



Correspondence

COVID-19 pandemic induced stress cardiomyopathy: A literature review



Letter to Editor,

Takotsubo syndrome (TTS, takotsubo cardiomyopathy, stress cardiomyopathy, or “broken heart syndrome”) is a sudden transient, reversible cardiac dysfunction that can cause symptoms like those of a heart failure characterized by acute regional and/or global left ventricular dysfunction usually in the setting of physical or emotional stress [1]. According to the World Health Organization, the current ongoing COVID-19 pandemic has infected over 20,439,814 people and has led to approximately 744,385 deaths worldwide as on 13th August 2020 [2]. A high burden of acute cardiac injury (19.7–27.8%), leading to significantly high mortality, has been reported in these patients [3,4]. TTS is usually more prevalent amongst postmenopausal women but in one of the previous study on TTS in COVID-19 positive patients it was observed that both the gender are equally affected [5]. First case of TTS was reported on 1990 [6]. This is the first ever truly major pandemic in history since 1990. It is of no surprise that incidence of TTS is likely to increase in times of such pandemic due to increased anxiety and stress that has long been associated with development of TTS [7]. COVID-19 has not only affected the physical health, but also triggered social, economic, and psychological distress.

In case reports by Chadha et al [8] and Sofia et al. [9] during hospitalization both the patients presented with chest pain and anxiety due to COVID-19 pandemic and both of them were Postmenopausal women with mean age of 82 years. One of them was hypertensive. Cardiac imaging showed reduced mean Ejection Fraction of 35%, and both ECG and Echocardiography were consistent with the TTS. One of the patient had elevated Troponin level. Both the patients recovered and were successfully discharged (Table 1).

A recent cohort study reported that incidence of Stress cardiomyopathy has increased in COVID-19 pandemic compared to pre-pandemic (7–8% vs 1–2%). All the patients in the cohort were negative for rt-pCR for COVID-19 [10]. That TTS may also present later after recovery COVID-19 infection as delayed sequelae can't be ruled out for sure as one of the recent study reported that 78% of recovered COVID-19 patients had positive cardiac MRI findings [11]. Moreover, TTS can also present in previously treated COVID-19 patients as Posttraumatic stress disorder or surge in number of TTS cases is plausible during or after ongoing pandemic due to possibly emergence of anxiety cases or as a manifestation of Posttraumatic stress disorder [12]. Study by Jabri A. et al also reported that TTS patients during pandemic had significantly longer median hospital stays than pre-pandemic (8 days vs 4–5 days) [10]. Study also showed that incidence of TTS in male (35%) was higher compared to Takotsubo Cohort [10]. Study by

Desai HD et al observed that Males had predominantly physical stress compared to emotional triggers as possible causative etiology [5]. Furthermore, Jabri A. et al also reported that pandemic induced stress too may be an important mechanism in development of TTS. However, study has not clearly mentioned if TTS patients had a proven history of stress or anxiety due to COVID-19 pandemic. In our previous study we observed that one patient presented with anxiety during hospital admission, while 2 had psychiatric illness as co-morbidity [5]. Emotional factors such as contact with hospitalized family member, worry about socioeconomic costs, nightmares, intrusive thoughts of COVID-19 related morbidity all may lead to central sympathetic hyperactivation and may contribute in development of Stress syndrome/Takotsubo Syndrome. According to one survey, most common concern of fear of the COVID-19 was health of others (parents, loved one and grandparents), followed by healthcare collapse, breakdown of economy, mass panic, personal health, societal breakdown, personal economy [13]. It is observed that patients of TTS with COVID-19 have higher mortality compare to Non COVID-19 TTS patients [5].

We recommend that Patients who present with Takotsubo like syndrome should undergo nasopharyngeal rTPCR and/or antibody testing for COVID-19 as there is a certain likelihood in this pandemic era.

