Social determinants and sexual risk behaviors within Immunodeficiency Virus cases in Solidaridad, Quintana Roo, Mexico

Determinantes sociales y conductas sexuales de riesgo en casos de Virus de la Inmunodeficiencia en Solidaridad, Quintana Roo, México

Gabriel Chavira-Trujillo[1], Leonardo Llamas-Ramos[2], Aida Jiménez Corona[3], Rudolf Geers[4], Antonio Reyna Sevilla[5], Gabriela Alejandra Grover Baltazar[6], María Eugenia Jiménez Corona[7]

Corresponding Author

María Eugenia Jiménez Corona. Postal address: Department of Epidemiology of the National Institute of Cardiology "Ignacio Chávez" Juan Badiano 1, Col. Section XVI, Tlalpan City Hall, C.P. 14080, Mexico City, Mexico. Email: mejimenez777@gmail.com

Abstract

Objective: To determine the prevalence of HIV in individuals by analyzing the influence of social determinants and sexual risk behaviors, in order to estimate the crude and adjusted risks of being HIV positive in the municipality of Solidaridad, state of Quintana Roo, Mexico.

Method and Materials: A cross-sectional study was conducted in the municipality of Solidaridad, Quintana Roo, Mexico. Third and fourth generation HIV rapid tests were performed. Descriptive statistics, measures of association (OR and 95 % CI) and p value were calculated for each stratum. Logistic regression models were performed to determine the risk factors associated with being HIV positive in the tests.

Results: The sample consisted of 4,800 people, of whom 3,030 were men (63.12%); the mean age was 32.6 years (SD 14.96). The variables included in the multivariate model for being HIV positive are: men who have sex with men with OR=61.20, age 30-39 years OR=1.72, having anal sex OR=2.21, and as a protective factor having health service OR =0.42.

Conclusions: This study confirms already known social determinants such as being male and being in economically active age and sexual practices such as: having anal sex and men with men. Being entitled to health services was shown to be the only protective factor.

Keywords: Epidemiologic Factors; Sexuality; HIV; Epidemiology.

Resumen

Objetivo: Determinar la prevalencia de VIH en personas analizando la influencia de los determinantes sociales y las conductas sexuales de riesgo, para estimar los riesgos crudos y ajustados para ser VIH positivo en el municipio Solidaridad, estado de Quintana Roo, México.

Método y Materiales: Se realizó un estudio transversal en el municipio de Solidaridad, Quintana Roo, México. Se realizaron pruebas rápidas de VIH de tercera y cuarta generación. Se calcularon las estadísticas descriptivas, las medidas de asociación (OR e IC del 95 %) y el valor de p para cada estrato. Se realizaron modelos de regresión logística para determinar los factores de riesgo asociados con ser VIH positivo en las pruebas.

Resultados: La muestra estuvo compuesta por 4,800 personas de las cuales; 3,030 hombres (63.12%); la edad promedio fue de 32.6 años (D.E. 14.96). Las variables incluidas en el modelo multivariado para ser VIH positivo son: hombres que tienen sexo con hombres con OR=61.20, edad 30-39 años OR=1.72, tener sexo anal OR=2.21, y como factor protector contar con servicio de salud OR =0.42.

Conclusiones: Este estudio confirma determinantes sociales ya conocidos como el ser hombre y estar en edad económicamente activa y prácticas sexuales como: el tener sexo anal y hombres con hombres. Contar con derechohabiencia se muestra como único factor protector.

Palabras clave: Factores Epidemiológicos; Sexualidad; VIH; Epidemiología.

---

[1] PhD, Department of Epidemiology of the National Institute of Cardiology "Ignacio Chávez", Mexico City, Mexico.

[2] MD, Physician into the physical and mental health department H. Ayuntamiento de Solidaridad Quintana Roo, México

[3] PhD, Conde de Valenciana Institute of Ophthalmology IAP, Deputy General Directorate of Epidemiology, Health Secretariat, Mexico City, Mexico.

[4] Positive Life Playa A.C., Playa del Carmen. Quintana Roo. Mexico.

