Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

American Journal of Emergency Medicine 43 (2021) 260–266

Contents lists available at ScienceDirect

American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem

Evolution of emergency medical calls during a pandemic – An emergency medical service during the COVID-19 outbreak

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ARTICLE INFO

Article history:
Received 9 June 2020
Accepted 13 June 2020

Keywords:
Emergency medical services
Pandemics
Epidemics
COVID-19
Coronavirus
Infectious diseases

ABSTRACT

Introduction: Emergency Medical Services (EMS) are expected to be affected by a pandemic outbreak. However, the available data about trends and extents of these effects is limited. *Methods:* We analyzed numbers of ambulance calls for all 136 diagnosis codes used by Magen David Adom (MDA), Israel's national EMS during 121 days between January 01 and April 30, 2020. *Results:* There was an increase in calls for COVID-19 symptoms (cough, fever, throat pain). This trend followed the same shape as the curve for confirmed COVID-19 patients. Trends were found to increase for calls not followed by transport to the hospital as well as in calls for mental or psychiatric causes. Simultaneously, there was a decrease in calls for cardiovascular issues, pneumonia, and all injuries. *Conclusion:* Understanding these correlations may allow better preparedness of the EMS and a better response towards the public needs in the period of an epidemic or a pandemic.

1. Background

Emergency Medical Services (EMS) are a crucial element of a national healthcare system [1,2]. EMS are designed to provide citizens with prompt, safe, and effective on-scene emergency medical treatment and access to the health-care system in times of urgent need [3]. In Israel (9.2 million residents), this role is performed by Magen David Adom (MDA) which is the national EMS organization, national blood bank, and blood services, and national red-cross society as outlined in the MDA law [4]. One of MDA chief roles is to provide a rapid and efficient response to medical emergencies. This is done by providing first aid instructions while simultaneously dispatching first responders and appropriate ambulance teams to provide medical care and transport to the hospital. MDA operates a fleet of over 1000 ambulances and Mobile Intensive Care Units (MICUs) spread throughout the country in 177 stations which are staffed by 2400 employees and over 24,000 volunteers [5]. In addition to the ambulances and MICUs 7000 volunteer first responders are utilized on over 600 motorcycles, 50 electric mini vehicles, 200 bicycles, and volunteers' personal vehicles which are also outfitted with emergency equipment [6]. As the national EMS, at any time of a crisis and especially in pandemics, disasters and wars, MDA must balance the increased needs created by the crisis with the ongoing needs of regular emergency incidents [7]. Finally, every citizen in Israel belongs to one of four Health Management Organizations (HMOs) except soldiers who receive medical care from the Israeli Defense Forces (IDF). Non-emergent medical conditions are typically treated by physicians and nurses in the domain of the HMO [8,9]. In cases of out of hospital death in Israel, only licensed physicians and certified MDA paramedics may declare and document death, which is usually done by MDA paramedics thus making MDA database a reliable representation for the number of out of hospital deaths [10].

In December 2019, the World Health Organization (WHO) China Country Office was informed of cases of pneumonia of unknown etiology. In January 2020, a new type of coronavirus – SARS-CoV-2 was isolated and identified as the cause of the rapidly evolving endemic known as Coronavirus Disease 2019 (COVID-19) [11]. This was soon to spread to many countries leading the WHO to declare it a pandemic [12].

EMS are expected to match response resources with patient needs, and the best use of EMS resources is achieved if they are tailored to service demand. It has been described that occupational, social, and recreational routines follow temporal patterns, as does the onset of certain acute medical diseases and injuries [13]. It is therefore important to understand these patterns in routine conditions. However, the spread of a pandemic outbreak can significantly disrupt the routine, as evidenced. Indeed, during previous pandemics, avoidance behaviors were described, including reluctance of visiting hospitals due to the fear of contracting the disease [14]. During this period there were reports of reductions in various causes of hospital emergency department visits and admissions including admissions for urgent lifesaving procedures such as Primary Coronary Interventions (PCI) [15,16]. A certain amount of

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https://doi.org/10.1016/j.ajem.2020.06.039
0735-6757/

fear and anxiety may be adaptative and motivates appropriate protective behaviors. However, excessive anxiety, as reported during pandemic-related restriction of movement of the population, leads to unwarranted distress, and has psychological impacts [17,18]. It appears therefore of tremendous importance to assess these modifications in demands and patterns of demands during a pandemic.

