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COVID-19 in Arab Americans Revealed a Public Health Concern

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Abstract

COVID-19 infection can lead to severe consequences, especially among ethnic minorities. Data about COVID-19 infection outcomes in the Arab American population as a minority ethnic group compared to other racial and ethnic minorities are lacking. We conducted a retrospective observational cohort study that included 1,740 hospitalized adult patients with confirmed COVID-19 infection from March 12th, 2020, to January 30th, 2021, at a single center to compare baseline characteristics and outcomes in Arabs hospitalized with COVID-19 to patients from other ethnic groups during the same study period. Of those, we identified 320 Arab patients. We found that Arab American population suffered similar odds of complications and adverse outcomes despite having fewer risk factors for severe illness.

Introduction

COVID-19 infection is caused by a highly transmissible respiratory virus (SARS CoV-2) that can cause severe illness and increased mortality among certain patient groups[1]. As of February 8th, 2022, the Center for Disease Control and Prevention (CDC) reported 76,415,622 cases of COVID-19 infection and 899,756 deaths related to COVID-19 infection[2]. Hospitalization and death rates from COVID-19 infection remain disproportionately higher in certain minority ethnic/racial groups according to the CDC data tracker[3]. In addition to higher rates of traditional medical risk factors in ethnic minority groups (such as underlying chronic illnesses, smoking, and obesity), members of ethnic minorities are more susceptible to increased risk of infection and complications from COVID-19 infection. Many studies have shown that the risk of infection in those groups is directly related to underlying socioeconomic factors, such as median income level, housing conditions, and poor access to health care[4-7]. Environmental factors such as higher rates of air pollution and lower use of sustainable energy resources play a significant role and tend to be more prevalent in communities of ethnic minorities which predisposes them to COVID-19 infection and can lead to worse outcomes[8]. Other factors that impact minority ethnic groups disproportionately include the over representation of these minority groups in front line jobs, and more recently, increased vaccine hesitancy rates[9-13].

Multiple reports have established the significant increase in morbidity and mortality due to COVID-19 infection in African Americans, Hispanic, and Asian Americans compared to White Caucasians[10-12]. However, data about outcomes of COVID-19 illness

among Arab Americans are still lacking[14]. Several studies examined the role of ethnicity in Arab communities but those were all done in wealthier Arab countries where Arabs represent the majority and not the minority[15]. As a minority in the US, Arab Americans face very different challenges from Arabs in their home countries. To our knowledge, this is the first study to look at Arab Americans as a disadvantaged group at risk for poor outcomes from COVID-19 infection. According to the Arab American Institute (AAI) Foundation, the Arab American population is one of the fastest growing populations in the United States. It has doubled in size in the last 10 years and continues to grow[16]. The US census 2020 estimates the Arab American population to be about 2, 041, 484. However, the AAI reports the true size of the Arab ethnicity to be 3,665, 789. The discrepancy in the census population stems from the lack of racial/ethnic identifier of the Arab ethnicity[16]. This issue challenged researchers who are trying to capture data in this group and made the Arab American group one of the least studied American ethnic groups in the medical literature[14].

The goal of our study is to present some insights into this understudied minority population. In this study, we describe COVID-19 outcomes in the Arab American population compared to other ethnicities in the city of Dearborn, Michigan. We chose Dearborn, Michigan due to its unique population in America. Dearborn is home to 40,000 Arabs per the 2000 US Census, Arab Americans totaled 29,181 or 29.85% of Dearborn's population[17]. Since then, the population grew to constitute about 42% of the city population according to the most recently published data on the Dearborn City's website[18]. This is the largest group of Arab congregations in any US city and is representative of the Arabic diaspora in America. Our hospital is in the city of Dearborn. Uniquely, it has an ethnicity identifier as "Middle eastern/Arabs" that captures most Arab Americans who self-identify as such during the registration process. We used this specific field in the electronic medical records to build our database using those identifiers to characterize the Arab American patients hospitalized with COVID-19 infection.

Methods

Population, Setting, and study design

This is a single-center study that was performed at Beaumont Hospital, Dearborn which is a major teaching and research hospital with 632 beds of which 75 are intensive care unit (ICU) beds. We performed a retrospective chart review that included COVID-19 hospitalized patients between March 12th, 2020, and January 30th, 2021.

