Voluntary and mandatory use of face mask by pedestrians in Guatemala City during the COVID-19 pandemic

Uso voluntario y obligatorio de mascarilla por peatones en la ciudad de Guatemala durante la pandemia de COVID-19

Dennis Guerra-Centeno[1*], Luisa Burmester-Ruiz[2], Paula Guerra-Burmester[2],
Dennis Guerra-Burmester[3], Federico Villatoro-Paz[1]

[1]Instituto de Investigación en Ciencia Animal y Ecosalud, Facultad de Medicina Veterinaria y Zootecnia,
Universidad de San Carlos de Guatemala, [2]Independent researcher,
[3] Facultad de Ciencias Médicas, Universidad de San Carlos de Guatemala

*Autor al que se dirige la correspondencia: msc.dennisguerra@gmail.com

Abstract

The COVID-19 pandemic has currently affected more than 200 countries and caused around four million cases. Face masks are recommended for preventing the contagion. The Guatemalan government issued a decree for the mandatory use of face masks in public places. In order to find out the frequency of voluntary and mandatory use of face masks by Guatemalans we conducted a case study divided in two episodes (pre and post mandatory use decree) by driving a 27.8 km car transect through 11 of the 22 zones of Guatemala City and observing the use of face mask by pedestrians walking on the sides of the transect. Pedestrians were visually classified by age category (children [< 12 years], juveniles [12-21 years], adults [21-65 years] and elders [> 65 years]) and gender. During the pre-decree observation, we registered 476 individuals using a face masks and 674 not using or using them improperly. During the post-decree observation, we registered 797 individuals using face masks and 211 not using or using them improperly. In general, the frequency of face mask use was higher in the post-decree sample. Males used face masks less frequently than females, especially the elders and especially before the use became mandatory. Although the mandatory use decree managed to increase the frequency of the use of the face mask, there is a portion of the population that is not using it or that is using it improperly, so this should be considered by the health authorities who are dealing with the COVID-19 pandemic.

Palabras claves: Coronavirus, 2019-nCoV, SARS-CoV-2, epidemic, outbreak

Resumen

La pandemia de COVID-19 ha afectado actualmente a más de 200 países y causado alrededor de cuatro millones de casos. Se recomienda el uso de mascarillas faciales para prevenir el contagio. El gobierno de Guatemala emitió el decreto 6-2020 para el uso obligatorio de mascarilla en lugares públicos. Para determinar la frecuencia del uso voluntario y obligatorio de la mascarilla por parte de los guatemaltecos, se realizó un estudio de caso dividido en dos episodios (pre-decreto y post-decreto), recorriendo un transecto de 27.8 km en 11 de las 22 zonas de la ciudad de Guatemala y observando el uso de mascarilla por los peatones que caminaban a los lados del transecto. Los peatones se clasificaron visualmente por categoría de edad (niños [< 12 años], jóvenes [12-21 años], adultos [21-65 años] y adultos mayores [> 65 años]) y sexo. Durante el recorrido pre-decreto, observamos 476 personas usando mascarilla y 674 que no la utilizaban o la utilizaban incorrectamente. Durante el recorrido post-decreto, observamos 797 personas utilizando mascarilla y 211 que no la utilizaban o la utilizaban incorrectamente. En general, la frecuencia de uso de la mascarilla aumentó, luego de publicado el decreto. Los hombres usan mascarilla en menor proporción que las mujeres, sobre todo antes de publicarse el decreto. Aunque el decreto de uso obligatorio logró aumentar la frecuencia de uso de la mascarilla, todavía hay una parte de la población que no la está utilizando o que la está utilizando de manera incorrecta por lo que esto debe ser considerado por las autoridades de salud que están lidiando con la pandemia.

Keywords: Coronavirus, 2019-nCoV, SARS-CoV-2, epidemia, brote

Introduction

Since 2007, Chinese scientists in Wuhan have warned the scientific community about the possibility of a Coronavirus pandemic emerging from the contact between wildlife and humans (Cheng et al., 2007). At the end of 2019, the prediction came true as a novel Coronavirus caused an outbreak (Lai et al., 2020), that soon became a pandemic now affecting more than 200 countries (World Health Organization [WHO], 2020a). The fast spreading of the virus mainly in big and crowded cities has forced the health authorities of the affected countries to recommend preventive measures such as quarantine, social distancing, frequent hand washing and the use of face masks.

