

RESEARCH ARTICLE

Impact of 100 days of COVID-19 lockdown on death patterns and mortality demographics of medico-legal autopsies done in the Northern Province of Sri Lanka

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ABSTRACT

Introduction: Effect of COVID-19 pandemic on main sectors including the judicial and medico legal system has been notable in Sri Lanka.

Objective: To determine the impact of lockdowns during COVID-19 on death patterns and mortality demographics of medico-legal autopsies conducted in Northern Province of Sri Lanka during the first wave of COVID-19 (between 20th March to 28th June 2020).

Methods: The data were compared on death patterns and mortality demographics of medico-legal autopsies conducted in Northern Province of Sri Lanka during the first wave of COVID-19 (between 20th March to 28th June 2020) (Group C) and autopsies done in the same pre-COVID period in 2019 (Group PC). Three hundred and fifteen autopsies were selected after exclusion of unclaimed bodies, reports with inadequate details and undetermined cause and manner of deaths.

Results: Number of cases in groups C and PC were 126 and 189 respectively. Majority of the deceased were males in both groups (C-73% and PC-67%). The proportion of natural deaths was similar in both groups (39.7% vs 38.9%). Proportion of suicidal deaths was higher in C (32.5% vs 24%). The proportion of home deaths was more during the lockdown period (34.1% vs 25%). The proportion of homicidal and accidental deaths collectively was higher in PC (36.5% vs 28.6%). No statistical significance was observed for any of the given parameters between the two groups.

Conclusion: Despite the absence of statistical significance, the increased percentage of home deaths and suicidal deaths could be attributed to the effect of lock downs such as reduced access to routine health care services and financial and psychological strain on individuals and families.

Recommendations: The effect of a high suicide rate even though not statistically significant should be considered in future lockdowns. More extensive studies are required in Sri Lanka in this aspect which might statistically be more revealing.

Keywords: Autopsies, cause of death, COVID-19 infection, lockdown, Sri Lanka

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ARTICLE HISTORY

Received: 17.11.2021

Received in revised form: 27.01.2022

Accepted: 27.05.2022

Available online: 13.06.2022



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INTRODUCTION

The spread of acute respiratory syndrome was first reported by the Chinese authorities in Wuhan City, Hubei province, China around December 2019¹. It was caused by SARS-CoV-2 and titled as Coronavirus disease 2019 (COVID-19)². The evidence suggests that patients become infectious before the symptomatology develops. This led to asymptomatic transmission in the community, whereas asymptomatic carriers were common among children and younger populations³. Conversely, the

disease severity and risk of death have been higher in the elderly population and people with co-morbidities, regardless of the age⁴.

There were several methods proposed and implemented to control the transmission of the virus in the community. These included social distancing, generalized lockdowns, and controlled movement of individuals, closing businesses, and travel restrictions^{5,6,7}. The first patient with COVID-19 was detected in Sri Lanka on 27th January 2020⁸. Later, government implemented curfews, lockdowns, inter-district travel restrictions during the first wave of COVID-19 spread from 20th March to 28th June⁹. Initially, a blanket curfew was implemented but later it was restricted to night time only.

Generalized lockdowns have serious negative effects, including psychological consequences in societies, especially in vulnerable groups. Most of the affected people belong to low socio-economic classes, migrant workers, the homeless, and refugees¹⁰. Impaired health care delivery to the public including routine services, increase in substance abuse and domestic violence, unhealthy lifestyle and dietary habits, loneliness and impaired cognitive functions are some of the direct detrimental consequences of lockdown¹¹. Few reports were available in the literature on the impact of COVID-19 on medico-legal work. In a study done in Italy, during the first two months of the pandemic, it was reported that medico-legal autopsies were drastically reduced, but a considerable number of domestic violence cases were reported¹². An autopsy study conducted in Greece revealed a reduced incidence of deaths from road traffic accidents and homicides, with no change in deaths following myocardial infarctions¹³. Up to date, there is no published data on the impact of COVID-19 on medico-legal autopsies in the Sri Lankan population. This study aims to describe and compare the types of autopsies performed during restrictions imposed in the first wave in 2020 with the same during 2019 pre-COVID period, in the Northern Province of Sri Lanka.

OBJECTIVES

To determine the impact of lockdown and restrictions following COVID-19 on death patterns and mortality demographics of medico-legal autopsies which were conducted in the Northern Province of Sri Lanka during 20th March to 28th June 2020 and to compare with the data of the same period in 2019.

