



THE IMPACT OF COVID 19 PANDEMIC ON THE IN VIVO RESEARCH AREA OF DENTISTRY – A CROSS SECTIONAL STUDY

Dental Science

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ABSTRACT

COVID-19 pandemic has adversely affected various fields and dentistry is one of them. Research plays an important role in dentistry to provide evidence-based practice. This survey aimed to evaluate the changing trends and their impact on the 'in vivo' research area of dentistry in this COVID 19 pandemic. A questionnaire consisting 12 close ended questions was prepared and distributed amongst dental professionals in India. This survey concluded that in vitro studies, surveys and literature reviews have gained more focus due to ongoing pandemic. Although clinical trials cannot be neglected since they have highest level of significance so as to perform evidence-based dentistry.

KEYWORDS

COVID-19, in vivo research, dentistry

INTRODUCTION

Human body is considered to be the most susceptible host of varied viral infections. Till date millions of viruses have shown their existence and with the power of science and technology, scientists have successfully combated the diseases caused by these viruses. Some of the viral outbreaks have influenced the global life to a large parameter and World Health Organization (WHO) has declared them as a public health emergency of international concern, examples like H1N1 (2009), Polio (2014), Ebola in West Africa (2014), Zika (2016) and Ebola in Congo (2019).^[1] Recently in December 2019, Wuhan city of China was flooded with a cluster of pneumonia cases increasing day by day. It was caused by a newly identified Coronavirus which was named as the '2019 novel corona virus (2019 n CoV)' on 12th January 2020 by (WHO). On 11th February 2020, WHO officially named the disease caused by this novel coronavirus as 'Coronavirus disease 2019 (COVID 19)'.^[2] As Coronavirus had started to spread its wings on all over the world, therefore, WHO declared the COVID 19 pandemics on 30 January 2020. With no time, it was entered on the lands of India through the various International travellers. India reported the first laboratory-confirmed case of COVID-19 on 30th January 2020, who was a student returning from Wuhan, China. A total of 38,53,406 laboratory-confirmed cases of COVID-19, of which 29,70,492 recovered cases, while 67,486 deaths are reported in India, as on 3rd September 2020.^[3]

Worldwide, COVID 19 has affected various health sectors including dentistry. Dental professionals are at high risk of contracting COVID-19 due to occupational hazard associated with aerosol generating dental procedures.^[4] In response to the COVID-19 pandemic, academic institutions have scaled back research activities with most laboratory-based experiments coming to a full stop or a ramp-down. Many ongoing studies in progress were terminated resulting in significant time and financial loss. Thesis submission of postgraduate students has been delayed due to the lack of key experimental results. Grant applications have been postponed due to the lack of preliminary data. In addition, many faculties have announced a hiring freeze, which puts postdoctoral fellows on the job market in a difficult position.^[5]

In vivo research refers to experimentation using a whole, living organism. Animal studies and clinical trials are two forms of in vivo research. In vivo testing is often employed over in vitro because it is better suited for observing the overall effects of an experiment on a living subject. But in COVID 19 pandemic situation, in vivo research is majorly affected due to unwillingness of participants to take part in research project as well as the increased risk for the researchers by getting infected with corona virus. Thus in vitro research and literature reviews have gained more importance in this pandemic situation since they do not include living participants along with it, they are less

expensive and less time consuming.

This survey aims to evaluate the changing trends and their impact on the 'in vivo' research area of dentistry in this COVID 19 pandemic.

MATERIAL AND METHODS:

This prospective, questionnaire based cross-sectional study was conducted from 29th of August, 2020 to 5th of September, 2020. It was carried out among the dental professionals including dental students (undergraduate & postgraduate students), academicians and practitioners from both the government and private sectors who are registered by the Dental Council of India. The questionnaire was forwarded to all the participants by means of various social media applications like Whatsapp and Telegram.

A self-explanatory, online questionnaire comprised of 12 close ended questions was prepared using Google forms. A questionnaire for the survey was designed in English language and was divided into 2 sections. The first section included the primary demographic data and the second section included 'Close ended' questions. It also included a consent to participate in the study. A link of this Google form was generated and distributed all over India via various social media applications.

To know about the reliability and validity of the tool and items, we conducted a pre-test in a sample of 15 dentists who were asked to evaluate its reliability and internal consistency. Cronbach's Alpha (α) score was calculated, $\alpha = 0.857$. A statistically highly significant reliability ($p < 0.01$) was seen. Thus, internal consistency of the questionnaire was good according to Cronbach's Alpha (α) score.

Over 400 dentists voluntarily participated, out of which 396 were included in the survey finally. Remaining 4 were excluded due to the incomplete survey filling. The confidentiality of information was preserved during the process by keeping it anonymous. Data was collected in an organized manner from the dental students studying in various institutions and dentists working in various health sectors across different states in India.

