

Full Length Research Paper

Excess deaths within the context of COVID 19 pandemic in Aden in May 2020

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The civil registration office in Aden (at Southern Yemen) reported unexpected high number of deaths in May 2020 that made people and authorities worry about this tragedy and the causes behind it. The study aims to explore the relationship of these excess deaths with COVID 19. The study used a review of the death related data from the civil registration records in Aden. Other sources reviewed were the surveillance data of ministry of health, the census data (projection of 2020). A total of 1823 deaths were reported by civil registration offices in Aden in May 2020. The mean daily number of deaths in May 2020 was 58 deaths, which are higher than the daily death threshold of Aden (22 deaths). The deaths in May 2020 were compared with deaths in May 2019 (306 deaths), there was 595% excess deaths. More specifically, 48 out of the 89 hospital deaths occurred in May 2020 were due to COVID 19 and some died in the COVID 19 isolation centers, bringing the deaths due to COVID 19 to 54% of the hospitalized patients. These excess deaths in May 2020 occurred parallel with spread of COVID pandemic in Aden.

Key words: Aden, COVID 19, excess death.

INTRODUCTION

SARS-CoV-2 is a corona virus and belongs to the β -corona virus cluster. COVID-19 is the third known zoonotic corona virus disease after SARS and the Middle East respiratory syndrome (MERS) (Sun et al., 2020). This marked the third introduction of a highly pathogenic and large-scale epidemic corona virus into the human population in the twenty-first century (Jin et al., 2020) COVID-19 can be transmitted via person-to-person contact through droplet spread (Fadaka, 2020). As of 25 October, 43,341,451 confirmed COVID-19 cases and 1,157,509 deaths have been reported globally giving

the global case fatality rate (CFR) due to COVID- 19 to be 2.67% (WHOa, 2020), while by 31 May 2020, there were 5,934,936 cases and 367,166 deaths (CFR 6.18%) (WHOb, 2020).

In Yemen, the first case was reported on 10th April 2020 in Hadramout region at eastern part; then cases spreads in Aden and other governorates of the country. The peak of the epidemic was in May 2020, a total of 419 confirmed COVID19 cases out of 979 suspected cases (42.8%) were reported in the southern and eastern governorates of Yemen from the period of 10th April

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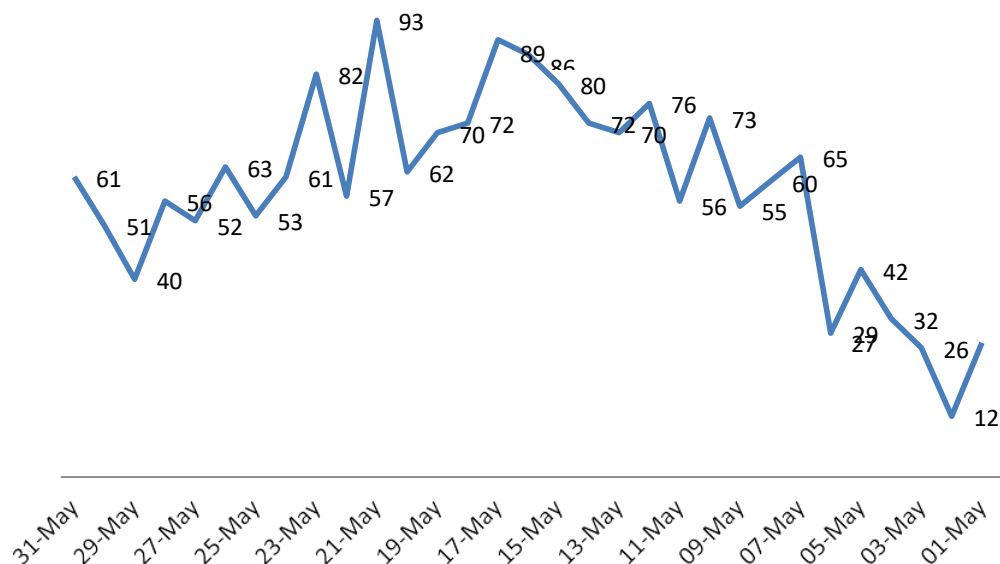


Figure 1. The daily trends of deaths in Aden, May 2020.

2020 to 31st May 2020, with 95 patients death, giving the case fatality rate (CFR %) to 22.7%. (Bin and Al-Waleedy, 2020) There is a perception that the COVID related deaths are underestimated due to limited diagnostic capacity, stigma and weak response of the health system. The situation was worse in Aden, in the beginning of May 2020, Aden was in a state of catastrophic events with the spread of COVID-19 pandemic with accompanying heavy raining season leading to increase of unexpected fever cases and as the diagnostic capacity for COVID-19 was limited, the available data underestimated the COVID-19 problem, including deaths (Bin et al., 2020).