Little data exists reporting the patterns of EMS demand in function of time [13,19,20], but little is known about the influence of pandemics on the pattern of EMS activity during epidemics. Therefore, the objective of this study was to assess the impact of the COVID-19 pandemic on the trends in EMS activities in Israel throughout the pandemic.

2. Methods

2.1. Study design

The 4-month study period (January 01–April 30, 2020) lasted 121 days. We analyzed all 136 diagnoses codes from the national EMS database (Table 1). This was compared to the same period in the previous year (January 01–April 302,019, i.e. 120 days) for consideration of normal seasonal trends.

A person in need of acute medical assistance should call the national medical emergency telephone number of Israel (1-0-1). The call is answered by a trained and experienced dispatcher who receives information, conducts initial triage, and defines the medical problem in a code. This information is simultaneously entered by the dispatcher into the unified command and control system which automatically dispatches the closest first responders together with the appropriate medical team (BLS teams in ambulances or ALS teams in MICUs), according to the urgency and medical needs at the scene as defined by the dispatcher. This study was approved by the Scientific Committee of Magen David Adom.

2.2. Case definition

This study was based on data extracted from Israel's national EMS database containing all emergency calls. The extracted data includes national EMS diagnosis codes (Table 1) and numbers of incidents in which each code was used. This study involves only retrospective de-identified data, which was extracted through the institutional Business Intelligence system from the command and control system.

Descriptive analyses were performed using numbers of calls as the variable. A very wide range analysis was first performed on all 136 diagnosis codes. Thereafter, the study chose to focus on several diagnoses codes which were found to be particularly informative. Several types of diagnosis were grouped into four batches (Table 2): (1) Total Cardiovascular – the sum of all cardiovascular-related calls, (2) Total Mental – sum of all mental disturbance and psychiatric illness related calls, (3) Total Injuries – sum of all injury-related calls, (4) Total Denials – All denial of treatment and/or transportation by patient or family.

2.3. Statistical analysis

Poisson regression analysis was used to examine the effect of time on the numbers of calls for all diagnoses or batches of diagnoses. When numbers of daily calls were found to change with time, the curve of the daily number of calls was analyzed and an approximative date where changes occurred was determined. Student *t*-tests were then employed to compare the mean number of daily calls between the first sub-period and the second sub-period. For all analysis-runs, a p-value of <0.05 was considered significant. XLSTAT 2020 Statistical and Data Analysis Solution for Excel (Addinsoft, Paris, France) was used to perform statistical analysis.

Table 1
List of Magen David Adom (MDA) medical diagnosis codes.