The face mask is one of the most popular and accessible devices used to prevent contagion and spread of COVID-19. However, its use is controversial because although the World Health Organization (WHO, 2020b) stated that only symptomatic people or medical personnel should wear it, one can find recommendations for massive use during social interaction on social networks and in the press. As a result, some people use it, and some do not. In Guatemala, the use of face masks during the COVID-19 pandemic was voluntary from March 13th −the day when the first COVID-19 was detected− to April 12th 2020. Subsequently on April 13th, the government promulgated a decree that made the use of the face mask mandatory for all people in public spaces (Presidencia de la República de Guatemala, 2020a).

In response to the lack of published information on the use of face masks, we conducted a brief cross-sectional investigation to record how often pedestrians used the face mask when walking the streets of Guatemala City 22 days after the first COVID-19 case was reported in the country. Two weeks after that, we conducted another investigation to record how often pedestrians use the face mask during the validity of the decree of mandatory use. Here, we present and discuss the results of our observations regarding the voluntary (pre-decree) and mandatory (post-decree) use of face masks by pedestrians in Guatemala City during the COVID-19 pandemic.

Case presentation

On Saturday, April 4th, 2020, we traveled a 27.8 km long transect by car, going between 20 and 40 km/h. The transect started in zone 18 and went through 11 of the 22 zones of Guatemala City (Figure 1) and was traveled from 10:00 a.m. to 12:30 p.m. We observed and recorded the frequency of face mask use in people walking or standing on the sides of the transect. On Saturday, April 18th, we did a second observation effort, traveling the same transect at the same hours of the day. We categorized people by estimated age categories (children [< 12 years], juveniles [12-21 years], adults [21-65 years] and elders [> 65 years]) and gender. The ages were, therefore, visual estimations. All kinds of face masks were considered. Any face mask positioned in a way that did not cover the mouth and the nose were considered as improperly used. We used generalized linear logistic regression models (Agresti, 2007) to test the association between the proper use of a face mask (binomial outcome, logit link) and age (categorical, see above), gender and time (pre and post decree).

Statistical analyses were performed with the R software (R. Core Team, 2019). Here we report the results of our analyses for a full model, including odds ratios (OR), confidence intervals and the difference in Akaike Information Criterion (AIC) that results from removing each predictor variable from the full model (Table 2). In addition, a second model was performed to evaluate interaction terms between age, decree, and sex and only the significant terms and their ORs are reported in the body text.

Results

Before the decree, we recorded 1,150 individuals along the transect. Four hundred seventy-six (41%) were using face masks, the rest were not using face masks or were improperly using it. During the post-decree observation, we recorded 1,008 individuals along the same transect. Seven hundred ninety-seven (79%) were using face masks. The distribution of frequencies and proportions between age categories, sex, and time (i.e., pre and post decree) is shown in Table 1 and Figure 2.

The odds of using face masks is mainly explained by the publication of the decree. In second place, by gender, and at last, by age (Table 2). The use of face masks was 5.5 times higher after the decree than before. Independently of the decree or gender, children were consistently less likely to use face mask compared to adults (OR = 0.5). The same way, males were consistently less likely to use face mask than females (OR = 0.7, Fig. 2). There were a couple of exceptions found

Table 1
Frequencies of face mask use by pedestrians in Guatemala City during the COVID-19 pandemic in a cross-sectional sample.