METHODS

This was a cross-sectional descriptive study conducted in a retrospective observational manner. Data collection was done between 20th March and 28th June 2019 (pre-COVID era) and same period of 2020 (COVID era) in the Forensic unit of the Teaching Hospital, Jaffna. Ethical clearance was obtained from the Ethics Review Committee of the Teaching Hospital, Jaffna. Medico-legal autopsies of unnatural deaths (accidents, suicides, and homicides) and natural deaths were studied. A total of 315 autopsies, with 189 in 2019 pre COVID-19 period and 126 cases in 2020, lockdown period were included in this study.

Information related to autopsies including medical history, place of death, cause of death and manner of death were obtained from completed post mortem reports, inquest reports prepared by inquirer into sudden death and police investigations reports. Anonymity was maintained at all times, denoting each case by a serial number.

Jurisdiction of the unit included the entire Jaffna peninsula and the only place where natural, accidental and complicated autopsies were performed by a board certified Forensic Pathologist. All cases are referred by the Magistrate and Inquirer into Sudden Deaths (ISD) to the Forensic Pathologist. A hospital death was defined as a death occurring in hospital after admission. In addition, deaths due to natural causes were defined as unexpected deaths while suicides, homicides and deaths following accidents were defined as violent deaths. Reports of unclaimed bodies, those with inadequate details, undetermined cause and manner of deaths following autopsy were excluded from this study. The cases which were still under investigation were similarly excluded for analytical purposes. Though assistance from two medico-legally trained doctors had been sought for collecting historical, clinical and autopsy data, reconfirmation and interpretation of such details were done by the investigators themselves. Total of 355 autopsies were selected for the study and later exclusions were made. Raw data collected on spread sheets were shifted to an electronic format. Data were coded and entered in Microsoft excel worksheets and analyzed by Statistical Package for Social Sciences (SPSS) version 21. Graphs and tables were used as appropriate to present the findings. Categorical variables were presented as percentages and numbers. Continuous data were presented as means and standard deviations. A P value of < 0.05 was considered as statistically significant. Pearson chi-square was used to calculate p value when the sample size was more

than 10 and Fisher's exact test, when the sample size was less than 10.

Table 1: Distribution of details of autopsies according to the Place, type, manner and cause of death

RESULTS

Total of 315 cases were selected for this study, with 189 cases in 2019 pre-COVID-19 period and 126 cases in 2020 lockdown period. Age of the deceased varied from one day to ninety-two years. In both pre-COVID and COVID periods the majority were male, being (66.7%) and (73%) respectively with a mean age of 49.9 ± 20.5 years in pre-COVID times and 47.9 ± 21.3 years in COVID times (**Table 1**).

Details of Autopsy	Variable	2019	2020	p-value
Autopsies performed (N)		189	126	
Age (Mean/median) \pm SD years		(49.85/52) \pm 20.47	(47.88/50) \pm 21.29	0.205
Range (min-max)		91(0-91)	92(0-92)	
Gender N (%)	Male	126 (66.7%)	92 (73.0%)	0.232
	Female	63 (33.3%)	34 (27.0%)	
Age group N (%)	Below 20	12 (6.3%)	11 (8.7%)	0.954
	21-40	49 (25.9%)	32 (25.4%)	
	41-60	59 (31.2%)	39 (31.0%)	
	61-80	62 (32.8%)	37 (29.4%)	
	Above 80	7 (3.7%)	7 (5.6%)	
Place of Death N (%)	Hospital	116 (61.4%)	66 (52.4%)	0.113
	Home	47 (24.9%)	43 (34.1%)	0.075
	Outdoor	26 (13.8%)	17 (13.5%)	0.947
Death type N (%)	Violence	101 (53.4%)	72 (57.1%)	0.518
	Unexpected	88 (46.6%)	54 (42.9%)	0.518
Manner of death N (%)	Homicidal	5 (2.6%)	1 (0.8%)	0.408*
	Accident	64 (33.9%)	35 (27.8%)	0.254
	Suicidal	45 (23.8%)	41 (32.5%)	0.088
	Natural	75 (39.7%)	49 (38.9%)	0.888
Specific cause N (%)	Burns	10 (5.3%)	9 (7.1%)	0.630*
	Cardiac cause	35 (18.5%)	26 (20.6%)	0.641
	Hanging/Drowning	34 (18.0%)	29 (23.1%)	0.275
	Other medical causes	41 (21.7%)	23 (18.3%)	0.457
	Other traumatic causes	17 (9.0%)	9 (7.1%)	0.677*
	Poisoning	11 (5.8%)	6 (4.8%)	0.802*
	RTA	40 (21.2%)	24 (19.0%)	0.647

*Test performed by Fisher's Exact, others by Pearson chi-square

The number of autopsies was reduced by 33% during the locked down period in 2020 (n-126) than pre-COVID period on 2019 (n-189). An increased proportion of home deaths were noted in the lockdown period in 2020 (34.1%) compared to the same period in 2019 (24.9%) while hospital deaths were higher in 2019 (61.4%) compared to hospital deaths in the lockdown period in 2020 (52.4%) (Table 1 and Fig. 1).

