Research Article

The COVID-19 Pandemic and Health Inequalities in Yemen

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Abstract

Background: Inequality has emerged through the nature of COVID-19; it interacts with and exacerbates existing social variations in relation to chronic disease and social determinants of health. In Yemen, data related to COVID-19 collected through the existing surveillance system has produced scarce studies impact of social inequalities and chronic diseases on pandemic outcomes.

Objective: To examines how these inequalities in COVID-19 mortality, and how critical care outcomes are related to existing inequalities in relation to chronic diseases and social determinants of health in Yemen.

Methods: A retrospective analysis of the available surveillance data of Yemen for the period form 10th April to 31st May 2020 which includes data of 419 confirmed COVID-19 cases.

Results: Case Fatality Rate (CFR) among patients over 15 years (22.8%) was more than CFR among children but the difference is not highly significant; gender is not a determinant for death. CFR among COVID patients has at least one chronic disease (38.8%) which is significantly higher than patients who have no chronic diseases (18.6%). CFR% is varied from 42,6% in Hadramout-Mukalla to 0% and 3.8% in Al-Maharah and Aden respectively (P-value=0.000). Admission to ICU also shows geographic variations from 61.5% in Mareb to 0% in Al-Maharah, Aden, Abyan and Shabwah (P-value=0.000). Only in five governorates respiratory ventilation was used in managing the critical cases with significant variations from 45% in Mareb to 3.4% in Hadramout-Mukalla.

Conclusion: Chronic diseases and geographical locations are main determinants to death and critical care of COVID-19 in Yemen.

Keywords: COVID-19; Health inequalities; Yemen

Abbreviations

COVID-19: Coronavirus Disease 2019; HUCOM: Hadramout University College of Medicine; CFR: Case Fatality Rate; PCR: Polymerase Chain Reaction; SPSS: Statistical Package for the Social Sciences; OR: Odds Ratio; ICU: Intensive Care Unit; P-value: Probability; 2019-nCoV: 2019 Novel Coronavirus; Chronic Obstructive Pulmonary Disease (COPD); 95% CI: 95% Confidence Interval

Introduction

Historically, pandemics have been experienced unequally with higher rates of infection and mortality among the most disadvantaged communities and in particular, in more socially unequal countries [1,2]. In the COVID-19 pandemic, there have been claims made by politicians and the media that we are 'all in it together' and that the COVID-19 virus 'does not discriminate' [3]. The inequalities emerge through the nature of COVID-19 as it interacts with and exacerbates the existing social inequalities in regard to the chronic disease and the social determinants of health which include age, gender and geographic location of patients. No doubt, inequalities are presented in terms of poor outcomes and in order to identify groups who are most likely to have poor outcomes, high-quality data on socioeconomic factors will have important implications in the development of public health measures.

Yemen is experiencing COVID pandemic since 10th of April 2020 when the first case was reported in Shihir near Mukalla, Hadramout [4]. Then, cases started to spread to record a figure of 979 suspected cases and 419 confirmed by PCR test by 31st May 2020. As of to-date, and as far as we could trace, the impact of social inequalities and co-existing chronic diseases on the outcome of the pandemic in Yemen [5]. The aim of this study is to examines how these inequalities related to the COVID-19 mortality, critical care outcomes in Yemen.

Methods

This is a retrospective analysis of the available surveillance data from 10th April to 31st May 2020. It includes data of 419 confirmed COVID-19 cases. Due to the continuing armed conflict in Yemen, the southern and eastern governorates, under the control of the Yemeni government, include 10 governorates with the temporary capital of the country being stationed in Aden. A specialized COVID surveillance system has been initiated and is continuously developing and supported by the rapid response teams in an intense effort to follow the contacts [5]. The diagnostic capacity is based on four new Polymerase Chain Reaction units (PCR units) in four main cities,

Table 1: COVID-related mortality and Socio-demographic and health inequalities among confirmed 419 cases of COVID-19 in Yemen.

		Confirmed (419)	Deaths (95)	CFR%	OR	95% CI	P-value
Age group in years	≤ 15	6	1	16.70%	1.4	0.17-12.7	1
	>15	413	94	22.80%			
Gender	Male	315	67	21.30%	1.2	0.86-1.8	0.28
	Female	104	28	26.90%			
Chronic diseases	Yes	85	33	38.80%	2	1.47-2.96	0
	No	334	62	18.60%			

Table 2: Admission of confirmed COVID-19 cases to ICU and Socio-demographic and health inequalities.

		Confirmed (419)	ICU Cases (53)	%	OR	95% CI	P-value
Age group in years	≤ 15	6	0	0.00%	1.14	1.10-1.19	1
	>15	413	53	12.80%			
Gender	Male	315	44	14.00%	1	0.9-1.1	0.177
	Female	104	9	8.60%			
Chronic diseases	Yes	85	14	16.50%	1.4	0.76-2.89	0.272
	No	334	39	11.70%			

Table 3: Treatment under respiratory ventilation and Socio-demographic and health inequalities among confirmed 419 COVID-19 cases in Yemen.

