ORIGINAL ARTICLE

HIV outcomes for foreign-born patients receiving care at a safety net county health system in the southern US

Christine Pack MBA[1], Joan Reisch PhD, MS[1], Henry Pacheco MD[2], Arti Barnes MD, MPH[3]

BACKGROUND: Foreign-born Human Immunodeficiency Virus (HIV) infected patients receiving care in the US have complex factors affecting their care outcomes.

METHODS: We analyzed viral suppression, CD4 count, and healthcare retention among foreign-born patients from non-Spanish speaking countries in a publicly funded health system in Dallas, Texas through a retrospective chart review from 2010 to 2016.

RESULTS: Foreign-born patients had a viral suppression rate of 79.3%. Unsuppressed viral load, CD4 counts less than 200, and loss to care were significantly associated with higher emergency room (ER) visits and hospital admissions. Lack of healthcare coverage (excluding Ryan White coverage) and missed primary care appointments were significantly associated with unsuppressed viral load and loss to care. In multivariate logistic regression, having Ryan White coverage made one less likely to be lost to care than other health care coverage options (OR 0.309).

CONCLUSION: This study revealed that, factors related to healthcare utilization like ER visits, hospital admissions, and lack of healthcare coverage had a negative impact on HIV outcomes rather than socio-cultural factors like region of origin or language. Ryan White coverage, a payer of last resort in Texas, was predictive of retention in care of foreign-born patients in this area.

Key Words: *HIV; Foreign-born; Immigrants; Epidemiologic surveillance; Viral suppression; Non-spanish speaking*

INTRODUCTION

Foreign born individuals make up an estimated 13.4% of the United States (US) population but contribute to a higher proportion (16.2%) of people living with HIV (PLWHA) in the US (1,2). The UNAIDS conference for HIV/AIDS in June 2016 stated a need for targeted and focused solutions for interventions tailored to vulnerable populations, such as the foreign-born PLWHA in the United States (3). With respect to general healthcare, foreign-born individuals are less likely to access routine healthcare, less likely to have health care coverage, and report lower levels of satisfaction with the healthcare received. Foreign-born PLWHA in the US are also younger at the time of their HIV diagnosis, come from mostly Hispanic countries in origin, and have more heterosexual contact as mode of transmission compared to their US-born counterparts (2). Additionally, foreign-born PLWHA are enrolled in care at lower CD4 counts compared to US-born PLWHA and had more opportunistic infections and AIDS diagnoses (4).

Existing literature on outcomes of foreign-born HIV infected individuals has been conflicting but the majority of the research has been on HIV patients from the most represented countries i.e., Mexico and other Central American countries. One study found differences in HIV related outcomes, with respect to country of origin, with a significantly higher proportion of foreign-born persons from Mexico achieving viral suppression as compared with US-born persons or those migrating from other regions. This study also revealed that those who migrated as adults achieved viral suppression in significantly higher proportions than US-born or those who migrated at younger ages and that those living in the United States for ten or more years achieved viral suppression in higher proportions than their US-born counterparts or those more newly arrived in the United States (5). In contrast, a national survey by the Medical Monitoring Project found no differences in viral load suppression between foreign-born patients and US-born patients who were in medical care and receiving antiretroviral therapy (6). This may be due to this study's inclusion of Spanish-speaking countries and the potential impact of bilingual care services in the US given the increase in the work force of Spanish-speaking nurses and interpreters (7). Limited English proficiency plays a major role in disparities and access to care, but this is not an issue for immigrants from many Caribbean and African countries where English is the national language. Adults with limited English proficiency and their children are much less likely to have health care coverage, have fewer physician care visits, and receive less preventive care than those who speak English (8).

However, language may not be the only factor defining healthcare experiences for HIV infected people in the US. There are other issues unique to HIV care in immigrant populations, such as lack of knowledge or trust of the US healthcare system, denial or stigma of the disease, cultural or religious practices and lack of access to healthcare, which may all impact their care outcomes (4). Though characteristics such as demographics and language have been explored in recent research, the role of healthcare coverage and its impact on HIV outcomes has not been addressed. Also, less is known about foreign-born PLWHA who are not from Spanish speaking countries. The purpose of this exploratory study is to determine which factors influence HIV outcomes in foreign born individuals who receive care at a Dallas county public hospital, a safety net healthcare system in the metro. The goal is to identify factors that could inform policy changes and quality improvement initiatives specifically to address the foreign-born HIV infected population.