Regarding the manner of death, percentage of homicidal deaths (0.8%), and accidental deaths (27.8%) were less in 2020 compared to 2019 (2.6% and 33.9% respectively).

Moreover, proportion of suicidal deaths was higher in 2020 (32.5%) compared to that of 2019 (23.8%). Natural deaths during the pre-COVID period, 2019 and COVID lockdown period, 2020, did not reveal significant difference in percentage (39.7 vs 38.9 respectively) (Table 2). The incidence of violent, unnatural deaths were higher in 2020 (57.1% vs 53.4) and natural, unexpected deaths were higher in 2019 (46.6% vs 42.9). Among the cause of deaths, more proportion of deaths have been due to cardiac origin in 2020 (20.6% vs 18.5) whereas deaths due to non-cardiac origin claimed 18.3% in 2020 to that of 21.7% in 2019 (Table 1 and Fig. 2).

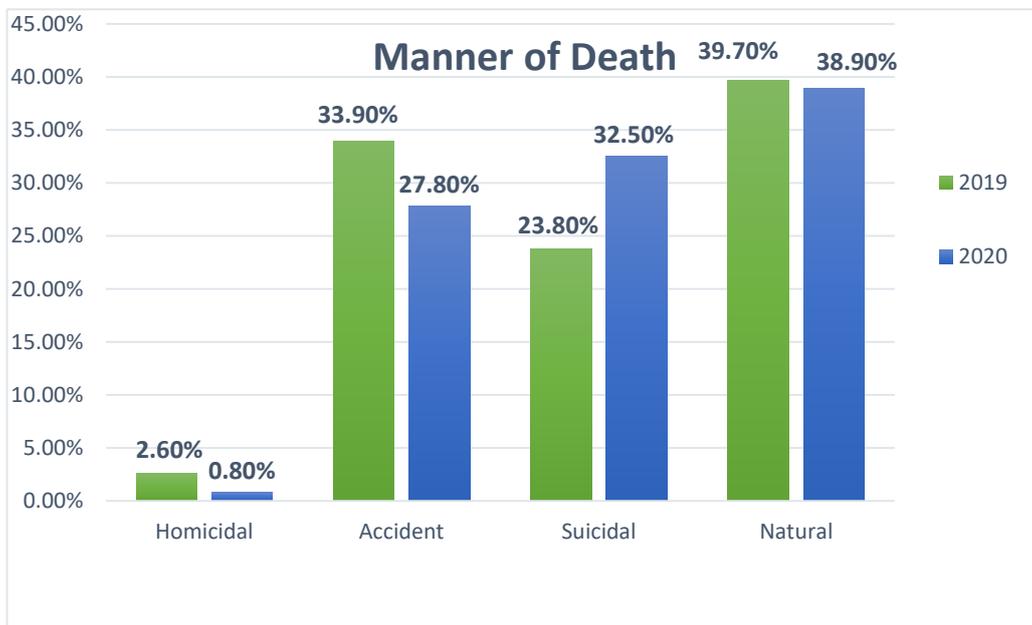


Figure 1: Distribution of details of autopsies according to the manner of death during pre-COVID period in 2019 and COVID lockdown period in 2020.