Aggressive patient	Dehydration	Severe injury	Asphyxia/aspiration/foreign body
Suspected suicide attempt	Scorpion sting	Non-traumatic bleeding/wound	Dyspnea
Suspected anxiety reaction	Animal injury	Non-cardiac chest pain	Cough/hemoptysis
Suicidal thoughts	Heat injury	Ear pain	COPD exacerbation
Mental disturbances	Cold injury	Abdominal pain	Asthma attack
Psychosis	Hypersensitivity/allergy	Back pain	Suspected pneumonia
Hypoglycemia	Poisonous inhalation	Eye pain	Suspected pulmonary embolism
Hyperglycemia	Smoke inhalation	Headache	Stridor
Thyroid disorder	Anaphylactic reaction	Groin pain	Confusion
Urine retention	Alcohol overconsumption	Throat pain	Syncope
Gynecological illness	Drugs overdose	Hand pain	Post-syncope
Vaginal bleeding	Medication overdose	Diffuse pain	Generalized weakness
UTI	Hanging	Neck pain	Unconsciousness
Hematuria	Limb injury	Leg pain	General deterioration
Suspected abortion	Neck injury	Tooth ache	Post-seizure
Renal colic	Multi-trauma	Menstrual pain	Dizziness/vertigo
Rupture of membranes	Thoracic injury	Pulmonary edema/heart failure	Seizures
Uterine contractions	Head injury	Bradycardia	Stroke/transient ischemic attack
Active labor	Pelvic injury	Cardiopulmonary arrest	Reduced level of consciousness
Preeclampsia/eclampsia	Abdominal injury	Palpitations	Nausea and/or vomiting
Patient denies transportation to hospital	Spinal injury	Other arrythmia	Rectal bleeding
Patient denies treatment	Facial injury	Acute coronary syndrome	Hematemesis
Family denies transportation to hospital	Suspected head of femur fracture	Hypertension	Constipation
Family denies treatment	Suspected upper limb fracture	Hypotension	Diarrhea
Confirmed dead - no CPR	Suspected lower limb fracture	ECG alterations	Suspected gastroenteritis
False call	Thermal burns	SIDS	Suspected bowel obstruction
Feared danger to human life	Chemical burns	Pacemaker/defibrillator dysfunction	Suspected abdominal emergency
Abnormal blood test	Crush injury	Cardiogenic shock	Peptic ulcer
Death declaration	Finger amputation	AV Block	Melena
Foreign body in ears	Limb amputation	Myocardial infarction	Hemorrhoids
Foreign body in nose	Burn 1st degree	Ventricular fibrillation	Fever
Foreign body in eyes	Burn 2nd degree	PSVT (AVRT/AVNRT)	Suspected meningitis
Snakebite	Burn 3rd degree	Atrial fibrillation	Suspected sepsis/septic shock
Poisoning	Light Injury	Respiratory arrest	Cellulitis

Table 2
Medical diagnosis codes batched in groups.

Batch	Diagnosis
Total cardio	Bradycardia
	Atrial fibrillation
	Cardiopulmonary arrest
	Palpitations
	Other arrythmia
	Acute coronary syndrome
	Hypertension
	Hypotension
	Pulmonary edema/heart failure
	Electrocardiogram alterations
Total mental	Aggressive patient
	Suspected suicide attempt
	Suspected anxiety reaction
	Suicidal thoughts
	Mental disturbances
	Psychosis
Total injuries	Limb injury
	Neck injury
	Multi-trauma
	Thoracic injury
	Head injury
	Pelvic injury
	Abdominal injury
	Spinal injury
	Facial injury
	Suspected head of femur fracture
	Suspected upper limb fracture
	Suspected lower limb fracture
	Light injury
Total denial	Patient denies transportation to hospital
	Patient denies treatment
	Family denies transportation to hospital
	Family denies treatment

3. Results

The total number of calls during the 4-month period of this study was 268,361, with a mean number of 2218 ± 209 calls per day. Regression analysis showed significant relationships between time and number of calls for several diagnoses.

This relationship was significantly positive for "Cough/Hemoptysis" ($r = +0{,}52$, $P < 0{,}001$), "Throat Pain" ($r = +0{,}45$, $P < 0{,}001$), and "Fever" ($r = +0{,}36$, $P < 0{,}01$). The relationship was also positive between time and calls resulting in "Patient denies transportation to hospital" ($r = +0{,}64$, $P < 0{,}001$).

Conversely, a negative relationships was found for "Limb Injury" ($r = -0{,}44$, $P < 0{,}001$), "Head Injury" ($r = -0{,}44$, $P < 0{,}001$), "Light Injury" ($r = -0{,}65$, $P < 0{,}001$), "Pulmonary Edema/Heart failure" ($r = -0{,}66$, $P < 0{,}001$), "Suspected Pneumonia" ($r = -0{,}76$, $P < 0{,}001$), "Acute Coronary Syndrome" ($r = -0{,}24$, $P < 0{,}05$), "Stroke/Transient Ischemic Attack" ($r = -0{,}27$, $P < 0{,}05$), "Hyperglycemia" ($r = -0{,}30$, $P < 0{,}05$), "Hypoglycemia" ($r = -0{,}31$, $P < 0{,}05$), as well for "Post-Syncope" ($r = -0{,}73$, $P < 0{,}001$) and "Post-Seizure" ($r = -0{,}82$, $P < 0{,}001$).