MATERIALS AND METHODS

Study design and participants

The study was a retrospective chart study of HIV patients from Parkland Hospital, a Dallas County public hospital in Texas, during the time period of January 1, 2010 and January 1, 2016 who attended at least one HIV medical care visit during that period. The Dallas metro area, in the southern US, has a significant proportion of foreign-born individuals. According to the Dallas City Hall data, 25 percent of Dallas' 1.3 million residents are foreign-born individuals (9).

The criteria for inclusion of subjects consisted of all Parkland Hospital patients from ages 18-75 years old and are foreign born from non-Spanish speaking countries. The study focused on non-Spanish speaking countries

[1]UT Southwestern Medical Center, Children's Medical Center Research Institution, Dallas, Texas, USA; [2]South Central AIDS Education and Training Center, Parkland Health & Hospital System, Dallas, Texas, USA; [3]MPH Cornell Scott Hill Health Center, Medical Clinic, New Haven, Connecticut, USA

Correspondence: Christine Pack, MBA, UT Southwestern Medical Center, Children's Medical Center Research Institution, Dallas, Texas, USA. Telephone +1 214-648-2361, e-mail: Christine.Pack@UTSouthwestern.edu

because of the extensive research already done on Hispanic communities in the United States and the limited ability to abstract reliable information on country of origin for Hispanics based on preliminary chart reviews. This study builds on themes that have already been explored in Spanish-speaking communities in the US that may also be applicable to other foreign-born patients. This study was approved by the University of Texas, Southwestern Medical Center Institutional Review Board as well as the Parkland Hospital Research Committee and was approved for ethical consideration and given a waiver of authorization for the release of protected health information for this study. The data was protected through triple encryption and de-identified. Only authors AB and CP had access to the patient medical records and the de-identified, blinded database was sent to the statistician JR to analyze the data (10).

The Parkland HIV care service is a publically funded safety net county system that receives Ryan White funding to care for over 5000 HIV infected individuals. Ryan White grants are federal funds dedicated to providing HIV specific care to those with limited resources. The electronic health record (EHR) system does not collect information based on country of origin or foreign-born status in discrete categories. Therefore, subjects were identified based on provider recall – all providers at the Parkland HIV clinics were approached to include patients who were known to be foreign born into a common or shared EHR database. In addition, since data on primary language is collected in the HER, all patients who had neither English or Spanish listed as their primary language were identified directly through the EHR. Immigration status was not found in most charts and only recorded if the patient was of refugee status (11).

Convenience sampling and cluster sampling was used to include foreign-born HIV patients in the study. Because electronic medical records (EMR) do not have a category of which country the patient originated, convenience sampling that relied on clinician recall was necessary and yielded 117 number of subjects. In addition, the entire patient database was sampled to identify those whose preferred language that was neither English or Spanish to further identify potential patients and yielded 243 number of subjects. Patients were also clustered from a public hospital from Dallas county. Rigorous chart review was able to exclude 7 subjects based on inaccurate sampling. These sampling methods could include under-coverage error and participation bias where the sampling frame does not include all the patients that would have otherwise been included. The total number of patients included through initial retrieval was 236, and 4 patients were excluded after review because the patients were over 75-years-old as that was considered an identifier in order to protect their privacy (12).

Data were extracted through manual chart reviews. Variables collected included data on HIV and AIDS diagnoses, CD4 count, viral loads, and antiretroviral therapy. Social demographic, economic, and clinical variables were reviewed in this study. Data on healthcare coverage were based on information listed from their most recent healthcare encounter. The variables included in this study use of healthcare services such as number of visits, missed visits, hospital admissions and visits to the emergency room (13).

Outcomes

The three main outcomes studied were viral suppression, CD4 count, and retention in care.

Definitions

All patients in the study were HIV positive, meaning they had evidence of HIV positive antibody test and were receiving care at an HIV specialty clinic. HIV Viral load suppression is defined as the most recent viral load count lower than 200 copies of viral ribonucleic acid (RNA) per milliliter. CD4 count is defined as CD4+ T-lymphocyte count per cubic millimeter at most recent visit. AIDS is defined as the most recent CD4 count lower than 200. An individual who is retained in care is defined as having at least two completed HIV appointments in a twelve-month period. Lost to care was defined as not having any completed HIV-related appointments in a twelve-month period. Healthcare coverage is defined by having a funding source that covers HIV clinical needs at the point of chart review. History of sexually transmitted diseases (STDs) was defined as any history of herpes simplex virus, gonorrhea, chlamydia, pelvic inflammatory disease, lymphogranuloma venerum, syphilis, human papillomavirus, and trichomoniasis. Tuberculosis (TB) exposure was defined as a history of ever testing positive for TB on Quantiferon gold blood test or history of active TB. Mental illness included depression, schizophrenia, bipolar disorder, anxiety, and memory loss as defined by ICD 9 diagnosis codes or if listed in electronic medical records. Substance abuse included abuse or dependence on the following substances:

alcohol, marijuana, cocaine, opiates, phencyclidine, amphetamines, benzodiazepines, and barbiturates. All conditions were identified based on ICD 9 codes or if listed in provider documentation.

