PAKISTAN JOURNAL OF Cardiovascular Intervention

OPEN ACCESS

ORIGINAL ARTICLE

Mortality Pattern in STEMI patients treated with Primary PCI during COVID-19 era at Manchester Heart Centre

Abid Ullah[1,2], Farzin Fath-Ordoubadi[2], Magdi El-Omar[2], Douglas Fraser[2] & Nadim Malik[2]

[1]Peshawar Institute of Cardiology, Peshawar, Pakistan.
[2]Manchester University NHS Foundation Trust, UK.

Citation:
Ullah A, Fath-Ordoubadi F, El-Omar M, Fraser D, Malik N. Mortality Pattern in STEMI patients treated with Primary PCI during COVID-19 era at Manchester Heart Centre. PJCVI. 2023; 3(2): 26-33

Corresponding Author Email:
draabed@yahoo.com

DOI: 10.58889/PJCVI.5.26.33

Funding:
This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflicts of Interests:
The authors have declared that no competing interests exist.

Received 04/10/2023
Accepted 14/11/2023
First Published 01/12/2023

Abstract

Background: The COVID-19 pandemic dramatically transformed the healthcare provision in the United Kingdom as the National Health Service (NHS) adopted to deal with the unexpected health emergency. Many well-established systems to deal with known acute conditions had to be adopted so that available resources can be utilized in the best possible efficient way. As with all regions with the UK, the greater Manchester cardiac services dealing with acute STEMI and providing primary PCI were reorganized with specific guidelines and clear pathways put in place, this led to significant change in the long-standing clinical practice for the acute management of PPCI.

Methodology: The effects of these changes were assessed by observing the overall mortality during the 3 months of strict lockdown introduced in the UK to contain the spread of COVID-19 and then comparing this with the corresponding 3 months in the preceding year.

Results: In this study we have highlighted the impact of COVID-19 pandemic on STEMI patients who underwent PPCIs. In this study, a total of 262 patients in both periods (March-June 2019) and (March-June 2020) were treated for PPCI. There were 15 mortalities in both periods. Among them majority were males (86.7%) while (13.3%) were females.

Conclusion: Although the mortality was high (53.3%) during the COVID-19 period as compared to 2019 (47.7%), there does not appear to be any causative/confounding relationship with the COVID-19 pandemic itself.

Keywords

COVID-19, Primary PCI, Mortality, STEMI

Published by Pakistan Society of Interventional Cardiology

Introduction

The routine hospital services including cardiac catheterisation procedures have been reorganized in order to tackle the COVID-19 pandemic situation and increase the hospital capacity for COVID-19 patients and minimize the risk of cross-infection. This has resulted in the cancellation of some elective procedures and reduced access of patients to other healthcare associated procedures.

The phenomenon of "lock down" has been implemented in different countries in order the minimize the spread of the virus which might have resulted in the delay of provision of immediate care to the patient due to the fear of COVID-19 contraction in hospitals and resulted in the reduction of cardiovascular admissions[1,2,3].

Those countries which were severely affected by COVID-19, faced noteworthy reduction in the number of Acute Coronary Syndrome (ACS) patients in the emergency department and resultantly a decrease in relevant cardiac procedures such as primary percutaneous coronary intervention (PPCI)[4] and reperfusion strategies[5]. Until now, the actual impact of COVID-19 situation on the patient outcomes presented with ST-segment elevation myocardial infarction (STEMI) who underwent primary PCI is still unknown.

Acute Myocardial infarction, and particularly STEMI makes a substantial proportion of acute medical emergencies leading to significant mortality and morbidity[6,7]. Primary Percutaneous Coronary Intervention (PPCI) is the established preferred management for STEMI and has led to remarkable improvement in the immediate and long-term outcomes of patients suffering from acute STEMI[8,9,10].

In Greater Manchester, the PPCI service is provided 24/7 by the two large tertiary cardiothoracic centres, Manchester Heart centre at the Manchester Royal Infirmary and North West heart centre at the University Hospital of South Manchester. During the COVID-19 Pandemic, there was an acute need for reorganization of medical services in order to deal with the unprecedent demands on the emergency and hospital services. The available logistical and human resources had to be reshaped to deal with the pandemic as well as maintain an effective PPCI service. Following extensive deliberations, an amended pathway for dealing with PPCI was agreed upon (GMPPCI pathway, ref1).

