Original Research

COVID-19 Vaccination Compliance Rate and Self-Reported Post-Vaccination Adverse Effects Among the Members of Dental Faculty in Malaysia: A Cross-sectional Study

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Abstract

Aim: To evaluate the COVID-19 vaccination compliance rate and post-vaccination Adverse Effects (AEs) among the Dental Health Care Workers (DHCW). **Materials and Methods:** An online, cross-sectional, self-administered, structured questionnaire was distributed to 54 DHCW at the Faculty of Dentistry, SEGI University to evaluate the demographic characteristics, history of infection, type of vaccine received, post-vaccination AEs, duration, and hospitalization. In this pilot study, a convenience sampling method was adopted and descriptive statistics was employed to describe the results. Chi-square test was used to compare the post-vaccination AEs among the CoronaVac® group, Pfizer-BioNTech group and AstraZeneca group and a *p*-value of less than 0.05 was considered statistically significant. **Results:** About 85% participants had completed the vaccination and one participant tested positive for COVID-19 after the first dose. Following the first dose, participants in Pfizer-BioNTech (88.9%) and AstraZeneca group (100%), experienced higher local AEs (pain and tenderness at the site of injection) than the CoronaVac® (33.3%) group which was statistically significant ($P < 0.006$). Although higher systemic AEs were observed in Pfizer-BioNTech (66.7%) and AstraZeneca vaccine (100%) than the CoronaVac® (30.6%) group, this was not significant. Similarly, after the second dose, higher percentage of participants in the Pfizer-BioNTech group experienced systemic (66.7%) and local AEs (66.7%) than CoronaVac® group. However, this was not significant too. The most common systemic AEs were fatigue and myalgia. One participant reported a mild allergic reaction and the majority of these AEs resolved in 24–48 hours after vaccination, without requiring hospitalization. **Conclusions:** DHCW exhibited a greater compliance rate to Covid-19 vaccination. Local AEs were more frequently encountered than the systemic ones and the common AEs were pain and tenderness at the injection site, fatigue, and myalgia.

Clinical Significance: Recognizing and reporting the AEs of COVID-19 vaccines are imperative to enhance the vaccine uptake among the public.

Keywords: Adverse Effects, AstraZeneca, CoronaVac®, COVID-19 Vaccine, Dental Health Care Worker, Pfizer-BioNTech

List of Abbreviations: SARS-CoV-2 = Severe Acute Respiratory Syndrome Coronavirus 2, AEs = Adverse Effects, DHCW = Dental Health Care Workers, NIP = National Immunization Program, NSAIDs = Nonsteroidal anti-inflammatory drugs, SOPs = Standard Operating Procedures

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Introduction

Towards the end of 2019, reports of Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) emerged from Wuhan, China, and spread to other parts of the world at an exponential pace.[1] COVID-19 rapidly became a pandemic and leading cause of death all over the

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world, evolving into a public health crisis.[2] Considering that the modus operandi of this virus to spread is through nasopharyngeal secretions, salivary secretions, aerosol, and droplets, DHCW are at a high risk of contracting COVID-19 infection.[3] Furthermore, front-line workers, older adults, and people with co-morbidities are at the highest risk for COVID-19 and its complications. Safe and effective prophylactic vaccination is the need of the hour to contain the pandemic, and many countries started vaccinating their population from December 2020.[4]

In Malaysia, the vaccinations against the pandemic began on the 24th of February 2021.[5] Currently, Drug Control Authority and the National Pharmaceutical Regulatory Agency of Malaysia have approved inactivated virus-based CoronaVac®, mRNA-based Pfizer-BioNTech (BNT162b2), and adenovirus-based AstraZeneca vaccine (ChAdOx1 nCoV-19) vaccines for emergency use for health care workers and the public.[6] DHCW including academic and non-academic staff from dental faculties are being vaccinated under Phase I of the National Immunization Program (NIP).[6] The health-related problem that occurs post-vaccination is considered an AEs. These can be true AEs, which are related to the vaccine, or a coincidental finding that appeared after vaccination. Vaccine AEs can be systemic, local, and allergic reactions, and severity may vary.[7] The ubiquitous AEs may cause hesitancy for vaccination thus impeding the success of the vaccination program.[7] There is a lack of literature on vaccination compliance rate and its AEs among the DHCW and to the best of our knowledge, no such study has been carried out in Malaysia. Therefore, in this study, an attempt was made to assess the vaccination compliance rate and self-reported AEs after the first and second doses of vaccination.