RESULTS:

Overall, 396 dentists were included in this study (137 post graduate students, 129 private practitioners, 49 undergraduate students, 65 academicians from private institutes, 15 academicians from government institutes, 2 practitioners from government sector). Among all the participants, 170 (42.9%) were male, 226 (57.1%) were female. Majority of the participants ($n=314$) were below 30 years of age and most of the participants ($n=189$) had years of experience of 5-15 years. Table 1, shows the demographic data of participants.

Table 1. Demographic data of participants

VARIABLES	GROUP	NUMBER
Age	< 30 years	314 (79.29%)
	30-39 years	50 (12.62%)
	40-49 years	22 (5.5%)
	> 50 years	10 (2.5%)
Gender	Male	170 (42.9%)
	Female	226 (57.1%)
Years of experience	<5 years	176 (44.44%)
	5-15 years	189 (47.73%)
	>15 years	31 (7.82%)
Designation	Undergraduate student	49 (12.4%)
	Postgraduate student	137 (34.3%)
	Private practitioner	129 (32.6%)
	Practitioner in Government sector	2 (0.5%)
	Academician in Private institute	65 (16.4%)
	Academician in Government institute	15 (3.8%)

Among 396 participants, 246 agreed that it will be difficult to initiate a new clinical trial in this COVID 19 pandemic while only 10 disagree to it. 44 participants were uncertain about the difficulty to initiate a new clinical trial. Although 353 participants felt that ongoing clinical trials will be affected because of corona virus pandemic. Out of all the participants, 301 were opinionated with the difficulty of collection of body fluids like saliva and gingival crevicular fluid (GCF). Also 306 participants said that it will be very tough to perform surgical clinical trial in this pandemic situation. As comorbidities like diabetes mellitus, hypertension, asthma, chronic obstructive pulmonary disease (COPD) etc are one of the risk factors of COVID 19, 262 participants thought that including such individuals with any kind of comorbidity in a clinical trial, will be of higher risk for researchers, while 183 participants, said that getting a consent from patients to participate in any clinical trial will be an obstacle in conducting a research project. Majority (n=375) of participants reported that the expenses has been increased due to use of personal protective equipment (PPE) kits in Corona virus pandemic. Almost 312 participants supported to change the protocol of in vivo clinical trials since aerosol generating procedures are contraindicated in this pandemic. 173 participants thought that animal research projects should be preferred while 266 participants felt that in vitro trials will be of more of an interest for researchers in this pandemic situation and they quoted various reasons behind it, accounting to nonrequirement of human participation, no longer duration follow up, easier ethical approval, lesser duration and lesser expenses. Also 332 participants reported that more focus would be given to off-campus and electronic study means such as conducting literature reviews and online surveys in this pandemic. Table 2, shows a detailed data on responses received for each question by all the participants.

Table 2. Distribution of responses recorded by respondents according to questions

QUESTION	N (Number)	%
1. Do you feel that initiating a new clinical trial will be difficult in this pandemic situation?	396	
Strongly agree	96	24.2
Agree	246	62.1
Uncertain	44	11.1
Disagree	10	2.5
Strongly Disagree	0	0
2. Do you feel that ongoing clinical trials will be affected because of corona virus pandemic?	396	
Yes	353	89.1
No	30	7.6
Don't know	13	3.3
3. Do you feel that in vivo clinical trials involving the collection of body fluids like saliva & gingival crevicular fluid, will be difficult to perform?	396	
Yes	301	76
No	80	20.2
Don't know	15	3.8
4. Do you feel that a surgical clinical trial will be difficult to perform during COVID 19 pandemic?	396	
Yes	306	77.3
No	78	19.7
Don't know	12	3

5. Do you think that patients without any comorbidities should be preferred for in vivo clinical trials in this corona virus pandemic (As it is considered to be the risk factor for COVID-19)?	396	
Yes	262	66.2
No	88	22.2
Don't know	46	11.6
6. Do you think that patients will give a consent to participate in the clinical trial in this pandemic situation?	396	
Yes	104	26.3
No	183	46.2
Don't know	109	27.5
7. Do you think that there will be increased expenses due to the use of Personal Protective Equipment (PPE) kits during in vivo clinical trials in this pandemic?	396	
Yes	375	94.7
No	13	3.3
Don't know	8	2
8. Do you think that there should be change in the protocol of in vivo clinical trials since aerosol generating procedures are contraindicated in this pandemic?	396	
Yes	312	78.8
No	55	13.9
Don't know	29	7.3
9. Do you think that conducting any animal research project would be preferred in this corona virus pandemic?	396	
Yes	173	43.7
No	133	33.6
Don't know	90	22.7
10. Do you feel that in vitro trials will be of more of an interest for researchers in this pandemic situation?	396	
Yes	266	67.2
No	67	16.9
Don't know	63	15.9
11. If your answer is yes to the above question, then what will be an apt reason behind it?	266	
Human participants are not required	57	21.4
No long duration follow-ups are required	19	7.1
Easier to get ethical committee approval	13	4.9
Less duration	5	1.9
Less expensive	0	0
All of the above	167	62.8
None of the above	5	1.9
12. Do you think that there will be more focus on the off-campus and electronic study means such as conducting literature reviews and online surveys in this pandemic?	396	
Yes	332	83.8
No	31	7.8
Don't know	33	8.3

