Risk perception about the covid-19 pandemic and its effect on self-medication practices in population of northwestern Mexico

Percepción del riesgo ante la covid-19 y su efecto sobre las prácticas de la automedicación en población del noroeste de México

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Abstract

The objective of the present study was to analyze the effect of the risk perception of covid-19 on self-medication practices in Mexican population. A total of 526 participants over 18 years of age were surveyed, 68.4% women and 31.6% men residing in northwestern Mexico. Using a structural model, the relation and prevalence of self-medication were analyzed. Risk perception about covid-19, consisting of preventive practices and the perception of the threat of the pandemic, was negatively correlated with self-medication practices, which indicates that people who follow preventive care recommendations tend to reduce the use of self-medication and to improve emotional self-medication. Furthermore, the study shows that at least half of the participants have used drugs during the pandemic without medical prescription. Self-medication is a critical health problem; therefore, awareness programs about the adverse effects of medications can help reduce self-medication practices in Mexico.

Keywords: Preventive practices; self-medication; emotional regulation; Mexican population; covid-19.

Resumen

El objetivo del presente estudio fue analizar el efecto de la percepción de riesgo de covid-19 sobre las prácticas de automedicación en población mexicana. Se encuestó a 526 participantes mayores de 18 años, 68.4% mujeres y 31.6% hombres residentes del noroeste de México, y mediante un modelo estructural se analizó la relación y prevalencia de la automedicación. La percepción del riesgo a la covid-19 se correlacionó negativamente con las prácticas de automedicación, lo que indica que las personas que siguen las recomendaciones de cuidados preventivos tienden a reducir el uso de la automedicación y a mejorar su automedicación emocional. Además, el estudio muestra que al menos la mitad de los participantes han consumido fármacos durante la pandemia. La automedicación es un problema de salud crítico, es por ello que los programas de concientización sobre los efectos adversos de los medicamentos son necesarios, ya que pueden ayudar a reducir la automedicación.

Palabras clave: Prácticas preventivas; automedicación; regulación emocional; población mexicana; covid-19.

Introduction

covid-19 is a recent disease caused by a new type of coronavirus, characterized by a respiratory illness that results from severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2) (Al-Mandhari *et al.*, 2020; Sohrabi *et al.*, 2020). This new virus in humans was initially reported in Wuhan, China, and rapidly has raised up concerns worldwide. On January 30th, 2020, the World Health Organization (WHO) declared a public health emergency of international grade due to the covid-19 (Al-Mandhari *et al.*, 2020; Sohrabi *et al.*, 2020). The spread of the coronavirus moved from China to Europe and few weeks later to the United States and Mexico (WHO, 2020). By April 10th, 2021, there were 135 030 164 confirmed cases including more than 2 920 537 deaths reported around the world, affecting at least 201 countries. In this regard, the United States is situated on first place, followed by India, Brazil, and Russia, and in México the reported deaths are also increasing (2 272 064), ranking 14th among the reported countries (Al-Mandhari *et al.*, 2020).

Due to the absence of a recognized treatment or vaccine, in most countries, official control actions have been applied to reduce the spread of covid-19, for instance, social distancing, preventive practices, travel restrictions, and stay-at-home guidance (Matias *et al.*, 2020). The pandemic has created psychosis, stress, anxiety, and lack of adequate medical systems among the population around the world; this could be the cause of the high mortality rate observed in some countries such as Italy, Spain, and United States (Sadio *et al.*, 2020). The WHO (2020) reports that underdeveloped countries have more difficulties in dealing with the pandemic. In this sense, different information has been circulating on the internet, social media, informal publicity, among others, about the use of substances for either preventing or treating covid-19; however, the information about these news is limited and in many cases fake (Pennycook *et al.*, 2020).

Despite recommendations for citizens around the world to prevent the virus, people consider self-medication practices as a good alternative; nevertheless, these practices can be a high-risk health and a need for more supportive health services caused by intoxication or secondary effects (Pennycook *et al.*, 2020). However, numerous clinical assays reported a favorable effect to reduce the covid-19 infection when using substances as hydroxychloroquine, chloroquine, antibiotics with synergic properties as azithromycin, antivirals (lopinavir, ritonavir), ivermectin, and anti-inflammatories. The clinical efficacy is still unclear and could be harmful if it is not prescribed by a medical doctor (Gérard *et al.*, 2020). Additionally, the use of different substances to combat the covid-19 disease has led the population to over-purchase medicine and, consequently, to practice self-medication (Neumann *et al.*, 2020).

