Impact of social isolation during COVID-19 pandemic on arrivals at emergency department and on percutaneous coronary intervention for myocardial infarction at a cardiology hospital

Impacto do isolamento social na pandemia de COVID-19 sobre atendimentos de emergência e angioplastias para infarto do miocárdio em hospital cardiológico

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ABSTRACT – Background: Social isolation and marketing campaign to avoid “unnecessary” use of healthcare system to fight against COVID-19 pandemic might impact on the decision to seek medical care. The aim of this study was to evaluate the effect of social isolation during COVID-19 pandemic on trends in numbers of visits to emergency department, non-elective admissions, and percutaneous coronary intervention procedures for treatment of patients with acute myocardial infarction, at a reference cardiology hospital. **Methods:** Daily numbers of visits to emergency department, non-elective admissions, and percutaneous coronary intervention procedures for the treatment of patients with acute myocardial infarction, at a high-volume cardiology hospital, were compared in two contiguous 3-week periods, before and during social isolation officially implemented for COVID-19. Mean and standard deviation for each variable were calculated. Comparisons were performed using two-tailed *t* test with *p*-value <0.05 for significance. **Results:** During social isolation, compared to the immediately previous period, the number of visits to emergency department per day decreased by 45% (before: 110.6±16.7 versus during lockdown: 61.1±10.2; *p*<0.0001), non-elective hospital admissions decreased by 50% (before: 31.7±10.2 versus during social isolation: 16.4±3.8; *p*<0.0001), and percutaneous coronary intervention procedures for acute myocardial infarction treatment decreased by 29% (before: 7.4±4.0 versus during social isolation: 5.0±2.6; *p*=0.032). **Conclusion:** A marked reduction in number of visits to emergency department, non-elective hospital admissions, and percutaneous coronary intervention for acute myocardial infarction treatment were observed during social isolation, as compared to the period immediately before the COVID-19 pandemic. Such trends raise concerns of underdiagnosis of acute myocardial infarction related to barriers.

Keywords: Social isolation; Coronavirus; COVID-19; Pandemics; Myocardial infarction; Percutaneous coronary intervention

RESUMO – Introdução: Isolamento social e campanhas de *marketing* para evitar o uso “desnecessário” do sistema de saúde para auxiliar no combate à pandemia de COVID-19 podem impactar no limiar de busca pela assistência médica. O objetivo deste estudo foi avaliar o efeito do isolamento social durante a pandemia de COVID-19 nos números de consultas no departamento de emergências, internações não eletivas e intervenções coronárias percutâneas para o tratamento de pacientes com infarto agudo do miocárdio em um hospital de referência em cardiologia. **Métodos:** Os números diários de consultas no departamento de emergências, internações não eletivas e procedimentos de intervenção coronária percutânea para o tratamento de pacientes com infarto agudo do miocárdio, em um hospital de cardiologia de alto volume, foram comparados em dois períodos contíguos de 3 semanas: antes e durante a instituição oficial do isolamento social para COVID-19. Foram calculados média e desvio

padrão para cada variável. Foram feitas comparações utilizando o teste *t* bicaudal, com valor de $p < 0,05$ significativo. **Resultados:** Durante o isolamento social, comparado ao período imediatamente anterior, o número diário de consultas à emergência diminuiu 45% (antes: $110,6 \pm 16,7$ versus durante o isolamento social: $61,1 \pm 10,2$; $p < 0,0001$), internações não eletivas diminuíram 50% (antes: $31,7 \pm 10,2$ versus durante o isolamento social: $16,4 \pm 3,8$; $p < 0,0001$) e procedimentos de intervenção coronária percutânea para tratamento de infarto agudo do miocárdio diminuíram 29% (antes: $7,4 \pm 4,0$ versus durante o isolamento social: $5,0 \pm 2,6$; $p = 0,032$). **Conclusão:** Foi observada redução acentuada no número de consultas à emergência, internações não eletivas e intervenções coronárias percutâneas para o tratamento de infarto agudo do miocárdio durante o isolamento social, em comparação ao período imediatamente anterior à pandemia de COVID-19. Tais tendências levantam preocupações de subdiagnóstico de infarto agudo do miocárdio relacionado a barreiras de acesso à assistência à saúde, ou relutância em buscar atendimento médico.