Statistical analysis

Continuous variables are expressed as mean with standard deviation (SD). Categorical data are summarized as frequencies and percentages. Characteristics of patients were compared between the groups, stratified by HIV outcomes such as CD4 count and viral load, using the t-test for continuous variables and the Chi-square test or Fisher's exact test for dichotomous variables, as appropriate. The association of lost to care, viral load, and CD4 count with all the variables in the study was investigated using multivariate logistic regression models. Covariates included in the multivariate model were identified using a stepwise method among all relevant clinical variables. The variables selected in the multivariable model included all demographic and clinical variables in the study. All p-values were two-sided, and a p-value <0.05 was considered significant. Analyses were conducted with SAS software, version 9.3.

RESULTS

Demographics

A from the 232 foreign born patients identified who had at least one HIV visit in the Parkland Hospital system, 108 were male and 124 were female. No transgender patients were identified. Patients came from a total of 35 different countries, with the regional divisions shown in Table 1. Ethiopia, Burma, and Kenya were the countries with the most representatives in this study. English-speaking patients made up 48% of the study population and non-English speaking patients made up 52% of the study population.

The foreign-born population in this study were mostly high school graduates (39%) and the majority (54%) were unemployed (Table 1). Ryan White coverage (the largest federally funded healthcare coverage program in the US for people living with HIV/AIDS) was the most prevalent healthcare coverage policy with 38% of the study population actively enrolled in Ryan White programs while 24% of patients had no healthcare coverage, i.e., no active Ryan White or county funding listed. More of the foreign-born patients were diagnosed in the United States (59%) rather in their originating countries. The majority of the patients (90%) contracted HIV through heterosexual transmission. Approximately 65% of patients had been residing in the US longer than five years (Table 1).

HIV clinical outcomes

Cd4 count

AIDS (CD4 <200 cells/mm^3) was prevalent in 25% of our sample. There was no significant difference in the prevalence of AIDS based on different regions of origin (Table 2). There was no significant difference in prevalence of AIDS by gender, number of children, marital status, employment status, education, years in the US, duration of HIV, Language of preference and other factors described in Table 3. The only factors that had a significant association with the prevalence of AIDS were: greater than one ER visit and greater than one hospital admission per year. Not having had a TB exposure, Hepatitis B or diabetes was associated with a higher prevalence of AIDS.

Viral load suppression

The total foreign-born population had suppressed viral load rate of 79%. The African region had the greatest number of individuals with unsuppressed viral loads (22.7%) followed by Asia (19.2%). However, there was no statistically significant difference in viral load suppression based on geographic region of origin (Table 2). The factors that had a significant association with prevalence of unsuppressed viral load included: greater than one ER visit, greater than one hospital admissions a year, not having healthcare coverage, having other STDs, and increased number of missed primary appointments.

Retention in care

The total foreign-born patient population had 70% of individuals retained in care with at least 2 primary care appointments per year. The Asian region had the most proportion of patients retained in care (75%), followed by the African region (70%). There was no statistically significant difference in retention of care based on region of origin (Table 2). The factors that had a significant association with retention in care included: greater than one ER visit, greater than one hospital admissions a year, not having healthcare coverage, and having more than one missed primary care appointment (Tables 2 and 3).

TABLE 1

Patient demographics of foreign-born HIV patients based on continent of origin in the Parkland Hospital system in Dallas, Texas from 2010-2016, N=Number of patients