Materials and Methods

Study design, setting, subjects and data collection

The present cross-sectional, online questionnaire-based pilot survey conducted among the academic and non-academic staff members of the Dental Faculty in SEGi University, Malaysia. Ethical approval was obtained from the SEGi UC Ethics Committee, SEGi University [SEGiEC/StR/FOD/ 02 /2021–2022]. Participation in the survey was voluntary and questionnaire were administered to 54 DHCW who were eligible for COVID-19 vaccination at the faculty. After the consent, the study participants were informed regarding the purpose of the study, research investigators, number of the survey items, length of time of the survey and the confidentiality of the data. This study was an open survey and used convenience sampling method. To reduce the selection bias, the questionnaire was administered through online to all the DHCW at the faculty and convenience sampling was used.

Inclusion criteria

Academic and non-academic members of dental faculty who are ≥18 years of age and are eligible to receive COVID-19 vaccination.

Exclusion criteria

Staffs members who refused to give consent and take part in the survey were excluded. Participants who had submitted incomplete questionnaires were not considered for statistical analysis.

Questionnaire design

A structured questionnaire was prepared in *Google form* and pre-tested on a sample of two staff members from the Dental Faculty of SEGi University to check for content and semantic comprehension. Item analysis of the questionnaire was done for internal consistency which was within Cronbach's alpha value of 0.79. Few items in the questionnaire were modified based on the feedback obtained. Following the validation, the final questionnaire with 25 items was administered using *Google Form*, and responses were accepted from the 26th of June to the 4th of July 2021. The questionnaire link was circulated via WhatsApp (Facebook Inc.) to all the academic and non-academic staff members of the Dental Faculty of SEGi university.

The first part of the questionnaire evaluated the demographic characteristics including the medical co-morbidities and the second part evaluated the history of COVID-19 infection, type of vaccine received, and types of AEs, duration of the AEs, and hospitalization after the vaccination. Following vaccination, a period of one week was set as the time duration to record the AEs.

The systemic AEs investigated in our study included headache, fatigue, diarrhoea, fever, arthralgia, myalgia, nausea, and increased heart rate, while the local AEs included pain and tenderness at the site of injection, swelling, and swollen armpit glands. Besides these, allergic AE in the form of anaphylaxis was also recorded.

Statistical analysis

Responses to the questionnaire from *Google form* were exported in Excel™ and data was analyzed with SPSS Statistics for Windows version 22 (IBM Corp.: Armonk, New York, The United States). A Chi-square test was employed to analyze the AEs among the three groups, and a *p*-value of less than 0.05 was considered statistically significant.

Results

A total of 54 respondents, consisting of 29 academic staff and 25 non-academic staff members participated in the study which gave a response rate of 84%. The demographic details, medical co-morbidities of the participants, and type of vaccine received are described in [Table 1].

At the time of our survey, 81.5% of participants confirmed that they have completed both the doses of the vaccine, 3.5% only received the first dose of the vaccine, while 14.8% had not received any dose at all. The majority of the participants received CoronaVac® (78.3%), followed by Pfizer-BioNTech (19.6%) vaccine and one participant received AstraZeneca [Table 1]. Since only one person received the AstraZeneca vaccine, to avoid misleading information, the results of this group will not be elaborated in the results or discussion. One participant had tested positive for the COVID-19 (3.7%) after the first dose of vaccination. However, there were no hospitalization required. [Table 2].