Registration of death is one component of vital statistics. In developed countries like Europe, a modern system of death registration was implemented before the 19th century. Designated death searchers visited the households of deceased people to assess the nature of deaths but the need for lay reporting of causes of death remained in low and middle income countries where there was a lack of medical capacity to produce death certificates for the population (WHO, 2020).

Alternatively, conducting all-cause mortality surveillance through the recording of all weekly deaths and comparing this number to established threshold values could provide more detailed information on changes in mortality. It could improve local information on COVID-19 spread and burden, and complement other COVID-19 surveillance efforts (WHO/PAHO, 2020).

In Brazil, using data from the Civil Registration System in the State of Amazonas, shows increase in all-cause cumulative deaths from 400,000 deaths in January to May 2019 to 500,000 deaths in the same period of 2020 (Portal da Transparencia, Registro Civil do Brasil, 2020). The civil registration office in Aden (at Southern Yemen)

reported daily unexpected high number of deaths in May 2020 that made people and authorities worry about this tragedy and the causes behind it. It may be difficult to determine the direct causes of deaths at the time of death especially that most deaths occurred at home. The aim of this study is to explore the relationship of these excess deaths with COVID 19, by analyzing secondary sources of death data and establishing a hypothesis of this relationship.

METHODOLOGY

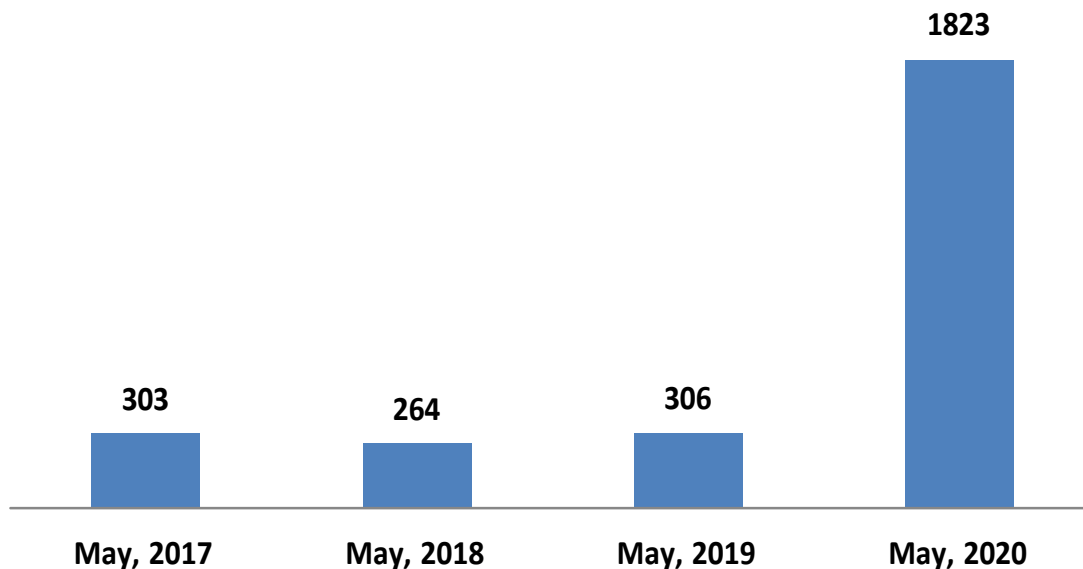
This study reviews death related data from the civil registration records in Aden. Other sources reviewed were the surveillance data of ministry of health, the census data (projection of 2020). The dependent variable is the number of death. The independent variables were day, month and year of deaths. Excel sheet were used for data entry and analysis Data are presented in tables and graphs.

RESULTS

A total of 1823 deaths were reported by civil registration offices in Aden in May 2020 based on the number of burred permission documents that were issued in the period from 1st May to 31st May 2020 (Table 1). The mean number of daily deaths in May 2020 was 58 deaths that are higher than the daily death threshold of Aden (22 deaths). This means that the mean number of daily deaths in May 2020 was two times more than the expected mean daily number of deaths. The new events occurred in May 2020 in Aden was COVID pandemic spread. Figure 1 presented the daily trends of deaths in Aden. Most of these deaths occurred at home with

Table 1. Comparison of deaths in May 2020 with deaths in the first four months in 2017, 2018, 2019 and 2020 in Aden.

Years/months	2017	2018	2019	2020
January	247	323	436	268
February	213	295	509	261
March	235	327	440	251
April	266	291	489	314
May	303	264	306	1823

**Figure 2.** comparison of deaths in May 2020 in Aden with deaths in May 2017, 2018, 2019.

no more details causes, the place of deaths were investigated for the period of the first 15 days of May 2020 which shows that only 89 out of 647 deaths (15%) occurred in hospitals. To confirm the relationship of these excess deaths in May 2020 with the COVID pandemic, data of the 89 hospital deaths were analyzed for causes of deaths; and out of them, 48 deaths were due to COVID 19 and those who died in the COVID19 isolation centers were 19 to 54% of the hospitalized patients.