The aim of this study was to explore the mortality of patients presenting with acute MI to the Primary PCI service in Manchester Heart Centre. We have tried to compare the results with the corresponding period in the preceding year.

Methodology

This retrospective study was conducted to explore the mortalities of patients presented with STEMI to the primary PCI service at Manchester Heart Centre. Data of 262 patients was collected which were presented with STEMI between time period of (March to June 2019 and March to June 2020) at Manchester Heart Centre.

Data was analysed using Statistical Package of Social Sciences (SPSS) version 26. The frequency and percentage of male and female patients were determined between the time period of (March to June 2019) and (March to June 2020). Similarly, the frequency and percentage of all the mortalities were calculated that occurred between 2019 and 2020 in the patients presented with STEMI.

The Baseline characteristics of mortalities were estimated that took place between 2019 and 2020 including mean and standard deviation of age, Charlson score and Death delay. Furthermore, baseline characteristics of mortalities including frequency and percentages of gender, out of hospital cardiac care, cardiogenic shock at presentation, Infarct territory, Charlson score, Prior coronary Revascularization, Troponin score, those who underwent successful PCI, those who had bystander disease, thrombus presence, Death delay and late presentation. The comorbidities were also analysed and compared for the both the years i.e., 2019 and 2020. The LV function of both

years (2019 and 2020) were also compared in the documented mortalities.

Results

In this study a total of 262 STEMI patients were included during the mentioned time period (March to June 2019 and March to June 2020) in UK. All these patients were treated with PPCIs. Among them, in 2019 over a 10 week's period (March to June 2019) there were 151 PPCIs, with 110 (73%) males and 41 (27%) females. While in 2020 (March to June 2020) the total number of patients were 111, with 89 (89%) males and 22 (11%) were females (Table 1).

Table 1: Demographics of STEMI patients in 2019 and 2020.

Characteristics	March to June 2019	March to June 2020
Male	110 (73%)	89 (89%)
Female	41 (27%)	22 (11%)

Out of 262 patients in both periods (March to June 2019 and March to June 2020) (Figure 1), there were 15 (7 and 8) mortalities (Figure 2). Among them majority were male (86.7%). The youngest mortality in this study was 49 years of age and the oldest was 91 years. The majority of mortalities were occurred in age group of 71-75 years. The mean age of mortalities was 71.33 years. The baseline as well as the clinical characteristics of the mortalities is illustrated in table 2.

Table 2: Baseline characteristic of mortalities in 2019 and 2020.

Characteristics	Mean ± Std. Dev
Age	71.33 ± 10.874
Charlson Score	13.20 ± 9.283
Death Delay	5.27 ± 5.077

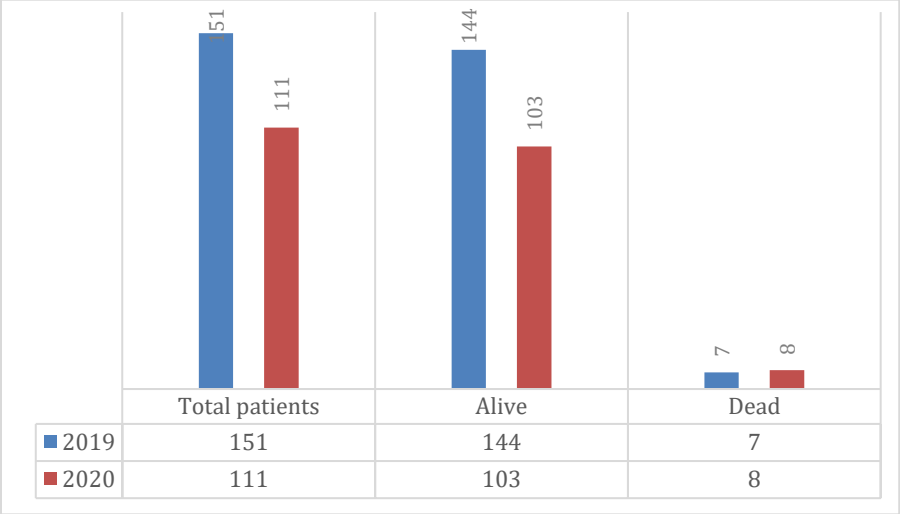

Figure 1: Total number of patients with STEMI and number of mortalities in both periods (2019 & 2020).