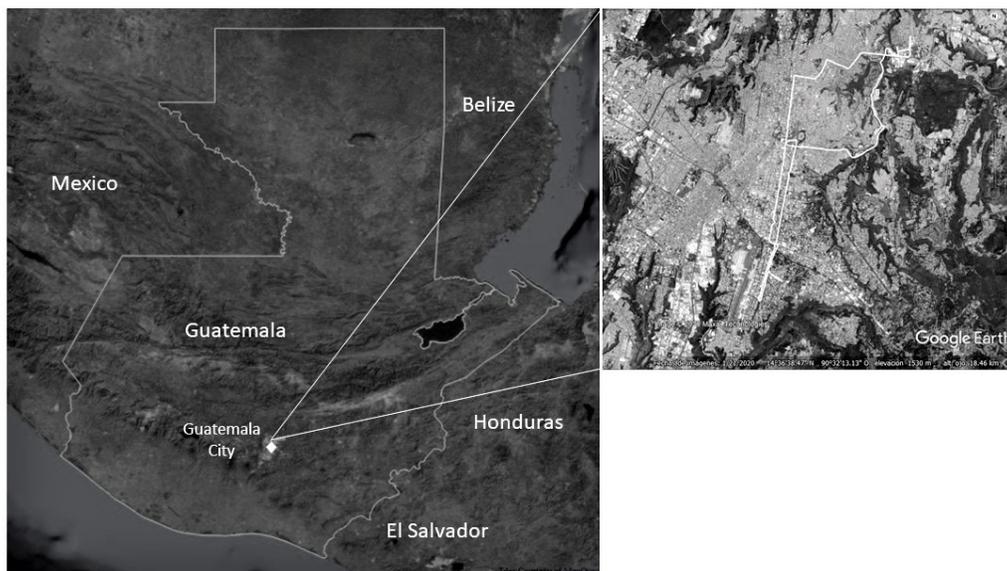|	Pre-decree			Post-decree		
	Using mask	Totals	Proportion (%)	Using mask	Totals	Proportion (%)
Children						
Females	5	14	35.7	9	15	60.0
Males	5	22	22.7	20	28	71.4
Juveniles						
Females	13	30	43.3	2	5	40.0
Males	23	83	27.7	46	52	88.5
Adults						
Females	143	286	50.0	210	252	83.3
Males	230	582	39.5	460	585	78.6
Elders						
Females	16	21	76.2	18	22	81.8
Males	41	112	36.6	32	49	65.3
Totals	476	1,150	41.4	797	1,008	79.1

Figure 1. Transect location (zones 1, 2, 4, 5, 6, 10, 13, 14,16, 17 and 18 of Guatemala City [images taken from Google Earth on April 4, 2020 at 22:00]).

Table 2

Generalized linear logistic regression model for the [proper] use of face masks by pedestrians in Guatemala. Delta AIC (ΔAIC) is the decrease in the Akaike's information criterion (AIC) for the full model without that variable.