Characteristic	Foreign-born total N (%)	Africa N (%)	Asia N (%)	The Caribbean and Brazil N (%)	Europe N (%)
Region of origin	232 (100)	141 (61)	76 (33)	12 (5)	3 (1)
Male	108 (47)	51 (36)	48 (63)	7 (58)	2 (67)
Female	124 (53)	90 (64)	28 (37)	5 (42)	1 (33)
Age					
18-34	36 (16)	16 (11)	17 (22)		2 (67)
35-49	110 (47)	59 (42)	45 (59)	5 (42)	1 (33)
50-64	66 (28)	49 (35)	9 (12)	7 (58)	
>65	20 (9)	16 (11)	5 (7)		
Number of children					
0	83 (36)	38 (27)	40 (53)	3 (25)	2 (67)
1	46 (20)	35 (25)	10 (13)	1 (8)	0 (0)
>1	98 (42)	63 (45)	26 (34)	8 (67)	1 (33)
Unknown	5 (2)	5 (3)			
Marital status					
Single	82 (35)	49 (35)	25 (33)	5 (42)	3 (100)
Married	74 (32)	40 (28)	29 (38)	5 (42)	
Divorced	53 (23)	32 (23)	19 (25)	2 (16)	
Widowed	23 (10)	20 (14)	3 (4)		
Education level					
None	11 (5)	8 (6)	3 (4)		
Primary	37 (16)	16 (11)	19 (25)	2 (16)	
High School	90 (39)	52 (37)	32 (42)	5 (42)	1 (33)
Bachelor	61 (26)	38 (27)	16 (21)	5 (42)	2 (67)
Unknown	33 (14)	27 (19)	6 (8)		
Employment					
Unemployed	123 (53)	78 (55)	38 (50)	5 (42)	2 (67)
Full Time	67 (29)	33 (23)	31 (41)	3 (25)	
Part Time	1 (0.43)	1(1)			
Health Workers	19 (8)	17 (12)		2 (16)	
Disability	11 (5)	5 (4)	5 (7)	1 (8)	
Student	1 (0.43)		1 (1)		
Retired	1 (0.43)			1 (8)	
Self Employed	3 (1)	2 (1)	1 (1)		
Jail	2 (1)	2 (1)			
Unknown	4 (2)	3 (2)			1 (33)
Length of stay in US					
Less than 1 year	7 (3)	7 (5)			
1-5 years	74 (32)	43 (30)	27 (36)	2 (16)	2 (67)
>5 years	151 (65)	91 (65)	49 (65)	10 (84)	1 (33)
Preferred language					
English	112 (48)	83 (59)	20 (26)	7 (58)	2 (67)
Non-English	120 (52)	58 (41)	56 (74)	5 (42)	1 (33)
HIV transmission method					
Heterosexual	209 (90)	124 (88)	71 (93)	11 (92)	3 (100)
Bisexual	5 (2)	4 (3)	1 (1)		
MSM	14 (6)	10 (7)	3 (4)	1 (8)	
Blood	1 (0.43)	1 (10)			
MTCT	3 (1)	2 (1)	1 (1)		
Location of diagnosis					
In US	137 (59)	85 (60)	47 (62)	4 (33)	1 (33)
Outside US	95 (41)	56 (40)	29 (38)	8 (67)	2 (67)
STD history	44 (19)	26 (19)	15 (20)	1 (8)	0 (0)
Hepatitis B	28 (12)	16 (12)	8 (10)	3 (25)	0 (0)
Hepatitis C	14 (6)	8 (6)	4 (5)	2 (16)	0 (0)
Diabetes	19 (9)	9 (6)	10 (13)	0 (0)	0 (0)
Malignancy	18 (8)	9 (6)	6 (8)	2 (16)	1 (0)
Tuberculosis exposure	72 (31)	48 (35)	20 (26)	4 (33)	0 (100)
Mental health	40 (17)	20 (14)	14 (18)	5 (42)	0 (0)
Substance abuse	21 (9)	10 (7)	10 (13)	2 (16)	0 (0)
Smoking	63 (27)	35 (25)	20 (26)	6 (50)	1 (100)
Healthcare coverage					

Ryan White/County	107 (46)	60 (43)	40 (53)	6 (67)	1 (33)
None	56 (24)	37 (26)	15 (20)	2 (16)	2 (67)
Private	28 (12)	21 (15)	7 (9)		
Medicaid/Molina	25 (11)	13 (9)	8 (10)	4 (33)	
Medicare	16 (7)	10 (7)	6 (8)		
# of ER visits/yr					
More than 1	33 (14)	15 (11)	16 (21)	2 (16)	
1	34 (15)	21 (15)	11 (15)	1 (8)	1 (33)
0	162 (70)	103 (74)	49 (65)	9 (75)	1 (33)
Unknown	1 (1)				1 (33)
# of admissions/yr					
More than 1	25 (11)	11 (8)	13 (17)	1 (8)	
1	33 (14)	23 (16)	9 (12)	1 (8)	
0	173 (75)	107 (76)	54 (71)	10 (84)	2 (67)
Unknown	1 (1)				1 (33)
# primary appts missed/yr					
1 or more	91 (39)	60 (43)	25 (33)	4 (33)	2 (67)
None	140 (61)	81 (57)	51 (67)	8 (67)	
Unknown	1 (1)				1 (33)

*The above percentage values are column percentages.