.

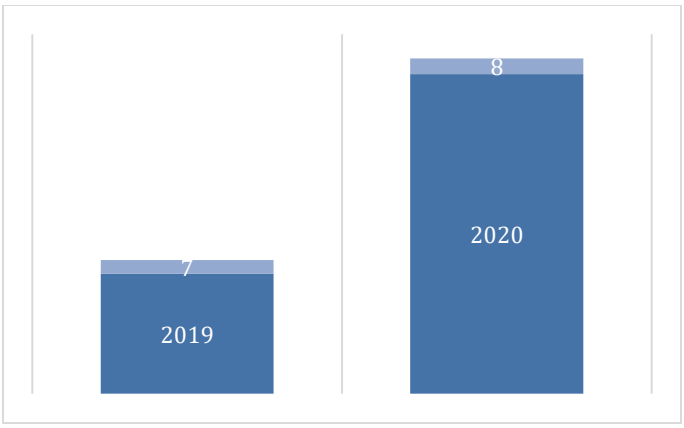

Figure 2: Comparative mortality over 10 week's period in 2 consecutive years (2019 & 2020).

In light of comparison with the corresponding periods, in 2019 (March to June 2019), there were 7 (46.6%) mortalities with mean age of 74 years. Out of 7 mortalities 3 (42.9%) had presented after an out of hospital cardiac arrest (OOHCA) and 3 (42.9%) had cardiac arrest during PCI procedure. The cardiogenic shock was documented in 3(42.9 %) patients on presentation. However, the Charlson score ranged from 6-30 and the prior coronary revascularization history was found in one (14.3%) patient in the form of PCI. Out of 7 patients had checked the troponin, this ranged from 1000-12000. In term of infract territory, the evidence of anterior infract was found in 2 (28.6%) patients, anterolateral infarct 2 (28.6%), one (14.3%) had interior one (14.3%) had lateral and one (14.3%) had Inferior infarct. Thrombus was present in 3 (42.9%), and bystander disease was found in 3 (42.9%) patients. Successful PPCIs were done in 4 (57.1%) patients. In terms of death delay, 3 (42.9%) patients had died on same day of procedure, one (14.3%) patient survived for 8 days, one (14.3%) had survived for 10 days, one (14.3%) for 11 days and one (14.3%) had survived for 14 days respectively.

While, in 2020 (March to June 2020), there were total 8 (53.3%) mortalities occurred, with mean of 69 years. Out of 8 (53.3%), 3 (37.5%) had presented after an OOHCA, one (12.5%) had in-hospital cardiac arrest and one (12.5) had peri-procedure cardiac arrest. The cardiogenic shock was documented in 3(37.5 %) on presentation. The history of prior coronary revascularization in the form of PCI was found in 3 (37.5) patients. The Charlson score ranged from 0-31 with a mean of 10.8. Of 8 (53.3%) 7 (87.5%) had evidence of anterior infarct while one (12.5%) had posterior infarct. Troponin was checked for 7 (87.5%), this ranged from 204-28000.

However, there were 3 (37.5%) COVID-19 suspected patients were treated for STEMI and procedure was done in dedicated lab. PCR was done in 7 (87.5%) patients with negative results. There were bystander disease and thrombus were found in 3 (37.5%) patients. Out of 8 there was only one patient referred to surgery. Successful PPCI was performed in all patients. In terms of death delay, one (12.5%) patient had died on same day of procedure, 3 (37.5%) patients survived for 1 day, one (12.5%) had survived for 6 days, and one (12.5%) had 7 days respectively. In overall these mortalities 7 (87.5%) were presented for PPCI within 2 hours and only one patient was presented late to the hospital. The baseline and clinical presentations of mortalities in both periods are illustrated in table 3.

Table 3: Baseline and clinical characteristics of mortalities in 2019 2020.

