Addressing COVID-19 Disparities Between Hispanic and NonHispanic White Populations of Arizona

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ABSTRACT

Introduction: The coronavirus disease (COVID-19) pandemic[1,2] contributed to over 1.03 million deaths in the United States (U.S.) and 30,768 deaths in Arizona[3]. Nationwide, Hispanics are at increased risk for infection, hospitalization, and death, when compared to non-Hispanic White (NHW)[4]. Although Hispanic COVID-19 disparities are clear in the U.S., study of Hispanic COVID-19 disparities in Arizona are less clear.

Objective: To compare COVID-19 interventions and clinical outcomes between Hispanic and NHW populations in rural and urban healthcare settings of Arizona.

Methods: A retrospective cohort of COVID-19 patients from January 1, 2020 through June 17, 2022 admitted to hospitals affiliated with the Midwestern University Graduate Medical Education consortium were assessed. Data was abstracted to counterbalance NHW and minority patients by date of admission. Data collected included patient demographics, presenting symptoms, vital signs, laboratory values at the time of emergency department presentation, treatment modalities, and clinical outcomes.

Results: A total of 627 patients were analyzed with 31.7% (199/627) identifying as Hispanic, 41.8% (262/627) female, and 61.9% (388/627) allocated to the rural hospital group. No difference in mortality was seen in the rural or urban setting and there was no difference in administered COVID-19 therapeutics. Kaplan-Meier curves were parallel between Hispanic and NHW patients who survived COVID-19 with no difference in the length of stay (LOS) days. Kaplan-Meier curves differed between Hispanics and NHW patients who expired from COVID-19 with Hispanics at a greater LOS prior to mortality. Differences between Hispanic and NHW mortality patients included Hispanics presenting at a younger age, increased CRP elevations, and a greater delay between symptom onset and COVID-19 testing. Hispanics who expired were more likely to present with shortness of breath, hypoxia, and a documented bacterial infection during hospitalization as compared to Hispanics who survived.

Conclusion: Following admission, patients regardless of Hispanic or NHW identification, received equitable care in our Arizona subset which resulted in comparable rates of mortality. Hispanics initially presented at increased disease severity, which is suggestive of factors outside of the hospital, prior to admission, responsible for the disparities seen at the national level with variation between states.

1. Introduction

Individuals who identify as Hispanic represent a diverse population with Cuban, Mexican, Puerto Rican, Central or South American, or other Spanish descent, regardless of race[5]. Hispanics are among the fastest growing ethnic minority groups in the United States (U.S.), with a population growth in the U.S. of over 50 million since 1970[6]. Currently, over 62 million Hispanics reside in the U.S., representing approximately 20% of the total U.S. population and are estimated to represent one-quarter of the total U.S. population by the year 2050[5-9].

Hispanics have historically struggled with inequities when pursuing medical care which has led to increased morbidity and mortality across disease processes [5, 7, 9]. Compared to Non-Hispanic White (NHW), Hispanics experience 1.7x higher rates of diabetes mellitus, 2x higher rates of renal failure, 2x higher mortality in liver disease and 1x higher mortality in asthma[5, 7, 10-14]. Individual agency when seeking healthcare for Hispanics is limited by a myriad of issues such as: language/cultural barriers, immigration status, lack of health insurance coverage, health hazardous occupations, low-income status, and medical mistrust[5, 7, 8, 15]. Hispanics often face disparate social determinants of health defined as lesser funding for education and school programs, lower access to healthy and affordable foods, and greater barriers to community health and exercise opportunities[15].

Biases affect interactions between healthcare providers and their Hispanic patients which may contribute to altered quality of care and worse health outcomes[15-17]. Providers caring for Hispanics may be less likely to refer to specialty services due to an assumption that the patient is unable to afford additional services[15]. Hispanic patients are less likely to receive equivalent analgesia medication compared to NHW patients in the emergency department and are more likely to remain with untreated pain throughout cancer treatment[15,18]. Hispanics have experienced significantly longer wait times compared to NHW for triage level 3 (urgent) and triage level 4 (semi-urgent) visits and a higher percentage of Hispanics remained unseen compared to NHWs at the top-coded wait time of 139 minutes[19].