[5] PhD, Directorate of Medical Benefits, IMSS, Mexico City, Mexico

[6] PhD, University Center for Health Sciences, University of Guadalajara, Guadalajara, Jalisco, Mexico.

[7] PhD, Department of Epidemiology of the National Institute of Cardiology "Ignacio Chávez", Mexico City, Mexico.

Introduction

The Acquired Human Immunodeficiency Virus (HIV) is still considered one of the main public health problems, it has caused 36 million deaths by 2021 according to the World Health Organization (WHO). Just in 2016, it has claimed a million lives associated with it. Although the incidence of HIV infections has decreased by 35% and the deaths related to Acquired Immune Deficiency Syndrome (AIDS) by 41%, there is still a big challenge ahead. Advances get us closer to the goal of the sixth Millennium Development Goal (MDG). however, still pleanty work to do Testing and the use of antiretrovirals are slowing the spread of HIV as they are the most effective strategies across countries. As published in July 2015 by the Joint United Nations Program on HIV/AIDS (UN/AIDS)[1]. Also, decreasing HIV infection is considered in the Sustainable Development Goals (ODS, for Spanish abbreviation): Third-"Good Health and Well-Being" and Fifth-"Gender Equality".

AIDS represents a disease caused by two lentiviruses: Human Immunodeficiency Virus type 1 (HIV-1) and type 2 (HIV-2). The patterns of dissemination of HIV-1 and HIV-2 are not the same across the world population, a decreasing in serotype two has been observed, meanwhile, the incidence of serotype one has continued to increase[2]. Starting in the 1980s HIV has a progressive spread of the disease, giving rise to a pandemic that everyone witnessed and suffered. About 40 million people have been infected with HIV, of which about two-thirds live in sub-Saharan Africa. This pandemic has continuously generated different kind of movements in society; since 1970s HIV is involved in mass migration, poverty, civil wars, and sexual promiscuity[3].

The prevalence of HIV infection in the world is still spreading according to datacenter reported by the WHO world regions estimates these rates for the main regions in the world: in Sub-Saharan Africa of the Sahara is 8.8%, in North Africa and the Middle East it is 0.2%, in South and Southeast Asia 0.56%, in East Asia and the Pacific 0.07%, Eastern Europe and Central Asia 0.35%, Western Europe 0.24%, Australia and New Zealand 0.13%, in the Caribbean 2.3%, North America 0.6% and, Latin America 0.5%[4]. Epidemiological surveillance in Mexico, estimates for 2017 an HIV prevalence of 0.3%, which implies that 3 out of every thousand people live with this disease. Having more than 3.7 million of peopeis an alarming data due to the number of infections. According to data published by the United Nation-AIDS report, a higher prevalence in populations with specific characteristics such as men who have sex with men (MSM) (17.3%); intravenous drug users (5.8%); female commercial sex workers (0.7%),male commercial sex workers (24.1%) and trans-women (15-20%)[5]. Although there are several studies that determine the prevalence of HIV, a little consider territorial disaggregation or internal migrattion (i.e. Country, State, Federal Entity,Department, Municipality, Census Unit) and rarely, places with high mobility of workers due to temporal labors.

Quintana Roo, has 1. 8 million habitants who represent 1.5 % of the total Mexican population[6], however, there is a special context, since is a touristic place and has a lot of migration during the year including workers. Most of the commercial activity is centred on tourism and there are several turistical places around such as: Tulum, Isla Mujeres, Cozumel and Bacalar, however, most of them are expensive places to live. The main cities in Quintana Roo are Benito Juarez (743, 626), Othón P. Blanco (224,080) and Solidaridad (209,634). The Mexican government estimates that Quintana Roo has more than 1.3 million people in the final three months of the Year with 490,014 national visitors and 814,406 international visitors[7]. Expand epidemiological surveillance is necessary to understand the HIV profile and mobility of these population. At the same time, some studies points the sexual behaviours as one of the main risk factors for the transmission of HIV and other illnesses, viruses, bacteria or protozoa such as lymphogranuloma venereum and syphilis. Conduct behaviours such as: sexual promiscuity and having intercourse without a condom are the main identified risk practices and also, the most prevalent[8,9]. The highest incidence of HIV and other sexually transmitted diseases are observed mainly in medium-sized and developing countries, except those of which has interventions to limit promiscuity or to promote safe sexual practices[8]. Another key factor is the access to health services since, without it, patients would not be able to get an early diagnosis and proper treatment for HIV infection with antiretroviral treatment[10].

