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COVID-19: Today's Ambiguity, Tomorrow's Uncertainty and After Tomorrow's Questions

Prof. Dr. Hamid Yahya Hussain

The daily facts of COVID-19 developments and progress, yielded amazing data, particularly that one related to the biological feature of the virus, and its rapid incursion nature, despite all the procedures applied. It is obvious that COVID-19 disrupted the entire world from the economic, social, and functional points of concern, or what relates to the consequences of the damages, the world is going to witness the future wisely. Both the extent of damages as well as nature shall pigment the foreseeable future. Prospectively, we can say that the whole world infrastructure is shaking and its givens are going to changing with the unrecognized speed in relation to this dilemma.

Unique challenges

At the time being, and in the lack of a vaccine and of particular medications of proven efficacy against COVID-19 infection, the only unique and effective measures, to adopt are preventative, such as social distancing protocols. The experience of countries like the USA, Spain, and Italy, the most devastatingly affected by the worldwide pandemic, can be a model for the other European countries that followed in facing the outbreak. The power of social isolation in Italy is reflecting now in terms of reduction of symptomatic cases requiring hospitalization. Nevertheless, there are still many observations need an explanation. For instance, the highest spread of the infection might be due to the high population density or other, yet unknown, factors.

An intelligent and smart investment in both fundamental research and public health is crucial if we are approaching a deep understanding of this aggressive and explosive Virus. Furthermore, developing science-based policies to address it comes to be a necessity. Part of that anxiety is rooted in the uncertainty, as we still have many unanswered questions so far: basic available information about the virus is inadequate at the time being, and not enough about how coronavirus will act in the future.

Now, at the present time, efforts are rightly focused on urgent issues like securing individuals and population protection, supplying emergency equipment and ventilators. We need furthermore research, to be able to win the field battle we. The understanding enemy shall be a key to victory, it will offer better diagnosis, treatment, and prevention will become a reality.

In recent memory, rarely has it been this difficult to look beyond the next day.... yet this is what exactly, we need to do, the world has no time to Wait. To see the light on the other end and the way past this crisis. To advance a step ahead of the next one- we need to operate in two types of investigations that will answer some gaped questions. Exploring questions of fundamental basic science, like how novel viruses like the coronavirus operate within the human body, extending to the cellular level, and examining the way a virus spreads throughout the population, utilizing public health research to inform the policies presently implemented at the local and national level.

Future Questions

It is a mandate of fundamental research to address:

- The exact time an individual infected with the coronavirus becomes contagious.
- What factors making the infected person becomes symptomatic?
 - In asymptomatic person, what makes him contagious without coughing, sneezing?
 - How infectious droplets generated?
 - Why infection spread when an individual is becoming symptomatic.
 - In case of serious complications, dose the person contagious for a longer period?
 - How to establish science-based policies for lifting "stay at home" restrictions.
 - How to improve the control of the spread of disease both for today and in the future.



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It is the mandates of Public Health Research to address:

- How social factors can affect a virus's impact.
- Does experiencing social factors affect person risk?
- How can we protect vulnerable communities such as people who are homeless, imprisoned, or poor?
- How to understand social complexity in COVID-19 context.
- How to utilize social modelling to breakdown the transmission chain.

Obtaining these answers will significantly tell how we dedicate future resources. Research Commitment for Long-term will affect our future now more than ever; engaging in both areas of research shall be critical investment nationally, regionally, and globally. In spite of generous financial supports pushed in the national health system worldwide, funding has increased and the CARES Act includes additional funding for vaccine development, it seems, there is still a high need for further support in a sustainable manner for continuous expansion. Greater National Science Foundation funding is needed to address our fundamental science questions. CDC funding is critical to adequately address population health. With greater investment in research and the ongoing great work of public-private partnerships, It appears that major questions can be answered we have today and get ahead of those that will occur tomorrow.

Where do we need to move?

With all effort made in time and place that have been adopted to try and counteract the spread of the virus, it is still not clear how to draw a clear epidemiological map of the diseases to assess the amount of exposure in linking to a proportion of cases converted to positive, amongst these cohorts, and the proportion of individuals who become symptomatic and, most significantly, the proportion of mortalities. The correlation between the spreading of COVID-19 and the density of the population still needs gap investigation, root analysis, and further hypothesis testing. The potential impact of other environmental factors, as well as other confounders, (e.g., air pollution), does not have at present a clear scientific basis.

Stepping Forward

Social isolation strategy, which is widely applied in COVID-19 pandemic, made a significant difference in reducing morbidities and mortalities at this

particular time, yet it was not passing without devastating effects on social and economic outcomes, that is why dealing with COVID-19 in the foreseeable future needs more effective preventive and therapeutic strategy but less devastating consequences on social and economic life. Epidemiological changes could be monitored in the future, putting into consideration the potential routes of spreading and subclinical infections, furthermore to adaptation, evolution, and spread of the virus amongst humans, intermediate host animals, and other reservoirs. The overall spectrum of the COVID-19 infection (proportion of cases found positive, those who revealed symptoms, that required hospital admission, and those who need intensive care and assisted ventilation, and those who die) may have been assessed by studies in small areas where the entire population can be been tested for infection. The medical registry of family doctors, General Practitioner, and other medical staff, who are currently at the front line of clinical care delivery in several worldwide countries, can be utilized retrospectively to identify the disease patterns and profiles in representative samples of the general population. Coming epidemiological and public health studies should be also performed in cohorts of patients who revealed symptoms and signs of COVID-19 infection, to assess the occurrence of any neurological and/or psychiatric features even after the present pandemic has over.