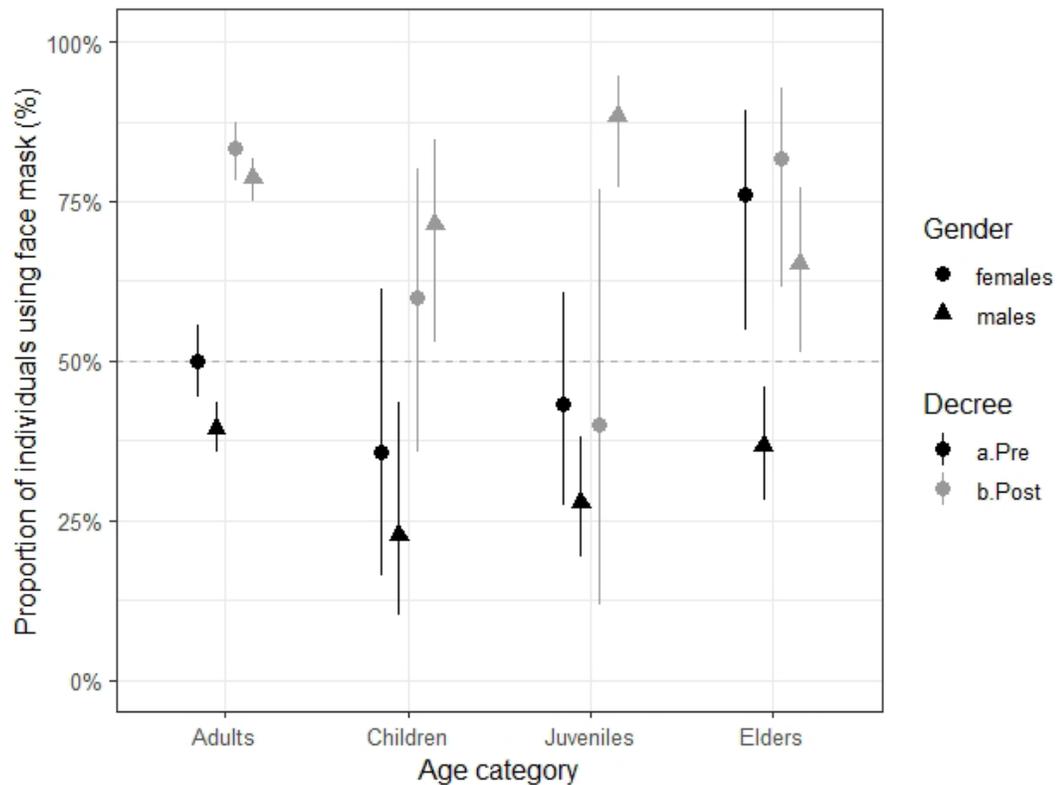| Variables | Odds Ratio | 95% Confidence Interval | | *p* value | Δ AIC |
		Lower	Upper		
Decree: Pre	Reference				-323.7
Post	5.5	4.5	6.6	< .001	
Age (class): Adults	Reference				-3.02
Children	0.5	0.3	0.8	.006	
Juveniles	0.8	0.6	1.1	0.176	
Elders	0.9	0.7	1.2	0.502	
Gender: Females	Reference				-13.3
Males	0.7	0.5	0.8	< .001	

Figure 2. Proportion of individuals properly using face mask. The Wilson score (Agresti & Coull, 1998), is being used for showing binomial 95% confidence intervals.

when the interaction model was run (see methods). Before the decree, elder females were more likely to use face mask than adult females (OR = 3.2, *p* = .03, Fig 2) and this difference, was kept after the publication of the decree (see Fig 2). In addition, after the publication of the decree, juvenile males were more likely to use face masks compared to females of the same age category (OR=20, *p* < .001, Fig 2).

Discussion

The first case of COVID-19 was reported in Guatemala on March 13th. Eight days after, a daily curfew was installed from 4:00 p.m. to 4:00 a.m. (Presidencia de la República de Guatemala, 2020b). In addition, shopping malls were closed, public transportation was banned, academic activities were suspended, and people were recommended to remain in their home unless they worked in health, drug, or food services. This reduction in transportation and freedom of movement generated a daily circulation of pedestrians seeking for health services, groceries, prepared food and other products or services during the hours when walking on the streets was allowed. Some people also claimed that they must go work in the streets daily to earn a living.

Although the WHO (2020b) has not recommended the use of the face mask for asymptomatic people, the rapidly increasing number of cases worldwide and the ease of access to epidemiological information through social networks and the press media, could have contributed to create a state of fear of infection that can explain the voluntary use of face masks.

The day we conducted the first sampling, there were 50 COVID-19 cases in Guatemala and the proportion of people using masks voluntarily was around 41%. So maybe there was some fear in the city population but not enough to cause voluntary mass use of the face mask.

The day we conducted the second sampling, there were almost 200 cases and the use of the face mask was mandatory by decree. However, despite the rapidly growing number of cases worldwide and the fact of being mandatory in Guatemala, around 21% of the observed individuals were not using the face masks or were improperly using them. Although some people have been arrested or fined for not wearing a face mask, it seems that a portion of the population is reluctant to use a face mask due to negligence, rebellion, alcohol, or drug use or perhaps, just ignorance.

At the time of writing this note, 763 COVID-19 cases were reported in Guatemala, 1.25 million in the United States, 26 thousand in Mexico −our neighboring country− and almost four million globally (Worldmeter, 2020). There appears to be a need to tighten controls to achieve best prevention practices. The proper use of the face mask could be a useful tool considering that the virus is transmitted primarily through large droplets (Zhang et al., 2020), so, during the exponential phase of the outbreak −which is currently occurring in Guatemala and other countries− the face mask could contribute to reduce the spread of the virus, especially if the free movement limitation measures could not be extended.