Sample and Data

Patients were recruited retrospectively through "The Infection Prevention and Hospital Epidemiology Data set". This is a database that information technology specialist was able to create to include all COVID-19 infected patients who visited the hospital from March 12th, 2020, till January 30th, 2021. Information technology specialist utilized Electronic Medical records to extract data and test results linked to the ICD 10 code that correlates with any COVID-19 infection in this cohort. This database is based on requested fields in the Electronic Medical Records (EMRs) that represented important epidemiologic, demographic, and clinical information. All Polymerase chain reaction (PCR) confirmed COVID-19 infected adults aged 18 years and older who were hospitalized were selected for this study (N=1,740). We excluded all COVID-19 infected patients aged less than 18 years old and all probable COVID-19 cases not confirmed by PCR testing. Beaumont institutional review board approved the study. Since the study involves no more than minimal risk to the patients, the patient's consent was waived.

Measures and Variables

We grouped and divided the patients based on ethnic identity into major four comparison groups: White American, African American, Hispanics, and Arab Americans. We collected data on all groups that included baseline characteristics: Age, sex, underlying comorbidities such as diabetes Mellitus, hypertension, chronic obstructive airways, chronic kidney disease, etc., Body Mass Index (BMI), and smoking. We defined outcomes as an associated new diagnosis that was identified through Electronic Medical Records and occurred during this hospitalization in one of five categories:

- Pulmonary outcomes: which included any of the following: requiring supplemental O2, Noninvasive O2 device use such as Continuous positive airway pressure (CPAP), or High Flow O2.
- Cardiac outcomes which included any of the following Myocardial infarction, arrhythmias, or new onset heart failure or myocarditis.
- Hematological outcomes: which included any of the following: thrombosis, pulmonary embolism, deep venous thrombosis, arterial blood clots, or new onset thrombocytopenia.
- Psychological outcomes: which included any of the following: Delirium, psychosis, or placement of a consult to psychiatry
- Neurological outcomes: which included any of the following: new onset stroke, limb weakness, or seizures.
- Additionally, we looked at outcomes such as Death, prone position (a surrogate of severe respiratory illness), Intensive care unit admission, and ventilator use as separate outcomes

We, then, compared patients of Arab ethnicity to other ethnic groups in terms of baseline characteristics and outcomes of COVID-19 infection in each category as mentioned above.

Data analysis Procedure

Many risk factors contribute to the severity of illness in patients who acquire COVID-19 infection. Studies early on showed that obese, older, and sicker patients at baseline suffer more complications and are at higher risk of death[9,10]. To account for those risk factors, we studied the odds of each outcome after adjusting for other risk factors of severe disease. We could not account for all factors due to the small number of patients in some categories (for instance we had zero HIV cases in Arabs in this sample). We chose the following risk factors or characteristics to adjust the likelihood of outcomes among the four ethnic groups: obesity (BMI>30), older age (age >60), male sex, and active smoking. Population characteristics were described using frequencies and percentages for categorical variables, means, standard deviation, medians, and ranges for continuous variables. The probabilities of each category of outcomes were computed by the chi-square statistic. The odds ratios of each outcome in Arabs as compared with other races are shown with 99.5 percent confidence intervals. We chose a 99.5 instead of a 95 percent confidence interval to account for the adjustments of multiple confounding factors to establish more rigorous criteria for inference. A multivariate analysis of the odds of these outcomes was performed using logistic regression models to examine independently, the relationship between each outcome and ethnicity, adjusting for the following factors: age, sex, smoking status, and obesity. The level of significance was set at 0.005 to adjust for the number of outcomes we tested simultaneously.

