the Educational Background in Pakistan

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### ABSTRACTS

We identify groups most at risk of ambiguity and reluctance to take a COVID-19 vaccination in a large sample of Pakistani people. A descriptive cross-sectional study was conducted to poll the Pakistani population on their views regarding COVID-19 vaccinations acceptance. COVID-19 vaccination acceptance among the general public in Pakistan was poor 37.8%. Multivariate analysis showed that participants who had received their Influenza vaccination in recent years are more likely to show their interest in COVID-19 vaccination acceptance. A similar pattern emerged among individuals who thought vaccinations are usually safe and showed their willingness to pay for vaccines. In contrast, individuals over 45, and those unemployed, were less likely to accept the COVID-19 vaccine. Adopting COVID-19 vaccinations was also less probable among individuals who thought there was a conspiracy behind them. Public health officials must take systematic steps to decrease vaccination apprehension and increase vaccine uptake. They should be concerned about the low rate of acceptance and the need for additional research into the underlying reasons and awareness efforts. These measures should include restoring public confidence in national health authorities and organized awareness efforts that provide clear information regarding vaccination safety, effectiveness, and manufacturing.

### ARTICLE INFO

#### Article History:

Submitted/Received 05 Jul 2021

First Revised 11 Aug 2021

Accepted 25 Aug 2021

First available online 26 Aug 2021

Publication date 01 Sep 2021

#### Keyword:

Acceptance,  
Attitudes,  
COVID-19,  
Pakistan,  
Vaccine.

## 1. INTRODUCTION

There is currently no curative therapy for infection with COVID-19. Therefore, the pandemic with catastrophic medical, economic, and social effects is urgently required to include a safe and efficient preventive vaccine (Helmy et al., 2020). So far, many emergency immunization vaccines have been produced and approved have provided an insight into the aim to avoid the COVID-19 pandemic (Ledford et al., 2020). Nations and governments across the globe have spent trillions of dollars to prepare the people of their countries to immunize. Vaccination programs may lead to herd immunity without needing the infection of a significant part of the population. However, such immunity needs adequate vaccination of a percentage of the people. While vaccination is widely recognized as an efficient method to decrease and eradicate COVID-19 burdens, its efficacy relies on the desire of the community to vaccinate. Immunization programs only succeed when the vaccine is highly acceptable (Fine et al., 2011). Vaccines are proven effective public health interventions that save millions of people (Balachandar et al., 2020). Pharmaceutical companies and scientists worldwide are racing against the clock to create vaccinations after decoding SARS-genomic CoV-2's sequence in early 2020, and WHO declared the pandemic in March 2020 (Cucinotta & Vanelli, 2020). So far, 85 vaccinations have been authorized for early or restricted use, two have been approved for full service. Both Pfizer-BioNTech (BNT162b2) and Moderna (mRNA-1273) have received emergency approval in the US (Teo, 2021).

Pakistan has a varied population of ethnic, religious, and socioeconomic groupings. These include a percentage of the people formerly opposed to polio vaccination, making Pakistan in those countries still recording the polio cases (Ali et al., 2019). The claimed misconception regarding the biological impacts of the vaccine was one of the numerous difficulties encountered in accepting polio immunization programs. The myth was spread by certain religious clergy, who were also raised for COVID-19 vaccinations ranging from the capacity of the vaccine in altering the DNA and usage of microchips for controlling human behavior (Salali & Uysal, 2020). With five vaccines authorized for use in Pakistan (AstraZeneca, Sinopharm, CanSino, Sputnik V, and Gamaleya) as of June 29, 2021, along with a phased rollout method for the mass vaccine, the research was aimed to assess the general population's attitudes and perceptions towards COVID-19 vaccination acceptance (Kaddoura et al., 2020). Thus, it is critical to investigate Pakistanis views about COVID-19 vaccinations and their adoption of COVID-19 vaccines. The present study's findings may help policymakers develop proactive campaigns and tactics that emphasize the significance of immunization for the community and encourage vaccine uptake and acceptance, particularly by vulnerable patients, to reduce fatalities and pandemic spread (Kaddoura et al., 2020). This research aimed to evaluate the acceptability of COVID-19 vaccination in the general Pakistani population.