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New Beginnings for IHRJ: Foraying into its Fourth Year of Publication...

IHRJ Editorial Team

Dear readers and authors,

Greetings from International Healthcare Research Journal (IHRJ)!

It is our pleasure to present the **Volume 4, Issue 1 (April 2020)** of IHRJ. The editorial team is extremely grateful to the contributors as without their efforts, it would have not come so far. IHRJ has always ventured to publish quality manuscripts in the all fields of healthcare. The success of IHRJ has motivated the editorial team to continue with the hard work and produce effective results. The authors have been the driving force in establishing it as a flourishing journal. There has been an immense response from readers which has taken IHRJ to its fourth year of existence due to which there are increased number of citations for various articles in the journal.

Last but not the least, we would again like to thank all the team members of IHRJ who have put their constant effort making the journal a grand achievement and wish luck for the future endeavours. We shall strive our best to make the journal one of the best platforms for aspiring authors.

It has been our earnest endeavour to provide assistance to our authors in any manner and as many times possible.

Stay safe! Stay healthy! As all of you are aware of the current scenario of COVID-19, we wish you and your family best of health in these testing times.

With Thanks and Regards,
Editorial Team

International Healthcare Research Journal (IHRJ).



The COVID-19 Pandemic and our Heroes

RENUKA YADAV

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The COVID-19 pandemic has affected millions of people across the globe and an equal number of people are at risk of contracting this disease. It has brought life to a standstill with people closing their businesses and adopting social distancing measures. Many countries/cities are under lockdown to contain the disease. To control this situation, the world has come together to combat this disease and return life back to normalcy. While many people are at their homes practicing social distancing, there are a few heroes which include healthcare professionals, law enforcement officers, volunteers etc. This short commentary focuses on the way COVID-19 has shaped the world and salutes its true heroes.

KEYWORDS: COVID-19, Pandemic, Healthcare Workers, Law Enforcement, Volunteers

INTRODUCTION

A nation can only prosper when different professionals work in tandem and contribute to its growth. A soldier guards the border to protect the citizens of the country from external threats; a farmer helps by providing healthy produce, it is a duty of the healthcare workers (HCWs) to keep the citizens healthy by providing them medical care.

In the face of pandemics, a healthcare worker is the first one to face and report such an outbreak and hence, is at the highest risk of getting infected. Scientific evidence shows that the likelihood of pandemics has increased over the past century and these trends will continue and intensify.¹ Therefore, policies have been made with the need to identify and limit emerging outbreaks that might lead to pandemics and to expand and sustain investment for building preparedness and health capacity.²

The transmission and etiopathogenesis of the viral strain are unknown and hence, its treatment becomes a daunting task. One such example is the sad demise of Dr Li Wenliang, ophthalmologist who was the first person to raise alarm about the coronavirus in the early days of the outbreak, but later lost the fight against the disease.³

As the entire healthcare fraternity mourned the loss of its colleague and people to such a strain, it started preparing for a mammoth task that lied ahead: controlling the spread of the disease. Governments of respective countries came into action and various steps

were taken such as screening of patients at airports and other points of entry.

COVID-19 has become a pandemic beyond control as it has affected millions of people and thousands have lost their life. In response to this, healthcare workers have been working around the clock. The Chinese National Health Commission reported that 3300 health-care workers have been infected as of early March and as per the local media, at least 22 deaths have been reported.

Italy, which is one of the worst affected countries reported that 20% of health-care workers were infected, and some have died. Reports from medical staff describe physical and mental exhaustion, the torment of difficult triage decisions, and the pain of losing patients and colleagues, all in addition to the infection risk.

In USA, which has become the latest epicentre of the disease and has surpassed other countries, the healthcare workers have been facing an unprecedented crisis. At the time this manuscript was prepared, there were 7,40,746 confirmed cases and 39,158 (data updated at time of publication) deaths due to COVID-19.

These healthcare workers are balancing the COVID-19 epidemic between their family and patients. They know that having the highest risk of the disease, any lapse from their end can put their loved ones at risk. On the other hand, it is their moral and social responsibility to



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treat their patients. We can only imagine the stress they must be facing dealing with this horrendous situation. Among HCWs, the risks posed to self and family would be of significant concern about being provided with protective equipment while treating their patients.⁴

While all healthcare workers are the real heroes at this hour of need, a few workers have gone beyond the call of duty for their patients and putting their lives at stake. One such mention is of Dr. Shirin Rouhani, a physician and general practitioner of Shohada Hospital in Iran who was herself on I.V. and still treated patients till her last breath.⁴ Her picture was widely circulated on social media and almost the entire world paid tribute to this real life hero.

Since a vaccine is currently in development and there is no specific treatment for COVID-19, social distancing norms and lockdowns have been implemented. Apart from healthcare workers, the other heroes are the men and women in uniform who are in charge of enforcing the lockdown i.e. law enforcement officers. The success of such measures cannot be possible without the untiring and constant efforts of these officers.

The next category of heroes are the people who have been tirelessly doing volunteer work for those in need. There is a vulnerable section of the society (refugees, migrant workers, aged people, those living in orphanages and old age homes) who cannot survive without the help of these good samaritans. The deadliest cluster in the USA so far has been linked to a nursing home in Kirkland, Washington where more than 20 residents and/or visitors have died. It has been reported that people who lived in other long-term care facilities in Washington, Florida and Kansas contracted the virus and died.

Last but not the least, the people are the heroes who are practising social distancing and staying indoors so that the rapid spread of the virus can be contained.