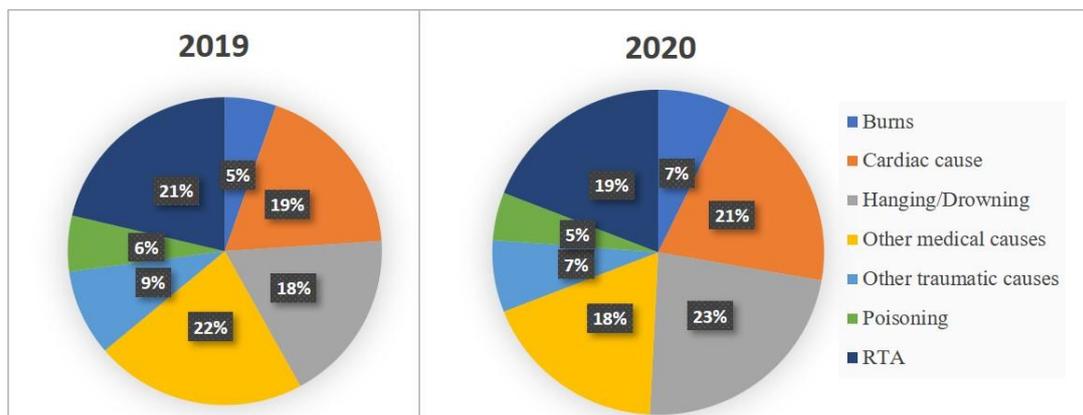


Figure 2: Distribution of details of autopsies according to the cause of death during pre-COVID period in 2019 and COVID lockdown period in 2020.

Pearson chi-square test revealed no statistically significant impact on autopsies done in Northern Province of Sri Lanka during COVID-19 lockdown period in 2020 when compared with autopsies done on the same period in 2019 (Table 2).

DISCUSSION

Autopsy examination is the key component of a medico-legal death investigation throughout the world. Sri Lanka follows the coroner system for this purpose. Several important issues related to personal safety and infection control arose when investigating deaths during the COVID-19 pandemic. Scene visit investigations, handling and transporting of dead bodies, are few of the primary concerns met by the medico-legal teams. Apart from the aforementioned, autopsy procedures, use of personal protective equipment, cleaning and disinfection are other practical concerns that were documented¹⁴. In Italy during the initial period of the crisis, due to lack of protective equipment and negative pressure autopsy rooms, targeted dissection was preferred than full autopsies¹⁵. In our setup, although several cases were reported during the first wave of COVID-19 infection in the Northern Province, no deaths were recorded. However, with the spread of the disease with the second and third wave, death rate rapidly rose proportionate to the number of patients, with more cases being presented to the Forensic Pathologists and warranting strict occupational safety measures due to the increased exposure to the public during the scene visit examinations, history taking process with relatives, public and law enforcement officers.

With regard to the findings of this study, the number of medico-legal autopsies during the lockdown period (2020) has been reduced to that of the same period in previous year by 33%. This finding correlates with similar studies of other countries^{13,15}. The restricted and controlled transportation, decline in aggressive physical altercations due to social distancing and fall in occupation-related deaths due to limitation on factory and construction works, may be considered as causes for this reduction during the period of lockdown. In contrast, deaths due to suicide were high during the same period. This may be due to increased psychological distress following isolation for longer periods of time which has led to disputes in between couples, family members, lack of hobbies and exercise and loneliness. The profound effect on mental health due to the pandemic has already being identified¹⁶. Moreover, self-isolation, physical distancing, and anxiety play a considerable, negative role on patients with mental illness¹⁷. Importantly, the pandemic has led to financial constraints, unemployment, entrapment,

loneliness, increased domestic violence, mental stress and alcohol consumption which are known precipitants of suicides^{18,19}. Access to highly lethal means of self-harm is another known risk factor for suicide which has been facilitated by this pandemic. Staying at home can lead bereaved individuals to access pesticides, poison, analgesics and drugs which are readily stored at home¹⁸. In our study, percentages of suicides were higher during the lockdown period compared to the same period in last year. Though hanging was the leading cause of fatality in both years, this was proportionately higher during the lockdown period. Similar results of increased suicidal rates were reported during 1918- 1919 influenza pandemic in United States of America (USA) and 2003 severe acute respiratory syndrome (SARS) epidemic in Hong Kong^{20,21}. On the other hand, Sri Lanka is well known for its high suicide rates, and this fact should be kept in mind while interpreting this study finding²².

It is commonly conceived that the lockdowns can drastically reduce the fatal road traffic related trauma due to restrictions in vehicular movement. This is in par with our study, where there was an overall reduction in percentage of road traffic trauma related fatalities. This finding is comparable with a previous study conducted in Nepal²³. In contrast, a study conducted in USA revealed increased number of fatal single vehicle crashes²⁴. Several reasons were postulated by researchers of the latter study, for relatively high or static Road Traffic Trauma related death during the lockdown time. Increased driving speed with reduced traffic congestion, speeding of vehicles and risky behaviors of drivers owing to absence of traffic police officers are some of them^{23,24}. This increased speeding due to less traffic was further strengthened by research studies on cognitive behavior of drivers involved in motor vehicular operation^{25,26}.