Descritores: Isolamento social; Coronavírus; COVID-19; Pandemias; Infarto do miocárdio; Intervenção coronária percutânea

INTRODUCTION

Social isolation has been proposed as a major strategy to reduce coronavirus dissemination and to spare hospital resources during the coronavirus disease 2019 (COVID-19) pandemic.¹ Confinement, limited access and marketing campaign to avoid “unnecessary” use of healthcare system might impact on the decision to seek medical care, even for cardiovascular emergencies.

The aim of this study was to evaluate the effect of social isolation during COVID-19 pandemic on trends in number of visits to emergency department, non-elective hospital admissions, and percutaneous coronary intervention (PCI) procedures for the treatment of patients with acute myocardial infarction (MI), at a reference cardiology hospital.

METHODS

A retrospective single-center study was conducted comparing the daily number of visits to the emergency department, non-elective hospital admissions and PCI procedures for treatment of patients with acute MI, in two contiguous periods of 3 weeks, before versus after the first official day of social isolation policy for COVID-19, in the state of Ceará, Brazil (March 19th, 2020). An exploratory analysis for primary PCI was performed.

Data were collected from registries of a high-volume public cardiology hospital (2,372 PCI performed in the last year) in the city of Fortaleza (CE), Brazil, with population of 2.6 million. This hospital accounts for almost 50% of the PCI procedures performed by the public healthcare system in the state, and receives patients referred for acute MI, including post-fibrinolytic acute MI patients. During COVID-19 pandemic, the catheterization laboratory remained fully available, with 24/7 PCI-capability, including an interventional cardiologist on duty, at the hospital.

The variables for each study in both periods (before and during social isolation) were expressed by mean $\pm$ standard deviation. Trends of these variables were reported as percentage. Comparisons were performed using a two-tailed *t*-test, assuming different variations between samples. The *p*-value was considered significant if < 0.05 . Statistics were calculated using the software Microsoft® Excel® for Office 365 MSO 32bits. This study was approved by hospital ethics committee (protocol 3.976.912, CAAE 30727720.1.0000.5039).

RESULTS

During social isolation, as compared to the immediately previous period, the daily number of visits to emergency department decreased by 45% (before social isolation: 110.6 ± 16.7 versus during social isolation: 61.1 ± 10.2 ; $p < 0.0001$), non-elective hospital admissions decreased by 50% (before social isolation: 31.7 ± 10.2 versus during social isolation: 16.4 ± 3.8 ; $p < 0.0001$), and PCI procedures for the treatment of acute MI patients decreased by 29% (before social isolation: 7.4 ± 4.0 versus during social isolation: 5.0 ± 2.6 ; $p = 0.032$). Figure 1 shows the trends of these variables. There was no difference in primary PCI procedures (before social isolation: 3.0 ± 1.6 versus during social isolation: 2.7 ± 1.4).

DISCUSSION

The main finding of this study was to identify a marked drop in visits to the emergency department, non-elective hospital admissions and PCI procedures for the treatment of patients with acute MI, at a high-volume cardiology hospital during social isolation, as compared to the period immediately before the COVID-19 pandemic. Such trends could reflect a true drop in the incidence of cardiovascular emergencies (including acute MI), limited access to cardiology care, or inability to recognize the warning symptoms of cardiovascular emergencies mixed with fear of COVID-19, making patients avoid seeking medical care.²

Many theories could explain marked decline in MI rates during social isolation. Decreased air pollution levels, less stress related to daily work activities or traffic, longer resting time at home, changes in sleep patterns, compliance to cardiovascular medications, and reduction in cigarette consumption due to fear of catching the disease are possible reasons. Even a protective effect of the virus could be argued, although extremely unlikely. Conversely, social isolation and loneliness may cause psychological, physical and economic burden, promoting stress, anxiety, and depression, and have been associated to increased cardiovascular mortality.^{3,4}

Limitations for cardiology care and reluctance in seeking medical care are the most likely explanations. Supporting this hypothesis, a recent study conducted in China has

ED: emergency department; AMI: acute myocardial infarction; PCI: percutaneous coronary intervention.