In 2020, the leading cause of death for Hispanics was COVID-19[5]. Hispanics in the U.S. are 1.5x more likely to be infected, 1.9x more likely to be hospitalized, and 1.7x more likely to die from COVID-19 compared to NHW[20]. The specific factors responsible for the disproportionate burden of COVID-19 seen in Hispanics are less clear with a gap in the literature for the state of Arizona. As Arizona is the fifth state with the largest Hispanic population, it is imperative to analyze the COVID-19 disparities seen at the state level[5]. Further analysis of Hispanic COVID-19 disparities in Arizona may lead to the development of precise points of intervention at the preventative, diagnostic, and therapeutic levels for the improvement of Hispanic health[7]. Therefore, the purpose of this study was to compare COVID-19 interventions and clinical outcomes between Hispanic and Non-Hispanic White populations in rural and urban healthcare settings of Arizona**.**

2. Methods

Setting

The Midwestern University Graduate Medical Education consortium is an Accreditation Council for Graduate Medical Education accredited sponsoring institution which oversees nine residency programs across four medical centers and five hospitals in Arizona. The five hospitals participated in the study data collection and were classified as either primarily rural or urban serving dependent upon patient population and United States Department of Agriculture State level maps. Kingman Regional Medical Center (Mohave County), Canyon Vista Medical Center (Santa Cruz County), and Verde Valley Medical Center (Yavapai County) were denoted as rural hospitals. Mountain Vista Medical Center (Maricopa County) and Flagstaff Medical Center (Coconino County) were denoted as urban hospitals.

Protocol

All procedures were approved by the Midwestern University Institutional Review Board (IRB # AZ 1413) prior to data collection. A retrospective cohort of COVID-19 patients from January 1, 2020 through June 17, 2022 admitted to hospitals affiliated with the Midwestern University Graduate Medical Education consortium were assessed. Data was abstracted to counterbalance NHW and minority patients by date of admission. Data collected included patient demographics, presenting symptoms, vital signs, laboratory values at the time of emergency department presentation, treatment modalities, and clinical outcomes.

Statistical Analysis

Data was analyzed using Statistical Product and Service Solutions (SPSS), v. 27 (IBM Corp., Armonk, New York) and statistical significance was defined as $p \leq 0.05$. Patient demographics and outcomes were reported via descriptive statistics. Categorical variables were assessed using Chi-square analysis, and continuous variables

were evaluated using the Mann-Whitney U test. Death free survival days were compared between Hispanic and NHW patients using a KaplanMeier analysis with the Log-Rank test.

3. Results

A total of 627 patients were analyzed with 31.7% (199/627) identifying as Hispanic, 41.8% (262/627) female, and 61.9% (388/627) allocated to the rural hospital group. Overall, Hispanics were younger (56 [Hispanic] vs 69 years [NHW], p=<0.001), less likely to require oxygen (79.4% vs 86.7%, p=0.020), and less likely to present with a prior history of chronic obstructive pulmonary disease (8.0% vs 16.1%, p=0.006). No difference in mortality was seen (13.1% vs 17.8%, p=0.135) (**Table 1**). In an urban setting, Hispanics were more likely to present with fever (55.1% vs 39.1%, p=0.024), cough (64.3% vs 45%, p=0.007), and dysosmia (18.5% vs 7.8%, p=0.024), and no difference in mortality was observed (14.3% vs 17.2%, p=0.584). In a rural setting, Hispanics were less likely to present with a prior history of chronic obstructive pulmonary disease (3.9% vs 18.5%, p<0.001) and no difference in mortality was noted (12.4% vs 18.1%, p=0.144).