African countries included were: Ethiopia, Tanzania, Zimbabwe, Rwanda, Kenya, Burundi, Nigeria, Cameroon, Sudan, Congo, Algeria, Eritrea, Zambia, Benin, Mauritania, Malawi, Uganda, Guinea, Togo, South Africa

Asian countries included were: Burma, Vietnam, Iraq, Thailand, South Korea, Pakistan, India, Kuwait, China

European countries included were: United Kingdom and Belgium

Caribbean countries included were: Haiti, British Virgin Islands, and Jamaica

TABLE 2

HIV clinical outcomes of foreign-born HIV patients based on continent of origin in the Parkland Hospital system in Dallas, Texas from 2010-2016, N=Number of patients

Characteristic	Foreign-born total N (%)	Africa N (%)	Asia N (%)	Caribbean and Brazil N (%)	Europe N (%)	p-value
Most recent viral load						
Suppressed	184 (79)	109 (77.3)	61 (80.3)	11 (91.7)	3 (100)	0.5374
Not suppressed	48 (21)	32 (22.7)	15 (19.7)	1 (8.3)	0 (0)	
Most recent CD4						
AIDS	58 (25)	36 (26)	19 (24)	3 (25)	0 (0)	0.553
No AIDS	174 (75)	105 (74)	57 (76)	9 (75)	3 (100)	
# Primary apt/yr						
More than 1	163 (70)	99 (70)	57 (75)	5 (42)	2 (67)	0.553
1	48 (21)	29 (21)	15 (20)	4 (33)		
none	20 (9)	13 (9)	4 (5)	3 (25)		
Unknown	1 (1)				1 (33)	

*The above percentage values are column percentages.

Table 2 demonstrates the p values for all the statistically significant variables for the healthcare outcomes. The number of ER visits and the number of hospital admissions were factors that were statistically significant for all three of the study outcomes: viral suppression, CD4 count, and healthcare retention. The lack of healthcare coverage and missed primary care appointments was statistically significant for viral suppression and healthcare retention. Sexually Transmitted Diseases (STD) comorbidities were inversely related to viral suppression. Finally, tuberculosis, diabetes, and hepatitis B were inversely related to CD4 count. The bolded values exemplify the variables that are within 0.05 p-values. The italicized values exemplify the variables that were within 0.1 p-value to 0.05, which included number of primary appointments and STD comorbidities inversely related to CD4 count.

Multivariable analysis

Through logistical regression analysis, Ryan White status was the only factor that was significant for retention of care, where having Ryan White coverage made a patient 0.309(0.159-0.601 95% CI) less likely to be lost to care. For the viral load suppression outcome, those with missed primary care visits had a 1.479 times higher odd of having an unsuppressed HIV viral load. Individuals with greater than one ER visit per year had a 0.709 times lower odd of a CD4 count greater than 200 and those with history of TB had a 2.7 times higher odds of having a CD4 count greater than 200 (Table 4).

DISCUSSION

Our study reveals that foreign-born patients had an overall viral suppression rate of 79.3%. compared with viral suppression rates of patients in HIV care in Texas and Dallas (82% and 88% respectively) (10). English speaking patients had similar viral suppression rates non-English-speaking patients (78.6%, Vs. 80%). Previous research showing that language barriers may play a significant role in HIV outcomes was not supported in this study, with non-English speakers having no significant difference in incidence of AIDS, viral load suppression and retention in care. The non-English speaking patients were mostly from Burma and Ethiopia, who came as refugees. Chart review

TABLE 3

HIV clinical outcomes of foreign-born hiv patients in the Parkland Hospital system in Dallas, Texas from 2010-2016, N=Number of patients