A statistically significant difference was seen for the frequencies among different designations of dental professionals, with higher frequency of response from postgraduate students for the questions mentioned in Table 2 except question no. 6, 7, 9. Also a statistically significant difference was seen for the frequencies of both male & female participants, with higher frequency of response from females for the questions mentioned in Table 2 except question no. 1, 7, 9. A statistically nonsignificant difference was found for the frequencies among different age groups for the questions mentioned in Table 2 except question no. 8. And a statistically nonsignificant difference was found for the frequencies of response from dental professionals with different years of experience for the questions mentioned in Table 2. Figure 1, shows a line diagram providing a brief view about p values of questions according to age, gender, designation and years of experience.

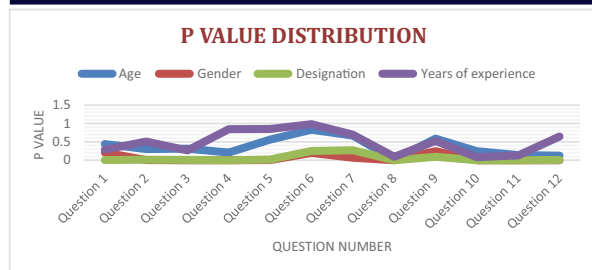


Figure 1. P values according to participants' age, gender, designations and years of experience

DISCUSSION:

Oral health is considered as a window to general health. Thus, research in oral health is of prime importance in this new era of development. "Research" is defined as the continual search for truth using the scientific method. While "Oral health research" refers to laboratory, clinical and field investigations that lead to improvement in the control of oral diseases and health care delivery. (Essentials of Preventive and Community Dentistry, Soben Peter, 4th edition)

The quality of scientific research is usually represented by means of a pyramid in which the base of pyramid is related to pre-clinical research, with in vitro and in vivo studies, which provides insights towards potential efficacy of a certain therapy. The middle part of pyramid is represented by clinical research which has a higher level of evidence. It includes randomized control trial. At the top, systematic reviews and meta-analyses are considered the best available knowledge, suitable for clinicians to face decision making.^[6]

The aim of this cross-sectional survey was to evaluate the changing trends and its impact on the 'in vivo' research area of dentistry in this COVID 19 pandemic. Majority of participants have agreed that initiating a new clinical trial will be intricate in this pandemic situation. According to a world report published in Lancet by Aaron van Dorn, Corona virus has severely affected the ability to conduct trials in safe and effective ways. He also mentioned that clinical trials often deal with vulnerable populations who are most at risk from exposure to COVID-19.^[7] In accordance to this report 66% of participants of this survey, reported that patients without any comorbidities should be preferred for in vivo clinical trials in this corona virus pandemic, as it is considered to be the risk factor for COVID-19.

89% of participants agreed to the fact that ongoing clinical trials are suspended or stopped because of corona virus pandemic. Aaron van Dorn supported this by stating 2 apt reasons behind this, one is an overwhelming unprecedented reorientation in clinical trials research towards COVID-19 and second would be difficulties in continuing under lockdown conditions, even though the restrictions have begun to ease in parts of the world.^[7]

Due to COVID 19 pandemic, >75% of participants felt that surgical clinical trials and in vivo clinical trials involving collection of body fluids like saliva and gingival crevicular fluid would be majorly affected. Also 67% of participants showed more interest in 'in-vitro' research projects since there is no requirement of human participants, no long duration follow ups, easier ethical approval and lesser duration and expenses.

76% of participants reported that in vivo clinical trials involving the collection of body fluids like saliva & gingival crevicular fluid will be difficult to perform. Dental professionals are at higher risk of Corona virus infection since many studies have proven a worrying fact that corona virus can be transmitted through saliva^[8] and gingival crevicular fluid.^[9]

78% participants also mentioned that there should be change in the protocol of in vivo clinical trials since aerosol generating procedures are contraindicated in this pandemic. Droplet and aerosol transmission of 2019-nCoV are the most important concerns in dental clinics and hospitals, because it is hard to avoid the aerosol generating procedures which lead to production of large amounts of aerosol and droplet mixed with patient's saliva and blood during dental practice.^[10] Particles of droplets and aerosols are small (<5 micron in diameter)^[11] enough to stay airborne for an extended period before they settle on environmental surfaces or enter the respiratory tract. Thus, the 2019-

nCoV has the potential to spread through droplets and aerosols from infected individuals in dental clinics and hospitals.^[12]

According to the responses of this survey, majority of the participants have shown more interest in conducting in vitro research in this pandemic rather than in vivo clinical trials. Although the drawback of this would be lesser clinical trials, which will lead to a major hollow in the area of research. Clinical trial is considered to be a very important step towards building a better future in the field of dentistry.