Figure 1. Comparison between two contiguous period of 3 weeks: before *versus* after social isolation. Trends in daily numbers of visits to emergency department (A), non-elective hospital admissions (B), and percutaneous coronary intervention for acute myocardial infarction (C) during COVID-19 pandemic. The vertical dotted line identifies the beginning of social isolation.

shown a dramatic increase in median time - from onset of symptoms to first medical contact (318 minutes during pandemic *versus* 82 minutes local reference), in patients with acute MI.⁵ During pandemic, public transportation has been affected, most primary care facilities were converted to fever clinics, emergency department of community hospitals became triage and diagnostic units for COVID-19, and even the private cardiology services cancelled many appointments or closed their doors, particularly after social isolation. Given the current strains on healthcare systems, patients may be discharged and not be seen by cardiologists, or referred for tests. Even more important, patients may not be seeking medical care required, ignoring or minimizing their symptoms out of the fear of catching COVID-19 if they end up in the emergency department.² Some degree of altruism could also contribute to this behavior, assuming other people have got far worse problems, and deciding not to overload healthcare system.

In the exploratory analysis of daily numbers of primary PCI procedures for treatment of ST-segment elevation myocardial infarction (STEMI) patients no significant difference related to social isolation was detected. Our result apparently disagrees from that reported in a survey applied to 81 centers in Spain, which presented a 40% reduction in primary PCI procedures during COVID-19 pandemic.⁶

However, in that survey, long-term historical controls were used to measure pandemic impact, while in the current study a contiguous short-period control, already during pandemic, was used to explore the impact of social isolation. Beyond potential underpowered, compared to non-ST-segment elevation acute myocardial infarction (NSTEMI) patients, STEMI patients usually presented with more severe and typical symptoms, and are more likely to promptly seek medical attention, even during social isolation.⁷ It is possible that NSTEMI patients defer cardiology care and some subtotal lesions might evolve to complete coronary occlusions, "converting" the presentation to STEMI.

This is a single center-study, which might limit the external validation of its results, although the selected center is the major reference cardiology hospital in the state, providing almost 50% of the PCI procedures in the public health system, it probably truly reflects the local health situation. In addition, a striking drop of the three variables in the same direction reinforces the message. Another potential limitation was the short period of evaluation. However, to address the effects of social isolation on hospital arrivals and PCI for acute MI, it was essential to select two contiguous short-time periods to minimize confounding bias related to changes in pandemic itself. Recognizing the possibility of many acute MI patients not receiving appro-

appropriate cardiology care during COVID-19 pandemic, either by limited access or fear of being infected, is a worrying scenario. Untreated MI patients may present as sudden death at home, and the survivors potentially evolve to myocardial dysfunction and heart failure.^{8,9} Urgent actions are paramount to prevent this burden.

CONCLUSION

A dramatic reduction in number of visits to emergency department, non-elective hospital admissions, and PCI procedures for treatment of patients with acute MI were observed during social isolation, as compared to the period immediately before COVID-19 pandemic. Such trends raise concerns of dangerous underdiagnosis of acute myocardial infarction related to barriers for access to healthcare services, or reluctance to seek medical care.

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None.

CONFLICTS OF INTEREST

The authors declare there are no conflicts of interest.

CONTRIBUTION OF AUTHORS

Conception and design of the study: JLAFF, DRVR and BAAF; data collection: JAPN and SNRSF; data interpretation: JLAFF, BAAF, LSB, FCSA and FDS; text writing: JLAFF and BAAF; approval of the final version to be published: FDS, LSB, FCSA and BAAF.

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