In this context, HIV test surveillance plays an important role in the control and management of infections. Epidemiological surveillance has identified that there is an underestimation in HIV rates in general, mainly due to underreporting or underidenfication of cases. Additionally, Panamerican Health Organization (OPS,for Spanish abbreviation) decribes than the main identified causes for achieving a successful epidemic database are: (a) person provides information consistent with the symptoms presented, (b) people have space for complaints (feedback),(c) people seek preventive care (promotion), (d) to have a presumptive diagnosis (identification), and a prompt confirmation (detection)[11].

In this sense, one of the objectives of this study were: to determine the prevalence of HIV in adults of 12-60 years stratified by some social determinants and sexual behaviors, to accomplish a region characterization.

Also, make an estimation of the odds and odds ratios for the significant variables, in the city of Solidaridad in the state of Quintana Roo, Mexico.

Materials and Methods

Study design

A descriptive cross-sectional study was carried out in the city of Solidaridad, Quintana Roo, Mexico. The applied questionnaire has an informed consent, socio-demographic questionnaire with gender, sexual preference, age, employment, schooling, legal status, indigenous origin, and native language. Questions related to sexual behaviours were also included, such as the use of condoms, the practice of anal sex, and if people pay or charge for sex or if they were victims of rape. The data validation was carried out through a double capture and rectification of emptying by a social service intern. The questionary includes a control question for VIH-Positive previous results, if they say "Yes" the test still continue, but it was exclude for this study.

Rapid tests for HIV Third-generation HIV rapid tests (Insti) were used for the general public. This test has a documented sensitivity and specificity of 99.9%. In cases with high-risk conditions identified (i.e. MSM, unprotected sex with an individual known to be HIV positive, unprotected sex with sex workers), fourth-generation HIV rapid tests were carried out (Avance Quality in collaboration with the Ministry of Health of the State). One of the advantagesof these 4th generation rapid tests is the detection of p24 antigen and/or HIV antibodies, shortening the window period for detection, also, has sensitivity and specificity of 99.9%. The presence of the p24 antigen will indicate an early HIV infection[12].

Space-time delimitation and information collection.

The information collection was carried out in the period from January to October 2018, to open population (Some stands out close to health facilities, some in hotels, and in main streets), regardless of whether or not had affiliation to a social security institution. The participants were interviewed in the waiting room for the test application and results. Participation was voluntary and coordinated by a civil association, which was also doing the rapid tests free of charge and without being conditioned to participate in the study.

Ethics and consent: The work was carried out under the code of ethics of the WHO, Declaration of Helsinki and follows the recommendations for the realization, registration, editing and publication of scientific works of the International Committee of Medical Journal Editors (ICMJE). The research is considered with minimal risk and all participants signed informed consent. In the case of minors, they had to bring a relative who signs the consent for the application of the test. No personal data were used in the database, instead, an "Id" was established for internal control purposes, taking care of the anonymity of the information. The data is expressed as encrypted data, preserving the confidentiality of each of the cases.

Statistical analysis.

Stratified prevalence was calculated. Comparisons of the main sociodemographic variables were made between the subjects who tested positive vs. negative for HIV. The calculation of the differences was made through the prevalence ratio using the chi2 and homogeneity test that considers the probability in the linear trend of the logarithm[13].

The risks (OR) were calculated using logistic regression models considering each social determinant, identifying according to statistical significance and/or biological plausibility, considering the explanation of the variance for HIV-positive cases. The adjusted models considered the significant conditions of the previous modelling, removing those that could present bias (i.e. Anal Sex with men who have sex with other men). The odds ratio was calculated at a significance level of $p < 0.05$ and the 95% confidence interval (95% CI). All analyzes were performed using the STATA/MP 16 program (Stata Corporation, College Station, TX, USA).