## 2. METHOD

The study was approved by the institutional review board of the University of Agriculture Faisalabad. In early 2021, a cross-sectional study followed by questionnaires was performed in Punjab, Pakistan. Eight districts in Punjab that have had more than 10% positive COVID-19 cases ratio daily, as revealed by the National command operation center (NCOC), were selected for the study. The standardized questionnaire included pre-coded and readily accessible elements about sociodemographic features, knowledge, attitudes, and perceptions towards COVID-19 vaccination acceptance was used to evaluate the people's attitudes towards COVID-19 vaccination acceptance. Only Pakistani citizens were residing in Punjab, Pakistan, and above 18 years of age were selected for the study. Participants from areas in Punjab who had 10 percent or more positive COVID-19 ratios (explained as ratio of

total COVID-19 testing a day and total active cases confirmed) reported by the National command operation center (NCOC) were questioned. Each participant received written informed consent before the beginning of their interview.

Participants were asked to evaluate their willingness to receive COVID-19 vaccines in Pakistan (Yes, No, Uncertain). In addition to age, gender, marital status, and employment status, the possible COVID-19 vaccine acceptance predictors were examined as factors such as whether a person has received a seasonal flu vaccination or not, fear of being infected with COVID-19, concerns regarding distribution, availability, and accessibility of vaccine.

We designed the questionnaire after reviewing the literature. To minimize the possibility for self-reported data bias, participants were assured of their answers' anonymity. The questionnaire was created to lessen survey weariness and was face-validated by survey research specialists. The questionnaire was drawn up based on a literary assessment of previous research and debate among authors after many in-depth interviews and assistance from epidemiologists. The questionnaire included four parts which included pre-coded and readily accessible elements about sociodemographic features, knowledge, attitudes, and perceptions towards COVID-19 vaccination acceptance. A trial sample of 22 people was utilized to enhance the survey questions' language and expression. The questionnaire took 8-10 minutes to complete. The questionnaire was designed in English and later translated into Urdu by following the instructions for questionnaires translation ([Harkness et al., 2004](#)).

SPSS Version 25 was utilized to analyze the data. The analysis of the acceptability of vaccinations among the various sociodemographic categories was evaluated utilizing a chi-square test and Fisher's exact test when applicable. Univariate and multivariate tests have been conducted to compare vaccination acceptability with interest variables. The odd ratio (OR) was determined of each variable at a 95% confidence interval (CI). If the p-value was 0.05 or below, the test result was deemed statistically significant.

OpenEpi software was used for estimation of sample size at 1678 (95% confidence interval (CI) (30% standard error and 50% acceptance) were used to determine the sample size. Sampling was done by deep insight into previous literature ([Naveed et al., 2021](#)). The final registration comprised 2981 individuals to consider the accretion rate and make up for missing data in the final data set. SPSS version 25 used data analysis.

We included research information with consent agreement. Data contained gender, employment status, age, locality, marital status, monthly income, financial problems, fixed income availability, and education degree. Participants were also questioned about chronic illnesses and whether they had their Influenza vaccine in recent years. Participants were asked to name their most trustworthy sources for COVID-19 vaccination information. Participants were also polled about their fears during the COVID-19 pandemic. The section discussed general perception and concerns about COVID-19, including pandemic time speculation, public trust, and views of the use of vaccine to control the pandemic, lack and difficulties with childhood vaccines, safety and confidence in vaccine, views on difficulties with distribution, availability, and accessibility of vaccines.

### 3. RESULTS

#### 3.1. Demographics

Socio-demographics are shown in **Table 1**. 2981 participants attended. 2678 participants were completed in the questionnaire. The median age of the participants was 41, and over half (56.80%) were women. Half of those interviewed 50.3% were married and having children. About 42% had high school degrees, and 46.5% had health degrees. Also, 52.2% of people were employed, and just 26.1% stated that they had suffered from chronic diseases.