Results and Discussion

A cohort of 1,740 patients was included in the final analysis. Arab Americans accounted for 320 (18.3%) of the population, which is significantly less than African Americans accounted for 554 (31.8 %), and Whites 665 (38.2 %). Comparison of the baseline characteristic and underlying disease among the four ethnic groups is shown in Tables 1A & 1B. At baseline, Arab Americans had lower proportion of obesity, chronic kidney disease and, hypertension than African Americans (22.5% vs 6.4% P: 0.012, 22.5% vs 34.8% P <0.001, 57.2% vs70.6% P <0.001 respectively). Similarly, Arab Americans were found to have significantly lower proportions of Chronic Obstructive Pulmonary Disease (COPD) than Whites (14.4% vs 26.2% P: <0.001). In contrast, Arab Americans were noted to have a significantly higher proportion of COPD (13.4%) than Hispanics (3.5%, P-value 0.001), and a higher proportion of diabetes than Whites (44.1% vs 34.7% P: 0.005). The Arab patients in this study are significantly younger than their White counterparts (those above the age of 60 accounted for less than 50% of Arabs but more than 70% of the White patients), see Table 1A. Overall, the mean BMI of Arab patients was smaller than their other groups (mean of 30.9, compared to 33 in African Americans, 32 in Hispanics, and 31.5 in Whites).

COVID-19 Outcomes

Outcomes of COVID-19 infection in our patients' population are summarized in Tables 2A & 2B. We analyzed

Table 1A: Frequencies of selected characteristics of hospitalized COVID-19 patients during the study period: March 12th, 2020, to January 30th, 2021, distributed over the most common four ethnic groups, (N 1740).

Selected characteristics	Arab		African American		Hispanic		White	
N	320		554		201		665	
Age								
median, range	60	18 - 95	60	19 - 102	53	17 - 97	69	20 - 102
Age>60	157	49.1%	267	48.2%	71	35.3%	471	70.8%
*p-value**			*0.805*		*0.002*		*<0.001*	
Sex								
Male	183	57.2%	241	43.5%	93	46.3%	318	47.8%
*p-value**			*<0.001*		*0.015*		*0.006*	
Current smoker								
Yes	25	7.8%	47	8.5%	8	4.0%	58	8.7%
*p-value**			*0.728*		*0.086*		*0.631*	
BMI *(Missing, n=8)*								
mean, std dev	30.9	7.0	33.3	9.7	32.6	8.6	31.5	9.0
Obese (BMI>30)	151	47.5%	310	56.4%	104	52.0%	326	49.1%
*p-value**			*0.012*		*0.317*		*0.636*	

*: p-value indicates the significance of differences in the occurrence of each characteristic between Arabs and each of the other ethnic groups.

Table 1B: Frequencies of comorbidities of hospitalized COVID-19 patients during the study period: March 12th, 2020, to January 30th, 2021, distributed over the most common four ethnic groups, (N 1740).

Comorbidities	Arab		African American		Hispanics		White	
Chronic liver disease (n-%)	5	1.6%	4	0.7%	4	2.0%	15	2.3%
*p-value**			*0.398*		*0.964*		*0.647*	
Chronic kidney disease (n-%)	72	22.5%	193	34.8%	34	16.9%	188	28.3%
*p-value**			*<0.001*		*0.124*		*0.055*	
Hypertension (n-%)	183	57.2%	391	70.6%	104	51.7%	479	72.0%
*p-value**			*<0.001*		*0.224*		*<0.001*	
Heart Failure (n-%)	55	17.2%	106	19.1%	25	12.4%	134	20.2%
*p-value**			*0.475*		*0.145*		*0.269*	
Chronic obstructive pulmonary disease (COPD) (n-%)	43	13.4%	84	15.2%	7	3.5%	174	26.2%
*p-value**			*0.486*		*0.001*		*<0.001*	
Asthma (n-%)	28	8.8%	82	14.8%	19	9.5%	45	6.8%
*p-value**			*0.010*		*0.785*		*0.267*	
Diabetes (n-%)	141	44.1%	253	45.7%	73	36.3%	231	34.7%
*p-value**			*0.646*		*0.081*		*0.005*	
Malignant Neoplasm (n-%)	5	1.6%	15	2.7%	2	1.0%	41	6.2%
*p-value**			*0.396*		*0.901*		*0.001*	
Alzheimer's (n-%)	11	3.4%	29	5.2%	1	0.5%	27	4.1%
*p-value**			*0.290*		*0.047*		*0.779*	

*: p-value indicates significant differences in the prevalence of each comorbidity between Arabs and each of the other ethnic groups.