Results

Characteristics of the study population.

The sample included 4,800 people, 3,030 men (63.12%) and 1,770 women (36.88%); the average age in the sample was 32.6 years with a standard deviation of 14.96, (minimum age : 12, maximum age:60). Only Mexicans participated, and no drug or alcohol use information was available for the study. The predominant sexual orientation was that of MSM (88.08%). Most of the participants have a permanent job (41.30%); secondary and high school education (31.42%) and health services conditions Mexican Institute for Social Security (IMSS, for Spanish abbreviation) (90.46%). Regarding sexual practices, most of the participants practice anal sex (83.27%), do not use a condom (71.69%), have paid for sex (4.94%), have charged for sex (9.44%), during their lives, were rape victims (18.56%).

The prevalence of HIV stratified by each of the sociodemographic characteristics and the variables of interest are shown in Table.1.

Table 1. Prevalence of factors related to HIV in Playa del Carmen, Quintana Roo.

Variable	Positive	Negative	Total	Prevalence	Odds	CI 95%		P Value
Sex								
Female	20	1858	1878	1.06	0.01	0.01	0.02	p < .00001
Male **	110	2812	2922	3.76	0.04	0.03	0.05	p < .00001
Sexual preference								
Homosexual	99	313	412	24.03	0.32	0.25	0.40	p < .00001
Heterosexual	20	4208	4228	0.47	0.00	0.00	0.01	p < .00001
Bisexual	11	149	160	6.88	0.07	0.01	0.14	p < .001
Age groups								
12 to 17	2	68	70	2.86	0.03	0.01	0.12	p = .9384
18 to 24	42	1857	1899	2.21	0.02	0.02	0.03	p = .0864
25 to 29	35	1320	1355	2.58	0.03	0.02	0.04	p = .7373
30 to 39	39	933	972	4.01	0.04	0.03	0.06	p < .01
40 to 49	7	352	359	1.95	0.02	0.01	0.04	p = .3574
49 to 60	5	140	145	3.45	0.04	0.01	0.09	p = .5773
Occupation type								
Permanent employment	64	1850	1914	3.34	0.03	0.03	0.04	p = .0272
Temporal employment	35	1298	1333	2.63	0.03	0.02	0.04	p = .8268
Housewife	6	430	436	1.38	0.01	0.01	0.03	p = .0723
Student	5	289	294	1.70	0.02	0.01	0.04	p = .2720
Businessman	3	231	234	1.28	0.01	0.00	0.04	p = .1682
Unemployed	10	267	277	3.61	0.04	0.02	0.07	p = .3409
Sex Worker	1	23	24	4.17	0.04	0.01	0.32	p = .6591
Other	4	118	122	3.28	0.03	0.01	0.09	p = .6943
Scholarship								
Elementary school	7	269	276	2.54	0.03	0.01	0.06	p = .8560
Middle School	26	1069	1095	2.37	0.02	0.02	0.04	p = .4385
High School	47	1563	1610	2.92	0.03	0.02	0.04	p = .5225
Technical career	8	288	296	2.70	0.03	0.01	0.06	p = .9951
Degree	36	1299	1335	2.70	0.03	0.02	0.04	p = .975.3
Postgraduate	2	64	66	3.03	0.03	0.01	0.13	p = .8711
Social security								
IMSS-	104	4227	4331	2.40	0.02	0.02	0.03	p < .0001
Popular Insurance	10	196	206	4.85	0.05	0.03	0.10	p = .0525
None	16	235	251	6.37	0.07	0.04	0.11	p < .001
Residence entity								
Quintana Roo	21	726	747	2.81	0.03	0.02	0.04	p = .8504
Veracruz	19	636	655	2.90	0.03	3.00	0.02	p = .7441
Yucatán	14	570	584	2.40	0.02	0.04	0.04	p = .6212
Ciudad de México	11	420	431	2.55	0.03	0.01	0.05	p = .8342
Chiapas	15	551	566	2.65	0.03	0.02	0.05	p = .9277
Tabasco	26	924	950	2.74	0.03	0.02	0.04	p = .9518
Estado de México	2	74	76	2.63	0.03	0.01	0.11	p = .9669
Oaxaca	2	63	65	3.08	0.03	0.01	0.13	p = .8538
Puebla	3	135	138	2.17	0.02	0.01	0.07	p = .6948
Morelos	3	89	92	3.26	0.03	0.01	0.11	p = .7417
Jalisco	3	116	119	2.52	0.03	0.01	0.08	p = .8986
Campeche	4	126	130	3.08	0.03	0.01	0.09	p = .7930
Durango	1	51	52	1.92	0.02	0.00	0.14	p = .7258
Nayarit	1	36	37	2.70	0.03	0.00	0.20	p = .9983
Baja California Norte	1	37	38	2.63	0.03	0.00	0.20	p = .9767
Chihuahua	2	66	68	2.94	0.03	0.01	0.12	p = .9052
Nuevo León	1	41	42	2.38	0.02	0.00	0.18	p = .8956
Guerrero	1	9	10	10.00	0.11	0.01	0.88	p = .1551
Condom use								
Yes	47	1312	1359	3.46	0.04	0.03	0.05	p = .0442
No	83	3358	3441	2.41	0.02	0.02	0.03	p = .0442
Anal sex								
Yes	119	3878	3997	2.98	0.03	0.03	0.04	p < .01
No	11	792	803	1.37	0.01	0.01	0.03	p < .01
Pay for Sex								
Yes	11	226	237	4.64	0.05	0.03	0.09	p = .0601
No	119	4444	4563	2.61	0.03	0.02	0.03	p = .0601
Charge for sex								
Yes	14	439	453	3.09	0.03	0.02	0.03	p = .5985
No	116	4231	4347	2.67	0.03	0.02	0.03	p = .5985
Rape victim (Historical)								
Yes	24	867	891	2.69	0.03	0.02	0.04	p = .9761
No	106	3803	3909	2.71	0.03	0.02	0.03	p = .9761