Characteristics		**March to June 2019**	**March to June 2020**
		n (%)	**n (%)**
Gender	Male	6 (85.7)	7 (87.5)
	Female	1(14.3)	1 (12.5)
Out of hospital cardiac care	During PCI	3 (42.9)	0

	Pre-procedure	0	1 (12.5)
	In-hospital	0	1 (12.5)
	Yes	3 (42.9)	3 (37.5)
	No	1 (14.3)	3 (37.5)
Cardiogenic shock at presentation	Yes	3 (42.9)	3 (37.5)
	No	4 (57.1)	5 (62.5)
Infarct Territory	Anterior	2 (28.6)	7 (87.5)
	Anterolateral	2 (28.6)	0
	Inferior	1 (14.3)	0
	Lateral	2 (28.6)	0
	Posterior	0	1 (12.5)
Charlson score	0	0	1 (12.5)
	5	0	2 (25)
	6	1 (14.3)	1 (14.3)
	9	1 (14.3)	0
	11	1 (14.3)	2 (25)
	13	1 (14.3)	0
	18	1 (14.3)	1 (12.5)
	24	1 (14.3)	0
	30	1 (14.3)	0
	31	0	1 (12.5)
Prior coronary Revascularization	Yes	1 (14.3)	3 (37.5)
	No	6 (85.7)	5 (62.5)
Troponin Score	1000	1 (14.3)	0
	1100	1 (14.3)	0
	12000	1 (14.3)	0
	6000	1 (14.3)	0
	6500	1 (14.3)	0
	Not done	2 (28.6)	1 (12.5)
	204	0	1 (12.5)
	258	0	1 (12.5)
	1261	0	1 (12.5)
	1300	0	1 (12.5)
	28000	0	1 (12.5)
	5500	0	1 (12.5)
	17800	0	1 (12.5)
Successful PPCI performed	Yes	4 (57.1)	8 (100)
	No	3 (42.9)	0
Bystander disease	Yes	3 (42.9)	4 (50)
	No	4 (57.1)	4 (50)
Thrombus present	Yes	3 (42.9)	0
	No	4 (57.1)	9
Death delay	0	3 (42.9)	0
	1	0	1 (37.5)
	6	0	3 (37.5)
	7	0	7 (12.5)

	8	1 (14.3)	1 (14.3)
	10	1 (14.3)	1 (14.3)
	11	1 (14.3)	1 (14.3)
	14	1 (14.3)	1 (14.3)
Late presentation	Yes	0	1 (12.5)
	No	0	7 (87.5)

The risk factors of both periods (March-June 2019 & March-June 2020) are shown in figure 3.

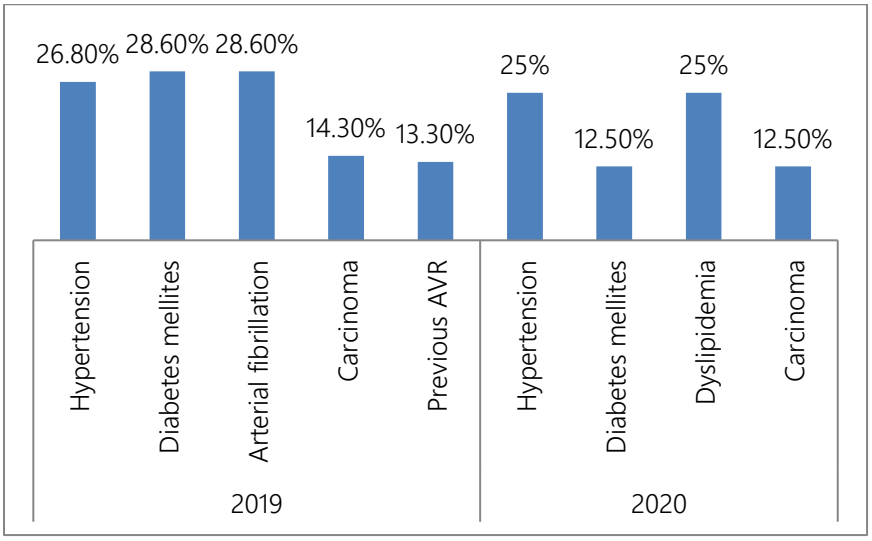

Figure 3: Comorbidities of mortalities in 2019 and 2020.

Left ventricular dysfunctions of mortalities in both periods (March-June 2019 & March-June 2020) are represented in figure 4 & 5.

