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.

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Original Research

Demographic factors associated with COVID-19-related death in Palestine

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ABSTRACT

Objectives: Understanding the case and death rates of COVID-19 in different countries should include socio-demographic variables to better guide health policies. We analysed COVID-19 cases in the Occupied Palestinian Territories (OPT) with attention to socio-demographic factors.
Study design: A retrospective chart review of laboratory confirmed COVID-19 cases was conducted between March and September 2020.
Methods: Demographic data such as age, gender, place of residence, pregnancy, and symptoms were analysed. Patients were divided into two outcome groups: discharged from quarantine restrictions and dead.
Results: A total of 15,338 confirmed cases was examined. COVID-19 cases tended to be young (48.2% were less than 30 years of age) with an average age of 34.3 ± 27.3, most were female (55.5%),and 20% smoked. Overall, 5183 (38%) were symptomatic and if pregnant, symptoms were more commonly reported (65.3%). The overall case-fatality was 0.93 [95% CI 0.83–1.04]. Males had a greater risk of death (OR = 2.7 [95%CI = 1.7–2.8], $P < 0.001$), as did those 60 years of age and older (OR = 52.0 [30.5–89.7], $P < 0.001$).
Conclusion: Early detection of socio-demographic risk factors helps understand the case distribution and guide better planning, especially in countries with limited resources. Better targeting of interventions may help to limit more expensive interventions such as intensive care admissions and avoid deaths. Such data are also important for planning vaccination campaigns.

1. Introduction

Coronavirus disease 2019 (COVID-19), the pandemic that invaded the world in 2020, caused more than 70 million cases and exceeded a million and a half deaths worldwide by the end of the year [1]. The World Health Organization declared COVID-19 a pandemic on March 11, 2020, [2] as unprecedented numbers of positive cases spread across the globe.

The Occupied Palestinian Territory (OPT) has experienced a high rate of COVID-19 transmission and the Ministry of Health (MoH) reported more than 80 thousand cases and 800 deaths as of December 2020 [3]. As a region of protracted political conflict marked by more than 50 years of Israeli occupation, insufficient compliance with international humanitarian law and human rights law, and internal Palestinian political divisions [4], COVID-19 added additional humanitarian and health burdens to the longstanding uncertainty.

Worldwide, health authorities and institutions have endeavoured to identify who is at the highest risk of death from COVID-19. Rudimentary inference focused on analysing the number or proportion of fatalities in different communities. At this point, it is essential to provide a comprehensive analysis of the highly aggregated data. A limited selection of micro-level studies have focused on comorbidities with little attention paid to sociodemographic factors [5].

Drefahl et al. demonstrated COVID-19 death rate differences among age groups, genders, civil status, and educational level in a broad population-based sample [5]. In studies from the USA, England, and India, males had higher COVID-19 case fatality rates [6-8]. Other research demonstrated regional differences in the incidence, prevalence and deaths from COVID-19 which are likely the result of epidemiologic and population variables, as well as clinical and public health practices [8,9]. The disparities in fatality due to COVID-19 have been geographical with a discrepancy between developed and developing regions. Older people in developed areas such as the USA and Italy are more likely to die from COVID-19 [10,11]. While in developing countries such as India, Brazil, and Iran, most deaths occurred in patients between 50 and 70 years of age [8,12,13].

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Palestine faces a number of uncertainties, fragility, socioeconomic mobility and poverty which impacted the COVID-19 response. The Ministry of Health (MOH), the United Nations Relief and Works Agency (UNRWA), non-governmental organisations (NGOs), and the private sector are the four primary suppliers of health services in the Palestinian Territories, with MOH and UNRWA providing the most care. MOH and NGOs are the main providers of secondary services, and the primary provider of tertiary care is the private sector. The MOH was responsible for case detection, tracing contacts, and screening high-risk groups during the pandemic, as well as care and treatment of COVID-19 cases. All COVID-19 related data have been collected by the central MOH surveillance department.