**Table 1.** Socio-demographic characteristics of participants.

| Variable  | N (%)        |
|---|--------------|
| <b>Age (years)</b>  |              |
| Median [IQR]  | 41 [21-52]   |
| 18-30 years   | 1,239(46.3)  |
| 31-45 years   | 799 (29.8)   |
| >45 years   | 640 (23.9)   |
| <b>Gender</b>   |              |
| Male  | 1,156(43.2)  |
| Female  | 1,522(56.80) |
| <b>Marital status</b>   |              |
| Married   | 1,345(50.3)  |
| Single  | 1,087(40.7)  |
| Others (Common-law marriage or Divorced)                        | 246(9.2)     |
| <b>Having children</b>  |              |
| No  | 1,675(62.5)  |
| Yes   | 1,003(37.5)  |
| <b>Education (Degree)</b>                                       |              |
| School education  | 856(32)      |
| High School   | 1,145(42.80) |
| College   | 657(24.5)    |
| Other   | 20(0.75)     |
| <b>Academic area</b>  |              |
| Medical   | 1,245(46.5)  |
| Non-Medical   | 1,433(53.5)  |
| <b>Employment</b>   |              |
| Yes   | 1,398(52.2)  |
| No  | 1,280(47.8)  |
| <b>Get benefits From Government</b>                             |              |
| Yes   | 643(24)      |
| No  | 2,035(76)    |
| <b>Not Trusted any source of information regarding COVID-19</b> |              |
| No  | 1157(43.2)   |
| yes   | 1203(45)     |
| Uncertain   | 318(11.8)    |
| <b>Suffered from Chronic disease Any</b>                        |              |
| No  | 1,978(73.9)  |
| Yes   | 700(26.1)    |
| <b>Got Influenza vaccine in recent years</b>                    |              |
| No  | 2,476(92.5)  |
| Yes   | 202(7.5)     |
| <b>Tested Positive for COVID-19</b>                             |              |
| Myself  | 114(4.3)     |
| A family member   | 98(3.7)      |
| A friend  | 976(36.4)    |
| Colleague   | 678(25.3)    |
| A neighbor  | 743(27.8)    |
| No one  | 69(2.6)      |
| <b>source of information regarding COVID-19</b>                 |              |
| Healthcare providers  | 1,456(54.4)  |
| Scientific literature   | 796(29.7)    |
| Pharmaceutical Reports  | 426(15.9)    |
| <b>Infected with COVID-19 (without testing)?</b>                |              |
| No  | 1,765(66)    |
| Yes   | 913(34)      |

Only 7.5% of participants received the influenza vaccine in recent years year. 4.3% of the respondents stated they tested COVID-19 positively. 34 % of people said they were infected with COVID-19, but no laboratory testing proved it. As shown in Table.1 more than half (54.4 percent) of participants trusted healthcare providers for information about COVID-19 vaccines. 29.7% of Participants trusted Scientific literature and 15.9% trusted pharmaceutical reports as a reliable source of information about COVID-19 vaccines.

### 3.2. COVID-19 Vaccinations Acceptance

**Table 2** shows vaccination acceptance among Pakistan people. Only 37.8% of people showed their positive behavior towards COVID-19 vaccination acceptance among the general population of Pakistan. 40.2% rejected COVID-19 vaccination and 22% did not answer regarding their willingness towards acceptability of COVID-19 vaccination. The Multivariate analysis showed the independent predictors of vaccination acceptance.

**Table 2.** Predictors of COVID-19 vaccination hesitancy.

| Variables  | OR <sup>1</sup> | 95% CI <sup>2</sup> | P-value |
|--|-----------------|---------------------|---------|
| <b>Age</b>   |                 |                     |         |
| 18–25 years  | -               |                     |         |
| 26–45 years  | 0.865           | 0.654–1.164         | 0.143   |
| >45 years  | 0.673           | 0.243–0.689         | < .001  |
| <b>Gender</b>  |                 |                     |         |
| Male   | -               |                     | < .001  |
| Female   | 2.477           | 1.921–3.375         |         |
| <b>Employed</b>  |                 |                     |         |
| Yes  | -               |                     | < .001  |
| No   | 0.453           | 0.411–0.727         |         |
| <b>Received flu vaccination in recent years</b>                        |                 |                     |         |
| No   | -               |                     | = .002  |
| Yes  | 2.062           | 1.309–3.153         |         |
| <b>Vaccines are safe</b>   |                 |                     |         |
| No   | -               |                     | < .001  |
| Not sure   | 3.781           | 2.187–5.721         | < .001  |
| Yes  | 8.967           | 6.042–14.762        | < .001  |
| <b>Afraid that the COVID-19 epidemic is the result of a conspiracy</b> |                 |                     |         |
| No   | -               |                     | = .002  |
| Yes  | 0.578           | 0.432–0.811         |         |
| <b>Distrust any source of information</b>                              |                 |                     |         |
| No   | -               |                     | < .001  |
| Yes  | 0.284           | 0.189–0.402         |         |
| <b>Willingness to pay for COVID-19 vaccines</b>                        |                 |                     |         |
| No   | -               |                     | < .001  |
| Not sure   | 4.237           | 3.012–5.014         | < .001  |
| Yes  | 20.327          | 13.785–27.063       | < .001  |
| <b>COVID-19 may pose side effects</b>                                  |                 |                     |         |
| No   | -               |                     | <.001   |
| Yes  | 2.09            | 1.08–2.06           |         |