I salute all our heroes and am confident that post COVID-19, the world shall emerge more resilient and the lessons learnt shall be applied in a manner that future epidemics can be controlled effectively before another pandemic ensues.

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The Off-Label Use of Hydroxychloroquine in Prophylaxis and Treatment of COVID-19

ASHISH PAUL

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Coronavirus pandemic has covered the entire globe only in a few months and has been declared as a public health emergency due to a very high morbidity as well as mortality rate. Till date no curative measure is available for this fatal disease and only social distancing has been of some help in prevention. However, anti-malarial drug hydroxychloroquine is being tried for prophylaxis and treatment at early stages of the disease although it is not an approved indication for this drug which has given some hope to health care professionals and the affected population.

KEYWORDS: Coronavirus, COVID-19, Hydroxychloroquine

INTRODUCTION

Coronavirus disease 2019 (COVID-19) outbreak caused by the novel corona virus was declared as a Public Health Emergency of International Concern on 30 January 2020 and recognized as a pandemic by the World Health Organization on March 11, 2020. As per the coronavirus disease 2019 (COVID-19) Situation Report –88 by WHO dated April 17, 2020, the number of reported confirmed cases exceeded 2 million globally.¹ Subjects infected with COVID-19 often present with dry cough, fever, and fatigue at onset, myalgia, sore throat, nasal congestion, runny nose, headache and diarrhoea in mild to moderate cases and may have a rapid progression to acute respiratory distress syndrome, septic shock, uncorrectable metabolic acidosis, coagulopathy, and multiple organ failure in severe cases.^{2,3} No available drug or vaccine is specifically approved for this virus in clinical practice, so it is an important task to find and develop such drugs that can inhibit SARS-CoV-2 infection. However, before a drug or vaccine is available in the market, it must go through multiple phases of drug development including safety and efficacy trials and this cycle is a time intensive procedure, so the selection of drugs with anti-SARS-CoV-2 activity among existing clinically available drugs has become a faster option at present. Till now, many clinical trials involving new coronavirus therapy have been registered nationwide, mainly involving antimalarials and antiviral drugs.

Hydroxychloroquine was synthesized in 1946 and marketed in 1955 as a safe alternative to chloroquine.⁴

It is currently mainly used for rheumatoid arthritis, juvenile chronic arthritis, mild systemic and discoid lupus erythematosus and the suppression and treatment of malaria, and photosensitivity disorders. The pharmacokinetics and clinical adverse effects of hydroxychloroquine have been established; however, since the target population of new indications, dosage and time are different from the previous application, there is a risk of adverse reactions and even serious adverse consequences. Therefore, it is necessary to comprehensively review the pharmacological effects, metabolism, and distribution in vivo, poisoning and toxicological mechanism of chloroquine drugs, enhance the understanding of medical workers, forensic doctors and the public on acute toxicity of this drug, timely detect and reasonably treat serious adverse reactions, reduce adverse reactions as well as even death caused by drug use.

Many trials assessing the efficacy of hydroxychloroquine against COVID-19 have been registered worldwide. Chen Z et al conducted a placebo controlled randomized trial with two different doses of hydroxychloroquine in 62 subjects who reported small improvements in body temperature and cough in the treatment group taking the higher dose.⁵

Off-label use of a drug refers to a situation where it is prescribed for an indication, route of administration or patient group not included in the labelling document of the drug. Till now, no medication has been approved by



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Therapeutic Goods Administration for COVID-19.⁶

Due to weak evidence of clinical benefits of hydroxychloroquine against COVID-19 and poor clarity on antiviral mechanism of action of this drug, the drug manufacturers have not included this disease as an indication in the product document. It is proposed that hydroxychloroquine could inhibit viral entry into host cells and interferes with the acidification of host cell lysosomes. Yao X et al.⁷ and Liu Y et al.⁸ conducted in-vitro studies and reported that hydroxychloroquine can inhibit the replication of SARS-CoV-2.

Although, long term use of hydroxychloroquine can result in serious cutaneous adverse reactions, fulminant hepatic failure, maculopathies, macular degeneration, retinopathy, torsade de pointes, ventricular tachycardia, cardiomyopathy and cardiac failure but it has been permitted by the USFDA and also advocated by the Indian Council for Medical Research because no definite treatment for COVID-19 is available yet.^{9,10} Since the start of this novel coronavirus outbreak, hydroxychloroquine has been applied in clinical practice and is expected to play an important role in controlling the pandemic. Researchers are involved in conducting trials of hydroxychloroquine but there is scarcity of evidence to support its efficacy in preventing COVID-19. Prophylaxis with hydroxychloroquine against COVID-19 needs to be thoroughly evaluated in observational studies and high quality randomized controlled trials. It is also necessary to strengthen the understanding of this drug and their toxicological characteristics.

CONCLUSION

There has been an urgent worldwide demand for treatments as a result of the essentially untreatable coronavirus disease, but no intervention can be assumed to be efficacious. The use of hydroxychloroquine is being trialled to investigate its capability in inhibiting coronavirus. However, it is also important to consider the toxicological profile before rational use of hydroxychloroquine. A breakthrough in the effective treatment with vaccine or drug for coronavirus infection may take time, but prevention with empiric drugs that target specific structures in the virus along with supportive measures can be of great help and relief. Along with efficacy studies, it is also important to check the safety profile of drugs like hydroxychloroquine. There is a need of conducting in-vitro studies as well as in-vivo randomized controlled trials of hydroxychloroquine to find out how effective it

can be in preventing and treating coronavirus infections at doses which do not cause any potential adverse reactions in humans.