Self-medication is a worldwide practice in which people take independent decisions to consume medicines to prevent or treat diseases without medical indications. There are different factors that affect self-medication, for example, age, sex, ignorance to secondary effects, salary, frequency of illness, a global pandemic situation, or emotional self-medication (Lei *et al.*, 2018).

In this sense, the covid-19 pandemic instilled a strong sense of out-of-control crisis. Responses to the covid-19 pandemic have caused a severe crisis in mental health that is reflected in the perception of fear, increased stress, anxiety, and even depression (Wang *et al.*, 2020a). Faced with psychological distress, the voluntary intake of drugs such as anxiolytics or antivirals increased (Zhang *et al.*, 2021). Precisely, *emotional self-medication* represents a set of behaviors that contribute to the excessive and disorderly consumption of substances in threatening situations (Torres & Papini, 2016). People can resort to this strategy to deal with painful situations and intolerable feelings that may cause distressing symptoms (Khantzian, 2013).

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However, the irresponsive use of self-medication can lead to negative consequences as polypharmacy, adverse drug reactions, development of antimicrobial resistance, drug dependency, and economical losses; including other several consequences such as toxicity, renal and liver diseases, and death (Nakhaee & Vatankhah, 2019). Moreover, the risk of physical health due to self-medication can also disturb emotional regulation by generating feelings of boredom, loneliness, and anger, and it also increases the levels of anxiety and insomnia due to the social confinement (Wang *et al.*, 2020b). Due to limited evidence, the WHO does not recommend the use of specific treatments or medicaments to treat the covid-19 disease; however, some groups of people do not follow these indications and still consume drugs to keep their emotions stable (Trajanovska *et al.*, 2010). This situation contrasts with the global efforts of public health to control self-medication practice.

In fact, there are limited studies of drugs consumption and its relationship with the actual situation of covid-19 pandemic in Mexico. In this sense, the objective of the present study is to evaluate the risk perception of covid-19 and its effect on self-medication practices in Mexican population by using a structural equation model.

Materials and Methods

This is an observational, correlational, and transversal study. The sample included 536 participants from northwestern Mexico over 18 years of age, 68.4% women and 31.6% men selected with a snowball sampling procedure. The sample size was calculated using a formula described by Villavicencio (2017). In the present study, we considered 50% of occurrence with a 5% of error with 95% of confidence level. The estimated minimum sample size included 384 participants; however, the sample reached 526 participants (Table 1).

The validity of the instruments was obtained through an exploratory factor analysis by principal components and Varimax rotation, where items with factorial weight $\geq$ 0.40 were preserved (Field, 2013; Pituch & Stevens, 2016). In addition, the Kaiser-Meyer-Olkin (KMO) index was calculated and, finally, the significance value (p < 0.05) was tested through the Barlett's sphericity test (Field, 2013). The number of factors were evaluated through the index of explained variance for the scales and subscales (Appendix 1 and 2).

Table 1. Sociodemographic characteristics of participants.

Variable	FE	%	Variable	FE	%
Sex			Medical service		
Male	166	31.6	*No medical service*	54	10.3
Female	360	68.4	*Public service*	385	73.2
BMI			*Private service*	87	16.5
≤24.9	382	72.6	Medical visits		
25.0-29.9	102	19.4	*When I am sick*	264	50.2
≥30	42	8.0	*One time per year*	72	13.7
Age			*Every six months*	92	17.5
18-30	207	39.4	*Every two or three months*	66	12.5
31-43	153	29.1	Every month	32	6.1
44-77	166	31.6	Exercise		
Education			*Never*	125	23.8
Elementary	71	13.5	*Once a week*	73	13.9
High school	308	58.6	*Two or three times a week*	136	25.9
Graduate and above	147	27.9	*More than three times a week*	192	36.5
Monthly household income (Mexican pesos)			Tobacco use		
$ 0 a $ 5000	80	15.2	*Yes*	468	89
$ 5001 a $ 10 000	95	18.1	*No*	58	11
$ 10 001 a $ 20 000	184	35.0	Alcohol use		
$ 20 001 a $ 40 000	103	19.6	*Yes*	276	52.5
More than $ 40 001	64	12.2	*No*	250	47.5
Occupation			Leaving home		
Employee	384	73	*Never*	43	8.2
Unemployed	142	27	Once a week	142	27.0
Marital status			*Two or three times a week*	187	35.6
Single	290	55.1	*Four or five times a week*	59	11.2
Married	236	44.9	*More than six times a week*	95	18.1
			Diseases		
			Yes	134	25.5
			No	392	74.5

Source: Author's own elaboration.