The systemic AEs following the first dose of the vaccine are higher in Pfizer-BioNTech (66.7%) than the CoronaVac® vaccine group (30.6%). There was statistical significance with regards to specific systemic AEs. For instance, significantly more participants experienced fatigue after they received the Pfizer-BioNTech vaccine (55.6%) when compared to the CoronaVac® vaccine (2.8%). Similarly, the occurrence of fever was higher in the Pfizer-BioNTech group than other groups ($P < 0.001$) [Table 3]. A significantly higher number of participants in Pfizer-BioNTech (88.9%) group experienced local AEs when compared to CoronaVac® vaccine (33.3%) and this was statistically significant (p-value 0.006). Among the participants who received the Pfizer-BioNTech vaccine, the percentage of those who experienced pain at the site of injection was 77.8%, when compared to the CoronaVac® group (33.3%). Tenderness at the site of injection was experienced by about 33.3% of respondents who received the Pfizer-BioNTech vaccine when compared to other vaccine groups (0%). Need for self-medication after the first dose of Pfizer-BioNTech was noted in 22.2%, compared to the CoronaVac® group (8.3%) [Table 3].

Following the second dose of vaccination, participants in the Pfizer-BioNTech group, experienced higher systemic AEs (66.7%) and local AEs (66.7%) when compared to the CoronaVac® group (40%). There was a statistical significance in the number of individuals who experienced fatigue after the second dose of Pfizer-BioNTech (55.6%) when compared to the CoronaVac® group (8.6%) ($P < 0.005$). Similarly, participants who experienced tenderness at the site of injection, and needing self-medication were significantly higher in the Pfizer-BioNTech group (33.3% and 44.4% respectively), when compared to those in the CoronaVac® group (0% and 2.9% respectively) ($P < 0.004$) [Table 4].

Table 1: Sociodemographic details and different vaccines received by the participants

Sociodemographic details	Group	N=54 (100%)
Gender	Male	16 (29.6)
	Female	38 (70.4)
Age group	20-29	9 (16.7)
	30-39	13 (24.1)
	40-49	17 (31.5)
	50-59	3 (5.6)
	60 and above	12 (22.2)
DHCW Position	Academician	29 (54.7)
	Non-academician	25 (46.3)
Medical Co-morbidities	No	47 (87.0)
	Yes	7 (13.0)
	Hypertension	3 (42.9)
	Diabetes	2 (28.6)
	Allergic	2 (28.6)
	Hearth diseases	1 (14.3)
	Hypercholesterolemia	1 (14.3)
COVID-19 vaccine received	No	8 (14.8)
	Yes	46 (85.2)
	One dose only	2 (3.7)
	Completed 2 doses	44 (81.5)
Type of vaccine	Pfizer-BioNTech	9 (19.6)
	CoronaVac®	36 (78.3)
	AstraZeneca	1 (2.2)

Discussion

Malaysia has reported 2.3 million infections and 26,876 COVID-19 related deaths with an average of 15,000 new infections each day.[8] Currently, 64.0% of the Malaysian population received two doses of vaccine and 74.1% has received the first dose of the vaccine.[9]

DHCW are potentially higher risk of acquiring COVID-19 infection due to close face-to-face contact and the nature of the dental treatment carried out.[1] At the time of this study, most of the dental faculty members from our university (85.2%) received the COVID-19 vaccine. This signifies the high compliance rate among the DHCW. From our cohort, only one participant received AstraZeneca. Hence to avoid false extrapolation, our discussion will be restricted to the AEs of CoronaVac® and Pfizer-BioNTech vaccines, as mentioned previously in the results section as well. A study by Syed Alwi *et al.* reported a similar higher acceptance rate of (83.3%) COVID-19 vaccine among the general Malaysian population.[10] A slightly higher (93.3%) acceptance rate

Table 2: COVID-19 infection status after vaccination

	Pfizer-BioNTech n=9	CoronaVac® n=36	AstraZeneca n=1
Tested positive for COVID-19 infection after first dose of vaccination	0	1	0
Tested positive for COVID-19 infection after second dose of vaccination	0	0	0

