Original Research Article

Effect of social determinants on knowledge and barriers to the use of preventive measures against SARS-CoV-2 infection

ABSTRACT

Aims: To analyze the effect of social determinants on knowledge and barriers to the use of protective measures against SARS-CoV-2 infection.
Study design: Analytical cross-sectional study.
Place and Duration of Study: Sample: Staff of Institute of Public Health from Guanajuato State and their relatives, between June 2009 and July 2010.
Methodology: As social determinants, data on age, sex, marital status and academic degree were obtained. Knowledge and barriers were quantified by a purposely designed questionnaire, with construct validity and reliability of 0.70 (95% CI 0.61 - 0.78) (Cohen's Kappa). The questionnaire was sent by e-mail from the Institute's workers and they were free to invite their relatives aged 18 or over.
Results: 1,414 questionnaires were obtained with a participation rate of 9.49%. The age ranged from 18 to 75 years, with a mean of 39.51 ± 10.02 years, women predominated 69.59%, married 51.49% and academic degree 55.80%. All participants showed adequate knowledge and there were internal and external barriers. The only barrier that showed a relationship and effect with social determinants was that the protective measures were expensive (with gender, X2= 10.35 df 1 P=.001), OR=0.65 (95% CI 0.50 – 0.85); for the rest of the social determinants (age, marital status and academic degree) they did not show any relationship or effect.
Conclusion: All participants had adequate knowledge and a few barriers to use the preventive measures against SARS-CoV-2.

Keywords: Knowledge; barriers; prevention; SARS-CoV-2; COVID-19

1. INTRODUCTION

The World Health Organization (WHO) recommends to the population some measures to try to avoid contagion by SARS-CoV-2 and the subsequent, in some cases, disease by the new coronavirus (COVID-19) [1].

Such measures include a distance of at least one meter from other people, the distance must be greater if it is indoors; use masks and wash their hands before putting it on, after removing it and every time they touch it, and they must ensure that it covers the mouth, nose and chin; preferably not to use masks with valves; another recommendation is to avoid

closed spaces when interacting with other people; proper handwashing or gel application [2]; avoid touching your face, nose, or mouth; avoid crowds of people; avoid handshakes [1].

Since the emergence of cases of pneumonia of unknown origin in China [3] and subsequent report that they were due to a new coronavirus, called novel coronavirus and later, acute respiratory distress syndrome coronavirus (SARS-CoV-2) [4] , protective measures have been recommended to try to avoid contracting the infection, such as washing hands with soap or water or with alcohol; keep at least 1 meter distance from other people; avoid places with many people; avoid touching nose, eyes and mouth; when coughing or sneezing, cover your nose and mouth with your elbow; stay home and wear face masks appropriately [5].

In Mexico, the first cases of COVID-19 were reported in January 2020 and the first death in March of the same year [6] and the database analysis showed that the epidemic curve of new cases has been maintained, with several spikes of increase in the number of new cases.

In Guanajuato, the first case was reported in March 2020 and the first death in April 2020 [7].

The state of Guanajuato in Mexico is located in the center of the country (Longitude # 102° 5'49.2" W # 99° 40'16.68" W, Latitude 19° 54'46.08" N 21° 50'21.84"N13). As of the 2020 census, Guanajuato had a population of 6,166,934, representing 4.89% of the population in the Mexican Republic [8].

In the state of Guanajuato, despite the efforts of the local government and state health sector authorities, such as the suspension of school attendance at all levels, suspension of massive events, cancellation of meetings with more than 10 people, the first exclusive hospital for COVID-19 patients is installed, a mobile hospital for COVID-19 patients is purchased and hospitals are converted to better care for COVID-19 patients [9].

Nola J. Pender's health promotion model says that internal or external barriers are obstacles to having a healthy lifestyle; external barriers are significant interactions or environmental stimuli, and internal barriers are physical and emotional aspects [10]. Hence the importance of identifying them and subsequently establishing ways to eliminate these barriers.

The intention was to identify if the administrative, health personnel and their families know the preventive measures and if they report barriers to their application.

2. MATERIAL AND METHODS

The protocol was approved by the Research Ethics Committee of Hospital General Penjamo, from Institute of Public Health from Guanajuato State (IPHGS).

A mixed, cross-sectional, descriptive study was designed.

All the administrative staff of the government of the state of Guanajuato, health personnel from the IPHGS were invited by email and they were also told that they could invite their relatives 18 years of age or older.

The inclusion criteria were that they be at least 18 years old and that they will work for the state government.

The sociodemographic variables were age, sex, role (administrative, health personnel, family), marital status, and school grade.