The risk perception of covid-19 scale (Table 2). This scale was developed particularly for this study and is composed by 20 Likert-style items (four-point scale: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree) separated into two subscales: preventive practices of covid-19 (13 items) and threat perception of covid-19 (seven items). The construction of this scale was designed from basic protection measures and mental health recommendations against the coronavirus offered by the WHO (2020).

Self-medication practices scale (Table 2). The instrument was specially developed for this study, considering self-medication practices described by Fainzang (2017). The scale is composed by 23 Likert-type items (four-point scale: 1 = strongly agree, 2 = agree, 3 = disagree, 4 = strongly disagree) constituted by two subscales: self-medication (17 items) and emotional self-medication (seven items). Items were prepared considering the representative actions of self-medication and frequency of medicine consumption (Sadio *et al.*, 2020).

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Sociodemographic variables. Participants answered sociodemographic questions such as age, biological sex, weight, height, income, employment status, marital status, and education. Finally, questions about physical health were included.

The survey was designed on the software Qualtrics and shared through social media and the internet, and it was applied from October to December 2020, aiming the states of Sonora and Sinaloa, Mexico. All participants signed an online informed consent. All procedures of the study were carried out according to ethical standards of the relevant national and international committees on human experimentation and surveys, and they were also approved by the University of Sonora Committee (CEI-UNISON-EPE-18/2020).

Initially, the normality of the data was verified through asymmetry and kurtosis tests with values between -2 and 2 (Pérez, 2004). The Cronbach´s alpha and univariate analyses were estimated for all the items. Subsequently, a structural equation model was performed using the software EQS v6.1 (Bentler, 2006) to analyze the risk perception of covid-19 and its effect on self-medication practices. For the grouping of the items, plots were used considering the recommendations of Hau and Mash (Bentler, 2007). For this analysis, practical goodness of fit and statistical goodness of fit were considered. Chi squared (χ^2) was calculated to measure the difference between the proposed theoretical models and the saturated $\chi2$. Additionally, to make the χ^2 test less dependent to sample size, relative χ^2 was calculated by dividing the χ^2 fit index by the degrees of freedom. Moreover, the mean quadratic approach error (RMSEA) was estimated, which considers values equal to or lower than ≤ 0.08; if this value is lower, the model is considered to have a proper fit. Furthermore, Bentler-Bonett normed fit (BNFI), Bentler-Bonett non-normed fit (BNNFI), comparative fix index (CFI), Joreskog-Sorbom´s GFI fit index, Standarized RMR, and confidence intervals of RMSEA were estimated. All procedures were processed using the statistical package SPSS version 25 as well as the software EQS version 6.1.

Results

Table 2 shows the values of means, standard deviation, and internal consistency coefficients (Cronbach´s alpha) of two scales used for the study. The scale "Preventive practices for covid-19" presented a consistency internal value of 0.86, meanwhile the factor "Threat perception of covid-19" showed a Cronbach alpha of 0.74; both factors are part of a higher order factor named Risk perception of covid-19.

Table 2. Reliability and univariate statistics of scales (scale range of responses: 1-4). Mean ± standard deviation (SD).

SCALE/items	Mean	SD	Alpha
PREVENTIVE PRACTICES OF covid-19	1.39	0.36	0.86
I Wash my hands before touching my eyes, nose, or mouth	1.43	0.58	
I wear a mask when leaving home	1.18	0.44	
I cover mouth and nose with my forearm when coughing or sneezing	1.27	0.52	
I maintain a 1.5 meters minimum distance from others in public places	1.29	0.50	
I decide to stay home to avoid infection	1.50	0.64	
I wash my hands with soap and water at least for 30 seconds	1.52	0.64	
I follow recommendations of governments about the pandemic	1.39	0.52	
I use sanitizer to clean my house or workplace	1.45	0.59	
I avoid having visitors at home	1.56	0.68	
I avoid traveling to other cities	1.41	0.61	
I do not wear a mask in public places	1.27	0.66	
I use antibacterial gel	1.25	0.52	
I change the mask often	1.62	0.70	
THREAT PERCEPTION OF covid-19	1.56	0.53	0.74
I do not worry about covid-19	1.40	0.74	
I worry about getting infected with covid-19	1.64	0.82	
I think covid-19 is not a threat for people	1.45	0.79	
I worry that my family or friends get infected with covid-19	1.26	0.54	
I feel anxious to be surrounded by people, because I think that I can be infected of covid-19	2.06	0.88	
SELF-MEDICATION	3.20	0.46	0.84
I use drugs only on medical prescription	3.39	0.79	
I think that self-medication is good	3.33	0.68	
If I am sick, I know what drug I should consume	3.12	0.73	
I use drugs at my own decision	2.99	0.84	
When I feel sick, I go to the doctor	3.19	0.76	
I ask my friends, family, or neighbors for advice before consuming any type of drug	2.99	0.89	
I consume drugs to take care of my health	2.93	1.00	
I feel more protected by self-medication	3.44	0.66	
I avoid self-medication in my lifestyle	3.27	0.87	
I have increased my drug use in the last few days	3.34	0.80	
Taking drugs without a medical prescription is bad	3.42	0.77	
I go to the doctor when I have any symptoms	3.26	0.70	
I consume drugs by myself when I feel sick	3.02	0.83	
I buy more drugs for prevention	3.22	0.81	
EMOTIONAL SELF-MEDICATION	3.51	0.58	0.86
I feel irritable or unmotivated when not taking drugs	3.63	0.57	
I need to take drugs to carry out my daily activities	3.60	0.67	
Drugs make me feel calm and relaxed	3.47	0.73	
My life wouldn't be the same without drugs	3.32	0.89	
Drugs help me to minimize my personal problems	3.56	0.70	

