Original Article

Sunlight Exposure on Sars-Cov-2 Samples; Descriptive Analysis

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ABSTRACT

OBJECTIVE: *To determine the association of* sunlight exposure and PCR positivity of SARS-COV-2 samples.

METHODOLOGY: This Quasi-Experimental Study was carried out at PAQSJIMS – Gambat, District Khairpur, Sindh, Pakistan. This experiment was conducted during the summer season from April - September 2020 with consecutive sampling techniques. The average temperature of the study during the given period was 41°C. Sample Size was 8 PCR positive Covid-19 Patients (Each sample divided into 12 portions) (6 controls and 6 test samples) and re-tested by PCR. Six control samples were kept in a laboratory environment. In contrast, six were kept in sunlight (each for a differing duration, i.e., 0, 5, 15, 30, 60, and 120 minutes), and the temperature and humidity levels were recorded. The experiment samples underwent a PCR test (along with its time-matched control), and SARS-COV-2 positivity was recorded. Following the experiment, the samples were discarded as per safety regulations.

Both male and female covid-19 patients (PCR positive) aged 18 years and above were included,

Patients enrolled in treatment trials were excluded.

RESULTS: Among the eight samples (each tested in six different batches after exposure to sunlight for varying amounts of time), most, i.e., 45 (93.75%), tested positive for SARS-COV-2. However, there may be a relationship between the length of exposure to sunlight and PCR positivity of the samples since all three samples that tested negative were exposed to sunlight for more at least 30 minutes, all controls (placed in the laboratory and not exposed to sunlight, tested positive).

CONCLUSION: There is no significant association between sunlight exposure and PCR positivity of SARS-COV-2 samples.

KEYWORDS: SARS-COV-2, nCovid-19, Ultraviolet Light, Sunlight PCR & U.V. Light, and Nasopharyngeal Swab.

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INTRODUCTION

Early in December last year, a rather unusual number of patients started presenting with pneumonia resulting from a novel factor in Wuhan, China[1,2]. The novel factor, now known as severe acute respiratory syndrome 2 (SARS-CoV-2)[3], was causing the novel coronavirus disease 2019 (nCovid-19).

After initially declaring an emergency on January 30, 2020, World Health Organization (WHO) on March 11, 2020, later reclassified nCovid-19 as a pandemic, owing to the worryingly high rate of disease spreading worldwide. In the absence of a definitive cure and the unavailability of a vaccine, some say that it is likely that the disease will continue to spread until we achieve herd immunity. Coronavirus able to infect humans (so far), the spread of SARS-CoV-2 is worrying since the reach of its predecessors, i.e., the Middle East respiratory syndrome (MERS-CoV) and severe acute respiratory syndrome (SARS-CoV), entailed death rates as high as 35.5% and 10%, respectively[4].

The remaining four types of coronaviruses have been linked mainly to minor colds and flu. Many believe that the abrupt emergence of SARS-CoV-2 among humans resulted via transmission from animals (supposedly bats or pangolins – confirmatory evidence for either of those is lacking). nCovid-19 contains a group of symptoms that include fever, fatigue, dry cough, aches, and difficulty breathing into severe shortness of breath and possibly death. It has also been reported that many infected individuals are still asymptomatic; this complicates public health efforts to contain the spread of the virus[5,6].