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Dental Practitioners and their Perceptions Regarding the Use of Antioxidants in the Promotion of Oral Health

NADIA KHAN¹, ANAM KHAN^{*2}, BURSHIDA KHALID², GAURI SHARMA²

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INTRODUCTION: The role of free radicals is well established as a crucial component of the immune system.

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MATERIALS AND METHOD: A pre-tested and pre-validated online questionnaire was distributed among various dental practitioners in Northern and Central India which consisted of dichotomous responses. Descriptive statistics were used to summarize the data, followed by the Chi square test to check significant differences between the responses. Correlation between responses were analysed through the Spearman's rank correlation. Statistical analysis was done using Statistical Package for Social Sciences version 20 (SPSS 20).

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CONCLUSION: The use of antioxidants in dentistry should be increased through the conduction of various CDE programmes, workshops and evidence-based practice guidelines.

KEYWORDS: Antioxidants, Free Radicals, Oral Health, Oral Cancer

INTRODUCTION

Reactive Oxygen Species (ROS) are unstable in nature as they contain oxygen and that easily reacts with other molecules of a human cell. A build-up of ROS in cells can cause extensive damage to DNA, RNA, and proteins, which may lead to cell death.^{1,2} Sources of free radicals include pollutants, metal ions, high intakes of polyunsaturated fatty acids, drugs, smoking and radiation. These may lead to cell damage resulting in inducement of cancer, neurological diseases, diabetes, vascular diseases, autoimmune diseases, lung cancer, aging and eye diseases.³

The presence of an increased number of free radicals leads to "oxidative stress" which affects the oral mucosa in the form of gingivitis and periodontitis. The other factors which can lead to oxidative stress in an individual are dental procedures, bleaching agents, dental cements, exposure to nicotine, alcohol consumption, composite fillings and metals used in dentistry.⁴

Various studies⁵⁻⁷ prove the theory that antioxidants play major role in the prevention of oral cancer as well

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Despite aiding in the prevention of dental diseases, antioxidants are seldom prescribed in dental practice. Therefore, the aim of this study was to assess the perception of dental practitioners of Northern and Central India regarding the role of antioxidants in oral health.

MATERIALS AND METHOD

The present collected data using an online forms created using google forms and was distributed to various dental practitioners in Northern and Central India using both random and chain-link referral (snowball) sampling from July 2019- November 2019. Firstly, dentists were selected at random and then they were asked to further suggest the names of their colleagues who would like to participate in the study.



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The participation in the study was purely voluntary and the dental clinic displayed a QR code for easy access of the questionnaire on the patient's phone itself.

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RESULTS

Total number of participating dentists

There were a total of 575 responses obtained, out of which 159 were excluded as the data was incomplete. A total of 416 responses were analyzed and the response

rate was (72.3%)

Demographic details of participating dentists (Table 1)

The present study comprised of 212(50.9%) males and 204(49.1%) females. A higher number of subjects 201(48.3%) belonged to the age group of 20-35 years whereas the lowest number of subjects 106(25.5%) belonged to the age group of 35-54 years. Considering their working status, 187(44.9%) of the subjects were self employed, 115(27.6%) were employed (by academic institution, other clinics, etc) and 114 (27.5%) were doing both. Based on the level of education, 163(39.2%) were post graduates and 253(60.8%) were graduates.

	NO. OF RESPONDENTS	% OF RESPONDENTS
GENDER		
Male	212	50.9
Female	204	49.1
AGE GROUPS		
20-35yrs	201	48.3
35-54yrs	106	25.5
>55yrs	109	26.2
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Both	114	27.5
LEVEL OF EDUCATION		
Post graduation	163	39.2
Graduation	253	60.8
Total	416	100

Table 1. Sociodemographic profile of study subjects

Responses of The Subjects Based On The Dichotomous Scale (Table 2)

It was seen that both the genders were mostly aware of antioxidants and a statistically significant difference along with a strong correlation was seen among both the genders with females 199(197.5%, $p=0.04$) being more knowledgeable. No significant differences were seen in the knowledge of the genders when they were asked about the antioxidants present in diet and the human body.

ITEMS	MALE	FEMALE	p-VALUE	SPEARMAN'S CORRELATION (r)
Do you know what antioxidants are?				
Yes	200(94.3)	199 (97.5)	0.04*	.76
No	12 (5.7)	5(2.5)		
Do you know about the natural antioxidants present in our diet?				
Yes	192(90.5)	187(91.6)	1.010	.62
No	20(9.5)	17(8.4)		
Do you know about the antioxidants present in human body?				
Yes	143(67.5)	157(76.9)	0.56	.13
No	69(32.5)	47(23.1)		

Table 2. Responses of the study subjects regarding their knowledge about antioxidants

Level of knowledge regarding antioxidants among study subjects (Table 3)

Males 162 (56.3%) had a high knowledge as compared to females 126 (43.7%). The young dentists (143, 49.6%) with age group of 20-35 years were having higher level of knowledge. Based on the level of education, the dental professionals who attained their graduate degree 188 (65.3%) were having higher level of knowledge than those having their master's degree. No statistical differences were observed in any of the responses.