Table 1. Patient demographics and disease burden by ethnicity

	Total (N = 627)	**Hispanic (n =199)**	**Non-Hispanic White (n =428)**	**p-value**
Age	63.4 (52 – 76)	56 (44 – 68)	69 (58 – 77)	<0.001
Urban	38.1% (239/627)	35.2% (70/199)	39.5% (169/428)	0.301
Rural	61.9% (388/627)	64.8% (129/199)	60.5% (259/428)	0.301
Male	58.2% (365/627)	58.3% (116/199)	58.2% (249/428)	0.979
Female	41.8% (262/627)	41.7% (83/199)	41.9% (179/428)	0.979
Smoker	9.2% (58/627)	6.0% (12/199)	10.7% (46/428)	0.144
Diabetes Mellitus	31.1% (195/627)	33.2% (66/199)	30.1% (129/428)	0.446
Hypertension	51.8% (325/627)	50.3% (100/199)	52.6% (225/428)	0.589
Congestive Heart Failure	11.5% (72/627)	8.5% (17/199)	12.9% (55/428)	0.113
Chronic Obstructive Pulmonary Disease	13.6% (85/627)	8.0% (16/199)	16.1% (69/428)	0.006
Oxygen Requirement	84.2% (528/627)	79.4% (158/199)	86.4% (370/428)	0.020
COVID-19 Mortality	16.3% (102/627)	13.1% (26/199)	17.8% (76/428)	0.135

There was no difference in administered therapeutics (steroids 83.4% vs 83.6%, p=0.943; anticoagulation 38.2% vs 36.4%, p=0.734; remdesivir 50.8% vs 51.9%, p=0.893; azithromycin 66.1% vs 68.0%, p=0.776; tociluzumab 5.5% vs 5.8%, p=0.878; convalescent plasma 23.6% vs 26.9%, p=0.409) between Hispanic and NHW (**Table 2**).

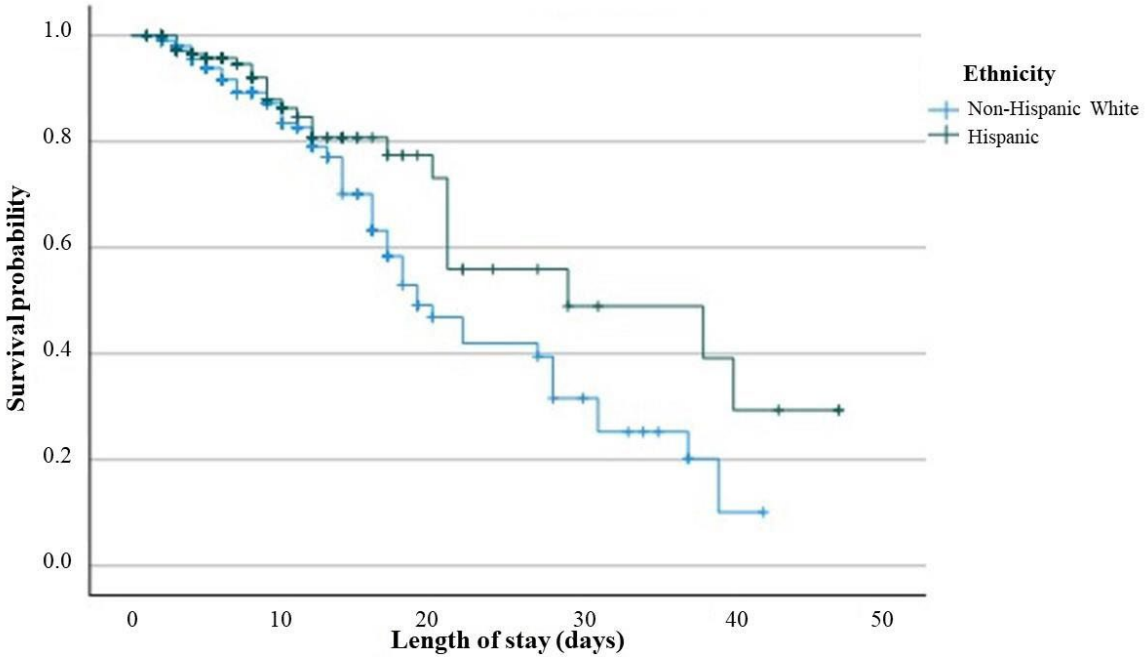
Table 2. Administered COVID-19 therapeutics by ethnicity