Variable	Viral Suppression N (%)	p-value	AIDS N (%)	p-value	Healthcare retention N (%)	p-value
Gender						
Male	83 (77)	0.3883	21 (19)	0.6621	76 (70)	0.9744
Female	101 (81)		27 (22)		87 (71)	
Number of children						
0	65 (78)		18 (22)		55 (66)	
1	41 (89)	0.1641	6 (13)	0.289	31 (67)	0.2821
>1	74 (76)		24 (24)		73 (75)	
Marital status						
Single	65 (79)		15 (18)		56 (69)	
Married	58 (78)	0.4135	20 (27)	0.2272	52 (70)	0.6746
Divorced	39 (75)		11 (21)		35 (67)	
Widowed	22 (92)		2 (8)		20 (83)	
Education						
None	9 (82)		2 (18)		7 (64)	
Primary	29 (78)	0.9749	8 (22)	0.3295	29 (78)	0.2143
High School	73 (81)		14 (16)		66 (73)	
Bachelor Degree	-79		17 (28)		39 (64)	
Employment status						
Student	0 (0)		0 (0)		1 (100)	
Jail	2 (100)		0 (0)		0 (0)	
Unemployed	97 (79)		27 (22)		87 (71)	
Self Employed	3 (100)		0 (0)		0 (0)	
Full Time	53 (79)	0.5332	13 (19)	0.9523	51 (76)	0.0987
Disability	9 (82)		2 (18)		8 (73)	
Health Worker	17 (89)		5 (26)		11 (58)	
Part Time	1 (100)		0 (0)		1 (100)	
Retired	1 (100)		0 (0)		1 (100)	
Length of stay in US						
<1	6 (86)		1 (14)		4 (57)	
01-May	57 (76)	0.6557	13 (17)	0.5924	57 (77)	0.2876
>5	121 (81)		34 (23)		102 (68)	
Language preference						
English	88 (79)	0.7884	26 (23)	0.3591	75 (41)	0.6002
Non-English	96 (80)		22 (18)		88 (73)	
HIV transmission						
Sexual	180 (79)	0.3028	0 (0)	0.3028	161 (71)	0.3216
Nonsexual	4 (100)		48 (21)		2 (50)	
Number of ER visits						
0	140 (85)		22 (13)		114 (70)	
1	23 (68)	0·0012	12 (35)	<0·0001	24 (71)	0·0111
>1	20 (61)		14 (42)		25 (76)	
# Hospital admissions						
0	144 (83)		24 (14)		119 (69)	
1	25 (76)	0·0063	10 (30)	<0·0001	26 (79)	0·0181
>1	14 (56)		14 (56)		18 (72)	
Healthcare coverage						
None	38 (69)		12 (22)		28 (52)	
Ryan White	84 (79)		21 (20)		87 (81)	
Private	25 (86)	0·0320	4 (14)	0.7044	19 (66)	0·0152
Medicare	16 (100)		3 (19)		13 (81)	
Medicaid/Molina	21 (88)		8 (32)		16 (64)	
STD comorbidities						
Yes	29 (67)	0·0333	5 (12)	0.1041	28 (65)	0.4303
No	**155 (82)**		43 (23)		135 (72)	
Missed primary appts						
0	117 (84)	0·0432	26 (19)	0.305	103 (74)	0·0373
≥ 1	66 (73)		22 (24)		60 (66)	
Diagnosis location						
In US	110 (79)	0.9364	31 (22)	0.4585	96 (69)	0.5546
Outside US	74 (80)		17 (18)		67 (73)	
Tuberculosis						

Yes	61 (84)	0.2787	7 (10)	0·0047	48 (66)	0.5408
No	123 (77)		41 (26)		115 (73)	
Mental illness						
Yes	30 (75)	0.4594	6 (15)	0·3288	25 (63)	0.2865
No	154 (80)		42 (22)		138 (72)	
Hepatitis B						
Yes	21 (75)	0.5482	10 (36)	0·0363	17 (61)	0.3913
No	163 (80)		38 (19)		146 (72)	
Hepatitis C						
Yes	14 (93)	0.1657	2 (13)	0.4671	8 (53)	0.1653
No	170 (78)		46 (21)		155 (72)	
Diabetes						
Yes	17 (89)	0.2537	0 (0)	0.0202	12 (63)	0.1041
No	167 (78)		48 (23)		151 (71)	
Malignancy						
Yes	16 (89)	0.2962	6 (33)	0.168	13 (76)	0.6026
No	168 (79)		42 (20)		150 (70)	
Substance abuse						
Yes	16 (73)	0.423	4 (18)	0.7602	13 (59)	0.3897
No	168 (80)		44 (21)		150 (72)	
Smoker						
Yes	47 (75)	0.2798	12 (19)	0.7062	41 (66)	0.6659
No	137 (81)		36 (21)		122 (72)	

*The above percentage values are row percentages.

TABLE 4

Multivariable analysis of variables significant for HIV clinical outcomes of foreign-born HIV patients in the Parkland Hospital system in Dallas, Texas from 2010-2016

Outcome	Variable	Odds Ratio	95% Confidence Interval
Lost to care	Ryan White coverage	0·309	0·159-0·601
Viral load	Missed primary care appointments	1·479	1·093-2·002
CD4 count	No ER visits	0·709	0·559-0·899
	Tuberculosis	2·709	1·130-6·493

Multivariable analysis was done using stepwise logistic regression.

revealed significant support from refugee support services who escorted patients to appointments, provided housing support, and assisted with job placement. This may have positively affected their outcomes, but further investigation into such support services for foreign born individuals is much needed to elucidate any potential impact of those services. Translators, whether formal or relational, may play a significant role in HIV outcomes for non-English speaking patients. Parkland hospital has a rapid phone-based translator service, which may have also assisted in patient care.