COVID-19 vaccination acceptance among the general public in Pakistan was poor 37.8%. Participants who had received their Influenza vaccination in recent years are more likely to show their interest in COVID-19 vaccination acceptance (OR = 2.062, 95CI percent = 1.309–3.153, p =.002) A similar pattern emerged among individuals who thought vaccinations are usually safe (OR = 8.967, 95CI percent = 6.042–14.762, p< .001) and showed their willingness

to endow for vaccines (OR = 20.327, 95CI percent = 13.785–27.063,  $p < .001$ ). In contrast, individuals over 45 (OR = 0.673, 95CI percent = 0.243–0.689,  $p < .001$ ), and those unemployed (OR = 0.453, 95CI percent = 0.411–0.727  $p < .001$ ), were less likely to accept the COVID-19 vaccine. Adopting COVID-19 vaccinations was also less probable among individuals who thought there was a conspiracy behind them (OR = 0.578; 95CI percent = 0.432–0.811,  $p < .001$ ). Multivariate analysis showed that there was higher vaccination acceptance among females. People residing in rural areas with illiteracy and socioeconomic vulnerability were also shown little vaccine acceptance.

### 3.3. Perception and Concerns Regarding COVID-19 Vaccines

People are more concerned regarding vaccine safety, availability, and accessibility. More than half participants (58.4%) revealed that they are more concerned and conscious regarding the availability of vaccines for their children. The same pattern emerged regarding the safety of vaccines. Participants believed in information and authorization of vaccines from WHO. Only one-third of participants believed that currently available vaccines are safer and could ameliorate the pandemic (See **Table 3**).

### 3.4. Views on COVID-19 Vaccinations

Almost half (55.2%) of participants believed that vaccination is needed to defend against the COVID-19. More than 60% thought pharmaceutical firms could produce safe and effective vaccines. Moreover, half of the respondents (52.3%) said adverse effects would prevent them from getting a COVID-19 vaccination, and nearly half will refuse to take it if approved. As indicated in **Table 4**, about a quarter of all respondents were neutral on most issues.

**Table 3.** Perceptions toward COVID-19 vaccination acceptance and related concerns.

| Perceptions towards Vaccine acceptance                                       | Agree (%)   | Uncertain (%) | Disagree (%) |
|--|-------------|---------------|--------------|
| There is a Shortage of COVID-19 vaccination availability for their children. | 1,564(58.4) | 421(15.7)     | 693(25.9)    |
| Receiving WHO authorized vaccine are safer.                                  | 1,398(52.2) | 813(30.4)     | 467(17.4)    |
| Confident about Government officials during a pandemic.                      | 876(32.7)   | 761(28.4)     | 1,041(38.9)  |
| Side effects are a great hinder in getting COVID-19 vaccination.             | 1,302(48.6) | 467(17.4)     | 909(34)      |
| There is a difficulty in the distribution of vaccines across the country.    | 1,342(50.1) | 564(21)       | 772(29)      |
| Current vaccine availability helps to prevent COVID-19 cases.                | 983(36.7)   | 654(24.4)     | 1,041(38.9)  |