	Total (N = 627)	Hispanic (n =199)	Non-Hispanic White (n =428)	p-value
Steroids	83.6% (524/627)	83.4% (166/199)	83.6% (358/428)	0.943
Anticoagulation	37.0% (232/627)	38.2% (76/199)	36.4% (156/428)	0.734
Remdesivir	51.5% (323/627)	50.8% (101/199)	51.9% (222/428)	0.893
Azithromycin	67.5% (423/627)	66.3% (132/199)	68.0% (291/428)	0.776
Tociluzumab	5.7% (36/627)	5.5% (11/199)	5.8% (25/428)	0.878
Convalescent Plasma	25.8% (162/627)	23.6% (47/199)	26.9% (115/428)	0.409

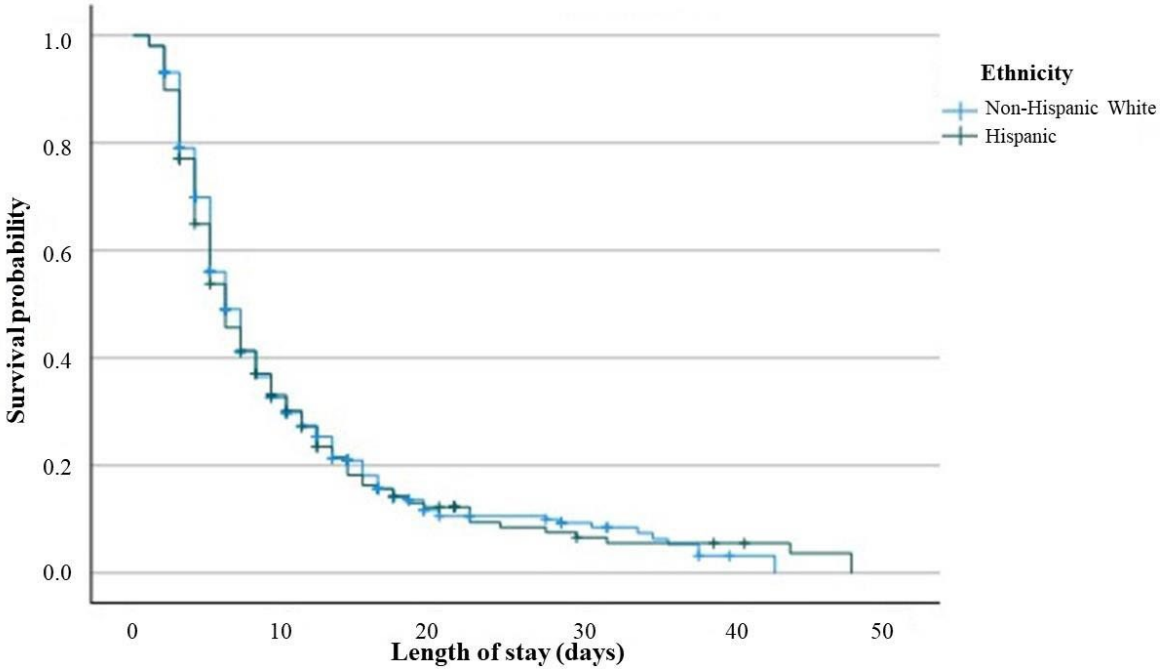
Kaplan-Meier curves were parallel between Hispanic and NHW patients who survived COVID19. There was no difference in the length of stay (LOS) days for COVID-19 survivors (median 6 vs 6, p=0.757) between the two groups. Kaplan-Meier curves differed between Hispanics and NHW patients who succumbed to COVID-19. Of those who expired, Hispanics had a greater LOS (29 vs 19, p=0.032) prior to mortality (**Figure 1**).