Source: Author's own elaboration.

In turn, the factor "self-medication" presented an alpha coefficient of 0.84, and the factor "emotional self-medication" generated an alpha coefficient of 0.86. These last two factors compose the factor Self-medication practices.

In a response range from 1 to 4, the means of subscales "Emotional self-medication" and "Self-medication" were between *disagree and strongly disagree* (3.51, SD = 0.58; 3.20, SD = 0.46, respectively). Meanwhile the means to the factors "threat perception of covid-19" and "preventive practices of covid-19" fluctuated between *strongly agree and agree* (1.56, SD = 0.53; 1.39, SD= 0.36, respectively). Before the confirmatory factor analysis, the parcels were calculated by adding items within each subscale. Two factors were considered for the Risk perception of covid-19 (preventive practices and threat perception of covid-19) and two for the self-medication practices (self-medication and emotional self-medication).

A confirmatory factor analysis was conducted to evaluate the validity of both scales. All factor loadings resulted significant ($p < 0.05$) and oscillated between 0.54 and 0.91 (Figure 1 and 2). The goodness of fit indicators of the preventive practices and threat perception scale included $p < 0.05$; $\chi2$ (27 df) = 63.124; relative $\chi2$ = 3.56; BBNFI = 0.98; BBNNFI = 0.97; CFI = 0.97; GFI = 0.967; RMSEA = 0.04; 90% confidence interval of RMSEA (0.000, 0.071); and Standarized RMR (SRMR) = 0.052. The goodness of fit indicators of self-medication and emotional self-medication included $p < 0.05$; $\chi2$ (27 df) = 86.118; relative $\chi2$ = 3.91; BBNFI = 0.98; BBNNFI = 0.97; CFI = 0.98; GFI = 0.958; RMSEA = 0.07; 90% confidence interval of RMSEA (0.000, 0.069); and Standarized RMR (SRMR) = 0.051.
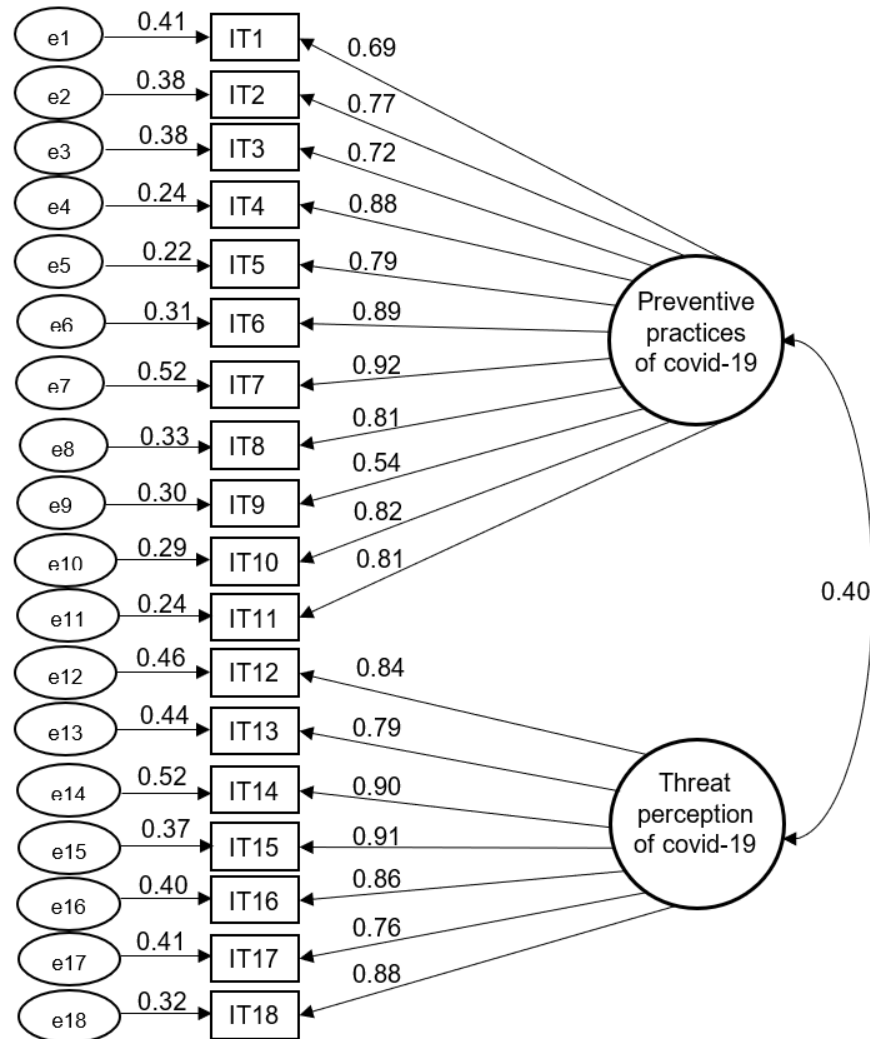