The homicidal deaths are associated with crime and COVID-19 lock down measures demonstrated a noteworthy but heterogeneous impact on this around the world. Studies conducted in Latin-American countries including Mexico reported a drop in homicidal cases since the COVID-19 restriction methods implemented²⁷. However, a study in USA signified a significant increase in homicides in some parts of the country. For example, from 2019 to 2020, a 15 % increase in homicide rates was reported from Philadelphia²⁸, while no significant changes were noted in a study from Los Angeles²⁹. In our study, there was an 80% reduction in homicide where only one case of homicide was reported during the lockdown period when compared to 5 cases in the previous year. Criminal activities, alcohol consumption, illicit drug

usage are some factors associated with homicides^{28,29} and in Sri Lankan context, increased surveillance of law enforcement forces, and increased number of police roadblocks during the pandemic lock down could possibly have led to the reduction of homicides.

The current pandemic made the health care system to restructure itself to encounter the acute respiratory problems following COVID-19 infection. The restructuring was carried out by cutting down of the routine services and out-patient clinics and diverting the resources towards the emergency and critical care management in Sri Lanka. Nevertheless, this process had reciprocal effects on management of chronically ill patients and this fact was reported in several studies around the world^{30,31}. In addition to the limitation of routine services, travelling restrictions, hesitancy of chronically ill patients to visit hospitals owing to the fear of acquiring infection might be other reasons for escalated home deaths during this period. This impression was reinforced by a UK based study on heart failure management, which revealed concomitant reduction (47 %) in admissions to treatment centers with increased home deaths following heart failure, during the pandemic³². In our study, even though increased percentage of home deaths were noted during the Covid period compared to the preceding year, no significant difference in natural unexpected deaths were identified. Among the natural cause of deaths, deaths due to cardiac origin were higher in 2020 (20.6%) and deaths due to non-cardiac origin were higher in 2019 (21.7%) in our study.

This simple descriptive study reveals that there is an impact on death patterns and mortality demographics of autopsies done during COVID-19 lockdown period to that of pre-COVID period. Even though a statistical significance was not observed, there was an impact on autopsies done in Northern Province of Sri Lanka, during COVID-19 lockdown period in 2020 when compared with autopsies done on pre-COVID period in 2019. Important reason for non-significant statistics may perhaps be a comparison samples only limited to autopsies of 2019, which did not include samples of 2018, 2017, etc. of pre-COVID era. Other reasons for non-significant statistical results may be multifactorial, which include small sample numbers, difference in sample sizes during pre-COVID (N-189) and COVID-19 locked down period (N-126), exclusion criteria, extreme outliers and random chance of occurrence of deaths.

CONCLUSION

Autopsy rates were reduced by 33% during the lockdown period. Even though it was not statistically significant there was an impact of COVID 19 on autopsies done in the Northern Province of Sri Lanka, during the COVID-19 lockdown period in 2020 when compared with autopsies done in pre-COVID period in 2019. These trends of change in the cause and manner of death during the COVID-19 period will guide health care providers to implement control measures to minimize suicides, homicides, accidental and natural deaths with new strategies which may be different from those during the non-COVID era.

RECOMMENDATIONS

The authors recommend larger scale, multicenter studies at medico legal morgues of other provinces locally and internationally and comparison with multiple control samples of pre-COVID years to obtain more valid data with statistically significant results.

LIMITATIONS

The study compares autopsy details of the lockdown period of 2020 with the autopsy material collected from the same period of 2019. Therefore it limits the outcome analysis of the study, as analysis did not compare autopsy material in previous years to ascertain a significant effect of lockdown on medico-legal autopsies done in the Northern Province of Sri Lanka.

LIST OF ABBREVIATIONS

ISD - Inquirer into Sudden Death
SPSS - Statistical Package for Social Sciences
USA - United States of America
SARS - Severe acute respiratory syndrome

CONFLICTS OF INTEREST

There are no conflicts of interest.

ETHICAL ISSUES

None

AUTHOR CONTRIBUTIONS

SP: conception, design, data acquisition, analysis, interpretation, manuscript preparation, final approval; **SR:** conception, design, data acquisition, analysis, interpretation, manuscript preparation, final approval; **UM:** conception, design, data acquisition, analysis, interpretation, manuscript preparation, final approval; **BMM:** design, data analysis, interpretation, manuscript preparation, final approval; **KV:** conception, design, data acquisition, analysis, interpretation, manuscript preparation, final approval; **NS:** design, data analysis, interpretation, manuscript preparation, final approval.

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