	LOW LEVEL OF KNOWLEDGE (128, 30.8%)	HIGH LEVEL OF KNOWLEDGE (288, 69.2%)
Gender		
Male	50 (39.1)	162 (56.3)
Female	78 (60.9)	126 (43.7)
Age groups (in years)		
20- 35 years	58 (45.3)	143 (49.6)
35-54 years	15 (11.7)	91 (31.6)
> 55 years	55 (43.0)	54 (18.8)
Working Status		
Self employed	66 (51.6)	121 (42.0)
Employed	38 (29.7)	77 (26.7)
Not employed	24 (18.7)	90 (31.3)
Level of education		
Postgraduates	63 (49.2)	100 (34.7)
Graduates	65 (50.8)	188 (65.3)

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Source of knowledge regarding antioxidants (Table 4)

It was revealed that 50.2% of dental healthcare personnel's main source of information was the Internet followed by newspaper (29.3%). Only 13.2% of the oral health care personnel referred books.

SOURCE OF INFORMATION	RESPONSES (n, %)
Newspaper	122 (29.3)
Internet	209 (50.2)
Books	55 (13.2)
Any other source	30 (7.3)

Table 4. Sources of Information about Antioxidants among the study respondents

DISCUSSION

Dental Healthcare professionals play an enormous role in molding the public opinions and beliefs regarding health-related issues and hence, it is crucial that the prescribing fraternity should be well-informed about nutrition and antioxidants present in our diet and its role in maintaining the good oral health.¹²⁻¹³

In the present study, there were an equal number of participants. This was because of both genders are now focused in their clinical practice. Majority (48.3%) of them were in the age group of 20-35 years due to the reason that in the last ten years, so many new dental colleges have been established in India.¹⁴

Various studies have shown the role of antioxidants in the caries prevention, and a study done by Shetty et al.¹⁵ who reported that free radicals in tobacco smoke increase the prevalence of dental caries. Motamayal et al.¹⁶ revealed that there are association between Total Antioxidant Capacity of saliva and dental caries and this may be helpful in caries prevention. In the present study, high knowledge of antioxidants was seen among 69.2% of dental professionals.

Finally, when the dental practitioners were asked from where they got the maximum information regarding antioxidants, it was highlighted that their main source of information was from Internet (50.2%) followed by newspaper(29.3%), which are in contradiction to Patil K et al. whose study reported that majority of graduate(40%) and postgraduate dentists(31.3%) gained their knowledge through journal articles only.¹⁷ However use of books and newspaper was low it may be due to their busy schedule or lack of interest.

A probable limitation in this study is social desirability bias as it describes the tendency of survey respondents to answer questions in a manner that will be viewed favorably by others. However, the researchers aimed to reduce this by assuring the respondents of the confidentiality of their data and incorporating a large sample size.

CONCLUSION

We suggest the organization of various dental educational programmes and evidence based guidelines for prescribing antioxidants in a dental setting.

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In the present study, there were an equal number of participants. This was because of both genders are now focused in their clinical practice. Majority (48.3%) of them were in the age group of 20-35 years due to the reason that in the last ten years, so many new dental colleges have been established in India.¹⁴

Various studies have shown the role of antioxidants in the caries prevention, and a study done by Shetty et al.¹⁵ who reported that free radicals in tobacco smoke increase the prevalence of dental caries. Motamayal et al.¹⁶ revealed that there are association between Total Antioxidant Capacity of saliva and dental caries and this may be helpful in caries prevention. In the present study, high knowledge of antioxidants was seen among 69.2% of dental professionals.

Finally, when the dental practitioners were asked from where they got the maximum information regarding antioxidants, it was highlighted that their main source of information was from Internet (50.2%) followed by newspaper(29.3%), which are in contradiction to Patil K et al. whose study reported that majority of graduate(40%) and postgraduate dentists(31.3%) gained their knowledge through journal articles only.¹⁷ However use of books and newspaper was low it may be due to their busy schedule or lack of interest.

A probable limitation in this study is social desirability bias as it describes the tendency of survey respondents to answer questions in a manner that will be viewed favorably by others. However, the researchers aimed to reduce this by assuring the respondents of the confidentiality of their data and incorporating a large sample size.

CONCLUSION

We suggest the organization of various dental educational programmes and evidence based guidelines for prescribing antioxidants in a dental setting.

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Child Drawing: A Projective Tool for Dental Anxiety Assessment

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INTRODUCTION: Assessment of child's anxiety is important in order to determine the success of dental treatment. Drawing, a nonverbal, self-report, projective and non-invasive technique may prove to be helpful and needs to be explored in order to access anxiety in children requiring dental treatment.

AIM: To investigate the applicability of children's drawings as an indicator to measure their level of anxiety.

MATERIALS & METHOD: A cross-sectional study was conducted in a total of hundred children between age group of 4-6 years. Children were asked to draw dental operatory on A4 sheet and colour it with basic set of 12 colours. The drawing was scored using Child Drawing: Hospital (projective scale) scale and the results were compared with pulse oximeter readings (physiological parameter) and Venham Picture Test scorings.

RESULTS: Child Drawing: Hospital scale scoring had a positive correlation with pulse oximeter reading (involuntary) (p-value = 0.125) and a negative correlation with Venham picture test (p-value = 0.140).

CONCLUSION: Drawing may be statistically significant projective tool significant to assess child anxiety in dental setting.