		Confirmed (419)	R. Ventilation (24)	%	OR	95% CI	P-value
Age group (Yrs.)	≤ 15	6	0	0.00%	1.06	1.03–1.08	1
	>15	413	24	5.80%			
Gender	Male	315	18	5.70%	1	0.39-1.6	1
	Female	104	6	5.80%			
Chronic diseases	Yes	85	8	9.40%	2	0.85–5.0	0.117
	No	334	16	4.80%			

namely: Aden and Taiz in the South and Mukalla and Syon in the East. All the suspected cases identified by the surveillance system were investigated by these PCR units. After confirmation, the surveillance officer in each governorate prepares and communicates the epidemiological, clinical and laboratory data to the central level where a trained data entry personnel manage the data and communicates to further higher emergency committee in Aden who announces the daily epidemiological report. The research team were able to extract data on 419 patients with laboratory-confirmed Covid-19 reported during the period between April 10, and May 31, 2020.

For purpose of this study, four independent and three outcome variables were studied. The independent variables include: age (≤15 and >15 years), gender (male versus female), location (governorates) and having at least one chronic disease (Yes or No). The chronic diseases include cardiovascular diseases, hypertension, diabetes mellitus, chronic renal diseases, chronic liver disease, chronic obstructive lung diseases and cancer. Data were entered to SPSS version 2.3 and analyzed using the mean standard deviation, median, frequency and percentages as tools for descriptive statistics. Chi-Square test was used for bivariate analysis with significant level at 0.05, Odds Ratio (OR) and 95% confidence interval (95% CI) were also used to measure strength of association [6].

Results and Discussion

Age and gender

A total of 419 confirmed COVID-19 cases were reported during the period from April 10 to May 31, 2020 in southern part of Yemen out of 979-suspected cases (42.8%). The mean age of the confirmed cases is 47.3 years (±15.5 years), the median age is 47 years with a range from 1 year to 90 years. A total of 315 patients are male (75%) and 104 are females (25%).

Mortality inequalities

Case fatality rate (CFR) among patients over 15 years (22.8%) was more than CFR among children, but the difference is not highly significant (OR 1.4, 95% CI 0.17 – 12.7, P-value =1), the same non-significant variations was exist regarding gender, CFR among female patient was 26.9% while among male patients was 21.3% (OR 1.2, 95% CI 0.86 -1.8, P-value=0.280). CFR among COVID patients who have at least one chronic disease is 38.8% which is significantly higher than patients who have no chronic diseases (18.6%) (OR 2, 95% CI 1.47-2.96; P-value=0.000). In general CFR among all COVID cases was 22.6% (95/419). See Table 1.

Inequalities in ICU capacity

Although no child was admitted to ICU and only 12.8% of patients over 15 years old were admitted to ICU, the difference is not highly significant (OR 1.14; 95% CI 1.10 -1.19; P-value =1). In relation to gender or chronic diseases, the differences are not significant (P-value= 0.177 and 0.272 respectively). See Table 2.

Treatment by respiratory ventilation

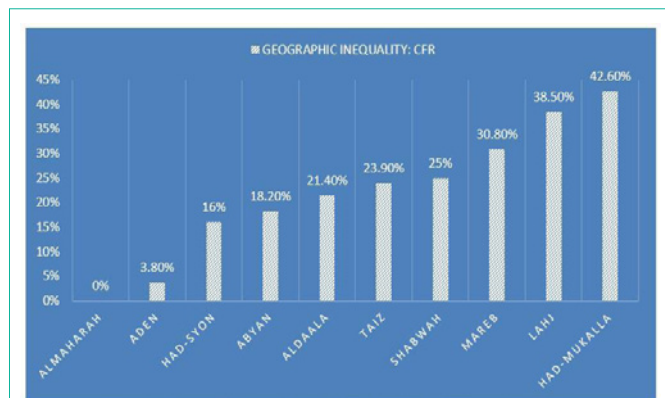Regarding age group, only 5,8% of patients above 15 years old

Figure 1: Geographic inequalities of CFR of COVID-19, Yemen, May 2020.
Note: x^2=54.9, P-value=0.000.

Figure 2: Geographic inequalities regarding admission of confirmed COVID-19 cases to ICU, Yemen, May 2020.
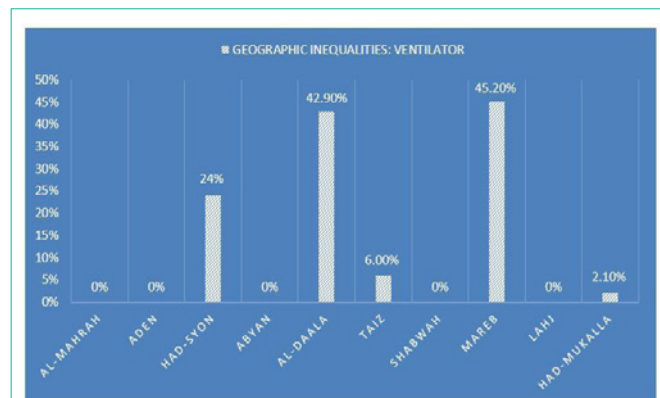Note: x^2=111, P-value=0.000.