Conversely, there was no temporal relationship for "Death declaration by paramedics" ($r = 0{,}06$, NS). Similarly, there was no relationship in cases where human life was suspected to be in danger ($r = 0{,}06$, NS).

Careful consideration of data let us evidence that the "Number of calls per day" tended to exhibit a 2-period repartition, with a marked change in shape around Day 62, which means March 02. Considering the apparent modification in the "Number of calls per day" beginning around day 62, the study timeline was separated into two periods: period 1 – from Day 1 to Day 62 (i.e. from January 01 to March 02), with $n = 62$ days; and period 2 – from Day 63 to Day 121 (i.e. from March 03 to April 30), with $n = 59$ days.

Based on this two-period repartition, the mean "Number of calls per day" was compared between the two periods by Student *t*-test for each diagnosis or batch. To make this report more focused, only medical diagnosis codes exhibiting the most significant changes are presented with mean numbers of calls per day, other diagnosis codes were batched together by topic as mentioned in the methods chapter (Table 3).

There was a significant increase in calls between the two studied periods for the following medical diagnosis codes: Cough/Hemoptysis (+212%), Throat Pain (+124%), Fever (+48%) (Table 3, Fig. 1), Total

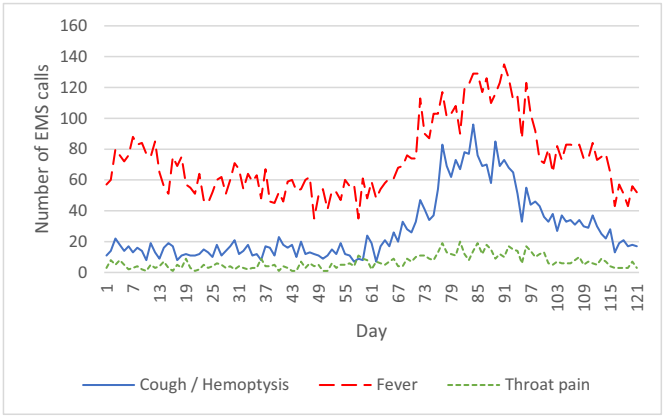

Fig. 1. Medical diagnosis codes for symptoms consistent with COVID-19.

Table 3
Student t-test comparison of "Number of calls per day" between Period 1 (December 01, 2019 - March 02, 2020) and Period 2 (March 03, 2020 - April 15, 2020),

	Period 1 (n = 62)		Period 2 (n = 59)		
Number of calls per day	Mean	SD	Mean	SD	P
Cough/hemoptysis	13,9	4,1	43,3	21,5	<0,0001
Throat pain	4,2	2,3	9,4	4,5	<0,0001
Fever	59,6	12,1	88,0	24,8	<0,0001
Suspected pneumonia	28,5	6,8	18,2	9,5	<0,0001
Generalized weakness	198,4	26,6	170,0	26,1	<0,001
Total "cardio"	254,0	34,1	214,2	29,8	<0,0001
Total "mental"	69,2	10,7	78,1	11,9	<0,001
Total "injuries"	378,2	48,3	286,3	64,6	<0,0001
Total "denial"	200,3	22,5	253,2	39,1	<0,0001
Total "other"	1110,9	56,7	995,1	72,9	<0,001

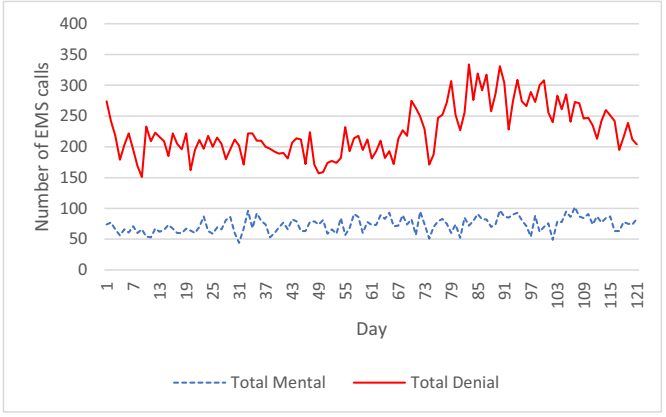

Fig. 2. Medical diagnosis codes which increased during the COVID-19 outbreak.