To strengthen the above conclusion about relationship of the excess deaths in Aden in May 2020 with COVID 19 pandemic, the investigator reviewed the number of deaths that occurred in the previous four months of 2020 and the deaths that occurred in May of the previous three years (2017, 2018, and 2019). The number of deaths in May 2020 in Aden (1823 deaths) was five times higher than in April 2020 (314 deaths) and seven times higher than deaths in March 2020 (251 deaths), February 2020 (261 deaths) and January 2020 (268 deaths) (Figure 1). The similar findings were obtained when deaths of May 2020 were compared with deaths in May 2019 (306

deaths) with 595% excess deaths (Figure 2).

DISCUSSION

Excess deaths are typically defined as the difference between the observed numbers of deaths in specific time periods and expected numbers of deaths in the same time periods (CDC, 2020). Count the number of deaths and compare with the baseline number of deaths used to determine the excess deaths in a certain period of a certain population group or comparison between causes. Countries in the EuroMOMO network collected weekly data on the number of deaths from all causes, and excess (deviation from baseline) all-cause number of deaths was estimated using the EuroMOMO statistical algorithm (van Asten et al., 2017). In this study, the investigator calculated the excess deaths occurred in Aden in May 2020 compared with baseline and it was found that there were 263% increase.

Calculation of excess deaths and attribute it to the

current health events was used in Spain in 2012. In the 2011-12 season, the FluMOMO model identified the maximum percentage (97%) of deaths attributable to influenza in people older than 64 years with respect to the mortality total associated with influenza (13,822 deaths). The rate of excess mortality due to influenza and pneumonia and respiratory causes in people older than 64 years, obtained by the Serfling model, it reached a peak in the 2011-2012 season: 18.07 and 77.20, deaths per 100,000 inhabitants, respectively (León- Gómez et al., 2015). The investigator used the same approach to calculate the excess deaths in Aden and relate it to COVID pandemic. The excess death in May 2020 in Aden was 595%, more than deaths in May 2019. May 2020 was the peak period of COVID19 pandemic in Aden (MOPH&P -Yemen, 2020).

As most of the deaths in Aden occurred at home and only 89 deaths occurred in hospitals, out of which 48 deaths (54%) were identified as they were related to COVID-19, this percentage may be underestimated. Counting only confirmed or probable COVID-19-associated deaths, however, likely underestimates the number of deaths attributable to the pandemic, the counting of confirmed and probable COVID-19-associated deaths might not include deaths among persons with SARS-CoV-2 infection who did not access diagnostic testing, died outside of a health care setting, or for whom COVID-19 was not suspected by a health care provider as the cause of death (New York City Department of Health and Mental Hygiene, 2020).

Underestimation of deaths and lack of information about causes of deaths in low income countries is a big problem. Estimates suggest that one in two deaths go unrecorded globally every year in terms of medical causes, with the majority occurring in low and middle-income countries (LMICs). This can be related to low investment in civil registration and vital statistics (CRVS) systems (Thomas et al., 2018). Verbal autopsy (VA) may be a suitable tool to determine causes of death where civil registration or medical certification of deaths was absent. Verbal autopsy (VA) is a method that enables identification of cause of death where no other routine systems are in place and where many people die at home. Verbal autopsy (VA) is a method that can be used to collect and analyze data on cause of death. VA is defined by the WHO as 'a method used to ascertain the cause of a death based on an interview with next of kin or other caregivers' that can be applied for deaths without certification of medical causes (WHO, 2016). Regarding this study, it is highly recommended to conduct verbal autopsy in Aden to identify the true causes of deaths and document the contribution of COVID-19 pandemic to excess deaths in Aden.

As this study monitored progress of COVID epidemic in low resource and crises-affected country could help to describe the virus' future epidemiology in Yemen and understand how the national public health strategies affect the spread of the epidemic. One recent implication

of this study is that it stimulates researchers from London School of Hygiene and Tropical Medicine (LSHTM) in partnership with the technology and innovation company, the Satellite Applications Catapult, which has expertise in geospatial analysis. The research studies excess mortality in Aden within the context of COVID 19, which is not yet peer-reviewed but it is a pre- print study.

Conclusion

More than half of the deaths that occurred in hospitals in Aden in May 2020 were related to COVID-19, the excess deaths in May from all causes double the deaths in the same period of the previous three years and more than the deaths in the previous four months of 2020, this excess deaths in May 2020 occurred parallel with spread of COVID-19 pandemic in Aden. Further study is needed to investigate the true causes of deaths and verbal autopsy is highly recommended.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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