Figure 3: Geographic inequalities regarding treatment by respiratory ventilation of confirmed COVID-19 cases, Yemen, May 2020.
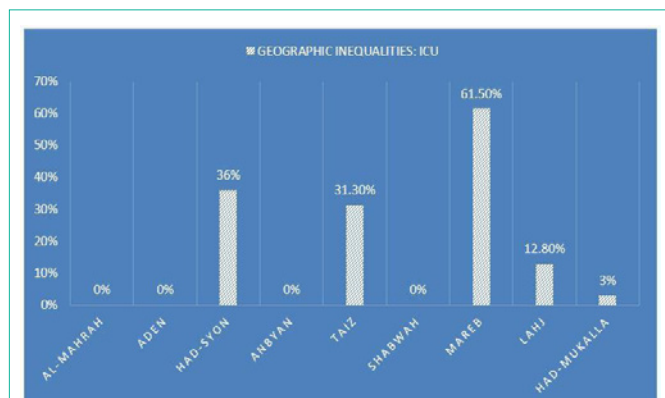Note: x^2=105, P-value=0.000.

determinants; the distribution is conforming with data reported in other countries. In China, the median age of the patients was 47 years and 41.9% of the patients were females [7,8]. Individuals of all ages are vulnerable to the 2019-nCoV, the elderly and those with underlying chronic illnesses are expected to become severe cases [9]. In Algeria, all pediatric cases with laboratory-confirmed 2019-nCoV disease were mild cases and no deaths had been described [10].

Chronic diseases represent a significant contributor to COVID-19 occurrence and related deaths. In this study, these diseases score highly significantly associated with mortality and with geographic variations. As was reported, the meta-analysis revealed Hypertension, Diabetes, Chronic Obstructive Pulmonary Disease (COPD), Cardiovascular disease and Cerebrovascular disease were major risk factors for patients with COVID-19 [11]. Furthermore, people with co-morbidities such as diabetes, heart disease or respiratory issues have shown higher fatality in case of COVID-19 infection [11].

In Yemen, it was found that the CFR is more than 20% which is considerably higher than the CFR reported in some countries e.g. 2.3% in China, [12] and 7.2% in Italy. [13]. Several explanations have been proposed to argue such discrepancies of the CFR between countries including the possible role of age structure in the affected population where the higher proportion of the elderly in a country the higher the CFR is. This has been reported in Italy where the CFR was compared higher to that in China [12]. This discrepancy was attributed to the high proportion of elderly group of population in Italy [13]. This study indicates that among patients older than 15 years old, the CFR was, still much higher as compared to those within the same age groups in China [12] and Italy [13]. As the population pyramid groups in Yemen is much younger than that in China or Italy, the present results suggest that the age structure might not be the main reason for high CFR in Yemen [14].

According to the geographical variations in Italy, data from 20 regions showed that the average inter-regional Case Fatality Rate (CFR) was 7.5% with a range of 3.1–16.7% accounting for different ICU capabilities with respect to different outbreak magnitudes [15]. In this study, variations of CFR% between governorates were present and varied from 3.8% in Aden to 40% 42.6% in Hadramout-Mukalla as shown in Figure 1. Despite the fact that both Aden and Mukalla

were subject to respiratory ventilation while no child treated by ventilation but the difference is not highly significant (OR 1.06, CI 95% 1.03 – 1.08, P-value =1). Regarding gender or chronic diseases, the differences are not significant (P- value= 1 and 0.117 respectively), see Table 3.

Geographic inequalities

The Case Fatality Rate (CFR%) is found to be changing in different geographic locations. It varied from 42,5% in Hadramout-Mukalla (Had-Mukalla) to 0% and 3.8% in Al-Maharah and Aden respectively. The difference is found to be significant (P-value =0.000), see Figure 1.

Admission to the Intensive Care Units (ICU) also shows significant geographic variations fluctuating from 61.5% in Mareb to 0% in Al-Maharah, Aden, Abyan and Shabwah (P-value=0.000), see Figure 2.

Likewise, the utilization of respiration ventilators in managing the critical cases of the COVID-19 cases varied significantly from 45% in Mareb to 3.4% in Hadramout-Mukalla (Had-Mukalla) with a P-value=0.000; see figure 3.

This study focusses on the role of social factors and the association of chronic diseases on the current COVID-19 pandemic in Yemen. Despite that the age and gender were found to be non-significant

are urban, Socio-demographic characteristics of a population can enhance risk of a pandemic spread and its subsequent consequences and these characteristics include elderly population, high urbanization and high population density [16,17].

Conclusion

Having chronic diseases and the geographic locations are the main determinants of COVID-related deaths and critical care in Yemen. The variations in COVID-related deaths are clearer in those patients who have chronic diseases as CFR among COVID patients has at least one chronic disease reached 38.8% which is significantly higher than patients who have no chronic diseases (18.6%). Geographic inequalities do exist in all aspects of mortality.

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