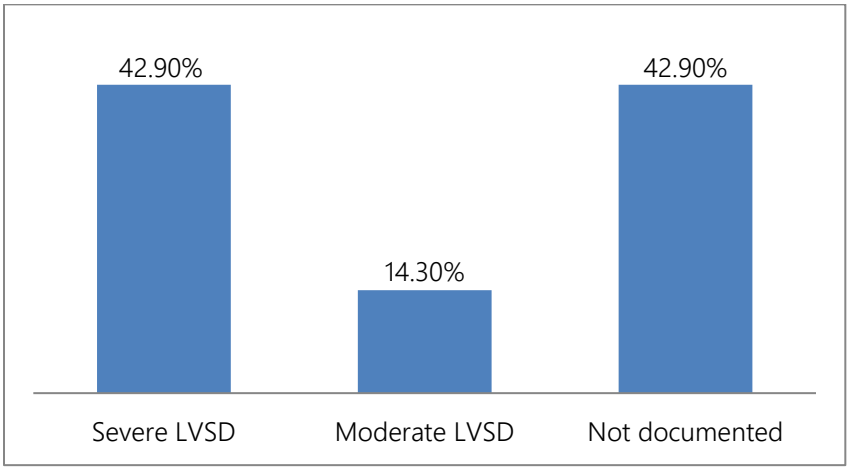

Figure 4: Shows the LV function of 2019 mortalities.

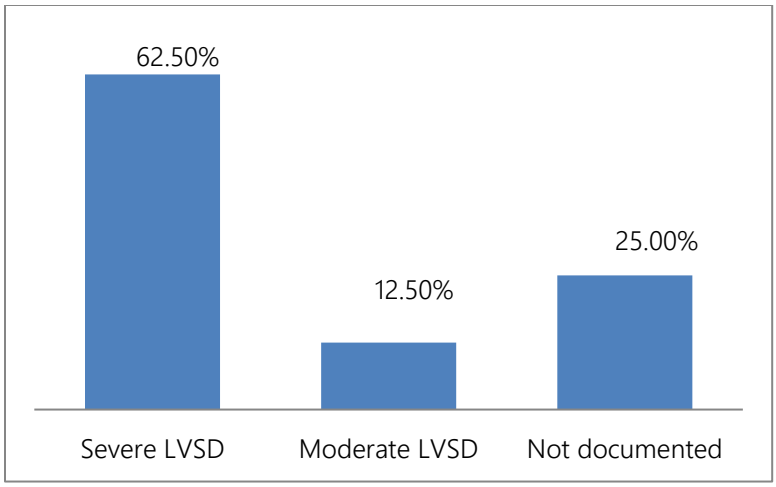

Figure 5: Shows the LV function of 2020 mortalities.

Discussion

Globally, COVID-19 pandemic has greatly affected the healthcare services[11]. The treatment of STEMI patients during pandemic was quite challenging[12]. As with so many other aspects of life and different specialities of medical field, the provision and practice of PPCI fundamentally changed during the COVID-19 pandemic. With the changing focus and attention of the emergency medical services to deal with the overwhelming issue of large number of COVID-19 cases, there was an inevitable knock-on effect of the management of patients with acute myocardial infarction (AMI). While the emergency service resources were prepared to respond primarily to the pandemic affected communities, hospital beds, departments and personnel were also re-organized to deal with a potentially large influx of these patients. Critical care and respiratory resources were significantly improved by provision of more bed space and reorganization of available workforce in order to be able to maintain an effective and safe level of cover where need was anticipated to be the most. If, on one hand, cardiology wards and acute care units were prepared to accommodate large number of patients with respiratory illnesses, cardiac intensive care units were primarily reserved for dealing with severe COVID-19 pneumonitis patients needed respiratory support. This inevitably shifted the focus somewhat away from cardiovascular conditions.

In this study we have highlighted the impact of COVID-19 pandemic on STEMI patients who underwent PPCIs. In order to understand the effects of these changing practices on the outcomes for patients with acute cardiovascular emergencies, and in particular with STEMI, we studied the outcomes of all patients presented through our Primary PCI centre. We chose to study over a period of 10 weeks, starting from march-june-2020, when a nation-wide lockdown was enforced in the UK. We then performed a comparative analysis with a 10-week equivalent period in 2019.