**Table 4.** Attitudes towards COVID-19 vaccination acceptance.

| Attitudes   | Agree N (%) | Uncertain N (%) | Disagree N (%) |
|---|-------------|-----------------|----------------|
| Vaccine is important to protect people from the pandemic.                             | 1,476(55.2) | 408(15.2)       | 794(29.6)      |
| Vaccine is going to be developed by pharmaceutical manufacturers with efficiency.     | 1,643(61.4) | 532(19.8)       | 503(18.8)      |
| Pharmaceutical companies in Europe and America are much safer than others.            | 867(32.3)   | 1,243(46.5)     | 568(21.2)      |
| Side effects are a great hinder in getting COVID-19 vaccination.                      | 1,398(52.3) | 631(23.5)       | 649((24.2)     |
| People refused to take the vaccine due to poor campaigns by social media influencers. | 1,742(65)   | 840(31.32)      | 96(3.6)        |
| Government should make the COVID-19 vaccine available for all citizens.               | 782(29.2)   | 781(29.1)       | 1,115(41.6)    |
| Concerned about safety, that is not revealed by Government officials.                 | 1,562(58.3) | 254(9.5)        | 862(32.2)      |

## 4. DISCUSSION

This research aimed to assess the general population's acceptability of COVID-19 vaccinations in the general population of Pakistan. A self-administered questionnaire was used to poll the Pakistani population on their views regarding COVID-19 vaccinations acceptance. A total of 2678 participants attended the study. It resulted that Pakistan ranks



37.8% among the lowest nations in terms of public acceptability and readiness to take the COVID-19 vaccines. Vaccine hesitancy may jeopardize the efficacy of COVID-19 vaccines once commercially accessible globally (Jin *et al.*, 2021). Negative attitudes emerged towards COVID-19 vaccination acceptance among the Pakistani population as they are concerned with its safety, effectiveness, availability, and accessibility. A survey of 13,426 people from 19 countries found that the worldwide acceptability of COVID-19 vaccinations varies from 54.8 percent in Russia to 88.6 percent in China (Lazarus *et al.*, 2021). Also, most Western nations have greater widespread acceptability of COVID-19 vaccination acceptance (59–75%) (Dryhurst *et al.*, 2020). In 2016–2018, the acceptance level of seasonal influenza vaccines was lower than the worldwide norm.

Both multinomial and binary logistic regression predicted COVID-19 vaccination's acceptability in this research. The present study found that younger individuals accepted COVID-19 vaccinations more readily than older participants (Kreps *et al.*, 2020). This is explicated by the age distribution of the nations, with Pakistan having a youthful population and high literacy among the young people in the Central Punjab regions. The adoption of COVID-19 vaccinations was also less probable among individuals who thought there was a conspiracy behind them, and they showed their concerns towards vaccine safety. Hence, healthcare providers, community leaders, and Government officials are responsible for promoting vaccine adoption (Islam *et al.*, 2021). Vaccination convenience also relates to the vaccine's availability, cost, distribution, and accessibility. Vaccine complacency is linked to the low perceived risk of vaccine-preventable illness and therefore linked to unfavorable vaccine perceptions. A recent US survey found that 50% of Americans are ready to take the vaccination, 30% are uncertain, and 20% reject it. On the other hand, another cross-sectional of adult Americans revealed that 58% of adults are ready to be vaccinated, 32% were unsure, and 11% rejected it. However, another research found that 67 percent of Americans would take a COVID-19 vaccination if prescribed (Malik *et al.*, 2020). Moreover, the research finds varying gender effects, with some finding greater acceptability among men (Lazarus *et al.*, 2021). and others showing higher acceptance among females (Malik *et al.*, 2020). In our research, Pakistani females were more likely than males to get the vaccination. We assessed the significance of variables such as vaccination costs, claimed efficacy, and protective length in influencing public acceptance. Prominent research, such as Lazarus and other colleagues, has shown that the variations in acceptance rates in Russia varied from 90% in China to less than 55% (Lazarus *et al.*, 2021). The misconception regarding COVID-19 in Pakistan, which has religious overtones in Pakistan, persists (Chandir *et al.*, 2020). The virus is an assault on Islamic countries, and the microchip vaccination enabling governments to manage the vaccine by introducing fifth-generation technology has been stated (Altamimi & Ahmed, 2020). The community trusted 44.5% on information provided by Government in our research. These are worrying developments because much research shows that people with greater confidence in national health systems have better adoption of vaccination and other health services (Barello & Graffigna, 2020). A systemic study by Maciaszek and colleagues has shown that medical professionals are at higher risk of infection and that their families are at greater risk of being vaccinated (Maciaszek *et al.*, 2020).