Table 2A: Adjusted COVID-19 Outcomes Analysis among patients from the four major ethnic groups who were hospitalized in a single facility between March 12th, 2020, and January 30th, 2021 (Odds Ratios and 99.5% Confidence Intervals).

Outcomes	Neurological[1]		Cardiological[2]		Hematological[3]		Pulmonological[4]		Death[5]	
Ethnicity	**OR**	99.5 CI	**OR**	99.5 CI	**OR**	99.5 CI	**OR**	99.5 CI	**OR**	99.5 CI
(ref) Arab	1.00		1.00		1.00		1.00		1.00	
African American	0.97	0.51, 1.83	1.21	0.72, 2.04	1.32	0.84, 2.07	1.83	1.10, 3.02	1.09	0.57, 2.09
Hispanic	0.46	0.16, 1.30	0.97	0.48, 1.94	0.86	0.47, 1.60	1.24	0.67, 2.30	0.88	0.36, 2.15
White	1.06	0.58, 1.94	1.89	1.17, 3.06	1.18	0.76, 1.83	1.33	0.82, 2.18	1.17	0.65, 2.13
Age										
Over 60	2.04	1.24, 3.34	3.75	2.56, 5.49	1.90	1.37, 2.64	3.46	2.36, 5.08	5.11	2.91, 8.95
Sex										
Male	1.29	0.84, 2.00	1.54	1.11, 2.15	1.30	0.96, 1.76	2.48	1.71, 3.60	1.52	1.00, 2.32
Current smoker										
Yes	1.35	0.65, 2.79	0.71	0.37, 1.37	1.29	0.75, 2.22	0.93	0.49, 1.74	0.54	0.20, 1.41
Obesity BMI>30	(BMI missing, n=8)									
Yes	0.79	0.51, 1.24	1.02	0.73, 1.42	1.02	0.75, 1.39	2.09	1.44, 3.02	1.16	0.76, 1.77

1: Neurological complications included delirium, stroke, or new onset seizures

2: Cardiological complications included Myocardial infarction, arrhythmias, acute heart failure or myocarditis

3: Hematological complications included thrombosis, pulmonary embolism, deep venous thrombosis, arterial blood clots, or new onset thrombocytopenia

4: Pulmonary complications included any of the following: requiring supplemental O2, Noninvasive O2 device use such as Continuous positive airway pressure (CPAP) or High Flow O2.

5: Death that occurred while the patient was still hospitalized

data to adjust the differences in baseline characteristics between Arab Americans and the other three major ethnicities. We found that Arab Americans suffered similar frequencies of respiratory complications to Hispanics and Whites but lower than African Americans {OR 1.83, 99.5% CI (1.10-3.02)}. Hematological and neurological complications were similar among the four ethnic groups in this study. Arab Americans suffered similar frequencies of cardiological complications to Hispanics and African Americans (OR Ref 1, vs 0.97 99.5% CI (0.48-1.94) and 1.21 (0.72-2.04) but lower than White Americans {odds ratio (OR) 1.89, 99.5% CI (1.17-3.06)} (Table 2A). Additionally, comparing the Arab American population with the other ethnicities did not result in any differences in the frequency of death at the end of hospitalization from COVID-19 infection even after adjusting for the presence of older age,

Table 2B: Adjusted COVID-19 Outcomes Analysis among patients from the four ethnic groups who were hospitalized in a single facility between March 12th, 2020, and January 30th, 2021 (Odds Ratios and 99.5% Confidence Intervals).

