**INTRODUCTION**

Death is a tragedy in whatever form, at whatever time and in whatever way it comes. Many studies utilize the Framingham Heart Study’s definition under which sudden deaths are considered to occur within one hour of the onset of terminal symptoms in an apparently healthy subject or whose disease was not so severe enough to predict an abrupt outcome. Sudden or unexpected death occurs from unnatural causes, as well as from natural causes. The death is natural when it is due to any pathology (disease) or ageing, and is unnatural when caused prematurely against the order of nature by injury, poison or other means of violence. Unnatural death, as defined under section 174 of the Code of Criminal Procedure, 1973, is that a person has committed suicide, or has been killed by another, or by an animal, or by a machinery or an accident or the person has died under circumstances raising a reasonable suspicion that some other person...
has committed an offence.\textsuperscript{4} The data of unnatural deaths may reflect the law and order situation in a particular area of jurisdiction.\textsuperscript{5} A total of 151,113 people were killed in 480,652 through road accidents across India in 2019, an average of 414 a day or 17 an hour, according to a report by the transport research wing of the Ministry of Road transport and Highways. India continues to have the largest number of road fatalities in the world. Kerala ranked at the fourth position with 41111 cases.\textsuperscript{6} India reported about 381 suicides daily for the year 2019, marking an increase of nearly 3.4% suicide deaths as compared to 2018.\textsuperscript{7} When it comes to the total Indian Penal Code (IPC) and Special and Local Laws (SLL) crimes’ cognizable rate, Kerala (1463.2) is the state with the highest crime rate, followed by the capital Delhi (1342.5).\textsuperscript{8} But after lockdown due to COVID-19 pandemic, there is a sharp decrease in suicide, homicide and road traffic accidents along with increase of natural deaths.

**Aims and Objectives**

The current study has made an attempt to study the pattern of death during the pre-lockdown period and COVID 19 lockdown period to determine and compare the trend in natural and unnatural deaths. Drawing public attention and awareness towards casualties is important to prevent unnatural deaths; this possibly could reduce the incidence of such cases.\textsuperscript{9}

**MATERIALS AND METHODS**

This retrospective study was conducted in the Department of Forensic Medicine, Govt. Medical College, Kottayam. The study data was collected from postmortem reports of Department of Forensic Medicine, Govt. Medical College, Kottayam. Pre-lockdown period was taken as from 21 March to 31 May 2019. There were total 424 cases during this period. Lockdown period, as from 21 March 2020 to 31 May 2020, witnessed a dip in the number of cases to 270. All these cases were grouped according to cause of death, manner of death and modalities of natural and unnatural deaths. All cases were entered into a proforma. All cases of natural and unnatural deaths brought to the department of Forensic Medicine were included in the study. These cases were subjected to a Covid 19 test before conducting the autopsy. Confirmed Covid positive cases, in which manner of death was natural and the cause of death undisputed were not undertaken for the same. Covid 19 positive suicides, accidents and homicides were carried out with extreme caution observing universal work precautions.

**Statistical Analysis**

Categorical variables were expressed as frequency (percentage). Chi-square test was used to find association of pattern of death with period. For all statistical interpretations, $p<0.05$ was considered the threshold for statistical significance. Statistical analyses was performed by using a statistical software package SPSS, version 20.0

**RESULTS**

There were a total of 424 cases in the pre-lockdown period in the year 2019. Out of these 424 cases, 71.9% constituted males (305) and the remaining 119 females, whereas in the lockdown period in 2020, number of cases phenomenally decreased to 270, that included 195 males (72.2%) and 75 females.

Accidental deaths which accounted for most of the deaths in pre lockdown period in 2019 (Table 1) went backstage during the lockdown period in 2020.

A comparison among the different causes of accidental deaths, showed a decreasing trend in road traffic accidents during the lockdown period (Figure 1), though this was not statistically significant.

Suicidal deaths showed no significant changes in patterns. This was the same case with homicides too (Table 2). Among suicidal deaths, hanging topped the list in both years followed by poisoning. Burns and other methods of suicide namely drowning, and self-inflicted cuts occurred subsequently.

Regarding the natural manner of deaths, cardiovascular (CVS) causes accounted for most of the deaths in periods, 60.6% in 2019 and 68% in 2020. Respiratory causes came second (12%) and neurological cause related deaths which were around 7% in 2019 came down to 4% in 2020. Other causes included deaths due to gastrointestinal pathologies and those deaths in which a definite opinion could not be established after the autopsy, requiring further laboratory and chemical analysis for the same. These accounted for 20.2% in the year 2019 and 16% in the year 2020. These differences were not however statistically significant.