The study variables were:

Knowledge. It is a dichotomous categorical variable. It is the quantification of knowledge about preventive measures for SARS-CoV-2 infection. It is measured with adequate knowledge (from 9 to 16 points) and poor knowledge (from 0 to 8 points) and is presented with frequencies and percentages.

Barriers. It is a dichotomous categorical variable. It is the presence of external or internal obstacles to the personal implementation of preventive measures against SARS-CoV-2. It is measured as there are barriers (0 to 11 points) and there are no barriers (12 to 22 points) and it is presented with frequencies and percentages.

For the measurement of the study variables, an express questionnaire was designed, which included items on beliefs about SARS-CoV-2 and construct validity of the questionnaire, and it was submitted to four experts in viral infections, and they reviewed and modified the questions, making them more accessible to potential participants and reliability was measured with Cohen's Kappa obtaining 0.70 (95% CI 0.61.0.78).

The questionnaire consists of 16 items for knowledge, with the weighting being 1 for yes and 0 for no, only item 11, the weighting is 1 for no and 0 for yes. Knowledge is considered adequate with a score of 9 to 16 and deficient with a score of 0 to 8. For barriers there are 22 items, with weighting 0 for yes and 1 for no. The presence of barriers is considered from 0 to 11 and the absence of barriers from 12 to 22.

Statistical analysis

Descriptive statistics were used for sociodemographic variables and for knowledge and presence of barriers.

Associations were sought between the sociodemographic variables and each of the barriers, with the Chi square test, degrees of freedom and P value; in cases of some cell with 0, Z for two proportions were calculated. To show statistical significance, the P value was set at .05.

The effect of each sociodemographic variable with each barrier was measured, with the Odds Ratio (OR) and Confidence intervals at 95% (CI95%). Multivariate logistic regression models were generated, including the four sociodemographic variables, and the OR and 85%CI adjusted for sex, role, marital status, and academic degree were obtained.

The analysis was performed in STATA 13.0 ® (Stata Corp., College Station, TX, USA).

3. RESULTS AND DISCUSSION

Of 14,900 emails sent, requesting their participation, a response was received from 1,414 people who agreed to participate by properly filling out the questionnaire, with a participation rate of 9.49%.

The age range of the participants was 18 to 75 years old with a mean of 39.51 and a standard deviation of 10.02 years.

Table 1 shows the sociodemographic characteristics of the participating sample, where IPHSG workers (61.60%), women (69.59%), married (51.49%) and with a bachelor's degree (55.80%) predominated.

Table 1 Distribution of social determinants of the participants

	n	%
Role		
Administrative	353	24.96
IPHSG	871	61.60
Relative	190	13.44
Sex		
Female	984	69.59
Man	430	30.41
Civil status		
Single	452	31.97
Married	728	51.49
Divorced	97	6.86
Widowed	10	0.71
Free union	127	8.98
Scholar grade		
Secondary	7	0.50
High school	78	5.52
Technical	224	15.84
Bachelor	789	55.80
Post grade	316	22.34

IPHSG Worker from Institute of Public Health of State Guanajuato

Regarding beliefs about the origin of SARS-CoV-2 infection, what the participants expressed is shown in Table 2. Some participants gave two answers and both answers were taken into account.

Table 2 Answers to the question What do you think was the cause that gave rise to the SARS-CoV-2 infection?

Answer	n	%
Failure to apply preventive measures	358	24.78
Zoonosis from the bat	248	17.16
New virus	243	16.82
Lack of application of personal and/or food hygiene measures	205	14.19
Virus that escaped from a laboratory	166	11.49
False information	106	7.34
I don´t know	83	5.74
Environmental pollution and climate change	33	2.28
Measure for population control	3	0.21
	1,445	100.0

Table 3 shows the answers to the questions: Are preventive measures against SARS-CoV-2 infection useful for you? And do you apply preventive measures for SARS-CoV-2 infection?

Table 3 Open questions about protective measures against SARS-CoV-2

Questions	n	%
Are preventive measures against SARS-CoV-2 infection useful to you?		
Yes	1,402	
Sometimes	3	
No	10	
Do you apply preventive measures for		

SARS-CoV-2 infection?	
Yes	1413
No	2

In the application of the knowledge and barriers questionnaire for preventive measures to avoid SARS-CoV-2 infection, knowledge scores were obtained from 11 to 16 with a mean of 15.18 and a standard deviation of 0.92. For the barriers, a range of 3 to 22 was obtained with a mean of 18.66 and a standard deviation of 2.99.

All participants had adequate knowledge of preventive measures.

Table 4 shows the distribution of barriers to the use of preventive measures by sociodemographic variables.