Evidence-based dentistry (EBD) reassures the quality improvement of health-care delivery by incorporating effective practices, while eliminating those that are ineffective or inappropriate. The main advantage of EBD is that, it uses significant findings obtained from large clinical trials and systematic reviews and applies them to the individual patient's needs. In this way, clinicians are able to deliver more focused treatment, while patients receive optimal care.^[13]

CONCLUSION

In this corona virus pandemics, a major setback has caused to research area of dentistry, thereby affecting Evidence-based dentistry. Dental professionals also agree to the fact that this pandemic has largely affected dentistry in various aspects, although research area stands on top of it. In vitro studies, surveys and literature reviews have gained more focus due to ongoing pandemics but still clinical trials cannot be neglected since they have highest level of significance so as to perform evidence-based dentistry.

REFERENCES:

- [1] Kaushik, S., Kaushik, S., Sharma, Y., Kumar, R., & Yadav, J. P. (2020). The Indian perspective of COVID-19 outbreak. *Virusdisease*, 31(2), 1–8. Advance online publication.
- [2] Guo, Y. R., Cao, Q. D., Hong, Z. S., Tan, Y. Y., Chen, S. D., Jin, H. J., Tan, K. S., Wang, D. Y., & Yan, Y. (2020). The origin, transmission and clinical therapies on coronavirus disease 2019 (COVID-19) outbreak - an update on the status. *Military Medical Research*, 7(1), 11.
- [3] <https://www.worldometers.info/coronavirus/country/india/>
- [4] Wu, K. Y., Wu, D. T., Nguyen, T. T., & Tran, S. D. (2020). COVID-19's impact on private practice and academic dentistry in North America. *Oral diseases*, 10.1111/odi.13444. Advance online publication.
- [5] Wu, D. T., Wu, K. Y., Nguyen, T. T., & Tran, S. D. (2020). The impact of COVID-19 on dental education in North America-Where do we go next? *European journal of dental education: official journal of the Association for Dental Education in Europe*, 24(4), 825–827.
- [6] Varoni, E. M., Lodi, G., & Iriti, M. (2015). Efficacy behind activity--phytotherapeutics are not different from pharmaceuticals. *Pharmaceutical biology*, 53(3), 404–406.
- [7] van Dorn, Aaron (2020). COVID-19 and readjusting clinical trials. *The Lancet*, 396(10250), 523–524.
- [8] To KK, Tsang OT, Yip CC, Chan KH, Wu TC, Chan JM, Leung WS, Chik TS, Choi CY, Kandambay DH, Lung DC, Tam AR, Poon RW, Fung AY, Hung IF, Cheng VC, Chan JF, Yuen KY. (2020 Jul) *Clin Infect Dis*; 71(15):841-843.
- [9] Gupta, S., Mohindra, R., Chauhan, P. K., Singla, V., Goyal, K., Sahni, V., Gaur, R., Verma, D. K., Ghosh, A., Soni, R. K., Suri, V., Bhalla, A., & Singh, M. P. (2021). SARS-CoV-2 Detection in Gingival Crevicular Fluid. *Journal of dental research*, 100(2), 187–193.
- [10] Cleveland, J. L., Gray, S. K., Harte, J. A., Robison, V. A., Moorman, A. C., & Gooch, B. F. (2016). Transmission of blood-borne pathogens in US dental health care settings: 2016 update. *Journal of the American Dental Association* (1939), 147(9), 729–738.
- [11] Ge, Z. Y., Yang, L. M., Xia, J. J., Fu, X. H., & Zhang, Y. Z. (2020). Possible aerosol transmission of COVID-19 and special precautions in dentistry. *Journal of Zhejiang University. Science. B*, 21(5), 361–368.
- [12] Peng, X., Xu, X., Li, Y., Cheng, L., Zhou, X., & Ren, B. (2020). Transmission routes of 2019-nCoV and controls in dental practice. *International journal of oral science*, 12(1), 9.
- [13] Kiriakou, J., Pandis, N., Madianos, P., & Polychronopoulou, A. (2014). Developing evidence-based dentistry skills: how to interpret randomized clinical trials and systematic reviews. *Progress in orthodontics*, 15(1), 58.