In this study, there was no gender difference in viral load suppression, which is an indirect marker of higher ART adherence. This is similar to US national averages where men and women are equally likely to be virally suppressed (58.8 and 55.2 respectively) (11). The three countries most represented in our study were Ethiopia, Burma and Kenya. Studies in Ethiopia revealed that women have higher rates of non-adherence to ART medication compared to men (73% of women compared to 49% of men) (12). In our study, Ethiopian men had rates of 67% and women had 75% viral suppression. However, data from Burma and Kenya revealed that male and female HIV clinical outcomes are similar (14,15). In our study, Kenyan women had 80% viral suppression while men had 71.5%. Among the Burmese patients, 80% of women and 73.9% of men had viral suppression. This underscores the complexity of gender relations and may reveal that factors affecting gender disparities in HIV care may change along with their socio-geographic environments.

Our findings are also unique because of the previous research that has shown characteristics such as length of stay in the US and English proficiency have made a difference in HIV outcomes but was not demonstrated in our study that included care through a safety net healthcare system. This exemplifies the complexity of the issues surrounding HIV in immigrant populations and that traditionally understood factors may not always be relevant in all healthcare settings (16).

Ryan White coverage provides comprehensive HIV care including primary care and medications for HIV infected people with limited resources. It is considered the payer of last resort in Texas. From our study, results showed that foreign-born patients have better HIV outcomes when they are supported by a healthcare coverage policy that involves Ryan White. Unfortunately, a heavy portion of our sample (24%) had no active Ryan White or county

funding, thus revealing the challenges with being retained in the program with changing regulatory requirements. Medicaid and Medicare recipients could have challenges with care related specifically to HIV including co-pays, prior authorizations, retail pharmacies that may not be familiar with HIV medications, and limited case manager support. This could be the explanation why Ryan White coverage specifically had a protective impact on HIV outcomes for foreign-born patients in our study (17).

Missed primary care visits was predictive of having unsuppressed viral loads (18). This has been well documented in the research literature on HIV related outcomes but has not been studied specifically in the context of foreign-born individuals receiving care in the US (2-5). More ER visits were predictive of having AIDS. This may imply the need for a greater effort towards enhancing access for patients to their primary care appointments which may in turn decrease the risk of opportunistic infections or other complications of AIDS which consequently result in increased ER visits (14).

Patients with TB exposure, Hepatitis B and Diabetes were predictive of having a CD4 count above 200. This seems like an unexpected outcome, but this could be explained by the likelihood of needing increased healthcare visits by patients with these co-morbidities and consequently a higher likelihood of being diagnosed with HIV sooner and getting started on antiretroviral therapy sooner in their course of HIV disease (11).

There are certain limitations to our study, which include incomplete chart information regarding specific demographics like immigration and employment status, small sample size for certain regions like Europe, and inconsistent documentation about social support of patients. In addition, we had to base our sample per provider recall which could produce a selection bias. However, we conducted an EHR data pull of all with a listed language that was neither English or Spanish. This could have slightly under-estimated the English-speaking foreign-born patients in our sample. However, 48% of our sample was English speaking and provided adequate power to compare language as a factor influencing care. This also highlights the need for listing country of birth as a discrete variable in the electronic health record so that this population could be easily identified for needs assessment as well as policy and research. However, there may be some greater political challenges that could be posed to these individuals by allowing easy identification by

their immigration status and the global risk versus benefit of such a measure would have to be assessed before it is implemented (15,16).

From this study, analysis has shown that healthcare utilization impacts HIV clinical outcomes in the foreign born to a greater extent than regional or socio-demographic factors. This may mean more interventions by case managers to discover reasons for missing primary care appointments and reasons for not having healthcare coverage for this particular vulnerable population. Therefore, HIV services should focus more on healthcare coverage and decreasing hospital admissions and ED visits for better HIV outcomes in foreign-born patients. From our study, results showed that foreign-born patients have better HIV outcomes when they are supported by a healthcare coverage policy that involves Ryan White. This could be done in the form of more embedded Ryan White case managers in the ED in order to connect these patients that are not already linked to HIV care and have uncontrolled HIV. In addition, having Ryan White case managers connected to different axillary organizations that serve immigrants or refugees would allow more newly entering patients to connect with HIV care upon entry to the US (17). Another way to better serve these patients would be to identify these patients through their EMR chart through indication of their foreign-born status. This does not mean citizenship or legality status to be included in the chart, but an indication that the patient may have barriers or health information disparities that the provider should specifically address by indicating the patient is foreign-born. Through having this status shown on a patient's EMR, a provider can be signaled to ask specific questions related to the patient's care that may be unique to foreign-born patients. If this foreign-born status was indicated in all Ryan White clinics across the country, this study could expand further in order to systematically evaluate outcomes in this particular vulnerable group. This would provide more data to illustrate the unique needs and barriers that foreign-born HIV patients experience and provide data to create programs and initiatives on how to better address needs to this group (18).