Figure 1. Kaplan-Meier for length of stay (LOS) days by ethnicity

A. Death free survival days for inpatients with COVID-19 mortality



B. Death free survival days for inpatients with COVID-19 survival



Between Hispanic and NHW mortality, Hispanics were younger (63 vs 72 years, p=0.007), displayed a higher CRP with a wider range (37 (IQR 17.6 – 125.6) vs 9 (IQR 3.1 – 14.9), p=<0.001), and an increased delay between symptom onset and COVID-19 testing (7 vs 3 days, p=0.013) (**Table 3**).

Table 3. Demographics and clinical features between Hispanic and NHW mortality

	Total (N = 102)	**Hispanic (n =26)**	**Non-Hispanic White (n =76)**	**p-value**
Age	71.0 (63 – 80)	63 (54 – 72)	72 (64 – 80)	0.007
Male	64.7% (66/102)	65.4% (17/26)	65.5% (49/76)	0.933
Female	35.3% (36/102)	34.6% (9/26)	35.5% (27/76)	0.933
Smoker	9.8% (10/102)	0.0% (0/26)	13.2% (10/76)	0.124
Diabetes Mellitus	34.3% (35/102)	38.5% (10/26)	32.9% (25/76)	0.606
Hypertension	58.8% (60/102)	53.8% (14/26)	60.5% (46/76)	0.550
Congestive Heart Failure	14.7% (15/102)	15.4% (4/26)	14.5% (11/76)	0.910
Chronic Obstructive	17.6% (18/102)	11.5% (3/26)	19.7% (15/76)	0.344
Pulmonary Disease				
Oxygen Requirement	96.1% (98/102)	100.0% (26/26)	94.7% (72/76)	0.233

Bilirubin (mg/dL)	0.7 (0.5 – 0.9)	0.7 (0.1 – 1.3)	0.6 (0.4 – 0.8)	0.050
AST (U/L)	51.0 (25.0 – 77.0)	54.0 (16.5 – 91.5)	51.0 (28.0 – 74.0)	0.063
ALT (U/L)	36.0 (21.0 – 52.0)	50.0 (20.5 – 79.5)	33.5 (22 – 45.0)	0.082
ALP (U/L)	88.0 (63.0 – 113.0)	97.0 (32.4 – 161.6)	87.5 (64.7 – 110.2)	0.252
LDH (U/L)	553.0 (278.0 – 829.0)	568.0 (445.5 – 690.5)	528.5 (231.5 – 825.5)	0.656
Protein (g/dL)	7.1 (6.5 – 7.7)	7.2 (6.5 – 7.8)	7.1 (6.6 – 7.6)	0.922
Albumin (g/dL)	3.0 (2.4 – 3.7)	2.8 (2.2 – 3.3)	3.0 (2.3 – 3.6)	0.143
CRP (mg/L)	12.4 (2.4 – 22.4)	37.0 (17.6 – 125.6)	9.0 (3.1 – 14.9)	<0.001
Symptom onset prior to testing (days)	4 (1 – 7)	7.0 (4 - 10)	3.0 (1 - 7)	0.013

Hispanics who expired were more likely to present with shortness of breath (92.3% vs 71.7%, p=0.036), hypoxia (100% vs 76.3%, p=0.005), and a documented bacterial infection during hospitalization (46% vs 17.9%, p<0.001) as compared to Hispanics who survived (**Table 4**).