KEYWORDS: Anxiety, Drawing, Psychology

INTRODUCTION

Monitoring and assessment of anxiety are indispensable to build a positive dental attitude in children in order to deliver effective dental services. The terms "anxiety" and "fear" are inter-related with fear being one of the many variables that contribute to heightened levels of anxiety whereas, anxiety is an excessive and unreasonable negative emotional state, the source of which is ambiguous, unclear, or not immediately present.¹ Anxiety hinders children's coping ability, causes behavioural changes, and encourages negative emotional behavior.²

Anxiety is a subjective component that brings about the physiological change in body which could be measured using pulse oximeter, a non-invasive technique. It helps in real-time recording of physiological parameters such as blood pressure, pulse rate, oxygen saturation, and body temperature.³

Motivating interventions such as information, relaxation, and cognitive coping strategies given preoperatively can minimize children's pre- and postoperative anxiety and increase their cooperation. The ideal measure should be valid, allow for limited cognitive and linguistic skills, and be easy to administer and score in a clinical context. Venham Picture Test

(VPT) is one of the few picture scales that covers all these criteria. However, anxiety scales range in complexity, sensitivity and reliability. Projective techniques are used to measure anxiety which encourage hidden emotions of child to be projected on to a non-threatening object. Drawing is one such projective technique that is used to measure anxiety in a fun way.⁴⁻⁷

Drawing facilitates children's abilities to talk, particularly about those events or concepts they might otherwise find difficult to describe. Unlike other assessment procedures, such as psychometric tests, drawing requires little or no training. For many children, drawing represents a natural activity that is spontaneously and frequently participated in, usually with much enjoyment. Therefore, when applied in the clinical dentistry settings it is likely to reduce the child's anxiety about the situation and the nature of the treatment.⁸

Tracing the history of this method, human figure drawings as assessment tools, have been widely used since as early as the 1920s by Goodenough and later by Koppitz PT et al. to estimate children's expectations of an ideal hospital. In 1999, Child Drawing: Hospital



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(CD:H) scale was developed as a means of measuring the anxiety of hospitalized school-age children. In the field of dentistry, Pond DA (1968) found stories concerned with pain, blood and other signs of aggression in a series of children's drawings collected by a dentist. Sheskin RB et al. (1982) utilized drawings of children in a dental setting as an assessment tool for their anxiety.⁹

This study aims to investigate the applicability of children's drawings as an indicator to measure their level of anxiety compared to pulse oximeter and VPT scale in the dental setting and hence apply for effective and precalculated child behaviour management techniques.

MATERIALS AND METHODS

The present cross-sectional study was carried out over a period of 3 months (August-September 2019) in children who visited the OPD of Department of Paediatric and Preventive Dentistry, within the specified time period. After initial examination, over 300 children were initially recruited. However, 100 children who fulfilled the inclusion criteria and whose parents gave the consent were included in the study.

Inclusion and Exclusion criteria: Children between the age group of 4-6 years who were visiting the department for the first time and required restorative treatment, with complete physical and mental health without any confounding medical history were included. However, children who reported with acute pain that required emergency dental treatment or children suffering from any illness requiring special medical care and who were not interested in drawing were excluded from the study.

Scales used: Three different scales were used in the present study:

1. Pulse oximeter: for measuring the physiological changes like heart rate.

2. Venham Picture (Figure 1): It consists of eight cards with pictures of children in various dental situations. There are two figures on each card, one in which a child appears non-anxious and the other one in which he looks anxious. Each child was asked how they would feel about visiting the dentist and to point out the figure they liked the most. A score of 1 was given for every anxious figure selected and 0 for every non-anxious figure selected. So, a child could score a maximum of 8

scores and a minimum of 0. A score of 4 or more was considered to be above average anxious score.

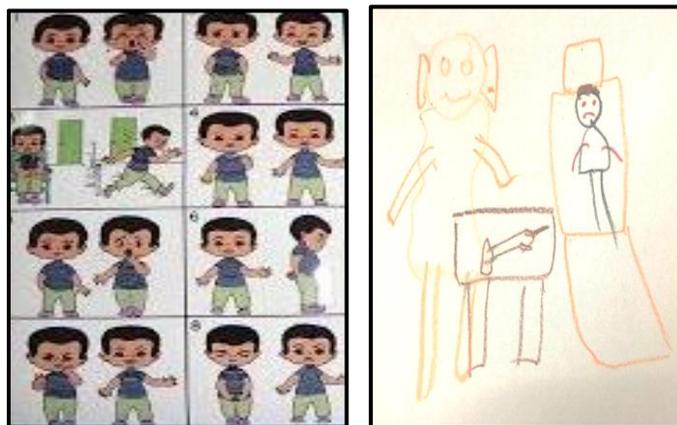


Figure 1. Venham Picture Test (left) and CD:H score interpretation on a child's drawing (right):

Part A: Lying on chair(8), Standing grounded(1), Frown(9), Smiling(1), Colour prominence-Orange(6), No. of colours used: 4(6) Placement of paper-centre(1), Quality of strokes: medium, equal light & dark(5), large & threatening(10).

Part B: Omission-feet & palm, exaggeration: ear, eye, mouth

3. Drawing Method and assessment method:

Children were then instructed to draw a picture of the dental operatory in their own understanding. The scoring of which was carried out according to CD:H Scoring Guide and Rating Scale and the CD:H score sheet. The scoring of drawing is divided into three sections. Part A which contains 14 items: position, action, length, width, and size of a person; eyes and facial expressions, colour predominance, numbers of colours used, use of the paper, placement on the paper, stroke quality, inclusion and size of dental equipment and developmental level. Each item is scored on a scale of 1-10, with 1 indicating the lowest level of anxiety and 10 the highest. [Figure 1 (Part A & B), Annexure 1]

Part B consists of eight items indicating pathological indices. The omission, exaggeration, and de-emphasis of a body part receive five points. Distortion, the omission of two or more body parts, transparency, mixed profile, and shading receive 10 points. If each of these items is not present, a score of 0 is recorded. Part C is a response by the scorer to the child's anxiety as expressed in the picture on a 1-10 scale. A score of 1 indicates coping or low anxiety and a score of 10

indicates disturbance or high anxiety. The total score is determined by adding the totals of parts A, B and C. Level of anxiety based on the total score obtained from the CD:H score sheet was as follows: ≤ 43 : very low stress, 44–83: low stress, 84–129: average stress, 130–167: above average; and 168 and over: very high stress. (Table 1)