*Some totals may vary due to "missing values" or multiple responses from participants.

**Trans woman was included in the male sex

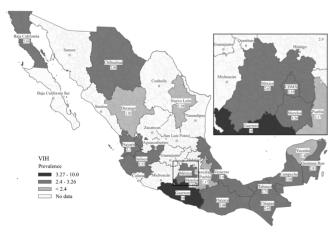Abbreviation: Mexican Institute for Social Security (IMSS, for Spanish abbreviation)

Source: Author elaboration

Table 2. Risk factors for positive HIV test using logistic regression

Variable	Bivariate			Multivariate		
	OR	(CI95 %)	Pseudo R2	OR	(CI95 %)	Pseudo R2
Men who have sex with men	44.45*	(29.23 -67.62)	0.31	61.20*	(38.67 -96.84)	
To have 30 to 39 years old	1.72*	(1.17-2.51)	0.01	4.3*	(2.66-6.94)	
IMSS	0.42*	(0.27-0.65)	0.01	0.35*	(0.21-0.59)	0.3491
Being male	3.24*	(2.04-5.15)	0.03	---	---	
Anal sex practice	2.21**	(1.19-2.12)	0.03	---	---	

* p < 0.0001; **p < 0.01
Abbreviation: Mexican Institute for Social Security (IMSS, for Spanish abbreviation)
Ecuation of the multivariate model: Y= -4.5627 + x (4.114102) + x (1.457754) + x (-1.048996) + 1.04
Source: Author elaboration.

Men has a higher prevalence with 3.76%, also, all the sexual preferences are significant, however, men having sex with men has the higher rate with 24.03%. The condition of not having social security seems to be related to a higher prevalence of positive cases 6.37%, schooling maintains the prevalence relatively constant, between 2.6 - 2.8 except for the high school and postgraduate group. People who provide sex services had a prevalence of 4.17%, followed by those in the unemployed category with 3.61%. The distribution of positive cases and the prevalence collected in the Solidaridad region by the state of residence is shown in Figure 1. Tabasco is the state with the highest number of cases (n=26), followed by Quintana Roo (n=21), Veracruz (n=19), Yucatán (n=14), and Chiapas (n=15) were the proximal residence states (temporal workers, tourist) with the highest prevalence. There is a decrease in the number of cases as the distance from the place where the sample was taken increases.