Figure 1. Confirmatory analysis of the perception of covid-19 and self-medication practices scales. Goodness of fit: $p < 0.05$; $\chi2$ (27 df) = 63.124; relative $\chi2$ = 3.56; BBNFI = 0.98; BBNNFI = 0.97; CFI = 0.97; GFI = 0.967; RMSEA = 0.04; 90% confidence interval of RMSEA (0.000, 0.071); SRMR = 0.052; IT = item.
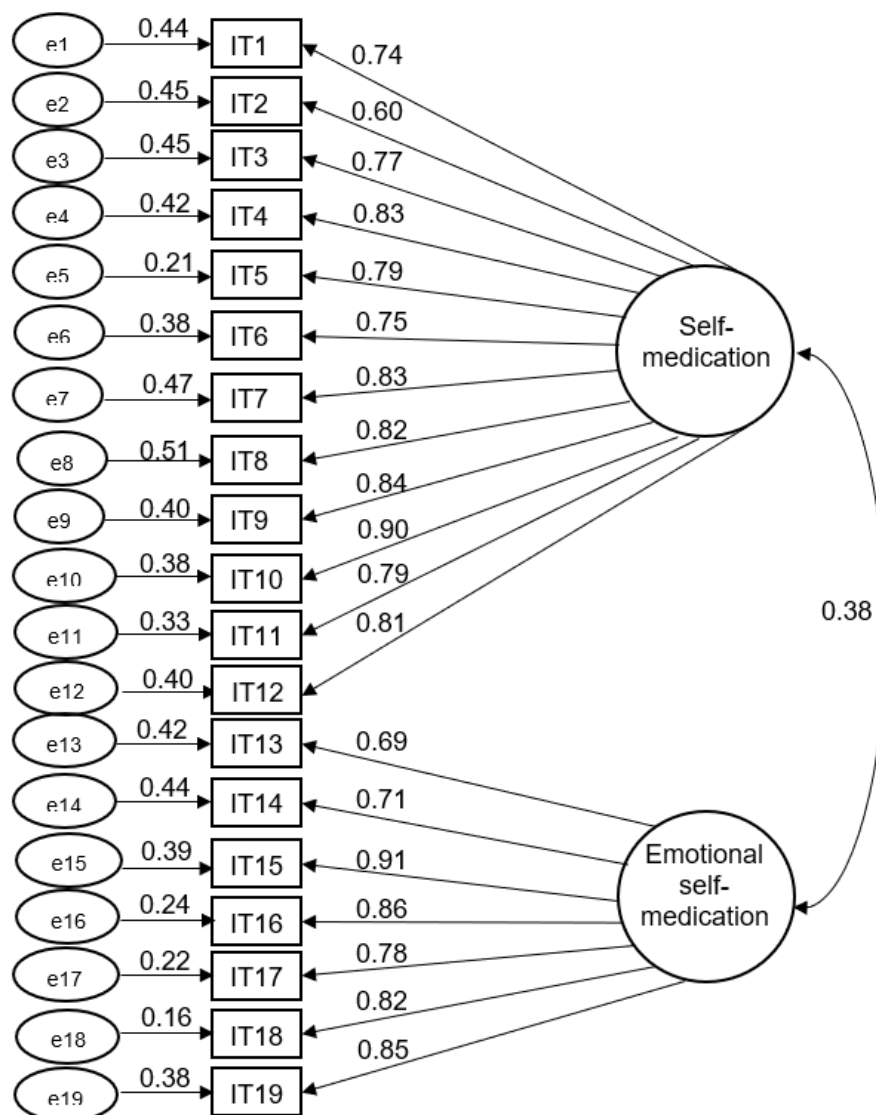Source: Author's own elaboration.