CONCLUSION

Based on our study, gender roles and language barriers do not play a significant role in HIV outcomes for foreign-born individuals from non-Spanish speaking countries. Instead, factors such as healthcare coverage, primary care visits, and comorbidities had a larger impact on HIV outcomes.

ACKNOWLEDGMENT

The authors thank all the patients, facilities, and staff members at Parkland Hospital, Amelia Court Clinic, South Central AIDS Education & Training Center, and the Division of Biostatistics at the University of Texas Southwestern.

SOURCES OF FUNDING

This work was an unfunded study. The authors had full access to all the data in the study and had final responsibility for the decision to submit for publication.

INDIVIDUAL CONTRIBUTIONS

AB and CP designed the study and were responsible for data management. JR analyzed the data with input from AB and CP. HP contributed to study design and provided clinical advice. AB and CP contributed to writing the report and JR and HP edited and have approved the final draft.

CONFLICT OF INTEREST

The authors have declared no conflict of interest for this work.

REFERENCES

1. Factank. Key findings about US immigrants. Pew Research Center. 2016.

2. Prosser AT, Tang T, Hall HI. HIV in persons born outside the United States, 2007-2010. JAMA. 2012;308(6):601-07.

3. WHO. 2016 United Nations political declaration on ending AIDS sets world on the fast-track to end the epidemic by 2030. UNAIDS. 2016.

4. Crawford T, Caldwell G, Bush HM, et al. Foreign born status and HIV/AIDS: A comparative analysis of HIV/AIDS characteristics among foreign and US born individuals. J Immigr Minor Health. 2012;14(1):82-8.

5. Carten ML, Castillo-Mancilla JR, Allshouse AA, et al. Characteristics of foreign-born HIV infected individuals and differences by region of origin and gender. J Immigr Minor Health. 2013;15:667-72.

6. Taylor K, Howard S. An end to the era of the US HIV entry ban. Clin Infect Dis. 2011;p:53.

7. Cowart R. Health care industry must adapt to growing Hispanic population, Tennessean. USA Today. 2016.

8. Ponce N, Hays RD, Cunningham WE. Linguistic disparities in health care access and health status among older adults. J Gen Intern Med. 2006;21(7):786-91.

9. Reich E. Community profile: Complete FY 2017-18 proposed budget book. City of Dallas. 2018.

10. WHO. Dallas eligible metropolitan area integrated HIV prevention and care plan: Dallas county health and human services. Dallas County. 2016.

11. WHO. HIV continuum of care, U.S., 2015, overall by age, race/ethnicity, transmission route and sex. CDC National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention. 2017.

12. Teshome W, Belayneh M, Moges M, et al. Who takes the medicine?: Adherence to antiretroviral therapy in Southern Ethiopia. Dovepress. 2015.

13. UNAIDS. UNAIDS prevention gap report Myanmar. 2016.

14. Thiha N, Chinnakali P, Harries AD, et al. Is there a need for viral load testing to assess treatment failure in HIV-infected patients who are about to change to tenofovir-based first-line antiretroviral therapy?: Programmatic findings from Myanmar. PLOS ONE. 2016.

15. Mwau M, Syeunda CA, Adhiambo M, et al. Scale-up of Kenya's national HIV viral load program: Findings and lessons learned. PLOS ONE. 2018.

16. WHO. Office of national AIDS policy. National HIV/AIDS Strategy for the United States. 2015.

17. Myers TR, Lin X, Skarbinski J. Antiretroviral therapy and viral suppression among foreign-born HIV-infected persons receiving medical care in the United States: A complex sample, cross-sectional survey. Medicine (Baltimore). 2016;95(11): e3051.

18. Marks G, Patel U, Stirratt MJ, et al. Single viral load measurements overestimate stable viral suppression among HIV patients in care: Clinical and public implications. J Acquir Immune Defic Syndr. 2016;73(2):205-12.