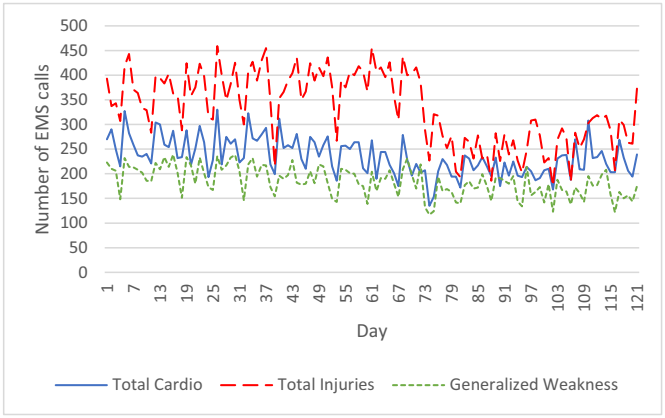

Fig. 3. Medical diagnosis codes which decreased during the COVID-19 outbreak.

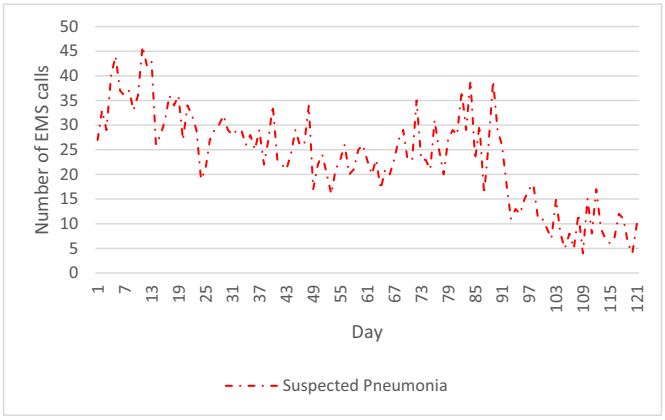

Fig. 4. Medical diagnosis code for pneumonia which decreased during the COVID-19 outbreak.

Mental (+13%), and Total Denies (+27%) (Table 3, Fig. 2). There was a significant decrease in calls between the two studied periods for the following medical diagnosis codes: Total Injuries (−24%), Generalized Weakness (−15%), Total Cardiovascular (−16%), and Suspected Pneumonia (−36%) (Table 3, Fig. 4).

Considering data recorded in 2019, no significant change was apparent in numbers of calls for Cough/Hemoptysis, Throat Pain, or Fever throughout the equivalent period. Moreover, the increase in "Total Denial" calls found in 2020 was not evidenced in 2019 (229 ± 26 vs 215 ± 23, period P1 vs period P2 respectively, NS), as was also not evidenced in 2019 the decrease in "Total Injuries" calls found in 2020 (361 ± 50 vs 380 ± 51, period P1 vs period P2 respectively, NS). Conversely, the time-related decreasing trend for calls for "Suspected Pneumonia" was also evidenced in 2019 ($r = -0{,}63$, $P < 0{,}001$), as was found the decreasing trends for "Total Cardio" calls ($r = -0{,}33$, $P < 0{,}05$), "Post-Seizures" ($r = -0{,}45$, $P < 0{,}05$), but not for "post-Syncope" ($r = -0{,}17$, NS), "Hyper or Hypo-Glycemia" ($r = -0{,}07$ and $r = -0{,}03$ respectively, NS) (Fig. 3).

