

openheart Effects of lockdown on acute coronary syndrome incidence in an area without community transmission of COVID-19

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ABSTRACT

Objective To assess the changes in cardiac hospitalisations, acute coronary syndromes (ACS) and out-of-hospital cardiac arrest (OOHCA) during COVID-19 isolation compared with prior time periods in an area of low COVID-19 disease incidence.

Methods Review of all cardiology admissions, non-ST segment elevation myocardial infarction (NSTEMI), ST-segment elevation myocardial infarction (STEMI) requiring urgent catheter laboratory activation and OOHCA. The 10-week period of government-imposed social isolation (23 March–31 May 2020) was compared with the same period in 2018, 2019 and a 10-week period prior to social isolation (6 January–15 March 2020). Incidence rate ratios were calculated. Symptom to balloon time was also compared for those requiring catheterisation laboratory activation for STEMI.

Results The incidence of COVID-19 in the health district was 0.14 per 100 000 per day during the isolation period. There was a significant reduction in cardiology hospitalisations, NSTEMI and STEMI presentations without changes in OOHCA or symptom to balloon time for STEMI.

Conclusions We observed a significant decline in cardiology presentations during social isolation without widespread COVID-19 disease. This provides further evidence for the important influence of social and behavioural factors on coronary event rates.

INTRODUCTION

During the COVID-19 pandemic, widespread use of social isolation has been instituted to reduce disease spread. A decrease in acute coronary syndrome (ACS) related hospital admissions was noted among populations with high rates of COVID-19.¹ However, these results were significantly impacted by confounding due to high rates of COVID-19 transmission. During the mandatory lockdown period in the Hunter New England (HNE) region of Australia, with a total population of approximately 950 000, there was very low community transmission of COVID-19.² This has allowed the establishment of a natural control group to examine the true

Key questions

What is already known about this subject?

► The COVID-19 pandemic resulted in the international uptake of social isolation measures. Dramatic declines in acute coronary syndrome admissions were seen in areas of high COVID-19 incidence. The underlying mechanism behind this observation was unclear but was hypothesised to be related to patient reluctance to present to healthcare facilities.

What does this study add?

► This study demonstrates that social isolation measures were associated with dramatic declines in acute coronary syndrome admissions in the absence of widespread community COVID-19. This was not accompanied by changes in out-of-hospital cardiac arrest or changes in symptom to balloon time for ST-segment elevation myocardial infarction.

How might this impact on clinical practice?

► The decline in coronary event rates is remarkable and demonstrates the important influence of social and behavioural factors on cardiac presentations. This study does not appear to support the hypothesis that the decline in acute coronary syndrome presentations was solely due to patient reluctance to present to healthcare facilities.

effects of social isolation on ACS incidence rates, independent of the impact of widespread COVID-19 disease and transmission.

METHODS

We examined the rates of the following types of admissions: total cardiology, non-ST segment elevation myocardial infarction (NSTEMI), primary percutaneous coronary intervention (PCI) for ST segment elevation myocardial infarction (STEMI) and out-of-hospital cardiac arrest (OOHCA) emergency department presentations to the John Hunter Hospital, the only tertiary hospital of the region.



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On 23 March 2020, chosen as the starting date, the Australian Federal Government officially enforced social isolation, announcing the closure of public food, entertainment and religious venues. On 31 May, the chosen end date, the Australian Government relaxed restrictions, permitting local travel and reopening select public venues. The same dates were examined in 2018 and 2019. A 10-week pre-COVID-19 period was assessed between 6 January and 15 March 2020. Cardiology admissions, OOHCA and primary PCI records were sourced via the local patient administration system. NSTEMI presentations were collected from an ACS database that incorporated presentations across the entire district, including small community hospitals. This highly sensitive database identified all presentations with chest pain or elevated high-sensitivity troponin above the 99th centile. Patients in this dataset were excluded if they did not meet the Fourth Universal definition of type 1 myocardial infarction (MI).³ Population data were sourced from the Australian Bureau of Statistics. The population of the HNE district in 2018 was 927 607. Populations for 2019 and 2020 were extrapolated from 2018 with an average yearly increase of 1.26% in New South Wales over the past 10 years.

