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Effect of Social Determinants on Knowledge and Barriers to the use of Preventive Measures against SARS-CoV-2 Infection

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Authors' contributions

This work was carried out in collaboration among all authors. Author NP-R designed the protocol, analyzed the data and wrote the manuscript. Author GF-V analyzed the data and participated in the writing of the manuscript. Author MJG-L, organized the e-mails and clean the database. Author EN-O participated in the design of the protocol and writing the manuscript. JPM-R, participated in the design of the protocol and writing the manuscript. All authors read and approved the final manuscript.

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Original Research Article

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ABSTRACT

Aims: To analyze the effect of social determinants on knowledge and barriers to using protective measures against SARS-CoV-2 infection.
Study Design: Analytical cross-sectional study.
Place and Duration of Study: Sample: Institute of Public Health Staff 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 survey was sent by e-mail to the Institute workers. They were allowed to invite their relatives aged 18 or over.

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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 with 69.59%, persons with married status with 51.49%, and academic degrees with 55.80%. All participants showed adequate knowledge. There were internal and external barriers. The only one 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 using 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 avoid contagion by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and the subsequent, in some cases, Coronavirus Disease 2019 (COVID-19) [1].

Such measures include a distance of at least one meter from other people. It must be longer if meeting indoors. It is also recommended to use masks and wash hands before putting them on, removing them, and any time we touch them. The facemask must cover the mouth, nose, and chin. It is advised not to use masks with valves. Other recommendations are: avoiding closed spaces when interacting with others, proper handwashing or gel application [2], avoiding touching face, nose, or mouth, avoiding crowds, and not handshaking [1].

These measures have been recommended since the emergence of pneumonia cases of unknown origin in China [3]. Subsequent reports showed these cases were due to the new coronavirus called SARS-CoV-2 [4]. The WHO encouraged the general population to use non-pharmaceutical to avoid the SARS-CoV-2 infection [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]. Database analyses showed that the epidemic curve of new cases had been maintained, with several waves.

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, concentrating 4.89% of the Mexican Republic population [8].

In Guanajuato state, the efforts of the local government and state health sector authorities include the suspension of school attendance at all levels, suspension of massive events, cancellation of meetings with more than ten people, the installation of the first exclusive hospital for COVID-19 patients, the purchase and implementation of a mobile hospital for COVID-19 patients, and the reconversion of hospitals 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, by identifying them, we can establish ways to eliminate them.

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. MATERIALS AND METHODS

The Research Ethics Committee in Pénjamo General Hospital from the Institute of Public Health from Guanajuato State (IPHGS) approved the protocol.

We designed a mixed, cross-sectional, descriptive study.

All the administrative staff of the Guanajuato state government and healthcare personnel from the IPHGS were invited by email. They were asked to invite their relatives aged 18 years or older if wished.

The inclusion criteria were to be at least 18 years old, be working for the state government, or be a relative.

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 barriers presence (0 to 11 points) and barriers absence (12 to 22 points). It is presented with frequencies and percentages.

For the study variables measurement, an ad-hoc questionnaire was designed. It included items on beliefs about SARS-CoV-2. For assessing the construct instrument validity, it was submitted to four experts in viral infections to review and modify the questions, making them more accessible to potential participants. On the other hand, reliability was measured with Cohen's Kappa obtaining 0.70 (95% CI 0.61.0.78).

The questionnaire consisted of 16 items for knowledge, codifying yes as one and no as zero -only for 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 a weighting of 0 for yes and 1 for no. If the corresponding score goes from 0 to 11, it is considered the presence of barriers. In other cases, we say they are absent.

2.1 Statistical Analysis

Descriptive statistics were used for sociodemographic variables, knowledge level, and barriers.

Associations were sought between the sociodemographic variables and each barrier with the Chi-square test, showing the degrees of freedom and the corresponding P-value. We performed the Z for two proportions test in cases where the Chi-squared was not applicable.
We performed logistic regression models to compute the effect of each sociodemographic variable on each barrier. We present the obtained Odds Ratio (OR) and Confidence intervals at 95% (CI95%). Multivariate logistic regression models were generated, including the four sociodemographic variables. The OR and 95%CI were adjusted for sex, role, marital status, and academic degree.

The significance level value was set at .05.

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

3. RESULTS AND DISCUSSION

Of 14,900 emails requesting their participation, we received a response from 1,414 people who agreed to participate by 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. IPHSG workers (61.60%), women (69.59%), married (51.49%), and with a bachelor's degree (55.80%) predominated.

Regarding beliefs about the origin of SARS-CoV-2 infection, what the participants expressed is shown in Table 2. Some participants gave two answers (in these cases, both were considered).

Table 3 shows the results from the following questions: Are the preventive measures against SARS-CoV-2 infection useful for you? And, do you apply preventive measures for SARS-CoV-2 infection?

In the knowledge application 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, by sociodemographic variables, the distribution of barriers to using the preventive measures.

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

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. 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	99.08
Sometimes	3	00.21
No	10	00.71
Do you apply preventive measures for SARS-CoV-2 infection?		
Yes	1413	99.86
No	2	00.14

In the group with barriers, the average age was 38.89 ± 9.73. 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.

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	-0.37, .7
High school	2	7.41	76	5.48	0.44, .66
Technical	7	25.93	217	15.65	-3.08, .002
Bachelor	17	62.96	772	55.66	0.76, .45
Post grade	1	3.70	315	22.71	-2.35, .002

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

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

Internal barrier	n	%
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

Internal barrier	n	%
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

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

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

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 (OR 0.65 95%CI 0.50-0.85), and it is not modified when adjusting for the role, marital status or school grade.

All participants showed adequate knowledge about protection measures. Meanwhile, only 27 presented barriers (Table 4). While analyzing 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 was found between the social determinants (age, sex, marital status, and academic degree) and internal or external barriers (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. These measures do not show substantial 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 facemask 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]. It 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 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. Scheid et al. [14] noted headache, itching, rash, and a feeling of shortness of breath among healthcare workers who wore masks for prolonged periods. They observed that symptoms were exacerbated by long work hours, stress, and anxiety.

Bakhit et al. [13] also reported difficulties for health workers in face-to-face communication, but not in telephone communication, regardless of the type of face mask. One study showed 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] and older adults [17].

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

In our study, 11% of the participants believed the pandemic origin was a virus leaked from a laboratory. On the other hand, 7% think 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 from Guanajuato, it is reported as a belief that the cause of the virus and the pandemic is the lack of preventive measures application (24.78%) in the first place, followed by the zoonotic origin belief of the virus (17.16%) (Table 2).

3.1 Weaknesses

The immense amount of information in the mass media has led to people knowing preventive measures. Hence, it was impossible to analyze knowledge with social determinants since 100% of the sample reported adequate knowledge.

The low participation rate (9.49%) limits generalizing 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) did not show a relationship or effect with internal or external barriers to using protection measures against SARS-CoV-2.

Having adequate knowledge about protective measures does not prevent barriers from being considered. Massive strategies should be analyzed to ensure the correct application of these measures during this and future pandemics -and not just knowing them.

Due to massive information, people know what must be done to avoid contagion by SARS-CoV-2. The question is, do they apply it 24 hours a day? At home, do they keep a distance of at least 2 meters, wear face masks permanently, and wash their hands with soap and water? These questions could be addressed in future research.

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

DISCLAIMER

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.

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

Authors have declared that they have no known competing financial interests or non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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