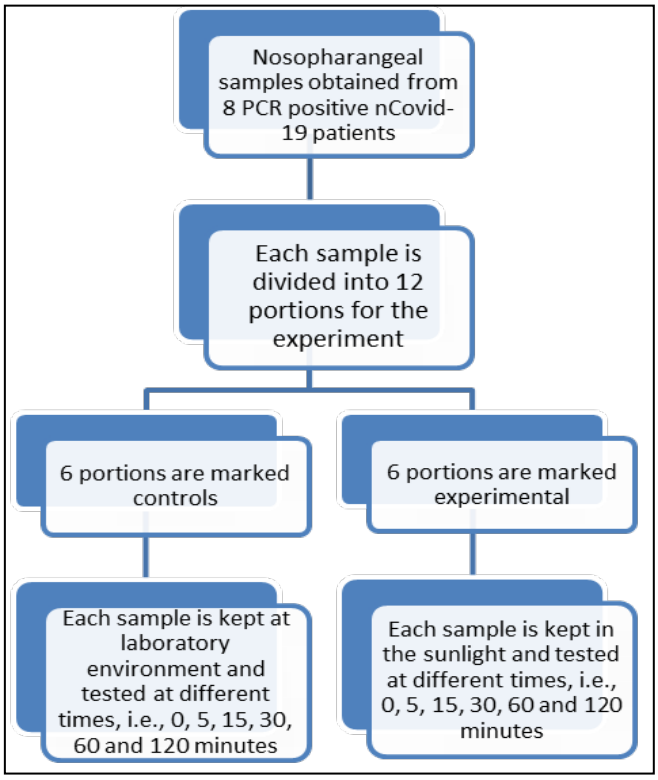
It is believed that ultraviolet light sources cause irreparable damage to nucleic acids (RNA / DNA). Because of how it works, the ultraviolet process selectively makes viruses, bacteria, and parasites unable to reproduce[7]. In addition to proving its effectiveness in reducing infectious titers in various viruses, bacteria, and parasites[8], the process of riboflavin and ultraviolet radiation has specifically demonstrated a high level of effectiveness against the Coronavirus that causes respiratory syndrome in the Middle East[9].

Thus, in addition to the time and efforts dedicated

towards conventional treatment and prevention approaches (such as vaccine development), it may be wise to explore the more accessible alternatives of limiting the spread of the disease. Climatic conditions (temperature, humidity, and sunlight) may play a more vital role than we currently understand; thus, this research hopes to explore a potent climatic and environmental factor, i.e., sunlight, and its impact on the PCR positivity SARS-COV-2 samples.

METHODOLOGY

This Quasi-Experimental Study was conducted at Pir Abdul Qadir Shah Jilani Institute of Medical Sciences – Gambat, District Khairpur, Sindh, Pakistan. This experiment was conducted during the summer season from April - September 2020 with consecutive sampling techniques. The average temperature of the study during the given study period was 41°C.



The sample size was 8 PCR positive Covid-19 Patients (Each sample divided into 12 portions). Both male and female covid-19 patients (PCR positive) aged 18 years and above were included, Patients enrolled in treatment trials were excluded.

Methods & Apparatus: Fresh samples of a nasopharyngeal swab from positive (ascertained by PCR) for SARS-CoV-2 Coronavirus for the research study. All the measures to handle the bio-hazardous material were be followed as per institutional protocol and in a controlled environment. I.R.B. permission was obtained before the start of study from Pir Syed Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat (PSAQSJ IMSG) Khairpur Mirs 66070, Pakistan Vide Letter No. PAQSJIMS/15-D/274, Dated: 03/4/2020.

RESULTS

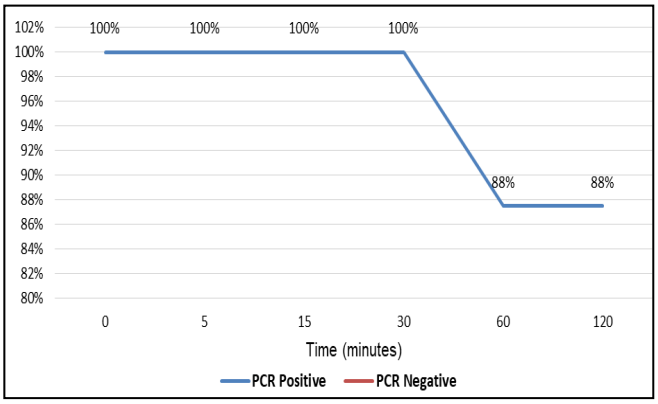
Among the eight samples (each tested in six different batches after exposure to sunlight for varying amounts of time), most, i.e., 45 (93.75%), tested positive for SARS-COV-2. However, there may be a relationship between the length of exposure to sunlight and PCR positivity of the samples since all three samples that tested negative were exposed to sunlight for more than 30 minutes, all controls (placed in the laboratory and not exposed to sunlight, tested positive).