Although the mortality was high (53.3%) during the COVID-19 period as compared to 2019 (47.7%), there does not appear to be any causative/confounding relationship with the COVID-19 pandemic itself. It appears that the mortalities were mostly more unwell patients. Closely following the national strategy, our local cardiovascular services were re organized in close collaboration with the primary care and community emergency services so that the services were prepared to deal with the effects of pandemic. As anticipated, this led to substantial reduction in the elective cardiovascular activity of the stable conditions. However somewhat unexpectedly the emergency cardiovascular presentations to our large cardiac tertiary centre were also down. The factors responsible for those have been postulated to be varying from general public's changing

attitude while seeking medical advice when unwell, to a high threshold of medical professionals for referring patients with cardiovascular conditions to the hospital.

This is a single centre, retrospective study with a small sample size.

Conclusion

This study concluded, following the COVID-19 pandemic, we observed no reduction in PPCIs procedures. STEMI in COVID-19 patients is not the same disease process compared with STEMI without COVID-19. The mortality ratio was high in 2020 as compared in 2019. It is assumed that the patients who died during 2020, were mostly sicker ones.

Acknowledgment

We are thankful to the staff of Department of Cardiology, CPEIC Multan that helped us to carry out this study.

References

1) Haberman R, Axelrad J, Chen A, Castillo R, Yan D, Izmirly P, et al. Reduced Rate of Hospital Admissions for ACS during Covid-19 Outbreak in Northern Italy. N Engl J Med. 2020;383(1):85–8.
2) Markus HS, Brainin M. COVID-19 and stroke—A global World Stroke Organization perspective. Int J Stroke. 2020;15(4):361–4.
3) Bromage DI, Cannatà A, Rind IA, Gregorio C, Piper S, Shah AM, et al. The impact of COVID-19 on heart failure hospitalization and management: report from a Heart Failure Unit in London during the peak of the pandemic. Eur J Heart Fail. 2020;22(6):978–84.
4) Mafham MM, Spata E, Goldacre R, Gair D, Curnow P, Bray M, et al. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. Lancet [Internet]. 2020;396(10248):381–9. Available from: http://dx.doi.org/10.1016/S0140-6736(20)31356-8
5) Xiang D, Xiang X, Zhang W, Yi S, Zhang J, Gu X, et al. Management and Outcomes of Patients With STEMI During the COVID-19 Pandemic in China. J Am Coll Cardiol. 2020;76(11):1318–24.
6) Hartley A, Marshall DC, Salciccioli JD, Sikkel MB, Maruthappu M, Shalhoub J. Trends in mortality from ischemic heart disease and cerebrovascular disease in Europe: 1980 to 2009. Circulation. 2016;133(20):1916–26.
7) Townsend N, Wilson L, Bhatnagar P, Wickramasinghe K, Rayner M, Nichols M. Cardiovascular disease in Europe: Epidemiological update 2016. Eur Heart J. 2016;37(42):3232–45.
8) Sugiyama T, Hasegawa K, Kobayashi Y, Takahashi O, Fukui T, Tsugawa Y. Differential time trends of outcomes and costs of care for acute myocardial infarction hospitalizations by st elevation and type of intervention in the United States, 2001–2011. J Am Heart Assoc. 2015;4(3):2001–11.
9) McManus DD, Gore J, Yarzebski J, Spencer F, Lessard D, Goldberg RJ. Recent trends in the incidence, treatment, and outcomes of patients with STEMI and NSTEMI. Am J Med [Internet]. 2011;124(1):40–7. Available from: http://dx.doi.org/10.1016/j.amjmed.2010.07.023
10) Widimsky P, Wijns W, Fajadet J, De Belder M, Knot J, Aaberge L, et al. Reperfusion therapy for ST elevation acute myocardial infarction in Europe: Description of the current situation in 30 countries. Eur Heart J. 2010;31(8):943–57.
11) Gong X, Zhou L, Dong T, Ding X, Zhao H, Chen H, et al. American Journal of Emergency Medicine Impact of COVID-19 pandemic on STEMI undergoing primary PCI treatment in Beijing , China. Am J Emerg Med. 2022;53:68–72.
12) Case BC, Yerasi C, Forrestal BJ, Chezar-azerrad C, Shea C, Rappaport H, et al. Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID- 19 . The COVID-19 resource centre is hosted on Elsevier Connect , the company ' s public news and information . 2020;2020.