Figure 1. Prevalence of positive cases for HIV according to residence entity in the city of Solidaridad de Quintana Roo, Mexico

Source: Author elaboration.

The risks for positive HIV tests were calculated using logistic regression models. Each social determinant and sexual behaviour were tested, leaving the statistically significant models. Table 2 details the coefficients that were statistically significant for each condition in the bivariate. The social determinants found as risk were: being a man, and being between 30 and 39 years old. On the other hand, the sexual practices with the highest risk were: MSM (OR: 44.45, CI: 29.23 - 67.62) and in general the practice of anal sex; was the only protective factor. For the multivariate model, the determinants included: being between 30 and 39 years old, and MSM practice (OR: 61.20, CI: 38.67 - 96.84) as factors.

Discussion

Since the discovery of HIV in 1983, various strategies have been implemented over the years to mitigate its impact on HIV. The World Health Organization (WHO) in coordination with some of the most important research facilities in the world have financed investigations that led to current achievements a better understanding of the virus transmission process, the development of antivirals and higher performance diagnostic tests.

Several health promotion campaigns have been carried out at the international and national levels, focused on prevention; however, the current agenda still presents important challenges primarily focused on social matters. Within the Mexican context, the legislative and political agenda recognizes the importance of the participation of civil society organizations, as a fundamental pillar to mitigate some of the social effects of HIV[14]. The perception of severity, the fear of HIV and the use of barrier methods, are factors that require more attention from health personnel[15]. In addition, stigma and discrimination[14,16] suffered by people living with HIV continue to impact their quality of life and testing rate, even in countries with universal coverage of health services such as Cuba17. In this same sense, social factors have become decisive in understanding the behaviours of the disease[15,18,19].

Quintana Roo has been increased VIH cases since 1990 according to the info of the Institute for Health Metrics and Evaluation. Also, the prevalence for people lowers of

70 years old in 2018 is 3.12 for each thousand people. The significant social determinants and sexual behaviors points to higher risk for MSM, also the condition of being man, as well as have 30-39 age. Something that was not described before in the literature, age group the highest risk of being positive among. Social Security has shown a protective factor, probably linked with health interventions.

Even though the increase in testing rates is one of the action lines that has proven to be most useful in terms of cost- benefit and is one of the main guidelines for managing the pandemic by the WHO[20], testing continues to be a problem. Recent studies in Spain report up to 83.3% of losses in diagnosis[19]. In Mexico, it has already been documented that MSM a vulnerable population[16]: Present study confirms the high risk for this group with a crude OR of 44.45 and an adjusted OR of 61.20, a previous systematic review estimates an OR of 108.96 for Mexico and 33.3 for MSM in Latin America[2]. Also, a threefold risk was observed in this study simply for having the male condition. In general, men tend to do more testing than women 17% vs. 82% respectively; In addition to this, there is a greater risk in being a man due to the association of higher risky sexual practices that this gender have[21].

Regarding the age groups that have 30 to 39 years was the unique significant risk in the regression models with a raw OR of 1.72 and an adjusted OR of 4.3 (95% CI 2.66- 6.94). In contrast, other studies previously carried out in Quintana Roo, report a higher prevalence of HIV in the age group of 25 to 39 years22. A longitudinal analysis of cases reported from 1983 to 2021 with epidemiological surveillance information from the General Management of Epidemiology reported 107,179 cases from 20 to 29 age group, representing 33.7% of all reported cases; the group of 30 to 39 years old has 104,969 cases representing 33.0% of the total cases. These two age groups historically account for more than 65% of the total cases in the past 38 years in the country, since the appearance of HIV23. This fact may be population bias compared to the region as it is a turistical place.

Some social determinants were associated with a higher risk of contagion and drive attention to the economically active population. Sexual practices and behaviours are also considered a significant risk, the practice of anal sex doubles the risk of positivity, these findings are consistent with other studies in Mexico and Latin America[2,21,22,23,24]. The findings of this study agree with what is reported in the
national and international literature, adding the information about stratified prevalence by social determinants and sexual behaviours, which describes and characterizes the panorama of HIV in a Mexican Region.