Normally distributed data were expressed as a mean with SD. Non-normally distributed data were expressed as a median with an IQR. Incidence rate ratios (IRRs) were calculated for each admission type comparing the COVID-19 isolation period to the prior time periods. The non-parametric continuous variable of symptom to balloon time was analysed with the Mann-Whitney U test.

RESULTS

The total number of new cases of COVID-19 in HNE during the isolation period was 96, the majority of which were returned travellers. In a projected population of 951

129, this reflects an incidence of 0.14 per 100 000 per day. Of these, nine patients were hospitalised, one required intensive care and two died. This is over 30 times lower than the incidence experienced in Italy (4.3 per 100 000 per day) during the period studied by De Filippo *et al.*^{4,5}

Sixty-five per cent of presentations were male (table 1). There was a significant decline in total cardiology and NSTEMI admissions during the COVID-19 isolation period (see table 2). The number of ACS admissions per day was 4.4 in 2019 compared with 2.4 during COVID-19 isolation, which is a 45% reduction. The IRR of NSTEMI admissions during isolation compared with 2019 was 0.59 (95% CI 0.47 to 0.73), p value <0.0001. Primary catheterisation laboratory activation rates for STEMI were significantly lower during the COVID-19 isolation period, without any change in clinical practice guidelines (specifically, thrombolysis was not recommended to replace primary PCI in those with suspected COVID-19). The IRR of STEMI presentations for the isolation period compared with 2019 was 0.24 (95% CI 0.14 to 0.40), p value <0.0001. This was not accompanied by a change in OOHCA presentations to the major tertiary centre of the region. There was no difference in symptom to balloon time for those with STEMI comparing prior time periods to COVID-19 isolation (see table 3).

DISCUSSION

In our unique population with exceptionally low incidence of COVID-19 infection, we observed lower rates of cardiology admissions, NSTEMI presentations and catheterisation laboratory activation for STEMI during the COVID-19 isolation period. This was not associated with changes in OOHCA presentations to the emergency department or symptom to balloon time for STEMI. In comparison, De Filippo *et al.*⁴ found a similar 30%

Table 1 Baseline demographics and management of patients presenting with acute coronary syndrome based on time period

Characteristics	2018	2019	P-COV 2020	COVID-19 2020
Total MI numbers	290	308	266	164
Age (SD)	69.8 (±12.9)	69.4 (±13.6)	68.8 (±13.3)	68.0 (±12.9)
Males, % (no.)	65.9 (191)	65.6 (202)	60.9 (162)	69.5 (114)
Death at 28 days, % (no.)	4.5 (13)	7.1 (22)	6.0 (16)	3.0 (5)
NSTEMI, % (no.)	65.5 (190)	70.5 (217)	75.2 (200)	78.7 (129)
STEMI, % (no.)	34.5 (100)	29.5 (91)	24.8 (66)	21.3 (35)
P-PCI STEMI, % (no.)	25.9 (75)	23.0 (71)	18.0 (48)	10.4 (17)
Thrombolysed STEMI, % (no.)	8.6 (25)	6.5 (20)	6.8 (18)	11.0 (18)
Angiogram, % (no.)	78.6 (228)	78.6 (242)	73.3 (195)	74.4 (122)
Revascularisation, % (no.)	57.9 (132)	59.5 (144)	62.6 (122)	77.9 (95)
PCI, % (no.)	46.1 (105)	54.1 (131)	54.9 (107)	68.0 (83)
CABG, % (no.)	11.8 (27)	5.4 (13)	7.8 (15)	9.8 (12)

CABG, coronary artery bypass graft surgery; MI, myocardial infarction; NSTEMI, non-ST segment elevation myocardial infarction; OOHCA, out-of-hospital cardiac arrest; PCI, percutaneous coronary intervention; P-COV, pre-COVID-19 isolation; P-PCI, primary percutaneous coronary intervention; STEMI, ST-segment elevation myocardial infarction.