Given the shape of the curve for "Cough/Hemoptysis", "Throat Pain", and "Fever", as shown in Fig. 1, it appears that the increase in numbers of calls per day in the second period (March 03 to April 30) is characterized by a sharp initial increase, followed by a decrease in that number. A correlation test was used to test this hypothesis. For that purpose, Period 2 was further separated into two periods: period 2a – from Day 63 to Day 85, (March 03 to March 24, i.e. 22 days); and period 2b – from Day 86 to Day 121 (March 25 to April 30, i.e. 37 days).

The results of the correlation tests for these three symptoms in periods 2a and 2b are given in Table 4. There was a marked and significant increase in the number of calls per day for each of the three symptoms, during the period 2a, followed by a marked and significant decrease of the values in period 2b.

Finally, despite the particularly marked increases in calls for "Cough/Hemoptysis", "Throat Pain", and "Fever", the total number of calls per day appeared to be globally significantly lower ($P < 0{,}05$) during period 2 (2135 ± 192) than during period 1 (2297 ± 188).

4. Discussion

EMS are widely recognized to play a key role in the health system in a nation. Their organization has been profoundly documented [1,2]. However, there is little data reporting types of calls and patterns of EMS demand. They describe seasonal, annual, hourly, or weekday impacts on EMS activity [13]. Other observational studies have described the field of emergency dispatching with a focus on citizens' initial

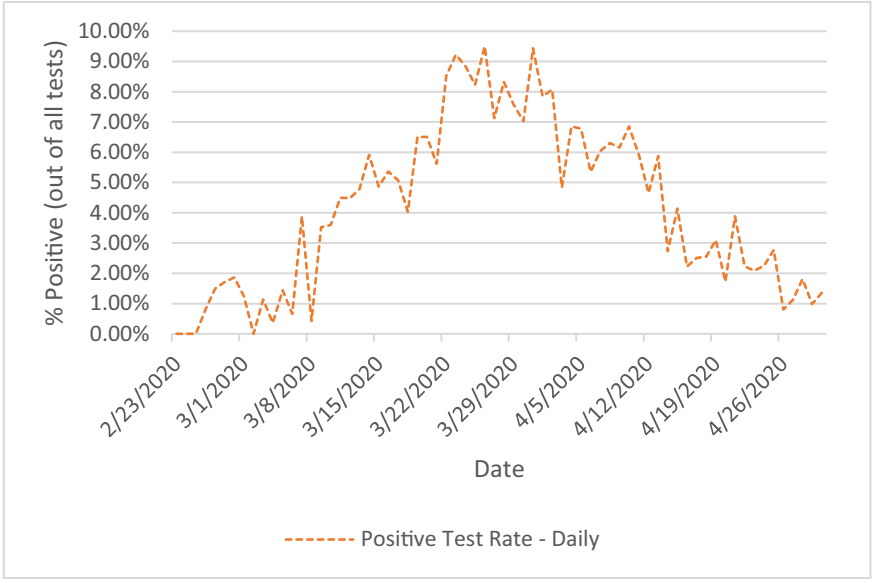

Fig. 5. Daily test rate of confirmed positive patients in Israel.

Table 4
Correlation tests between time and "Number of calls per day" during periods 2a (March 03–March 24, 2020) and 2b (March 25–April 15, 2020).

Symptom	Period	Pearson r	P value
Throat pain	2a	+0.73	<0.001
	2b	−0.78	<0.001
Cough/hemoptysis	2a	+0.93	<0.0001
	2b	−0.91	<0.0001
Fever	2a	+0.92	<0.0001
	2b	−0.89	<0.0001

contact with the healthcare systems through emergency calls [19,21]. Surprisingly, there were very few previous reports about the pattern of calls to an EMS during a pandemic or an epidemic. Chow-In-Ko et al. evaluated the use of EMS systems during the 2003 outbreak of SARS in Taipei (Taiwan) [22]. Their 3-month study, which was based on the number of EMS transports, revealed that the overall volume of EMS incidents did not change significantly, but that non-SARS EMS activities decreased. As the present outbreak of coronavirus disease continues, this manuscript aims to report very first insights into the call-type pattern during the emergence of a pandemic and draw indications that can be used for future preparedness.