SCORE	STRESS LEVEL
≤ 43	Very low stress
44–83	Low stress
84–129	Average stress
130–167	Above average
168 and over	Very high stress

Table 1. Interpretation of CD:H Scoring

The children who fulfilled the inclusion criteria were then subjected to three scales where in the first appointment before the start of the treatment the children were made to sit on dental chair and pulse oximeter was applied. The readings were recorded at regular intervals. While the children still in the dental chair, children were given set of Venham picture test cards and were asked to score their anxiety level accordingly. Later on, after the treatment they were made to sit in waiting room and instructed to draw a picture of the dental operatory in their own understanding. The children were given a blank A4 sheet of paper and a box of twelve basic colours. Parents were allowed to be with them during their drawings. However, the objective of the study was described for the parents and they were instructed not to influence the child respond in any way. There was no time restrictions and the drawings were collected once the child has completed.

RESULTS

A total of 100 children (50 male and 50 females) participated in the study. In the present study, anxiety of children was first observed with pulse oximeter. Reading of 110 and above indicated child to be anxious whereas reading between 70–110 indicated non-anxious child. Based on the reading criteria 26 children were non-anxious and 74 children were anxious. On basis of sex of the child, males showed more anxiety with mean pulse oximeter reading of 124.66 ± 15.29 as compared to females 120.78 ± 16.1 . However, no statistical difference

was observed between them p-value was 0.187 (Figure 2). The pulse oximeter readings indicated that 74% of children were already anxious about their dental treatment as they entered the operatory.

The mean VPT score for children with 4 or more score indicated anxiety. For females whereas mean score was 3.9, it was higher for males 4.3 (Figure 3).

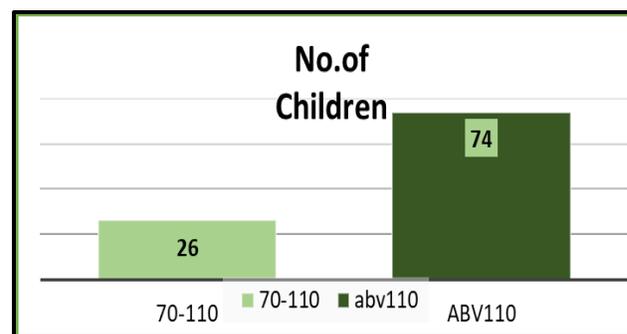


Figure 2. Number of children showing above 110 pulse oximeter reading. ABV: Above

However, on statistical analysis using Chi-square test no significant difference was observed (p value 0.45). This value indicates that though the difference was not significant but half the number of children were anxious before the treatment owing to the figures, they selected from the VPT cards.



Figure 3. Number of children showing 4 or more VPT Score. VPT: Venham Picture Test

On evaluating the drawings, out of 100 children, 84 children (38-females and 46-males) had above average anxiety and 16 children (12-females and 4-males) had anxiety (Figure 4). Chi square value calculated was 4.762 and p value was significant (< 0.029). On basis of

	Pulse Oximeter Reading	VPT Score	CD:H Scale reading
Gender	Mean \pm SD	Mean \pm SD	Mean \pm SD
Female	120.78 \pm 16.15	3.9 \pm 1.33	140.26 \pm 15.36
Male	124.66 \pm 15.29	4.3 \pm .2	143.68 \pm 13.27

Table 2. Mean \pm SD score for all three scales according to gender. VPT: Venham Picture Test, CD:H: Child Drawing: Hospital Score

gender, mean CD:H score was 140.26 \pm 15.36 for females and 143.68 \pm 13.27 for males with above average anxiety (table 3). The Chi square value calculated was 38.45 and p value was 0.168 (not significant). The interpretation of the drawings reveal that about 84% of children had stress indicators in their drawing indicating their above average anxiety level.

There was a negative correlation between VPT and pulse oximeter (-0.140), however, a positive correlation was seen between CD:H score and pulse oximeter(0.125) which implies that CD:H scores are closely associated with physiological parameters i.e. pulse oximeter readings which indicates a relatively comparative anxiety level between both the methods. As the pulse oximeter readings correlates with the physiological parameters like heart rate, blood pressure and respiratory rate, its was considered as a control and its correlation values with the CD:H scale implies that drawing provides a positive medium to indicate the relevant anxiety level of a child (Table 3).

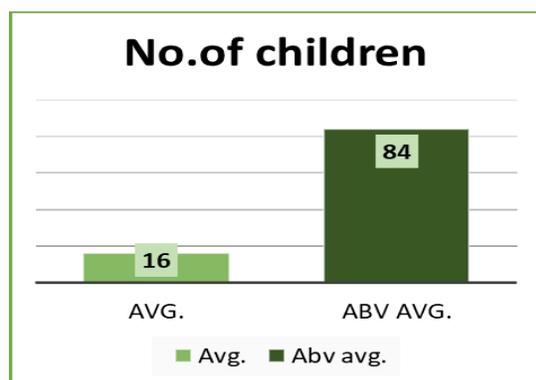


Figure 4. Child Drawing: Hospital Scale-Number of children showing above average score (130-167) AVG: Average, ABV: Above