In an online poll, Gul Deniz and colleagues examined the reluctance of administering vaccines in the UK and Turkey (Salali & Uysal, 2020). In either country, approximately 3% had no intention of getting the vaccination COVID-19, while 31% of participants in Turkey and 14% in the UK were uncertain about the vaccine (Salali & Uysal, 2020). Overall, 54 percent in Turkey and 63 percent in the UK thought the emergence of the new coronavirus was natural, with no traceable conspiracy theories, leading ultimately to enhanced readiness for the

COVID-19 vaccine (Salali & Uysal, 2020). Negative attitudes and perception towards acceptability of COVID-19 vaccinations among Pakistani are due to many reasons, some of which are worldwide. The COVID-19 vaccinations are questionable (Sallam, 2021). First, the new mRNA-based vaccinations as a novel technology may be met with suspicion given the lack of previous experience or success with such an approach. Also, the vaccine's rapid development and approval in less than a year may have lowered acceptability. The present study revealed that half of the general population was concerned about vaccine safety. This is in line with Dryhurst and colleagues' findings that most Americans (63%) were concerned about the COVID-19 vaccine's adverse effects (Dryhurst et al., 2020). Also, most participants (66.5%) said that vaccination is essential to guard against COVID-19. But nearly half (49%) believed that most individuals would reject the immunization. Perhaps they were worried about the vaccine's adverse effects. Anti-vaccination efforts driven by modern technology and rapid vaccine development contributed to the low level—such social media efforts with forged, incorrect, and often inaccurate Urdu translations fuel conspiracy theories. Our findings backed this perception, with non-believers in a COVID-19 conspiracy more inclined to embrace the vaccination. From August to October 2020, a growing number of people believed Pakistan was going in the wrong way, with increasing verified cases and a high mortality rate, reaching 80% disapproval in late October (Cheval et al., 2020). These findings matched studies linking poor adoption of COVID-19 vaccines. According to the Ministry of Health, the Government will start giving free COVID-19 vaccinations to the Whole population, by following the vulnerable groups as starts from older people to young, with no indication on whether they would be subsidized in Pakistan. Should be considered into government vaccination plans and how vaccine uptake levels may vary based on vaccine costs. In the present research, just 36.2% thought the Government could give the vaccination for free, suggesting that the Pakistani Government's fiscal difficulties may have played a part in decreasing acceptability. However, another research carried out in western Ugandan revealed only the average acceptability of vaccination COVID-19 among the general community. The COVID-19 pandemic, like earlier ones, causes dread, anxiety, and worry (Vos et al., 2021). However, it is distinct in that individuals are concerned about becoming sick or spreading the illness and the social and economic consequences of the governments' efforts to contain the pandemic and halt human-to-human transmission (Szilagyi et al., 2021). Closing of schools and colleges, closure of borders, travel restrictions, and quarantine (Chandir et al., 2020). Identifying the most reliable sources of information concerning COVID-19 vaccinations is essential to the success of any future national immunization program (Afzal et al., 2021). In our study when asked which sources they trusted for information about COVID-19 vaccinations, above 50% of Pakistanis said health care professionals, one-third of pharmaceutical reports. Social media and family members were the least trusted information sources. The research design flaws may have created selection bias and restricted generalizability. Future research should use hybrid techniques, including qualitative and quantitative approaches, to adequately capture the COVID-19 vaccination reluctance in Pakistan. A prospective study may reveal how COVID-19 vaccination reluctance varies over time and what variables influence these changes. The research at this point may allow researchers to track Pakistanis changing attitudes about vaccinations

## 5. CONCLUSION

In conclusion, we found Pakistan one of the least accepting nations for COVID-19 vaccines, with 37.8% of the population accepting to get vaccinated, 42% rejected it and 22 percent unsure. This rejection was linked to vaccine safety concerns, knowledge, and expenses.



Hence, health authorities should develop awareness campaigns through various kinds of multimedia platforms to publicize more transparent information about the vaccines' safety and effectiveness.

## 6. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. The authors have confirmed that the paper is free of plagiarism.

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