Among road traffic accidents occupant injuries stood first in both periods, whereas pedestrian injuries contributed to less than half in both pre-lockdown and lockdown periods. Again, these were not statistically significant.
DISCUSSION

Covid 19 was declared a pandemic by the WHO in December 2019. The spread of the virus worldwide evolved quite rapidly. It was hypothesized that COVID-19 outbreak would have an impact on patient with co-morbidities such as cardiovascular diseases.10

There was a significant drop in the number of cases being admitted in health care facilities for causes other than covid infection. Literature suggests delays in the treatment of patients presenting with myocardial infarction (MI) during the pandemic, as a cause for increased mortality.11 As to the place of death, we hypothesize that many patients would be reluctant to visit a hospital during the outbreak, thus leading to an increase in out-of-hospital deaths.11 Our analysis confirmed statistically significant differences as regards deaths due to natural causes in lockdown and pre-lockdown era.

Comparing the two scenarios, we clearly understand that the number of cases in 2020 were drastically reduced to just a bit more than half of the cases in 2019. Accidental causes which were the leading cause of death in 2019 came second to natural causes in the year 2020. The reason most significantly attributable for this decrease might be the indirect impact of lockdown during the period from March to May 2020. This period interestingly, coincides with school summer vacations and a plethora of religious festivals where human mobility and transportation are at a peak. Naturally when there is a drastically reduced movement of people and vehicles in the entire nation, road accidents will then take a backseat.

Another reason might be peoples’ apprehension of going to hospitals out of a fear of getting infected with Covid-19. Cardiovascular cases accounted for the maximum, out of the people who died due to natural diseases. Among the cardiac causes, cardiac tamponade topped the list, arising as a complication of myocardial infarction. This implies that an early medical intervention for uneasiness due to myocardial ischemic injury could have probably prevented the evolution of a full-scale infarction leading to cardiac rupture and tamponade.

Suicides showed no significant statistical difference and were almost equal during pre-lockdown and lockdown periods. Isolation and quarantine (more extreme forms of social distancing) during the outbreak could have precipitated depression and anxiety.12 Similar effects would be seen as confined people are detached from their loved ones, deprived of personal liberties, and devoid of purpose owing to altered routine and livelihood.13 This can contribute to frustration, boredom, low mood, and depression. Anxiety might arise from

| Manner        | Pre-lockdown Period | COVID 19 Lockdown Period | $\chi^2$ | p   |
|---------------|---------------------|--------------------------|---------|-----|
|               | Count | Percent | Count | Percent |         |         |
| Natural       | 99    | 23.3    | 125   | 46.3    | 45.84**| p<0.01  |
| Accidental    | 189   | 44.6    | 71    | 26.3    |         |         |
| Suicide       | 130   | 30.7    | 66    | 24.4    |         |         |
| Homicide      | 6     | 1.4     | 8     | 3.0     |         |         |

*: Significant at 0.01 level

| Homicide      | Pre-lockdown Period | COVID 19 Lockdown Period | $\chi^2$ | p   |
|---------------|---------------------|--------------------------|---------|-----|
|               | Count | Percent | Count | Percent |         |         |
| Blunt trauma  | 4     | 66.7    | 7     | 87.5    | 0.88    | 0.347   |
| Sharp trauma  | 2     | 33.3    | 1     | 12.5    |         |         |

Figure 1: Comparison of accidental deaths based on period
fear of contagion and inadequate clarity around social distancing guidelines, often made worse by less reliable media sources heightening a state of confusion and fear mongering.14 Those with pre-existing mental illness might suffer from limited interpersonal interactions that are central to their management, as well as reduced access to helpful but “non-essential” (and thus often cancelled) psychiatric services. Additionally another factor contributing to suicides may be the loss of wages during the lockdown period precipitating economic crises in households.

A slight increase in homicides during the lockdown period may be linked to the venting of pent-up frustration imposed by the sudden control over the freedom of movement and employment.

Road traffic accidents showed statistically significant decrease in 2020 lockdown period due to the virtually nil traffic on roads during lockdown days. Ostensibly, it is this congestion and explosion in vehicular traffic that contributes to an alarming rise in road fatalities. Accidental falls increasing during lockdown period could have been due to people attempting activities not accustomed to. There were several instances of accidental falls from trees, while climbing to pluck mangoes or jackfruits, which are seasonal fruits in Kerala during this lockdown period. Moreover, a clamor for opting for homegrown products in the face of severely restricted visits to shops and stores could also account for the same.