Figure 2. Confirmatory analysis of the self-medication and emotional medication scales. Goodness of fit: $p < 0.05$; χ2 (27 df) = 86.118; relative χ2 = 3.91; BBNFI = 0.98; BBNNFI = 0.97; CFI = 0.98; GFI = 0.958; RMSEA = 0.07; 90% confidence interval of RMSEA (0.000-0.069); SRMR = 0.051; IT = item.
Source: Author's own elaboration.

Results of the structural model showed that the first order factors (preventive practices of covid-19, threat perception of covid-19, self-medication, and emotional self-medication) with their manifest indicators (parcels) represented in rectangles are conformed by second order factors (risk perception of covid-19 and self-medication practices). It is observed that the risk perception of covid-19 has a direct, negative, and significant effect on self-medication practices. The model showed goodness of fit and acceptable practice (χ2 [18] = 52.062; $p < 0.05$; relative χ2 =2.89; BBNFI = 0.98; BBNNFI = 0.96; CFI = 0.98; GFI = 0.968; RMSEA = 0.06; r^2 = 0.42; 90% confidence interval of RMSEA [0.000, 0.073]); and Standarized RMR ([SRMR] = 0.048) (Figure 3).
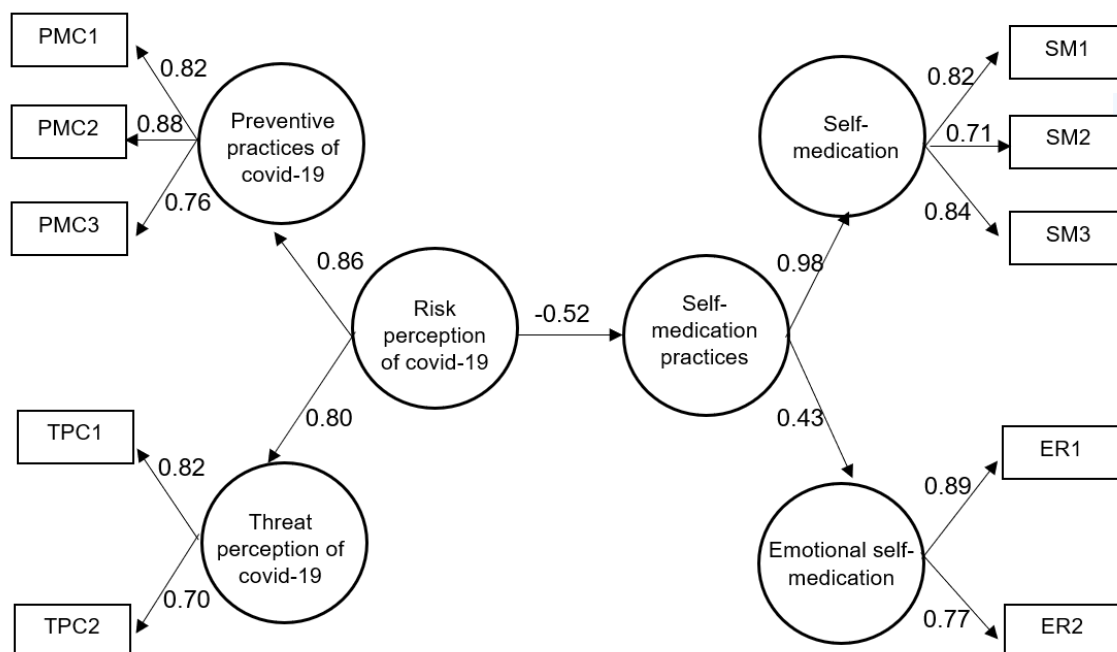
Figure 3. Structural model of perception of covid-19 and self-medication practices. All coefficients and evaluated factors are significant ($p <$ 0.05). Reliability coefficient = 0.803; χ2 (18 df) = 52.062; relative χ2 = 2.89; BBNFI = 0.98; BBNNFI = 0.96; CFI = 0.98; GFI = 0.968; RMSEA = 0.06; r^2 = 0.42; 90 confidence interval of RMSEA (0.000, 0.073); Standarized RMR (SRMR) = 0.048; all data are standardized. PMC = Preventive practices of covid-19; TPC = Threat perception of covid-19; SM = Self-medicaton; ER = Emotional self-medication.
Source: Author's own elaboration.