When analyzing all diagnosis codes before and during the emergence of COVID-19 in Israel, we found a positive relationship between time and the number of calls per day for the three diagnoses codes: "Cough/Hemoptysis", "Throat Pain", and "Fever". Moreover, when means of the number of calls per day were compared between period 1 and period 2, it was found that there was close to three times more calls for "Cough/Hemoptysis" and more than two times more calls for "Throat Pain" in period 2, whereas calls for "Fever" increased by 48%. Fever and cough (and consequently the associated throat pain) were the two most common symptoms of patients with COVID-19 [23]. Very interestingly, the calls for these three symptoms began to increase on Day 63 around March 03. The first positive case of contaminated COVID-19 in Israel was evidenced on February 22. According to data from the Israeli Ministry of Health, the rate of tests found positive with COVID-19 increased slowly from February 22 until the beginning of March (Fig. 5) [24]. This rate then markedly increased until March 24–26 and thereafter decreased sharply. Interestingly but not surprisingly, this is fully in line with the curves describing the evolution of the number of calls for "Throat Pain", "Cough/Hemoptysis" and "Fever". They indeed follow the same shape in the second period of our study (i.e. from March 03 to April 30) as the rate of positive tests for COVID-19, with an initial and sharp increase followed by a similarly sharp decrease in the number of calls, with the peak being around March 24. The increase in EMS calls for medical conditions, part of which does not usually justify EMS intervention may be explained by the general state of confinement together with the reduction of in primary care clinic activities and opening hours. Additionally, MDA was in constant public focus as the main gateway to healthcare during the outbreak, thus causing people to contact the health care system through EMS.

Even more interestingly, a 38% increase was found in the total number of calls where patients (or family) denied transportation to the hospital. Patients or families sometimes call an ambulance for treatment and then deny transportation. In recent years, the issue of "inappropriate calls" is one of constant discussion [25,26], and have been reported to represent up to 32% of all ambulance responses and could lead to fewer resources being available [25]. The documented reasons for refusing hospital travel were found to be complex. However, it has to be stated that in most cases the given reasons were a minor injury (55%), or a patient who recovered significantly (25%), and more rarely a patient who explicitly refused to travel against medical advice (15%) [26]. In the present study, the reasons for denying transportation to the hospital are probably similar in period 1 of our study to the reasons raised by Shaw et al. [26]. However, the marked increase evidenced in the rate of calls ended with denial of treatment and/or transportation during the spread of the outbreak could also be due to the fear and anxiety of being exposed to the virus in the ambulance or hospital [14,27,28]. Fear is one factor in avoidance of medical care, and during epidemics, such behaviors were associated with misconceptions regarding the severity of other prevalent diseases [16]. This has been well reported in patients with ACS [15]. Not only the number of visits changed, but the time from onset of symptoms to presentation was also reported to be prolonged [29]. It is noticeable that, even though people were reluctant to go to the hospital even with cardiovascular complaints, this study did not find excess mortality at home compared with routine times. This requires further investigation.

Another reason for denying transport to the hospital could also be related to the fact that, regarding disease-containment measures inside the hospital, family members would not be allowed to accompany the patient, and both the patient and the family could thus refuse to be separated.

Social distancing and restriction of movement are among the most commonly recognized non-pharmaceutical public measures to prevent human-to-human transmission in the absence of specific antiviral therapy and of admitted vaccines [30,31]. Even if pandemic illnesses, such as COVID-19, are often associated with high levels of anxiety, self-isolation, or quarantine, which also has been widely reported to induce important psychological impact [17,18,27]. Persons in quarantine have their freedom restricted, and it has been shown that a substantial proportion of quarantined persons are distressed, display symptoms of PTSD, anxiety, and depression [17,32]. Pandemics have much in common with other disasters (unpredictability, fatalities). But there is a huge difference from other disasters: in place of social convergence, the exact opposite is demanded (isolation, separation), and the interruption of such community and family rituals, norms, and values may diminish individual resilience, worsen mental health and increase the potential for adverse reactions [32]. The 12% increase that we found in "Total Mental" calls could reflect the direct effect of confinement on psychologically unstable patients.