As national governments have begun to relieve isolation constraints and prepare a path through the pandemic, accurate information is imperative to identify which population members are at high risk of becoming ill or more likely to die. This analysis emphasizes the early epidemiological features of COVID-19 cases in the OPT in order to guide to policy decisions on the health, commercial, social, and fiscal fronts.

2. Methods

2.1. Study design and setting

Between March and September 2020, an observational chart review study of COVID-19 confirmed cases was conducted using medical records. Data were obtained from District Health Information Software Records (DHIS2), which, like many other countries, is used by the Palestinian MoH to speed case recognition, situation reporting, active surveillance, and response to COVID-19. DHIS2 uses a digital data package based on standard metadata compatible with COVID-19 surveillance technical advice from the WHO and case descriptions. It is primarily used for reporting and reviewing routine health data [14].

2.2. Participants and eligibility criteria

We identified all laboratory-confirmed COVID-19 cases reported by the Palestinian MoH to WHO between March 5, 2020 and September 30, 2020. A confirmed case was defined as any person with laboratory confirmation of COVID-19 infection based on positive real-time polymerase chain reaction (PCR) of SARS-CoV-2 virus. Respiratory samples were obtained from all patients and submitted to the regional lab for SARS-CoV-2 testing. All PCR tests were carried out at the Palestinian MoH regional laboratories located in the north, center and south of the OPT.

2.3. Data collection

We reviewed DHIS2 records of all patients with laboratory-confirmed SARS-CoV-2 infection. We extracted demographic data such as age, gender, and place of residence. In addition, we collected information about pregnancy, and presence of symptoms such as fever, cough, general weakness/fatigue, headache, myalgia, sore throat, coryza, dyspnoea, anorexia/nausea/vomiting, diarrhoea, and altered mental status. We divided patients into two groups for final analysis based on survival: discharged vs. dead. Discharged referred to patients that were released from isolation (i.e., no longer required to take transmission-based precautions) in accordance with WHO guidelines, which means that for symptomatic patients: 10 days from the start of symptoms, plus at least 3 days without symptoms (including without fever and without respiratory symptoms) and 10 days after a positive SARS-CoV-2 test in asymptomatic cases [15]. A total of 33,756 confirmed cases were reported. A thorough review of the missing outcome data and the identifiers resulted in 15,338 patients with completed files available for risk factors analysis.

2.4. Statistical analysis

Categorical variables were represented as counts and percentages. Means were calculated using independent sample *t*-test. Differences were evaluated using Chi-square to compare nominal variables of significance. The risk factor for mortality was estimated using univariable and multivariable regression. Statistical analysis was carried out using SPSS software, version 21 (IBM Corp., Armonk, NY, USA). $P < 0.05$ was deemed to be statistically significant.

3. Results

COVID 19 cases appeared to be young (48.2% were less than 30 years old) with a mean age of 34.3 ± 27.3 and most were female (55.5%). Smokers contributed just 20% of confirmed cases. Overall, 5183 (38%) were symptomatic. More cases have been recorded in Palestine's southern areas (40.9%) than in the central and northern regions. Of the 33,765 confirmed cases included in this study, 314 people (0.93) [95% CI 0.83–1.04] died of COVID-19 before September 30, 2020, as shown in Table 1. The first death of COVID-19 was recorded in the South on June 16, 2020, in an obese diabetic patient with advanced heart failure.

Symptomatic COVID-19 cases were more common in people over 30. More symptomatic cases occurred in the southern region. Pregnant women were more likely to be symptomatic than others. However, smoking was not linked to symptoms, as seen in Table 2.

Among those that died from COVID, the mean age of death was 65.17 ± 18.66 years, ranging from 0.12 years (39 days) to 80 years, and the majority of fatalities occurred in the geriatric population (≥60 years of age). Males (64%) and symptomatic cases (78.2%) were more likely to die. Pregnancy was not associated with death in our study population (see Table 3).