One of the main limitations of this study is that, since it is not population-based. Also, self-selection may induce sampling bias of the results; however, as noted among the argumentation, findings follow the previously reported national and international patterns. Another factor that limits the results; is the bias due to the stigma HIV testing represents. These results confirm national and international trends for the testing strategy, therefore, a possible over-representation of men with risky sexual practices and economically active population (i.e. it´s more likely to travel if you are in this economic population) should be considered. Also, it may be a strength of sampling, making test in not usually context may low stigma and prejudice bias.

Conclusions

This study provides relevant data for decision making, confirms witch social determinants are relevant to the VIH infection: being a man, have 30 to 39 years old as one of the determinants. Social Security shows to be a protective factor with an adjusted OR of 0.35 (I.C.95% 0.21 – 0.59). Sexual practices such as MSM and the practice of anal sex in general, are shown as cardinal risk factors for positive HIV tests.

Conflict of interests

None to declare.

Funding

None to declare.

Contribution of the authors

Study design; analysis and interpretation of results, writing of the article and approval of the final version. G.C.T., Study design; analysis and interpretation of results, writing of the article. L.L.R., Analysis and interpretation of results and approval of the final version. A.J.C., Collection of patient data, revision of the final manuscript. R.G., Design and preparation of the geographic database and elaboration of cartography. A.R.S., Writing of the article and approval of the final version. G.A.G.B., Study design; analysis and interpretation of results, writing of the article and approval of the final version. M.E.J.C.

References

1. Programa Conjunto de las Naciones Unidas sobre el VIH/sida. Hoja informativa — Últimas estadísticas sobre el estado de la epidemia de sida | ONUSIDA. Onusida. 2020.

2. Baral S, Sifakis F, Cleghorn F, Beyrer C. Elevated Risk for HIV Infection among Men Who Have Sex with Men in Low- and Middle-Income Countries 2000–2006: A Systematic Review. PLoS Med [Internet]. 2007 Dec [cited 2022 Mar 14];4(12):1901–11. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2100144/

3. Ostroff SM. Encyclopedia of Infectious Diseases: Modern Methodologies. Emerg Infect Dis. 2008;14(2):356–356.

4. Pisani E, Cuchi P, Zacarías F, Schwartlander B, Stanecki K. VIH y SIDA en las Américas Organización Panamericana de la Salud (OPS) Organización Mundial de la Salud (OMS). Programa Conjunto de las Naciones Unidas sobre el VIH/SIDA. 2001;

5. PAHO. Día Mundial del Sida. Organizacion panamericana de la Salud. 2017;1–18.

6. Instituto Nacional de Geografía y Estadistica (INEGI). Población total por entidad federativa y grupo quinquenal de edad según sexo, serie de años censales de 1990 a 2020 [Internet]. 2022 [cited 2022 Mar 31]. Available from: https://www.inegi.org.mx/app/tabulados/interactivos/?pxq=Poblacion_Poblacion_01_e60cd8cf-927f-4b94-823e-972457a12d4b&idrt=123&opc=t

7. Secretaria de turismo (SECTUR). Datos Abiertos de México - Resultados de la Actividad Hotelera en los destinos monitoreados por el Sistema DataTur (DGIIS) - Informacion sobre la actividad hotelera en los destinos turisticos del pais. [Internet]. 2022 [cited 2022 Mar 31]. Available from: https://datos.gob.mx/busca/dataset/resultados-de-la-actividad-hotelera-en-los-destinos-monitoreados-por-el-sistema-datatur-dgiis

8. Yi S, Tuot S, Chhoun P, Pal K, Tith K, Brody C. Factors associated with inconsistent condom use among men who have sex with men in Cambodia. PLoS One. 2015 Aug 19;10(8):e0136114.

9. Li R, Wang H, Pan X, Ma Q, Chen L, Zhou X, et al. Prevalence of condomless anal intercourse and recent HIV testing and their associated factors among men who have sex with men in Hangzhou, China: A respondent-driven sampling survey. PLoS One. 2017 Mar 1;12(3).