The 24% decrease that we found in "Total Injury" calls could be related to the progressive decrease in travels and sports activities of the population due to confinement at home. It could also be proposed that the above-mentioned fear of being contaminated induced less numerous calls for EMS in case of non-serious injuries. Concerning the 16% decrease in the "Total Cardiovascular" calls, it can be argued again that the patients' threshold to calling for an ambulance was raised by the fear of being contaminated, which possibly caused a decrease in calls for non-vital cardiovascular reasons. This could be supported by the fact that in 2019 we only found a slight and non-significant 6% decrease for calls for "Total Cardiovascular" calls. This remains also to be confirmed. Another assumption that could be likewise made is that patients remained at home, due to confinement measures, and experienced a better fulfillment of their treatment, in these times where underlying pathologies were well known by the public to be of pejorative prognosis in case of contamination by COVID-19 [23]. Some patients either did not call or would have thus waited longer before calling. The same reason regarding possible better fulfillment of treatment and/or increased threshold for calling for an ambulance might be raised for the decreasing trends for calls for Hyper/Hypo-Glycemia, and for "Post –Syncope" calls. However, the decrease in calls for "Post-Seizures" found in our study was also evidenced when assessing the Year 2019. This could be related to previously reported seasonal variations in epileptic seizures, with a peak in January and a nadir in August [33].

Generalized weakness is one of the main symptoms associated with COVID-19 [23]. It is also well known to be one main symptom of flu and many other viral illnesses, sometimes leading to a state of post-infectious fatigue syndrome [34]. This retrospective study has found a decrease of 15% in the number of calls for "Generalized Weakness" over time. More than to the emergence of COVID-19, this decrease is

to be related to the period in the year of that study, which began on January 1, i.e. during the peak in the seasonal epidemic flu outbreak. Whereas it has been overshadowed by the coronavirus outbreak, Influenza activity peaked in late December 2019 and decreased significantly since and its activity was below baseline levels by end of February 2020 [35]. Moreover, another finding was a 36% decrease in the daily number of calls for "Suspected Pneumonia" in period 2 as compared with period 1. Here also, this could be related to the incidence of flu in late December 2019–January 2020. This could be supported that the same cause of calls ("Suspected Pneumonia") exhibited a similar decreasing trend in 2019 (−31%), and probably for the same seasonal-flu reason. Interestingly, even though its lower mean "Number of calls per day" in period 2, calls for "Suspected Pneumonia" exhibited a slight increase during period 2, following the same trend as "Cough/Hemoptysis", "Throat Pain", and "Fever". This last shape of the curve could probably be to attribute to the peak in COVID-19 cases.

Finally, despite the increases in daily calls for "Cough/Hemoptysis", "Throat Pain", "Fever", "Suspected Pneumonia", "Total Mental", and "Total Denies", the global mean daily number of calls decreased in period 2. This is in line with the findings of Chow-In Ko et al. during the 2003 SARS outbreak which evidenced a decrease in non-SARS EMS activities during this period. This is probably the consequence of the marked decreased rates of calls of "Total Injuries" and "Total Cardiovascular", that together represent the largest proportion of the daily activity of the EMS [22].

5. Conclusions

This study analyzed calls received between January 01, 2020 and April 30, 2020, the period of pre-exposure, and then to the emergence of COVID-19 in Israel. There is strong evidence supporting that the patterns of calls to MDA were closely affected by the pattern of the spread of the pandemic in the country, especially for the main symptoms of this viral illness. Regression analyses showed significant relationships between time and number of calls for several diagnoses. An increase was found in calls for mental or psychiatric causes, which could be related to the marked anxiety and stress associated with the outbreak, and to the direct psychological impact of quarantine, confinement, and social distancing. There was an increase in calls that were not followed by transport to the hospital, which could reflect the increased fear of being contaminated in the hospital. Finally, it appears that the volume of other calls either did not change for most of the diagnosis codes or decreased when reflecting the decreased activity of most of the population due to general measures of confinement. Understanding these trends would allow better planning of EMS organization logistics and operational array.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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