Table 4. Initial clinical presentation between Hispanic mortality and Hispanic survivors

	Total (N = 199)	**Hispanic Mortality (n = 26)**	**Hispanic Survivors (n = 173)**	**p-value**
Fever	45.7% (91/199)	34.6% (9/26)	47.4% (82/173)	0.245
Cough	65.3% (130/199)	69.2% (18/26)	64.7% (112/173)	0.753
Dysosmia	10.6% (21/199)	7.7% (2/26)	11.0% (19/173)	0.768
Dysgeusia	9.0% (18/199)	3.8% (1/26)	9.8% (17/173)	0.346
Diarrhea	16.6% (33/199)	7.7% (2/26)	17.9% (31/173)	0.156
Chest Pain	16.6% (33/199)	11.5% (3/26)	17.3% (30/173)	0.672
Abdominal Complaints	18.6% (37/199)	7.7% (2/26)	20.2% (35/173)	0.191
Shortness of Breath	74.4% (148/199)	92.3% (24/26)	71.7% (124/173)	0.036
Oxygen Requirement	79.4% (158/199)	100.0% (26/26)	76.3% (132/173)	0.005

Factors associated with death among Hispanics includes decreased oxygen saturation on presentation (84 (IQR 79-91) vs 93 (IQR 88-96), p<0.001), increased age (63 (IQR 55-72) vs 54 (IQR 42-67), p=0.006), high respiratory rate (25 (IQR 24-33) vs 20 (IQR 18-22), p<0.001), abnormal aspartate transaminase (AST) (54 (IQR 43-117) vs 40 (IQR 27-56), p<0.001), abnormal lactate dehydrogenase (568 (IQR 435-680) vs 391 (IQR 290-595), p=0.033), high CRP (37 (IQR 18-126) vs 9.7 (IQR 4.4-48.8), p=0.005), and high d-dimer levels (639 (IQR 2-2225) vs 1.6 (IQR 0.6-283), p<0.001) (**Table 5**). A combination of five variables (temperature, respiratory rate, oxygen saturation, age, and AST) was a significant predictor of mortality (p=0.008) with 40% sensitivity and 98.1% specificity.

Table 5. Laboratory values between Hispanic mortality and Hispanic survivors

	Total (N = 199)	**Hispanic Mortality (n = 26)**	**Hispanic Survivors (n = 173)**	**p-value**
Bilirubin (mg/dL)	0.6 (0.4 – 0.8)	0.7 (0.6 – 1.7)	0.6 (0.4 – 0.8)	0.007
AST (U/L)	43.0 (28.0 – 58.0)	54.0 (42.5 – 117.0)	40.0 (27.0 – 56.0)	<0.001
ALT (U/L)	35.0 (20.0 – 57.0)	50.0 (24.0 – 83.0)	32.5 (21.0 – 54.5)	0.042
ALP (U/L)	81.0 (68.0 – 107.0)	97.0 (64.0 – 193.2)	81.0 (68.0 – 105.0)	0.136
LDH (U/L)	409.0 (298.0 – 614.0)	568.0 (435.0 – 680.0)	391.5 (290.0 – 594.8)	0.033
Protein (g/dL)	7.4 (6.9 – 7.8)	7.2 (6.3 – 7.6)	7.4 (6.9 – 7.9)	0.039
Albumin (g/dL)	3.4 (2.8 – 4.0)	2.8 (2.2 – 3.4)	3.5 (2.9 – 4.0)	<0.001
CRP (mg/L)	13.7 (4.6 – 64.0)	37.0 (18.0 – 125.6)	9.7 (4.4 – 48.8)	0.005

4. Discussion

Prior analysis of Hispanic COVID-19 disparities in California, New York, and Texas, states ranked first, second, and fourth for largest Hispanic populations, are congruent with study findings seen in our cohort[5, 21-22]. Hispanic COVID-19 patients were younger than non-Hispanic patients, initially presented with similar now-recognized COVID-19 respiratory symptoms, no difference in hospital treatment was observed, and no significant difference in COVID-19 mortality between Hispanic and non-Hispanic patients was found[21-22]. Although following admission there was no difference in administered therapeutics or mortality rates, there were differences between Hispanic and NHW deaths. In our sample, Hispanic mortality patients were younger, had higher CRP, and a greater delay between symptom onset and COVID-19 testing compared to NHW. This is suggestive of factors outside of the hospital, prior to admission, responsible for the disparities seen at the national level with variation between states. A potential pitfall towards COVID-19 recovery may include delayed care seeking secondary to medical mistrust and immigration policies.