	ICU[1]		VENT[2]		PRONE[3]	
	OR	99.5 CI	**OR**	99.5 CI	**OR**	99.5 CI
Race						
(ref) Arab	1.00		1.00		1.00	
African American	1.26	0.68, 2.33	0.95	0.57, 1.60	0.65	0.32, 1.33
Hispanic	0.74	0.31, 1.81	0.92	0.47, 1.82	1.37	0.61, 3.06
White	1.24	0.68, 2.24	0.93	0.56, 1.52	0.69	0.35, 1.35
Age						
Over 60	1.60	1.03, 2.51	2.02	1.37, 2.97	1.59	0.94, 2.71
Sex						
Male	1.90	1.25, 2.88	1.68	1.18, 2.41	1.69	1.03, 2.80
Current smoker						
Yes	1.09	0.52, 2.27	0.86	0.43, 1.72	1.03	0.41, 2.61
Obesity BMI >30 *(BMI missing, n=8)*						
Yes	1.36	0.89, 2.07	1.74	1.21, 2.51	1.69	1.02, 2.82

1: Intensive Care unit admission
2: Ventilator use
3: Prone position (An intervention used in patients with severe respiratory distress).

male sex, active smoking, and obesity. Ventilator use was slightly more frequent among Arab American patients, but the difference did not reach statistical significance (Table 2B).

Ethnicity is one of the important risk factors for acquiring COVID-19 infection and suffering severe complications afterward. Ethnic minorities are disproportionately affected with COVID-19 infection [9-12]. Some minority groups such as Native Americans, African Americans, Hispanics, and Asians were found to have worse outcomes of COVID-19 infection and higher death rates when compared to white ethnic groups[19, 20]. There are several reasons for the ethnic disparities in health outcomes from COVID-19 infection as discussed above and we believe that the Arab American ethnicity shares many of those characteristics with the other minority groups. Arab ethnicity in the US accounts only for less than 1% of the US population according to 2010 US census data[21]. Many members of this group are at disadvantage in terms of income level and house ownership[21] although there is a variation within the Arab ethnicity depending on the country of origin.

In this retrospective study, we describe similar odds of outcomes of COVID-19 infection among Arab American patients hospitalized with COVID-19 to patients from other ethnic groups. The frequency of complications from COVID-19 infection (specifically neurological, pulmonological, cardiac, hematological, and death) during hospital stay did not differ significantly in Arab Americans from other ethnic groups despite having fewer risk factors for severe illness (less obesity and less frequent COPD) compared to white patients for example. The findings in our study are different from the outcomes reported by Arabic studies conducted among the native Arabic population. In those studies, the Arab ethnicity was actually at an advantage compared to other ethnicities. We believe the difference is related to the nature of ethnic minority living and economic conditions that is revered for the Arabs who live in the US.

In Michigan, where the study is conducted, the Michigan Department of Health and Human Services reports on ethnic and racial differences in certain outcomes[22]. However, there is no reliable COVID-19 outcomes data of Arab Americans in Michigan mainly due to the lack of a common ethnic identifier for the Arab Americans. Arab American population is misclassified sometimes as White or other which can lead to misleading data. Hence, Arab Americans remain an understudied minority population[14]. To our knowledge, this is the first study in the US to report the outcomes of COVID-19 infection in the Arab American population compared to other ethnicities.

Conclusion

Arab Americans may suffer disproportionately from adverse outcomes of COVID-19 infection.

To better characterize this problem and address any health disparity we first need a racial/ ethnic identifier unique to the Arab American ethnicity in the medical records and other publicly available state data bases to accurately identify those patients. Better reporting of the Arab American COVID-19 infection and outcomes starts with proper identification of the Arabs in the current health data sets. Accurate quantification of COVID-19 case burden in Arab Americans will put pressure on public health agencies to allocate more resources in this underserved community to 1) increase testing for early detection 2) improve access to health care systems for treatment and 3) inform efforts to elevate COVID-19 vaccine awareness and other mitigation strategies and 4) address overall health disparities in Arab Americans.

Limitations

Despite conducting the study in the largest hospital that serves the City of Dearborn, the Arab population was underrepresented in our sample. Dearborn's population is about 42% Arabs, but they only accounted for 18 % of the study population. This could be due to the misidentification of Arabs as other ethnicity or a lower number of COVID 19 cases among Arabs during the study period. Additionally, the comparison groups were different at baseline in multiple aspects which forced multiple adjustments to account for those differences and may have obscured some of the true associations with poor outcomes in Arab Americans. Another factor is the relatively short study

period and dependence on incomplete electronic medical records data. The small numbers in certain outcomes precluded statistical analysis to show potential differences. Our study took place before the era of COVID-19 vaccine approval which limited our ability to address that factor in our reporting.

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