Table 3: COVID- 19 vaccine adverse effects after the first dose of vaccination

		Pfizer-BioNTech n=9	CoronaVac® n=36	AstraZeneca n=1	p value *
Systemic AEs	No	3 (33.3)	25 (69.3)	0 (0)	
	Yes	6 (66.7)	11 (30.6)	1 (100.0)	0.063
	Headache	0 (0)	4 (11.1)	0 (0)	0.544
	Fatigue	5 (55.6)	1 (2.8)	0 (0)	**<0.001**
	Fever	1 (11.1)	0 (0)	1 (100)	**<0.001**
	Nausea	0 (0)	(1 (2.8)	0 (0)	0.868
	Arthralgia	1 (11.1)	1 (2.8)	0 (0)	0.536
	Myalgia	1 (11.1)	7 (19.4)	0 (0)	0.755
	Diarrhoea	0 (0)	0 (0)	0 (0)	
	Increased heart rate	0	0	0	
	Other	0 (0)	(1 (2.8)	0 (0)	0.868
Local AEs	No	1 (11.1)	24 (66.7)	0 (0)	
	Yes	8 (88.9)	12 (33.3)	1 (100.0)	**<0.006**
	Pain at injection site	7 (77.8)	12 (33.3)	1 (100.0)	**<0.028**
	Tenderness	3 (33.3)	0 (0)	0 (0)	**<0.001**
	Swelling	0 (0)	0 (0)	0 (0)	
	Swollen armpit gland	0 (0)	0 (0)	0 (0)	
Allergic reactions	No	8 (88.9)	36 (100.0)	1 (100.0)	
	Yes	1 (11.1)	0 (0)	0 (0)	0.122
Did you self-medicate to avoid the AEs before and after vaccination	No	7 (77.8)	33 (91.7)	0 (0)	
	Yes	2 (22.2)	3 (8.3)	1 (100.0)	**<0.018**
Did you consult a general physician	No	9 (100)	32 (88.9)	1 (100)	
	Yes	0 (0)	4 (11.1)	0 (0)	0.544
Duration of AEs	Less than 24 hours	7 (77.8)	27 (75.0)	0 (0)	
	24-48 hours	2 (22.2)	8 (22.2)	1 (100.0)	0.476
	24-72 hours	0 (0)	1 (2.8)	0 (0)	
	More than 72 hours	0 (0)	0 (0)	0 (0)	

* Chi-square test

* p <0.05 is considered statistically significant

was reported by Harapan *et al.* from Indonesia and Wang J *et al.* from China (91.3%).[11,12] However, a lower acceptance rate was reported by Al-Mohaithef M *et al.* from Saudi Arabia (64.7%)[13] and Neumann-Böhme S *et al.* (73.9%) from several European countries.[14]

Although COVID-19 vaccination is hailed to be one of the most outstanding public health inventions of the 21st century, a small percentage of the population refuses to get vaccinated. This could be due to the concerns regarding the AEs, safety, lack of information, effectiveness, religious beliefs, and other cultural factors related to the COVID-19 vaccine. This has driven the WHO and other concerned government agencies to initiate various health education measures and campaigns that could address the concerns and increase the COVID-19 vaccine acceptance rate.[10]

Of the 46 participants who received the vaccine, one participant had tested positive after the first dose of the vaccine and none tested positive after the second dose, at the time of data collection. The efficacy level of COVID-19 vaccines varies according to the clinical studies conducted, type of vaccine, the risk of disease among the vaccine receivers. The efficacy of the Pfizer-BioNTech vaccine was found to be 95%,[15] while the AstraZeneca vaccine was 62%- 92%[16] and CoronaVac® was 50.4%-91.25%.[17] These vaccines were not only effective in reducing the new infections but also significantly reduces the hospitalization, ICU admission, and fatality rate.[15-17]

Although the efficacy of the Pfizer-BioNTech vaccine is higher than the AstraZeneca vaccine and CoronaVac®, the latter two vaccines have the distinct advantage of less temperature sensitivity, facilitating easy transportation and storage.[16] All the three COVID-19 vaccines received by our study participants have shown excellent safety and efficacy in phase 3 trials.[18-20]

Local AEs such as pain and tenderness at the site of injection were frequently observed as compared to the systemic AEs after the first dose of the vaccination. Higher local AEs were observed in Pfizer-BioNTech (88.9%) group when compared to the CoronaVac® group (33.3%). Similarly, greater systemic AEs were observed in Pfizer-BioNTech (66.7%) group than in the CoronaVac® group (30.6%). These findings were in accordance with the large community-based study in the UK by Menni