On further sub-analysis, most COVID-19 cases occurred among those aged 10–19 years and 20–29 years. The probability of death was highest in those between 70 and 79 years of old (19.2%), followed by 60–69 years and greater than 80 years (10.1%,10% respectively), as seen in Figure (1).

In the bivariate analysis, death was significantly associated with male gender, older age group, residence in the South and having symptoms. A logistic regression analysis showed that the same variables

Table 1
Background characteristics of the COVID-19 cases in the Occupied Territories of Palestine (n = 15,338) between March and September 2020.

Characteristic	Frequency	Percentage
Gender		
Male	6823	44.5%
Female	8515	55.5%
Age in years[a]		
<30 years	7385	48.2%
30–59 years	6090	39.7%
≥60 years	1848	12.1%
Residence		
South	6279	40.9%
Center	3886	25.3%
North	5181	33.8%
Smoking		
Non-Smoker	7822	80.0%
Smoker[b]	1953	20.0%
Pregnancy		
Yes	120	0.80%
No	15218	99.2%
Symptomatic		
Yes	5183	38.0%
No	8469	62.0%
Outcome		
Recovered	15024	98.0%
Dead	314	2.0%

[a] Mean age = 34.3 ± 21.7.
[b] Include passive and ex-smokers.

Table 2
Risk factors among symptomatic COVID-19 cases in the Occupied Territories of Palestine (n = 15,338) between March and September 2020.

Characteristic	Symptomatic		P-value[a]
	Yes (n = 5183)	No (n = 8469)	
Gender			
Male	2265 (37.3%)	3828 (68.8%)	0.089
Female	2920 (38.6%)	4646 (61.4%)	
Age in years			
< 30 years	2067 (31.5%)	4488 (68.5)	<0.001
30–59 years	2427 (44.7%)	3008 (55.3)	
≥60 years	691 (41.4%)	978 (58.6)	
Residence			
South	3070 (54.0%)	2614 (46.0%)	<0.001
Center	294 (9.6%)	2279 (90.4%)	
North	1821 (37.1%)	3081 (62.9%)	
Smoking			
Non-Smoker	3571 (49.0%)	3722 (51.0%)	0.098
Smoker[a]	803 (49.0%)	836 (51.0%)	
Pregnancy			
Yes	77 (65.3%)	41 (34.7%)	<0.001
No	5108 (34.7%)	8488 (68.5%)	

[a] Include passive and ex-smokers.

Table 3
Risk factors for Death among cases of COVID-19in the Occupied Territories of Palestine (n = 15,338) between March and September 2020.

Characteristic	Outcome		P-value[a]
	Death (n = 314)	Recovered (n = 15024)	
Gender			
Male	201 (64.0%)	6622 (44.1%)	<0.001
Female	113 (36.0%)	8402 (55.9%)	
Age in years[a]			
< 30 years	15 (4.8%)	7385 (49.2)	<0.001
30–59 years	77 (24.5%)	6013 (40.0)	
≥60 years	222 (70.7%)	1626 (10.8)	
Residence			
South	194 (61.8%)	6077 (40.4%)	<0.001
Center	47 (15.0%)	3839 (25.6%)	
North	73 (23.2%)	5108 (34.0%)	
Smoking			
Non-Smoker	183 (79.9%)	7639 (80.0%)	0.96
Smoker[b]	46 (20.1%)	1907 (20.0%)	
Pregnancy			
Yes	1 (0.30%)	119 (0.80%)	0.34
No	313 (99.7%)	14905 (99.2%)	
Symptomatic			
es	233 (78.2%)	4950 (37.1%)	<0.001
No	65 (21.8%)	8404 (62.9%)	

[a] Mean 65.17 ± 18.66, Min 0.12 years, Max = 80 years.
[b] Include passive and ex-smokers.

were significantly associated with death from COVID-19. Males were about two times more likely to die from COVID-19 than females. Being over 60 years of age brought a 96 times greater chance of death than for those less than 30 years of age. Furthermore, people with symptoms were over 4 times more likely than those without symptoms to die from COVID-19, as seen in Table 4.