Table 2 Comparison of cardiology admissions, NSTEMI admissions, primary catheterisation laboratory activation for STEMI and OOHCA presentations between COVID-19 isolation and three prior time periods

Years	Admissions	Per 100 000	IRR COV versus prior periods	P value
2018	453	47.97	0.87 (0.76 to 0.99)	0.035
2019	463	48.23	0.86 (0.75 to 0.98)	0.024
P-COV 2020	473	49.41	0.85 (0.74 to 0.97)	0.016
COV 2020	402	41.32		
NSTEMI				
2018	190	20.48	0.66 (0.53 to 0.83)	0.0003
2019	217	23.10	0.59 (0.47 to 0.73)	<0.0001
P-COV 2020	200	21.03	0.65 (0.52 to 0.80)	0.0001
COV 2020	129	13.56		
STEMI P-PCI				
2018	75	8.09	0.22 (0.13 to 0.37)	<0.0001
2019	71	7.56	0.24 (0.14 to 0.40)	<0.0001
P-COV 2020	48	5.05	0.35 (0.20 to 0.62)	0.0002
COV 2020	17	1.79		
OOHCA				
2018	12	1.29	1.22 (0.57 to 2.60)	0.51
2019	15	1.60	0.99 (0.48 to 2.02)	0.97
P-COV 2020	16	1.68	0.94 (0.46 to 1.90)	0.86
COV 2020	15	1.58		

COV, COVID-19; IRR, incidence rate ratio; NSTEMI, non-ST segment elevation myocardial infarction; OOHCA, out-of-hospital cardiac arrest; P-COV, pre-COVID-19 isolation; P-PCI, primary percutaneous coronary intervention; STEMI, ST-segment elevation myocardial infarction.

reduction in ACS admissions per day, 18.9 in the prior year compared with 13.3 during COVID-19.⁴

There are several potential reasons for this observation in our population. There is a significant association between respiratory tract infections and rates of MI.⁶ Social isolation has resulted in a reduced incidence of respiratory infective illness in the community.⁷ This decreased inflammatory milieu may reduce risk of plaque destabilisation and MI.⁸ Second, while habitual exercise decreases cardiovascular risk, acute vigorous exercise can increase risk of ACS.⁹ Activity modification with reduced exercise during social isolation may have contributed to lower short-term rates of MI. Third, behavioural changes in the population due to fear of contracting COVID-19

from healthcare facilities may have led to decreased hospital presentations. However, the most dramatic difference was on catheter laboratory activation for STEMI. This would be predicted to be the least affected, due to the typically more severe nature of symptoms, if patient reluctance were contributing to reductions in presentations.

Although there appeared to be a decrease in ACS incidence during the lockdown, behavioural changes observed in other studies may not be beneficial for long-term cardiovascular health. A study from Denmark found 28% of surveyed participants reported eating more during the isolation period.¹⁰ Sedentary behaviour also increased during social isolation in the UK.¹¹ Others argue that lockdown from the COVID-19 pandemic may increase population risk of cardiovascular events long term.¹² The degree to which isolation measures may have contributed to cardiac morbidity is unable to be answered based on this review.

Community OOHCA not presenting to the emergency department was not included, so our assessment of cardiac arrest incidence may be limited. One limitation is that the extent to which social isolation simply delayed the inevitable occurrence of a coronary event cannot be answered by this observational study. Nonetheless, the profound effect on the incidence of STEMI is remarkable and does illustrate the important

Table 3 Comparison of symptom to balloon times for STEMI presentations using the Mann-Whitney U test between COVID-19 isolation and three prior time periods

Years	Symptom to balloon time	COV versus prior periods (p value)
2018	366 (±334)*	0.97
2019	345 (±493)*	0.83
P-Cov 2020	332 (±239)*	0.83
COVID-19 2020	324 (±274)*	

*SD.

COV, COVID-19; P-Cov, pre-COVID-19 isolation.

influence of social and behavioural factors on coronary event rates.

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