A total of 52.7% participants declared to have consumed medicaments without medical prescription during the confinement by covid-19. This study showed that multivitamins, paracetamol, analgesics, aspirin, antibiotics, and anti-flu were consumed from one to three or more weeks. Regarding medications, the results suggested that people used ivermectin more frequently than other medications, followed by melatonin, chloride dioxide dexamethasone, oseltamivir, hydroxychloroquine, and hydrocortisone. Furthermore, participants presented a light prevalence to consume antidepressants, antidiarrheal, and anticoagulant, which were consumed at least once a week for three weeks or more (Table 3).

Table 3. Frequency of drug use of participants.

Drug	Frequency N (%)				
	None	Less than 1 week	During 1 week	During 2 weeks	During 3 weeks or more
Dexamethasone	498 (94.7)	15 (2.9)	8 (1.5)	2 (0.4)	3 (0.6)
Hydrocortisone	520 (98.9)	3 (0.6)	0 (0)	0 (0)	0 (0)
Hydroxychloroquine	512 (97.3)	8 (1.5)	4 (0.8)	2 (0)	0 (0)
Oseltamivir	510 (97.0)	7 (1.3)	5 (1)	3 (0.6)	1 (0.2)
Aspirin	381 (72.4)	87(16.5)	27 (5.1)	8 (1.5)	23 (4.4)
Paracetamol	258 (49.0)	180 (34.2)	43 (8.2)	23 (4.4)	22 (4.2)
Melatonin	490 (93.2)	15 (2.9)	8 (1.5)	4 (0.8)	9 (1.7)
Ivermectin	480 (91.3)	36 (6.8)	7 (1.3)	2 (0.4)	1 (0.2)
Chlorine dioxide	498 (94.7)	17 (3.2)	5 (1)	1 (0.2)	5 (1)
Antiviral (avifavir, lopinavir, ritonavir)	494 (93.9)	19 (3.6)	6 (1.1)	7 (1.3)	0 (0)
Anticoagulants (enoxaparin, apixaban, rivaroxaban)	510 (97.0)	9 (1.7)	3 (0.6)	2 (0.4)	2 (0.4)
Analgesics "for pain" (diclofenac, ketorolac, indomethacin)	379 (72.1)	102 (19.4)	28 (5.3)	6 (1.1)	11 (2.1)
Antibiotics (ceftriaxone, amoxicillin, levofloxacin, azithromycin)	425 (80.8)	60 (11.4)	31 (5.9)	6 (1.1)	4 (0.8)
Flu	454 (86.3)	55 (10.5)	11 (2.1)	3 (0.6)	3 (0.6)
Antidiarrheal	491 (93.3)	24 (4.6)	5 (1)	2 (0.4)	4 (0.8)
Antidepressants	471 (89.5)	25 (4.8)	9 (1.7)	2 (0.4)	19 (3.6)

Source: Author's own elaboration.

Discussion

Self-medication is a common practice in developing regions such as the Middle East, Africa, and Latin America (Al-Worafi, 2020), including Mexico. The results of the structural model showed that people maintained preventive practices against covid-19 and perceived the virus as a threat to the population; furthermore, participants are more likely to take care of themselves and reduce self-medication practices and regulate their emotions. Overall, the findings suggest that the majority of the participants reported adequate knowledge and positive attitudes regarding antibiotic use. These findings are similar with the results showed by Makowska *et al.* (2020), where 45.6% of the Polish respondents indicated that they had engaged with self-medication during the lockdown by covid-19 pandemic. However, in this study, the participants' trend towards self-medication was reported by 52.7% of the population, which is a matter of concern for the health sector.

According to another study, a progressive increase in the search for the word *self-medication* on websites worldwide has increased since the pandemic began (2020). This could represent an indicator that people's interest in seeking information to use medications without prior medical prescription has increased. This self-medication practices were reported in Wuhan, China, with 45.4% (Lei *et al.*, 2018) and Egipt with 96% (Zeid *et al.*, 2020). The differences in prevalence can be explained by the size of the samples, the type of study, global situation like the current pandemic, among others; nevertheless, the important part is to show that self-medication constitutes a global issue that increases by critical situations.

The results in the present study showed that the drugs used by the population were multivitamins, paracetamol, analgesics, aspirin, antibiotics, and anti-flu. These findings are consistent with previous studies that reported that the most used medications by the population were analgesics and anti-inflammatory drugs (Domingues *et al.*, 2017).