References

- [1] C. Templin, J.R. Ghadri, J. Diekmann, L.C. Napp, D.R. Bataiosu, M. Jaguszewski, et al. Clinical features and outcomes of takotsubo (stress) cardiomyopathy, *N. Engl. J. Med.* 373 (2015) 929–938.
- [2] World Health Organisation Coronavirus Disease (COVID-19) Dashboard, Available from: <https://covid19.who.int/>.
- [3] S. Shi, M. Qin, B. Shen, Y. Cai, T. Liu, F. Yang, et al, Association of cardiac injury with mortality in hospitalized patients with COVID-19 in Wuhan, China, *JAMA Cardiol.* (2020).
- [4] T. Guo, Y. Fan, M. Chen, X. Wu, L. Zhang, T. He, et al, Cardiovascular implications of fatal outcomes of patients with coronavirus disease 2019 (COVID-19), *JAMA Cardiol.* (2020).
- [5] H. Desai, D. Jadeja, K. Sharma, et al., Takotsubo Syndrome a rare entity in patients with COVID-19: an updated review of case-reports and case-series. *Int. J. Cardiol. Heart Vascul.*, doi: 10.1016/j.ijcha.2020.100604.
- [6] H. Sato, H. Tateishi, T. Uchida, et al., Takotsubo type cardiomyopathy due to multivessel spasm, in: K. Kodama, K. Haze, M. Hon, (Eds.), *Clinical aspect of myocardial injury: from ischemia to heart failure*, Kagaku Hyoronsha; Tokyo, 1990. pp. 56–64 (in Japanese).
- [7] J.-R. Ghadri, I.S. Wittstein, A. Prasad, et al, International expert consensus document on Takotsubo syndrome (Part I): clinical characteristics, diagnostic criteria, and pathophysiology, *Eur Heart J.* 39 (22) (2018) 2032–2046, <https://doi.org/10.1093/eurheartj/ehy076>.
- [8] S. Chadha, 'COVID-19 pandemic' anxiety-induced Takotsubo cardiomyopathy, *QJM* 113 (7) (2020) 488–490, <https://doi.org/10.1093/qjmed/hcaa135>.
- [9] S. Giannitsi, P. Tsiniyov, L.E. Poulimenos, et al, [Case Report] Stress induced (Takotsubo) cardiomyopathy triggered by the COVID-19 pandemic, *Exp. Ther. Med.* 20 (3) (2020) 2812–2814, <https://doi.org/10.3892/etm.2020.8968>.
- [10] A. Jabri, A. Kalra, A. Kumar, et al., Incidence of stress cardiomyopathy during the coronavirus disease 2019 pandemic, *JAMA Network Open*, doi:10.1001/jamanetworkopen.2020.14780.

Table 1
 "Baseline clinical and laboratory characteristics, clinical outcome in patients of COVID-19 pandemic induced Stress Cardiomyopathy" (Abbreviations: PMH: Past Medical History ; HTN: Hypertension ; LV: Left Ventricle ;ECG: Electrocardiogram ; HPA: Hypothalamic-Pituitary-Adrenal ; TC: Takotsubo Cardiomyopathy ; ACE: Angiotensin Converting Enzyme).

Author	Country	Age/ Sex	Comorbidities/ PMH	Clinical Features and Medical Illness during Hospitalization	Covid- 19	Ejection Fraction LV (%)	ECG findings	Echocardiography/ Ventriculography Findings	Troponin- I/T (pg/ ml)	Mechanism	Improvement/Outcome	Medical Management
Chadha	USA	85/F	N/A	Sudden onset substernal chest pain Anxiety because of Corona Pandemic	-ve	35	Septal q ST pattern in VI-V3	Basal hyperkinesis Apical ballooning	112 (cTnT)	catecholamine induced myocardial stunning, coronary ar- tery spasm, plaque rupture and microvascular dysfunction have been suggested. acute psychological or physical stress mediated via the sympathetic-adrenal- medulla axis with catecholamine release in the adrenal medulla and the HPA axis with consecutive cortisol release from the adrenal cortex may act as a trigger for TC	Discharged & improvement with resolution of symptoms and good haemodynamic compensation	-
Sofia	London	79/F	Arterial HTN	Acute chest pain Anxiety because of Corona Pandemic	-ve	35	Diffuse ST segment elevation	Severe hypokinesia in mid apical segment. Hyperdynamic basal segment.	2,950 (cTnT)		Improvement of dyspnea & discharged from the hospital.	ACE inhibitors, beta blockers, statins

- [11] V. Puntmann, L. Carerj, I. Wieters, et al., Outcomes of cardiovascular magnetic resonance imaging in patients recently recovered from coronavirus disease 2019 (COVID-19), *JAMA Cardiol.*, doi:10.1001/jamacardio.2020.355.
- [12] C. Delmas, O. Lairez, E. Mulin, T. Delmas, N. Boudou, N. Dumonteil, C. Biendel-Picquet, J. Roncalli, M. Elbaz, M. Galinier, D. Carrié, Anxiodepressive disorders and chronic psychological stress are associated with Tako-Tsubo cardiomyopathy—new physiopathological hypothesis, *Circ. J.* 77 (2013) 175–180.
- [13] G. Martens, L. Gerritsen, S. Duijndam, E. Saleminck, I. Engelhard, et al., Dear of Corona Virus (COVID-19): predictors in an online study conducted in March 2020, *J. Anxiety Disord.*, <https://doi.org/10.1016/j.janxdis.2020.102258>.

Hardik D. Desai^a
 Kamal Sharma^b
 Dhigishaba M. Jadeja^{a,*}
 Harshil M. Desai^c
 Pratiksha Moliya^d

^a Graduate Medical Doctor, Gujarat Adani Institute of Medical Sciences, Affiliated to K.S.K.V University, Bhuj, India, 370001

^b Associate Professor of Cardiology, Department of Cardiology, U.N. Mehta Institute of Cardiology and Research Center, Affiliated to B.J Medical College, Ahmedabad, India

^c Resident physician, Department of Respiratory Medicine, B J Medical College, Affiliated to Gujarat University, Ahmedabad, India

^d Graduate Medical Doctor, Shri M.P Shah Medical College, Jamnagar, India

* Corresponding author.

E-mail address: dhigishabajadeja@gmail.com (D.M. Jadeja)

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