4. Discussion

The COVID-19 pandemic has been a worldwide catastrophe. Socio-demographic factors have a significant effect on the total losses incurred by COVID-19. We examined the sociodemographic data from the case charts of PCR confirmed COVID-19 cases in the OPT and compared the outcomes of recovered and death.

Gender showed significant differences, with females more likely to contract the disease, but males more likely to die. Other global data have shown more equal distributions between the genders for case frequency, but males surpassed females in intensive care admission and death [16]. Early data from China showed that men developed more severe cases than women using the clinical severity classification [17]. While differences in biology may play a role in how COVID-19 affects men and women, social contexts, health and social support systems, and cultural norms should not be overlooked [16].

A woman in Palestine has many roles and responsibilities. She is responsible for her entire household, including her in-laws. She goes to work and also cares for the sick and elderly in her extended family. She does most of the shopping. Despite social distancing rules, her children and siblings come to visit because “honor” and “respectability” of the female are valued in Palestinian communities. These norms may put Palestinian women at greater risk for exposure to COVID-19.

In this study, the age distribution of COVID-19 cases was similar to worldwide data in which (64%) of patients were between 25 and 64 years of age [18]. Although more recentlyCOVID-19 transmission has increased in all age groups, the increase was most significant among the young in the US [19]. Because as we found that younger age groups did not have symptoms with COVID-19, dissemination of SARS-CoV-2by this population was a problem. In contrast, symptomatic COVID-19 cases were 38% of this large cohort in our data. Other studies found lower rates; Al-Qahtani et al. observed a lower incidence of symptomatic cases (23.4%), and suggested that viral clearance did not vary between symptomatic and asymptomatic patients [20]. In a meta-analysis and systematic review of studies published during Summer 2020, 20%–31% of infections were asymptomatic [21]. Since then, updated data suggested between 17% and 20% [22]. Most asymptomatic cases have continued to be in younger age groups who have served as silent carriers, accelerating the pandemic’s spread.

A significant feature of an infectious disease is its severity, including its ability to cause death. Our overall case-fatality in the completed charts was 0.93 (95%CI 0.83–1.04), which was consistent with worldwide figures. Global figures also showed higher death rates for men compared to women. Male to female fatality rates in countries with available data ranged from 1 to 3.5. During the pandemic, vast differences in fatality rates have been reported, and comparisons between countries may be misleading. However, such data guide public safety policies and improve response effectiveness [18].

Deaths from COVID-19 have occurred more frequently in the elderly. The high prevalence of COVID-19 infections and deaths in Spain and Italy were probably due to older populations. Median populations ages for Italy and Spain were 46.5 and 43.5 years, respectively, and the percent over age 65 years were 25% and 20%, respectively [23]. In comparison, Palestine’s demographic is younger, with individuals aged 0–14 years accounting for 38% of the population and those 65 years and over 3% in2020 [24]. This explains why the case fatality rate in Palestine, a low-income developing country, was lower than in developed countries.

Socio-demographic and geography variables andCOVID-19 cases and deaths have been studied worldwide. Such analyses in Europe identified unequal distribution likely due to a variety of factors including demographic, environmental, cultural, and socioeconomic differences between nations [23]. In Palestine, COVID-19 case and death rates were higher in the southern region. Cultural traditions include wedding celebrations and funeral rituals which involve large groups gathering and sharing a meal. While lockdown and limited gathering regulations were in effect, there was less enforcement in the South due to the limited presence of government authority because of the proximity to Israel and the presence of Israeli border guards and defence forces (Area C and H2). In addition, the political situation causes many young males to work in Israel which played a significant role in the initial COVID surge [25].

