بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة /صفاء محمود عبد الشافى

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لايوجد

Detection of Early Cardiac Affection in Post-COVID Syndrome Using Heart Rate Variability and 2D Global Longitudinal Strain Echocardiographic Assessment of the Left Ventricle

Thesis

Submitted For Partial Fulfilment of
Master's Degree in Cardiology

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2022

Acknowledgment

First and foremost, I feel always indebted to **ALLAH,** *the Most Kind and Most Merciful.*

I'd like to express my respectful thanks and profound gratitude to **Prof. Zainab Abdel Salam Fahmy Mahmoud,** *Professor of Cardiology - Faculty of Medicine- Ain Shams University for her keen guidance, kind supervision, valuable advice and continuous encouragement, which made possible the completion of this work.*

I am also delighted to express my deepest gratitude and thanks to **Dr. Amira Ahmed Nour El Din,** *Lecturer of Cardiology, Faculty of Medicine, Ain Shams University, for her kind care, continuous supervision, valuable instructions, constant help and great assistance throughout this work.*

I would like to express my hearty thanks to all my family for their support till this work was completed.

Last but not least my sincere thanks and appreciation to all patients participated in this study.

Mirna Bassem Elzarif Fouad

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List of Abbreviations

Abb.	Full term
2D STE	*Speckle tracking echocardiography*
ACE	*Angiotensin converting enzyme*
ACE2	*Angiotensin converting enzyme 2*
ALI	*Acute lung injury*
AngII	*Angiotensin II*
ANS	*Autonomic nervous system*
ARDS	*Acute respiratory distress syndrome*
AUC	*Area under curve*
BAME	*Black Asian and Minority Ethnic*
CMR	*Cardiac magnetic resonance imaging*
COVID-19	*Coronavirus disease 2019*
CV	*Cardiovascular*
DSN	*Dysautonomia*
DSN	*Dysfunction or dysautonomia*
DTI	*Doppler tissue imaging*
EDD	*End-diastolic diameter*
EF	*Ejection fraction*
ESD	*End-systolic diameter*
GLS	*Global longitudinal strain*
HF	*High-frequency component*
HIV	*Human immune deficiency virus*
HRV	*Heart rate variability*
HS	*Highly significant*
IQR	*Inter-quartile range*
LF	*Low frequency component*
LGE	*Late gadolinium enhancement*
LV	*Left ventricular*
MAPSE	*Mitral Annular Plane Systolic Excursion*
MCAS	*Mast cell activation syndrome*

List of Abbreviations *(Cont...)*

Abb.	Full term
MRI	*Magnetic resonance imaging*
NIH	*National Institutes of Health*
NIV	*Non-invasive ventilation*
NS	*Nonsignificant*
PC	*Pro-inflammatory cytokines*
POTS	*Postural orthostatic tachycardia syndrome*
PSNS	*Parasympathetic nervous system*
PW	*Pulsed-wave*
ROC	*Receiver operating characteristic curve*
ROI	*Region-of-interest*
S	*Significant*
SDNN	*Standard deviation of N-N intervals*
SEMA3	*Class 3 semaphorin*
SNS	*Sympathetic nervous system*
SR	*Strain rate*
TDI	*Tissue Doppler imaging*

INTRODUCTION

Coronavirus disease 2019 (COVID-19), the viral illness caused by the novel coronavirus SARS-CoV-2 has resulted in significant morbidity and mortality across the world since the first cases were identified in Wuhan, China, in December 2019. Although most of the patients who had COVID-19 are asymptomatic or have mild to moderate disease, approximately 5% to 8% of the infected patients develop hypoxia, bilateral lung infiltrates, decreased lung compliance requiring non-invasive ventilation (NIV) or mechanical ventilatory support ***(Halpin et al., 2021; Li and Ma, 2020)*** .

The previous epidemics of SARS-CoV and MERS-CoV left individuals who recovered from these viral illnesses with persistent symptoms of severe fatigue, decreased quality of life (QOL), persistent shortness of breath, and behavioral health problems that resulted in a significant burden on local healthcare systems where the epidemics occurred. Similarly, a variety of clinical symptoms termed post-acute COVID-19 syndrome has been described in a proportion of patients who recovered from COVID-19 despite biochemical evidence that the replication of SARS CoV 2 ceases to exist after four weeks after the initial infection (based on the sampling of viral isolates from the respiratory tract and not the nasopharyngeal/ oropharyngeal specimen). The presence of lingering post COVID symptoms was evident even in absence of severe symptoms or hospitalization ***(Chippa et al., 2022)***.

Aim of the Work

To estimate the two-dimensional left ventricular global longitudinal strain (LVGLS) by speckle tracking echocardiography (2D STE) and heart rate variability (HRV) in post-COVID patients after mild to moderate acute SARS COV-2 infection.

Chapter 1

POST-ACUTE COVID 19 SYNDROME

1) Acute COVID-19 illness severity grading

Patients with SARS-CoV-2 infection can experience a range of clinical manifestations, from no symptoms to critical illness.

In general, adults with SARS-CoV-2 can be grouped into the following severity of illness categories.

Asymptomatic or pre-symptomatic infection:

Individuals who test positive for SARS-CoV-2 using a virologic test (i.e. nucleic acid amplification test or antigen test) but have no symptoms that are consistent with COVID-19.

Mild illness:

Individuals who have any of the various signs and symptoms of COVID-19 but who don't have shortness of breath, dyspnea or abnormal chest imaging.

Moderate illness:

Individuals who show evidence of lower respiratory disease during clinical assessment or imaging and have an oxygen > 94% on room air.