Table 4 Distribution of sociodemographic variables by presence of barriers

	Barriers				X^2, df, P-value
	Existent		Nonexistent		
	n	%	n	%	
Rol					0.44, 2, 0.80
Administrative	8	29.63	345	24.87	
IPHSG	15	55.56	856	61.72	
Relative	4	14.81	186	13.41	
Sex					0.87, 1, 0.35
Female	21	77.78	963	69.43	
Male	6	22.22	424	30.57	
Civil status*					
Single	6	22.22	446	32.16	-1.10, .27
Married	15	55.56	713	51.41	0.43, .67
Divorced	2	7.41	95	6.85	0.11, .91
Widow	0	0.00	10	0.72	-8.14, .0000
Free union	4	14.81	123	8.87	1.07, .29
Scholar grade*					
Secondary	0	0.00	7	0.50	
High school	2	7.41	76	5.48	
Technical	7	25.93	217	15.65	
Bachelor	17	62.96	772	55.66	
Post grade	1	3.70	315	22.71	

* Z was calculated for two proportions because there were cells with “0” and Chi square could not be calculated

In the group with barriers, the average age was 38.89 ± 9.73 and in the group without barriers, the average age was 39.55 ± 10.03, obtaining a Student's t for independent means of 0.34, with 1412 degrees of freedom and a P-value of 0.73. .

The barriers most frequently reported by the participants were classified as internal (Table 5) and external (Table 6).

Table 5 Distribution of internal barriers to the use of protective measures against SARS-CoV-2 infection

Internal barrier	n	%
It bothers me to use the protection measures		
Yes	80	5.66
No	1,334	94.34
Using protective measures takes up a lot of my time		
Yes	40	2.83

No	1,374	97.17
I am tired of using protective measures		
Yes	189	13.37
No	1,225	86.63
I feel less relaxed when using protective measures		
Yes	242	17.11
No	1,172	82.89
Restrict contact with relatives		
Yes	369	26.10
No	1,045	73.90
I am embarrassed to use protective measures		
Yes	12	0.85
No	1,402	99.15
Protective measures are expensive		
Yes	412	29.14
No	1,002	70.86
Wearing a face mask fatigues me when walking		
Yes	421	29.77
No	993	70.23
My well-being worsens with protective measures		
Yes	37	2.62
No	1,377	97.38
The use of protection measures takes time away from family relationships		
Yes	73	5.16
No	1,341	94.84
My family does not support me using protective measures		
Yes	317	22.42
No	1,097	77.58
The use of protective measures makes me tired		
Yes	315	22.28
No	1,099	77.72
Using protective measures affects my performance		
Yes	84	5.94
No	1,330	94.06
The use of protection measures decreases the acceptance of others towards me		
Yes	58	4.10
No	1,356	95.90
I look funny using protective measures		
Yes	41	2.90
No	1,373	97.10

Table 6 Distribution of external barriers to the use of protective measures against SARS-CoV-2

External barriers	n	%
In open places it is uncomfortable to use protective measures		
Yes	368	26.03
No	1,046	73.97
In closed places to exercise it is uncomfortable to use protection measures		

Yes	438	30.98
No	976	69.02
My family does not use protective measures		
Yes	400	28.29
No	1,014	71.71
People who use protective measures look funny		
Yes	13	0.92
No	1,401	94.08
My family does not support the use of protective measures		
Yes	428	30.27
No	986	69.73
My boss does not encourage the use of protective measures		
Yes	363	25.67
No	1,051	74.33

All sociodemographic variables showed no relationship or association with internal and external barriers (P>.05) and the raw and adjusted ORs were close to 1 with 95% CI including 1, so they were not considered significant; only the external barrier the use of protection measures are expensive, a relationship with sex was found, in addition, being a woman prevents having this barrier (RM 0.65) and it is not modified when adjusting for role, marital status or school grade.

Table 7 Effect of social determinants on the internal barrier: protection measures are expensive

	Protective measures are expensive				OR (95%CI)	OR adjusted (95%CI)
	Yes		No			
	n	%	n	%		
Sex	X^2= 10.35 df 1 P=. 001				0.65	0.66
Female	312	75.73	672	7.07	(0.50 -0.85)	(0.51 – 0.86)
Male	100	16.67	330	32.93		
Role	X^2=2.59 df 2 P=.27				1.11	1.10
Administrative (basal)	105	25.49	248	24.75	(0.92 – 1.34)	(0.91 – 1.33)
Operative (IPHGS)	261	63.35	610	60.88		
Relative	46	11.17	144	14.37		
Civil status	X^2=4.41 df 4 P-=.35				1.08	1.08
Single	147	35.68	305	30.44	(0.97 – 1.20)	(0.97 – 1.20)
Married	204	49.51	524	52.30		
Divorced	24	5.83	73	7.29		
Widowed	2	0.49	8	0.80		
Free union	35	8.50	92	9.18		
Scholar grade	X^2= 5.34 df 4 P=.25				1.10	1.09
Secondary	3	0.73	4	0.40	(0.96 – 1.27)	(0.94 – 1.25)
High school	20	4.85	58	5.79		
Technical	77	18.69	147	14.67		
Bachelor	229	55.58	560	55.89		
Postgraduate	83	20.15	233	23.25		