There are limitations to this study. First, detailed patient information was not available in the data set because it is not collected by the laboratory. Only the death result was recorded due to a shortage of personnel to follow up on COVID-19 cases. We lacked specific information on hospital or ICU referral, as well as comorbidities for the cases.

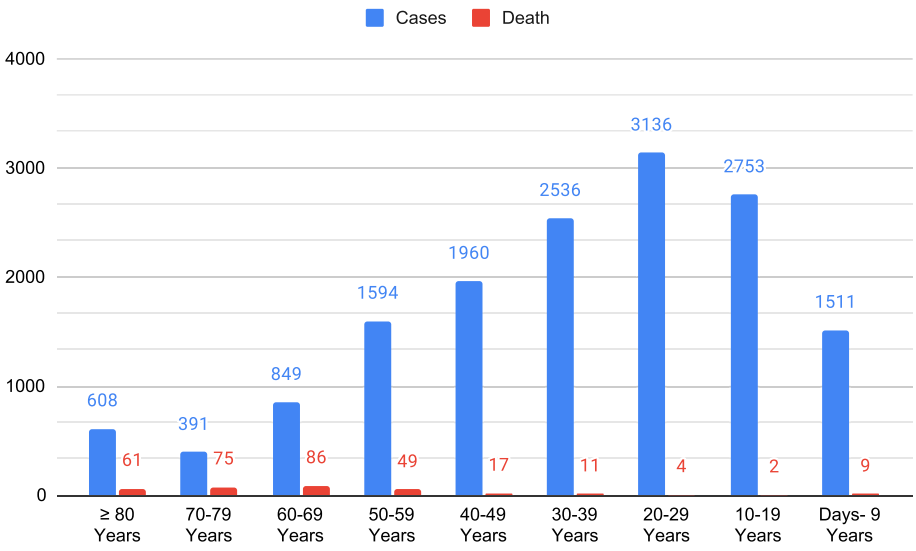

Fig. 1. Percentage of deaths in different age groups.

Table 4
Multivariable analysis of factors associated with Death among reported COVID-19 cases.

	Death				
	β	SE	Adjusted OR	95%CI	P-value
Sex					
Female[a]					
Male	0.65	0.156	1.92	1.41–2.61	<0.001
Age					
<30 years[a]					
30–59 years	2.49	0.165	12.09	8.75–16.71	<0.001
≥60 years	4.57	0.389	96.79	45.12–207.65	<0.001
Residence					
South	0.542	0.165	1.68	1.22–2.33	0.002
Center	0.302	0.258	0.739	0.43–1.29	0.289
North[a]					
Symptomatic					
Yes	1.45	0.191	4.26	2.93–6.20	0.001
No[a]					
Smoking					
Smoker	0.130	0.196	1.139	0.77–1.67	0.508
Non-smoker[a]					

[a] Reference Group.

Second, due to the way death results are documented, the COVID-19 mortality rate may be overestimated with the actual cause of death being due to another disease process. Because of limited financing and staffing, more detailed data collection systems are not available in Palestine. This may result in incomplete data that affected our findings. Better data collection in the clinical setting would have enhanced our understanding and improved the data available to guide policy making.

Nevertheless, identifying the epidemiological risk factors for COVID-19 is essential. Early identification of patients who are at greatest risk for hospitalization and death helps to guide resource allocation and plan guidelines and policies. In addition, better targeting of interventions may help to limit more expensive interventions such as intensive care admissions and avoid deaths. Such data are also important for planning vaccination campaigns. To create an efficient, equitable response to the pandemic, especially in countries where resources are limited awareness of the roles of gender, age, and geography in the outbreak are imperative.

Author contributions

BM guarantees the integrity of the entire study. BM and KA participated in conceiving and study design, literature review, supervised data collection, data analysis, manuscript writing. BM, RJ, and MA performed the material preparation, data collection, and analysis. All authors interpreted the results. BM wrote the first draft of the manuscript, and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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