TABLE I: THE TABLE DEPICTS OUTCOMES OF THE POSITIVITY OF THE PCR SAMPLES WHEN EXPOSED TO SUNLIGHT FOR DIFFERENT TIMES

Sample	Time (Minutes)											
	00		05		15		30		60		120	
	E	C	E	C	E	C	E	C	E	C	E	C
1	+	+	+	+	+	+	+	+	+	+	+	+
2	+	+	+	+	+	+	+	+	+	+	+	+
3	+	+	+	+	+	+	+	+	-	+	+	+
4	+	+	+	+	+	+	+	+	+	+	+	+
5	+	+	+	+	+	+	+	+	+	+	+	+
6	+	+	+	+	+	+	+	+	+	+	+	-
7	+	+	+	+	+	+	+	+	+	+	+	+
8	+	+	+	+	+	+	+	+	+	+	-	+

"E" refers to the Experiment group, while C refers to the Control group. + signifies the positive PCR result while – depicts a negative PCR result.

CHART I: EXPERIMENTAL SAMPLES



DISCUSSION

There are many speculations regarding the effect of sunlight on the SARS-COV-2, most stemming from previous experiments on different viruses. However, little direct evidence-based literature is available regarding its impact on the PCR positivity of SARS-COV-2. It reported that the body of all envelop viruses comprises a lipid-protein shell that may easily be damaged at temperatures above 56 degrees centigrade. Damage resulting from exposure to sodium ions and zinc derivatives is also reported[10,11].
Theories have surfaced, suggesting that ultraviolet (U.V.) light may inactivate viruses by causing cross-linking of the nucleotides in the viral genome. However, the planned exposure to U.V. rays of sunlight for the SARS-COV-2 samples in this research did not exterminate the virus. The discrepancy between the theory and actual results may be attributed to the fact that the sunlight comprises a tiny proportion of U.V.C. light that is believed to destroy the viruses and a significant portion of the sunlight composed of the milder UVB and the relatively safer UVA light that may not disintegrate the virus or destroy it[12,13].
There is also much unproven talk regarding how the summer and higher temperatures may diminish the spread of SARS-COV-2, as it may not live longer on surfaces in the summer temperatures. Still, this speculation was put to rest in this research. Since, in most instances, the relatively milder temperatures in the laboratory (for the controls) and the high environmental temperature on the day of the experiment in the sunlight (average 41 degrees centigrade) yielded positive samples ever after 120 minutes of exposure to the said temperature[14,15].
The samples that did turn out to be negative following the exposure to sunlight had an exposure of at least 60 minutes of sunlight each. Though it may be safe for inanimate objects to be placed in the sunlight for durations exceeding 60 minutes, it is not safe for humans. Also, indoor use of U.V. lights (especially U.V.C.) lights is not recommended since U.V.C. light can cause sunburn in less than a minute, and both UVB and U.V.C. are implicated in cases of skin cancer. Thus the lights can only be safely used to disinfect inanimate objects (such as floors in hospitals and banknotes in banks)[16,17].

CONCLUSION

Sunlight seemingly casts no significant effect on the PCR positivity of SARS COV2 samples. Regardless of the extent of time the samples are exposed to sunlight, the positivity does not impact. Thus, the belief that sunlight nullifies the virus or renders it ineffective may be disregarded. Though U.V. light for disinfection is being practiced internationally, minimal success may be achieved by exposure to direct sunlight. It is important to note that even the World Health Organization has stressed that sunlight does not prevent Coronavirus and can be highly damaging if used incorrectly.

Ethical Permission: Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences Gambat Khairpur Mirs ERC letter No. PAQSJIMS/15-D/274, Dated 03-04-2020.

Conflict of Interest: There is no conflict of interest among the authors

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DATA SHARING STATEMENT: The data supporting this study's findings are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions

AUTHOR CONTRIBUTIONS

Bhatti S:	Conception, design
Kumar P:	Design, revision
Ali W:	Data handling
Hassan SM:	Data analysis
Bhatti SK:	Manuscript writing
Ahuja K:	Statistical analysis

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