OR Odds Ratio df Degree of freedom

All participants showed adequate knowledge about protection measures and only 27 showed the presence of barriers (Table 4). When breaking down the internal and external barriers, the reports by the participants were very different; of the internal variables, the most frequently reported were: 29% (wearing a face mask makes me tired when walking), 29% (protection measures are expensive), 26% (restricts contact with relatives) (Table 5) and of external barriers, with around 30% the most frequent (in closed places to exercise it is uncomfortable to use protection measures), 30% (my family does not support the use of protection measures), 28% (my family does not use protection measures)(Table 6).

No relationship or effect of the included social determinants (age, sex, marital status and academic degree) with internal or external barriers was found; the use of protection measures alone are costly (Table 7).

According to Jefferson et al. [11], the recommended measures to reduce the spread of viruses are hand washing, not touching eyes, nose or mouth, sneezing or coughing into the elbow, cleaning surfaces with disinfectants, wearing a face mask, isolation or quarantine, distancing from other people, but these measures do not show significant differences for respiratory viruses such as influenza or H1N1.

The use of face masks widely applied by the population can reduce the transmission of SARS-CoV-2; the benefits of using a face mask outweigh the risks of using it; The psychological effects of wearing face masks are shaped by culture and compulsory use restricts people's freedom [12]. This could influence the population to refuse to use the protection measures, if they are not mandatory.

Another consideration would be that people use protection measures in public places, but abandon them when they are at home.

Bakhit et al. [13], reported in a systematic review that there is discomfort, subjective respiratory distress, skin rashes and headache with the prolonged use of face masks in health workers. In a review by Scheid et al. [14] noted headache, itching, rash, and a feeling of shortness of breath among healthcare workers who wore masks for prolonged periods, but noted that symptoms were exacerbated by long hours of work, stress, and anxiety.

Bakhit et al. [13], reported difficulties of health workers in face-to-face communication, but not in telephone communication, regardless of the type of face mask. One study reported that only 3% of health professionals had trouble communicating while wearing face masks [15].

Communication while wearing a mask can be especially difficult for children [16], older adults [17].

False information usually emerges at the onset of pandemics: conspiracy theories and rumors are common [18], and accurate information is compromised by the avalanche of unreliable information [19].

In our sample, 11% consider that the pandemic is due to a virus escaping from a laboratory and 7% that the information offered about the pandemic and the virus is false (Table 2).

Agley et al [20] reported the zoonotic origin of SARS-CoV-2 and subsequent COVID-19 pandemic; in the sample of the population of Guanajuato, it is reported as a belief that the cause of the virus and the pandemic is the lack of application of preventive measures

(24.78%) in the first place and in second place, the zoonotic origin of the virus (17.16%) (Table 2).

3.1 Weaknesses

With the avalanche of information in the mass media, it has led to people having knowledge about preventive measures and it was not possible to analyze knowledge with social determinants, since 100% of the sample reported adequate knowledge.

The low participation rate (9.49%) is a limitation to be able to generalize the results to all IPHSG personnel and their families.

Another limitation is that by not having a sampling scheme for relatives of IPHSG administrative and operational personnel, the sample of relatives may not be representative of the target population.

Another limitation detected is that it was not asked if the protection measures were always applied (24 hours), sometimes or never. Therefore, there is an information bias.

4. CONCLUSION

The social determinants: age, sex, marital status and academic degree, do not show a relationship or effect with internal or external barriers, for the use of protection measures against SARS-CoV-2.

Having adequate knowledge about protective measures does not prevent barriers from being taken into account; massive strategies must be used, not only that these measures are known, but that they are applied adequately for the duration of this pandemic and for future ones.

These results give rise to the search for other social determinants that could be related and influence the barriers to the use of protection measures.

CONSENT

All participants signed the electronic consent to participate.