Hispanics are reluctant to seek professional medical treatment until disease is severe which can be detrimental in COVID-19 as current guidelines recommend treatment within 5-days of symptom onset[7, 12, 22]. Studies support a delay in timely diagnosis and treatment for Hispanics in other disease processes, including coccidioidomycosis[23]. Prior examination of medical mistrust in ethnic groups with a Group-Based Medical Mistrust Scale revealed Hispanics scored 1.5x greater than NHW[24]. Medical mistrust stems from decade's worth of exploitative medical research and treatment ranging from immoral, unethical human experiments in Guatemalan prisons in the 1940s

to forced sterilization of Hispanic women in the 1970s to the present-day absence of quality medical care in immigrant detention centers[25-27].

A growing body of evidence points towards exclusionary immigration policies as being harmful to health and Hispanics may be reluctant to seek care due to the fear of immigration policy enforcement[9, 28]. As 50% of Hispanics are immigrants, a large proportion of Hispanics who are not U.S. citizens or legal residents may fear deportation in a climate riddled with anti-immigrant rhetoric[10, 25, 29]. Avoidance of public programs for fear of harming their immigration status was reported by Hispanic immigrants which coincided with a 2x increased delay of needed medical care[30]. This could have led to decreased utilization of COVID-19 monoclonal antibodies leading to increased hospitalization rates secondary to uninhibited viral replication[31-33]. Institutional disenfranchisement may further underly this reluctance as Arizona proposed vaccine policies prioritizing U.S. citizens and legal residents, a significant obstacle for undocumented Hispanics seeking protection with the COVID-19 vaccine[25].

The COVID-19 pandemic provided an additional lens to a longstanding issue of health inequity and the call to action is clear. Efforts must be made by healthcare providers to reduce health inequities in the Hispanic population by working with the community to gain trust, delivering culturally appropriate education regarding prevention and treatment services, and increasing the diversity of healthcare teams to allow for more culturally diverse care[10,12]. *Promotoras/promotores*, Spanish for "community health workers", are an example of a way to build trust and deliver health education as *promotoras(es)* are adept at utilizing their own social networks for community mobilization, including vaccine uptake during the COVID-19 pandemic[34-35]. Increasing the number of medical students who identify as Hispanic would create a diverse physician pool with an innate understanding of cultural nuances and mastery of a language that may more closely align with a patient's preferred language[12,35].

Study limitations include sample size, number of health institutions evaluated, impact of COVID19 vaccination rates, infectious dose of COVID-19 strains, survey of individual opinion regarding belief and/or trust in the healthcare system, and perceived health concern of COVID-19. The intersectionality of the potential factors affecting Hispanic health, such as income status, language barriers, risk of infection, health insurance coverage, etc., are outside the scope of this study.

5. Conclusions

Although Hispanic COVID-19 disparities are reported at the national level, this is incongruent with our study subset of healthcare centers in Arizona. Upon admission, patients regardless of Hispanic or NHW identification, received equitable care which resulted in comparable rates of mortality. It is unclear if the novelty of medical treatment during the COVID-19 pandemic allowed for equitable care or if biases are less evident in Arizona compared to other states in the U.S. Given the presentation of Hispanics who succumbed to COVID-19 at increased disease severity per symptomology (dyspnea, oxygen requirement) and clinical values (elevated AST, ALT, CRP, LDH) future studies may analyze comorbidities not addressed in this study. It is debatable if an underlying asthma or liver disease diagnosis can be to blame for the heightened respiratory and hepatic abnormalities seen in Hispanic COVID-19 deaths of our sample, or if caused by acute COVID-19 changes.

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