Table 4: COVID- 19 vaccine adverse effects after second dose of vaccination

	Group	Pfizer-BioNTech n=9	CoronaVac® n=35	p value *
Systemic AEs	No	3 (33.3)	21 (60.0)	
	Yes	6 (66.7)	14 (40.0)	0.261
	Headache	1 (11.1)	2 (5.7)	0.506
	Chill	0 (0)	1 (2.9)	>0.999
	Fatigue	5 (55.6)	3 (8.6)	**<0.005**
	Diarrhoea	0 (0)	1 (2.9)	>0.999
	Fever	1 (11.1)	1 (2.9)	0.371
	Arthralgia	1 (11.1)	1 (2.9)	0.371
	Myalgia	1 (11.1)	9 (25.7)	0.659
	Increased heart rate	1 (11.1)	0 (0)	0.205
	Other	0 (0)	1 (2.9)	>0.999
Local AEs	No	3 (33.3)	22 (62.9)	
	Yes	6 (66.7)	13 (37.1)	0.144
	Pain at injection site	5 (55.6)	11 (31.4)	0.250
	Tenderness	3 (33.3)	0 (0)	**<0.006**
	Swelling	0 (0	0 (0	
	Swollen armpit gland	1 (11.1)	0 (0)	0.205
Allergic reactions	No	9 (100.0)	35 (0)	
	Yes	0 (0)	0 (0)	-
Did you self-medicate to avoid the AEs before and after vaccination	No	5 (55.6)	34 (97.1)	
	Yes	4 (44.4)	1 (2.9)	**<0.004**
Did you consult a general physician for the AEs	No	8 (88.9)	32 (91.4)	
	Yes	1 (11.1)	3 (8.6)	>0.999
Duration of AEs	Less than 24 hours	3 (42.9)	16 (72.7)	
	24-48 hours	1 (14.3)	4 (18.2)	0.118
	24-72 hours	3 (42.9)	2 (9.1)	
	>72 hours	0 (0)	0 (0)	

* Chi-square test

**p* <0.05 is considered statistically significant

et al.[18] They reported significantly higher local AEs than the systemic AEs and the participants from Pfizer-BioNTech experienced slightly higher local AEs (71·9%) than in the AstraZeneca group (58.7%) after the first dose of vaccination. Nonetheless, contrast observation was reported regarding the systemic AEs. They noticed lower systemic AEs (13.5%) in the Pfizer-BioNTech group than in the AstraZeneca group (33.7%).[18] The most common systemic AEs observed in our study were fatigue and myalgia.

The phase 1 and 2 clinical trials of CoronaVac® in China revealed the incidence of 29% - 38% AEs.[21,22] However, this was reduced to 18.9% in the interim phase 3 trial from Turkey.[20] The most common local and systemic AEs were pain at the site of injection, and fatigue. The majority of these AEs were mild in intensity and the participants recovered within 48 hours and no vaccine-related untoward adverse events were reported within 28 days of vaccination.[20] These findings were in accordance with our study.

In our study, the differences in the AEs among the vaccine groups could partially be attributed to the small proportion of participants from the Pfizer-BioNTech group when compared to the CoronaVac® group. Additionally, gender, age, immunogenic profiles of the participants, and differences in the immunogenic mechanisms of inactivated vaccines and mRNA-based vaccines may play role in the onset of AEs.[19,20]

Interestingly, six participants in our study chose to self-medicate before vaccination to avoid the AEs although there is no evidence till date to show any advantage by premedicating with nonsteroidal anti-inflammatory drugs (NSAIDs). In fact, recent studies have shown that the NSAIDs taken before vaccination could dampen the cytokine and antibody response to SARS-CoV-2 infection, leading to lower production of antibodies and curtailing other aspects of the immune response to SARS-CoV-2.[23]

The majority of the participants in our study did not consult a physician for their AEs and most of the AEs were resolved within 48 hours after the vaccination. This observation was in accordance with studies by Menni C *et al*, Zhang Y *et al*, and Wu Z *et al.*[18,21,22] Following the second dose of vaccination, we observed that the distribution of systemic and local AEs in the

Pfizer-BioNTech group was similar to the first dose. However, the CoronaVac® group showed a slightly higher rate of local and systemic AEs. The most common systemic AEs in the Pfizer-BioNTech group was fatigue while in the CoronaVac® group was myalgia. Most of the AEs reported in our study after two doses of vaccination were consistent with the Pfizer-BioNTech vaccine and CoronaVac® vaccine fact sheet.[15,24]