ETHICAL APPROVAL

The protocol was approved by Ethics Committee for Research, from Hospital General Penjamo, Mexico

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

REFERENCES

[1] Organización Mundial de la Salud. Qué hacer para mantenerse y mantener a los demás a salvo de la COVID-19. 2020. Available in: https://www.who.int/es/emergencies/diseases/novel-coronavirus-2019/advice-for-public. Accessed October 28, 2021.

[2] Organización Mundial de la Salud. COVID-19: Cómo ponerse y quitarse el equipo de protección personal (EPP). Available in: https://openwho.org/courses/IPC-PPE-ES. Accessed February 15, 2022.

[3] World Health Organization. Rolling updates on coronavirus disease (COVID-19). Updated March 27, 2020. 2020. Available in: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen. Accessed March 29, 2020.

[4] Zhu N, Zhang D, Wang W, et al. A novel coronavirus from patients with pneumonia in China, 2019 [published online ahead of print January 24, 2020]. N Engl J Med. https://doi.org/10.1056/NEJMoa2001017

[5] World Health Organization. Coronavirus disease (COVID-19) advice for the public. 2020. Accessed August 7, 2020. Available in: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public

[6] Secretaría de Salud. Datos-Abiertos Bases históricas. 6 mayo 2020. Available in: https://www.gob.mx/salud/documentos/datos-abiertosbases-historicas-direccion-general-de-epidemiologia. Accessed May 20, 2020.

[7] Departamento de Epidemiología de la Dirección de Servicios de Salud. Sistema Nacional de Vigilancia Epidemiológica, Dirección General de Epidemiología, Secretaría de Salud. Available in: http://www.sinave.gob.mx/. 2020. Accessed: May 21, 2020.

[8] Instituto Nacional de Geografía, Estadística e Informática. Censo de Población y Vivienda 2020. 2021. Available in: https://www.inegi.org.mx/programas/ccpv/2020/

[9] Rodríguez-Vallejo DS. Tercer Informe del Gobierno del Estado de Guanajuato. 2020. Available in: https://3erinformeds.guanajuato.gob.mx/index.php/informe-completo/

[10] Pender NJ, Murdaugh CL, Curas MA. Health promotion in nursing science. 4ª ed. New Jersey, Prentice Hall; 2002.

[11] Jefferson T, Del Mar CB, Dooley L, Ferroni E, Al-Ansary LA, van Driel ML, et al. Physical interventions to interrupt o reduce the spread of respiratory viruses (Review). Cochrane Database of Systematic Reviews. 2020; 11:artCD006207. Doi: https://doi.org/10.1002/14651858.CD006207.pub5

[12] Czypionka T, Greenhalgh T, Bassler D, Bryant MB. Masks and Face Coverings for the Lay Public. A Narrative Update. Ann Intern Med. 2021; 174(4):511-520. Doi: https://doi.org/10.7326/M20-6625

[13] Bakhit M, Krzyzaniak N, Scott AM, et al. Downsides of fase masks and possible mitigation strategies: a systematic review and meta-analysis. BMJ Open. 2021;11:e044364. Doi: https://doi.org/10.1136/bmjopen-2020-044364

[14] Scheid JL, Lupien SP, Ford GS, et al. Commentary: physiological and psychological impact of face mask usage during the COVID-19 pandemic. Int J Environ Res Public Health. 2020; 17:6655. doi: https://doi.org/10.3390/ijerph17186655

[15] MacIntyre CR, Seale H, Dung TC, et al. A cluster randomised trial of cloth masks compared with medical masks in healthcare workers. BMJ Open. 2015;5:e006577. Doi: https://doi.org/10.1136/bmjopen-2014-006577

[16] Shack AR, Arkush L, Reingold S, et al. Masked paediatricians during the COVID-19 pandemic and communication with children. J Paediatr Child Health. 2020;56:1475-1476. Doi: https://doi.org/10.1111/jpc.15087

[17] Knollman-Porter K, Burshnic VL. Optimizing effective communication while wearing a mask during th e COVID-19 pandemic. J Gerontol Nurs. Doi: https://doi.org/10.1097/01.HJ.0000717184.65906.b9

[18] Mian A, Khan S. Coronavirus: the spread of misinformation. BMC Med. 2020; 18:89 Doi: https://doi.org/10.1186/s12916-020-01556-3

[19] Dutta B, Peng MH, Chen CC, Sun Sl. Role of infodemics on social media in the development of people's readiness to follow COVID-19 preventive measures. Int. J. Environ. Res. Public Health. 202219:1347. Doi: https://doi.org/10.3390/ijerph19031347

[20] Agley J, Xiao Y. Misinformation about COVID-19: evidence for differential latent profiles and a strong association with trust in science. BMC Public Health. 2021;21:89. Doi: https://doi.org/10.1186/s12889-020-10103-x