In this study, part of the participants reported to consume medications at least once a week, and they have shown their uncontrolled use, for instance, with antibiotics that can generate bacterial resistance, currently considered a global crisis (Abdel-Qader *et al.*, 2020), and the use of antibiotics, which reduces therapeutic options to combat infections. We also found that people use some antibiotics to prevent and treat covid-19, such as azithromycin, ceftriaxone, amoxicillin, levofloxacin, and cefaclor; however, none of those have shown a direct efficacy against the virus (Tanioka & Tanioka, 2020). We should consider that any antibiotic or analgesic could also induce allergic reactions, including anaphylaxis, urticaria, generalized itching, tachycardia, hypotension, cardiac arrhythmias, nausea, vomiting, and headache (Yuan & Kaplowitz, 2013).

Regarding the consumption of analgesics, including paracetamol, the results showed that around a third part of participants consume it at least once a week, considering that most participants seek for medical attention only when they are sick. Adverse effects are related to different factors such as dosage, interactions with drugs, and health conditions of the participants. Adverse effects are kidney and liver damages, and cardiovascular alterations and increased blood pressure have also been described (Warner & Mitchell, 2008).

The ivermectin is an antiparasitic drug at doses of 6 mg-12 mg in one or two doses, and there is only evidence of its usefulness in inhibiting SARS COV2 *in vitro*, although its efficacy and effectiveness have not been demonstrated completely (Vora *et al.*, 2020). In this sense, literature indicates that results of ivermectin to reduce viral loads in laboratory cultures are not enough to indicate that this drug will be of clinical benefit to reduce viral loads in patients with covid-19 (Caly *et al.*, 2020). Therefore, the doses consumed by some participants are not effective, getting the risk to adverse effects (allergic reactions, gastrointestinal disorders, and to a lesser degree liver damage). People seem to consume Ivermectin for prevention; however, its use should only be limited to controlled clinical trials.

Regarding the case of chlorine dioxide for long periods of time, there is not enough scientific evidence of its usefulness for covid-19 or other diseases (Burela *et al.*, 2020). The WHO prohibits the use of this product due to serious adverse effects related to injuries in different tissues such as burns in the esophagus, stomach (manifested with nausea, diarrhea, and vomiting), or dental erosions; and by inhalation, it causes edema of the lung, cardiovascular and kidney disorders, acute liver failure, among others (Burela *et al.*, 2020). Among the multi-vitamins, the most used during the pandemic are: Vitamin C, Vitamin D, and complex B; only vitamin D has suggested a benefit for the prevention of serious disease due to infection secondary to SARS-COV2 in people with deficiency of the vitamin (Grant *et al.*, 2020); however, more studies are still required to show its efficacy.

The role that emotional self-medication plays in the way people react to the virus outbreak is significant. Our findings demonstrated that the participants presented greater emotional regulation during confinement. This situation has been beneficial to avoid self-medication, although it should be noticed that some people present greater regulation of their emotions and are better prepared to identify how emotions impact their behavior (Hu *et al.*, 2014).

The relationship between risk perception of covid-19 and self-medication practices indicates that when people perceive a high risk of the virus outbreak, the effect of emotional self-medication is

significant, which also leads to adopt protective behavior of health care. Therefore, people who showed greater emotional regulation during confinement decreased self-medication practices and carried out protective health care behavior. These results are consistent with the literature that shows emotional regulation function as a moderating variable between the perception of the risk of the virus and protective behavior (Rubaltelli *et al.*, 2020).

Conclusions

The model showed that people who maintain better preventive practices against covid-19 avoid self medication and can regulate emotional self-medication. However, it was found that despite the lack of medical prescription, a third part of our participants practice self-medication at least once a week. In addition to this, we found out that healthy participants consume medications and other substances to prevent covid-19.

More studies on frequency and dose consumed to prevent or treat covid-19 are needed to find the adverse effects. As limitations of the study, the model investigated some indicators related to preventive practices for covid-19, but certainly there are other measures related to the general health of people that could be impacting the reduction of self-medication during confinement. Other studies could include the role played by family interactions, physical health, influence of the living conditions or family incomes and its influence on self-medication.

This research contributes to better understand the importance of emotional self-medication to avoid self-medication during covid-19 pandemic. The results could be of special interest to health professionals and public policy makers to create programs to educate people in order to take better care of their health and reduce the inappropriate use of drugs without prior medical prescription.

Conflict of interest

The authors declare that there is not conflict of interest.

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