DISCUSSION

Age has been cited as a determining factor in the contest to anxiety as its seen that younger children display more anxiety than older children.¹ This could be explained by Piaget's theory of cognitive development where an increase in anxiety in children aged between 3 and 6 years is cited as they are in the preoperational stage of development and are not able to think logically. They focus on magical thinking and are less able to distinguish reality from fantasy. As children get older and enter into the concrete operational stage, their cognitive abilities mature. The logical progression may enable children to develop coping behaviours to help deal with the stress thereby reducing anxiety.¹⁰

In the present study pulse rate was used as a reliable indicator to evaluate anxiety level in children. It was used as an objective measure of dental anxiety and it was seen that the mean reading for both the genders was above 110 which indicates an increased level of anxiety in the youngest age group evaluated. The physiological change in the body such as an increase in perspiration, breathing rate, blood pressure, heart rate, and pulse rate, which is primarily due to the release of stress hormones in the blood such as cortisol, adrenaline, and nor-epinephrine could be recorded by the pulse oximeter.^{3,11} According to the study by Rosenberg and Katcher et al. (1976) the anxiety provoking situations alter the physiological functions like Pulse Rate and Blood Pressure.¹² The increase in Pulse Rate and Blood Pressure can be used to assess dental anxiety in children. Studies by Messer JG et al. (1977)¹³ and Beck FM et al. (1981)¹⁴ confirmed that the physiological changes occur in the body as a result of the stress suffered by patients during dental procedures and these physiological changes are very useful for measuring anxiety level in a patient before and after the dental treatment.¹⁵

	Mean	SD	Correlation	Sig
VPT	4.44	0.760	-0.140	0.331
PO	127.66	8.898		
CD:H	146.58	9.546	0.125	0.290
PO	127.34	9.317		

Table 3. Correlation between VPT, CD: H and Pulse oximeter. VPT: Venham Picture Test, CD:H: Child Drawing: Hospital Score

Venham picture test was given by Venham 1979, it is one of the few picture scales that fulfills the required criteria to assess dental anxiety in children, which assesses how negative the child feels. In our study though the number of anxious and non-anxious children were equal the mean value for anxious males (4.3) was comparatively more than females (3.9). When the anxiety rating scores were compared for gender differences, significant differences were not found in the present study. However, some studies have reported higher anxiety for girls but this was not found in our study, where boys were more anxious than girl.¹⁶ To understand a child's internal psychological state projective testing is one strategy that may be use. This strategy is designed to allow the child to respond openly to an ambiguous stimulus to reveal internal conflicts and subconscious distress.¹⁷

Drawing can be used in any setting and for many purposes, such as diagnosis, assessment, research, or the measurement of progress in therapy. It is used as an art therapy and represents a phenomenological approach. It is visual imagery of how children see the world in both its simplicities and its complexities. It is used as projective technique for assessing children's inner world, emotions and interpersonal styles. According to this approach, drawing is not a spontaneous action but rather an intentional process involving projection and introjections by the children. This process can help children express themselves in ways that verbal language cannot and can provide helpful information on their emotional attitudes and well-being.¹⁸

In the present study, a statistically significant CD:H score of the 4–6 year-old children was noticed, which probably indicates an increased level of anxiety in the youngest age group. In fact, for children of 4–6 years of age, drawing can facilitate discussions about traumatic

experiences by providing a link between children's internal thoughts and their perceived reality, by which the young children seek to express themselves and their experiences.¹⁹

The results of our study are in accordance with the result of Clatworthy S et al., who found children's drawing in hospital is a valuable assessment tool to measure the emotional status of hospitalized children.²⁰

According to Mathur J et al. (2017) children requiring specialized behavioral techniques can be identified by the presence of stress markers in their drawings. This nonverbal activity by itself can have an overall positive effect on the behavior displayed in the dental clinic.²¹

Drawing has a large significant effect on children's reports about their presenting problems. The opportunity to draw not only increases the amount of clinically relevant information that children reported, but it also has a positive effect on the overall interaction of the child with the dentist.²²

CONCLUSIONS

Drawing can be used as an efficient tool for determining level of the dental anxiety in young patients. It is easier, familiar and correlates with the physiological parameters.

Limitation of the study: It is time-consuming and does not correlate with other projective scales like VPT, however, better results could be achieved with larger sample size and due to its exploratory nature, further studies are advised.

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ANNEXURE 1: CD:H Scoring sheet

Child's Number _____	
Age _____	Gender _____
PART A	PART B
1. PERSON: POSITION _____	Add 5 points for each
2. ACTION _____	15. OMISSION: 1 PART _____
3. LENGTH OF PERSON _____	16. EXAGGERATION OF A PART _____
4. WIDTH OF PERSON _____	17. DEEMPHASIS OF A PART _____
5. FACIAL EXPRESSION _____	Add 10 points for each
	18. DISTORTION _____
6. EYES _____	19. OMISSION: 2 OR MORE PARTS _____
7. SIZE OF PERSON TO ENVIRONMENT _____	20. TRANSPARENCY _____
8. COLOR: PREDOMINANCE _____	21. MIXED PROFILE _____
9. COLOR: NUMBER USED _____	22. SHADING _____
10. USE OF PAPER _____	TOTAL PART B _____
11. PLACEMENT _____	PART C
12. STROKES: QUALITY _____	Circle the number which most clearly describes the
13. DENTAL EQUIPMENT _____	Gestalt of the picture
14. DEVELOPMENTAL LEVEL _____	
TOTAL PART A _____	1 2 3 4 5 6 7 8 9 10
	TOTAL PART C _____
TOTAL SCORE A _____ + B _____ + C _____ = _____	