10. Holland CE, Papworth E, Billong SC, Kassegne S, Petitbon F, Mondoleba V, et al. Access to HIV services at non-governmental and community-based organizations among men who have sex with men (MSM) in Cameroon: An integrated biological and behavioral surveillance analysis. PLoS One. 2015 Apr 23;10(4).

11. Organización Panamericana De La Salud. Organización Panamericana de la Salud Oficina Sanitaria Panamericana, Oficina Regional de la Organización Mundial de la Salud Módulos de principios de epidemiología para el control de enfermedades (MOPECE) Segunda Edición Revisada Unidad 2: Salud y enferm. Módulos de Principios de Epidemiología para el Control de Enfermedades (MOPECE). 2002;1–50.

12. Miranda-Ulloa E, Romero-Ruiz S, Briceño-Espinoza R, Santos-Anaya D. Evaluación de tres marcas comerciales de pruebas rápidas para la detección de VIH. Rev Peru Med Exp Salud Publica. 2015;32:395–406.

13. Biometrika RT, 1985 undefined. On heterogeneity tests based on efficient scores. academic.oup.com [Internet]. 1985 [cited 2022 Mar 9];72(1):91–6. Available from: https://academic.oup.com/biomet/article-abstract/72/1/91/242544

14. Solís OAM, Aguiar LAC, Pérez BG, Flores RS, Mendoza VO. Conocimientos, actitudes y prácticas de los profesionales de la salud ante el VIH/SIDA en el primer nivel de atención. South Florida Journal of Development. 2020 Dec 29;1(4):221–9.

15. Giménez-García C, Ruiz-Palomino E, Ballester-Arnal R. Prevención del VIH: análisis de conductas sexuales de riesgo y propuestas de intervención. Revista INFAD de Psicología International Journal of Developmental and Educational Psychology. 2021 Aug 8;3(1).

16. Villarreal FC. El VIH y la opresión de los hombres seropositivos con identidades no heteronormativas en Chiapas, México. Sexualidad, Salud y Sociedad (Rio de Janeiro). 2020 Feb 3;(36):74–94.

17. llody YB, Llody YAB, Acuña YP. Acciones coordinadas de prevención del VIH para hombres que tienen sexo con hombres, Cuba. Rev Cub Salud Publica. 2021 Aug 18;47(3).

18. Carmona SE, Fuentes DBH, Moreno EA, Aranda GIP. Resiliencia y adherencia al tratamiento en personas que viven con VIH/SIDA. Apunt Psicol. 2021 Jul 28;39(1):3–7.

19. Gallego-Márquez N, Iniesta C. Targeting fast-track goals: Missed opportunities for HIV testing in the Community of Madrid. Enferm Infecc Microbiol Clin. 2021 Jun 8;

20. Infante C, Zarco A, Cuadra SM, Morrison K, Caballero M, Bronfman M, et al. El estigma asociado al VIH/SIDA: el caso de los prestadores de servicios de salud en México. Salud Publica Mex. 2006;48(2):141–50.

21. CENSIDA. Tarjeta Temática Infecciones de Transmisión Sexual y VIH-SIDA [Internet]. Instituto Nacional de Mujeres. 2019 [cited 2021 Sep 1]. p. 2018–20. Available from: https://www.gob.mx/cms/uploads/attachment/file/415154/RN_D_a_mudial_sida2018.pdf

22. Galicia IS, Cámara KBS. Prevalencia y características de portadores de VIH en un Hospital público de Quintana Roo, México. Revista Salud y Bienestar social [ISSN: 2448-7767]. 2018 Jul 19;2(2):27–35.

23. Secretaría de salud. Informe Histórico VIH1er trimestre 2021-Sistema de Vigilancia Epidemiológica de VIH. 2022.

24. Gallego CA. Factores Predisponentes y Facilitadores de Conductas Sexuales de Riesgo en Pacientes con VIH. Psicología, Psicoanálisis y Conexiones (PSYCONEX); 2021.