In our study, fever, chills, arthralgia, diarrhoea, nausea, and increased heart rate were the less commonly observed systemic AEs following both the doses of the vaccination. A study by El-Shitany *et al.* reported that pain at the injection site, headaches, flu-like symptoms, fever, and tiredness as the most common symptoms while, tachycardia, whole body ache, difficulty breathing, joint pain, chills, and drowsiness as AEs observed less commonly after Pfizer-BioNTech Vaccine.[25]

The onset of AEs after vaccination signifies the immune system's response to the vaccine. The immune system produces cytokines that exert an inflammatory effect on the blood vessels, muscles, and other tissues, which probably leads to flu-like symptoms. These symptoms commonly last for about 24 to 48 hours. Recent studies have found that the high prevalence of the AEs in those below 60 years of age could be attributed to the stronger and efficient immune systems in them as compared to older individuals.[25]

Few authors have reported the possibility of developing an intense and severe allergic reaction within a few minutes to one hour following the vaccination.[26] Fortunately, in our study, none of the participants experienced any such allergic reactions. The onset of life-threatening allergic reactions such as anaphylaxis after vaccination raised concerns regarding the safety of the vaccines in very few cases.[27] Therefore, in addition to the meticulous screening before vaccination, vaccine centers should implement a mandatory post-vaccination observation period and should immediately treat persons experiencing anaphylactic signs and symptoms.[27] In Malaysia, a 30-minute mandatory post-vaccination observation, for both doses, is being followed.

Although the current pilot study was conducted on an institutional cohort involving only the dental faculty members for a short term, we were able to record data and make comparisons to similar studies conducted worldwide. We could use our data to inform the public on the likelihood of the type and duration of AEs expected following vaccination.

An apparent limitation of our study is the uneven distribution of the sample size that received the different types of vaccination, viz, thirty-six participants received the CoronaVac® vaccine, while nine participants received the Pfizer-BioNTech vaccine, and only one received the AstraZeneca vaccine. Due to this disparity, the side effects of the AstraZeneca vaccine could not be discussed here, as it would cause discrepancy in the information. Additionally large prospective observational studies are required to assess the real-life effectiveness and chronic AEs of vaccines.

Our aim is to encourage and improve the rate of vaccination among the public, which seems to be the only way to combat this dreaded disease. It is imperative that we resume normal lives as early as possible and to achieve this goal would be to get everybody vaccinated and follow strict standard operating procedures (SOPs) while interacting with each other. This would hold true for practicing dentists who need to treat patients without the fear of infecting or contracting the disease. It is well known that despite vaccinations, we could still be asymptomatic carriers which could pose a danger for vulnerable patient groups such as the elderly or the young ones especially those with special needs. Hence avoiding cross-infections in the dental practice, in the post-COVID19 era by adopting strict SOPs is the way to go in the future.[28,29]

Conclusions

Recognizing and reporting the AEs of COVID-19 vaccines assumes particular significance in the present scenario for obvious safety reasons. Local AEs were more frequently encountered than systemic ones. Common AEs observed were pain and tenderness at the injection site, fatigue, and myalgia. The majority of these AEs were of short duration and the participants recovered within 48 hours and no serious allergic reactions were reported.

Additionally, we opine that an app-based survey would be a frugal but very effective tool in enabling the participants to report the real-time onset of AEs. Such surveys are the need of the hour as the scientific community works together in bringing all their considerable collective might to bear down on this epidemic so that we can all come out unscathed and resume our normal lives as soon as possible.

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Not applicable.

Conflicts of interest

There are no conflicts of interest.

Author contributions

SKV, AKP, and ATZ were involved in Conception, design of the study, analysis and interpretation of the data and drafting of the article. SNAR was involved in Critical revision of the article and Final approval of the article.

Ethical policy and institutional review board statement

The study was approved and reviewed by the Ethics Committee of SEGi University with code No SEGiEC/StR/FOD/02/2021–2022.

Patient declaration of consent

The authors certify that all the participants have provided their online consent to participate in the research and to publish the analyzed data. The participants understand that their names and initials will not be published, and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request (dr.suri88@gmail.com).

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