CONCLUSION

The severity of the COVID-19 outbreak is the greatest public health threat caused by a respiratory virus since 1918.15 Two months into lockdown, statistically significant differences were noted in patterns of deaths. Further study should be conducted in the near future, when more data will become available. Further research into mortality trends for the specific time in question, might help answer whether the pandemic caused any changes in mortality patterns overall. By providing early warning in patterns of mortality within the community, can prove to be yet another invaluable public health asset in decision and policy making.

Coming to mental health scenarios during a pandemic, mitigating mental health effects requires a concerted effort from the public, policy makers, and healthcare professionals. Government, media, and healthcare professionals should communicate clear and accurate public health information and guidance. Health care workers could remotely monitor people at risk to provide additional support.

ACKNOWLEDGEMENTS

We sincerely acknowledge the timely help by Dr. Oommen P. Mathew, Research Investigator, Population Research Centre, and University of Kerala in conducting the statistical analysis part, without which this research work would not have been complete.

REFERENCES

1. Vagheela P. Profile of unnatural deaths in Bhuj (Gujarat) retrospective study. NJIRM. 2012;3(2):110-112. https://doi.org/10.4103/njm.NJM_153_19
2. Modi JP. Medical Jurisprudence and Toxicology In:25th ed. Lexit Nexus Butterworths Publishers; 2016. p. 457
3. Nwafor CC and Akhiwu WO. Profile of Medicolegal Deaths in Females: An Autopsy-Based Study. Niger Med J. 2019;60(6):300-305. https://doi.org/10.4103/njm.NJM_153_19
4. Police manual: Investigation of Unnatural Deaths.pdf [online]. [cited 2020 Nov 27].
5. Rahim M and Das T. Mortuary Profile for Unnatural Deaths at Forensic Medicine Department of Dhaka Medical College. Bangladesh Medical Journal.2009; 38(2): 44-47. https://doi.org/10.3329/bmj.v38i2.3572
6. India had most deaths in road accidents in 2019: Report Hindustan Times[online] 2020 [cited 2020 Nov 27].
7. Rise in suicides in India in 2019; highest suicide rate in Maharashtra: NCRB [online]2020 [cited 2020 Nov 27].
8. The Financial Express. Shocking crime and conviction data! Kerala, Delhi registers highest crime rate [online] 2020 [cited 2020 Nov 27].
9. Vishal G and Verma S.K. Profile of medicolegal cases at Adesh Institute of Medical Sciences and Research Bathinda Punjab. Journal of Indian Academy of Forensic Medicine. 2010; 32(2):150-152.
10. Sakellariadis EI, Katsos KD, Zouzia EI, Spiliopoulos CA and Tsiodras S. Impact of Covid-19 lockdown on characteristics of autopsy cases in Greece Comparison between 2019 and 2020. Forensic Sci Int. 2020; 313:110365. https://doi.org/10.1016/j.forsciint.2020.110365
11. Tam CF, Cheung KS and Lam S. Impact of Coronavirus Disease 2019 (COVID-19) Outbreak on ST-Segment-Elevation Myocardial Infarction Care in Hong Kong, China. Circ Cardiovasc Qual Outcomes. 2020; 13(4):e006631. https://doi.org/10.1161/CIRCOUTCOMES.120.006631
12. Hawryluck L, Gold WL, Robinson S, Pogorski S, Galea S and Styra R. SARS control and psychological effects of quarantine, Toronto, Canada. Emerg Infect Dis. 2004; 10(7):1206-1212. https://doi.org/10.3201/eid1007.030703
13. Venkatesh A and Edirappuli S. Social distancing in covid-19: what are the mental health implications? BJM Clinical Research ed. 2020; 369:m1379.
https://doi.org/10.1136/bmj.m1379

14. Brooks SK, Webster RK, Smith LE, Woodland L, Wessely S, Greenberg N, et al. The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet. 2020; 395(10227):912-920.

https://doi.org/10.1016/S0140-6736(20)30460-8

15. Sen-Crowe B, McKenney M and Elkbuli A. Social distancing during the COVID-19 pandemic: Staying home save lives. Am J Emerg Med. 2020; 38(7):1519-1520.

https://doi.org/10.1016/j.ajem.2020.03.063

Authors Contribution:
SSB-Main content and design, statistical analysis and preparation of manuscript; RR-Concept of the study, Overall review, Corrections; AKA-Revision and preparation of manuscript

Work attributed to:
Government Medical College, Kottayam, Kerala

Orcid ID:
Dr. Shilpa S Babu - © https://orcid.org/0000-0002-1091-1989

Source of Support: Nil, Conflict of Interest: None.