The use of face masks has increased in other countries after the onset of the epidemic (Feng et al., 2020). Face masks have also been proposed to be useful inside households for controlling pandemics of other respiratory-transmitted viruses (MacIntyre et al., 2009).

The recent information about the possible participation of domestic animals in the transmission of the SARS-CoV- 2 (World Organisation for Animal Health, 2020) could also stimulate the use of face mask among the community because stray dogs and cats are common in the streets of urban settings in Central America (Lyu, 2015). This would of course depend on the education programs that could accompany the public health interventions amid the COVID-19 pandemic.

One interesting finding of this study was the fact that not only more men were walking outside than women but men were using masks less frequently. It is known that men are more likely to engage in health-related risky behaviors than women (Harris et al., 2006). Therefore, it is important to consider this difference when designing interventions aimed at COVID-19 prevention.

References

Agresti, A. (2007). *An introduction to categorical data analysis* (2nd ed.). New Jersey: John Wiley and Sons.

Agresti, A., & Coull, B. A. (1998). Approximate is better than exact for interval estimation of binomial proportions. *The American Statistician*, *52*(2), 119-126. https://doi.org/10.1080/00031305.1998.10480550

Cheng, V. C. C., Lau, S. K. P., Woo, P. C. Y., & Yuen, K. Y. (2007). Severe acute respiratory syndrome coronavirus as an agent of emerging and reemerging infection. *Clinical Microbiology Reviews, 20*(4), 660-694. https://doi.org/10.1128/CMR.00023-07

Feng, S., Shen, C., Xia, N., Song, W., Fan, M., & Cowling, B. J. (2020, March 20). Rational use of face masks in the COVID-19 pandemic. *The Lancet Respiratory Medicine, 8*(5), 434-436. https://doi.org/10.1016/S2213-2600(20)30134-X

Harris, C. R., Jenkins, M., & Glaser, D. (2006). Gender differences in risk assessment: Why do women take fewer risks than men? *Judgment and Decision Making, 1*(1), 48-63.

Lai, C. C., Shih, T. P., Ko, W. C., Tang, H. J., & Hsueh, P. R. (2020). Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and corona virus disease-2019 (COVID-19): The epidemic and the challenges. *International Journal of Antimicrobial Agents, 55*, 105924. https://doi.org/10.1016/j.ijantimicag.2020.105924

Lyu, P. (2015). Proposal on solutions to stray dog problem in American cities. *Journal of Political Science and Public Affairs, 3*(3), 1-3. https://doi.org/10.4172/2332-0761.1000175

MacIntyre, C. R., Cauchemez, S., Dwyer, D. E., Seale, H., Cheung, P., Browne, G., ... Ferguson, N. (2009). Face mask use and control of respiratory virus transmission in households. *Emerging Infectious Diseases, 15*(2), 233. https://doi.org/10.3201/eid1502.081167

Presidencia de la República de Guatemala. (2020a). Disposiciones presidenciales en caso de calamidad pública y órdenes para el estricto cumplimiento. Guatemala, 12 de abril de 2020. Diario de Centro América, No. 48, T. 314. Retrieved from http://construguate.com/wp-content/uploads/2020/04/Disposiciones-presidenciales-12-de-abril-2020.pdf.pdf

Presidencia de la República de Guatemala. (2020b). Decreto gubernativo número 6-2020. Guatemala, 21 de marzo de 2020. Diario de Centro América, No. 34-B T. 314. Retrieved from https://export.com.gt/covid-19/sites/default/files/pdf/2020-05/DECRETO%20GUBERNATIVO%206-2020.pdf

R. Core Team (2019). *R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria* (version 3.6.3). https://www.R-project.org/.

Worldmeter. (2020). COVID-19 Coronavirus Pandemic. Retrieved May 6, 2020, from https://www.worldmeters.info/

World Health Organization. (2020a). WHO Coronavirus Disease (COVID-19) Dashboard. Retrieved from https://covid19who.int/?gclid=CjwKCAjwwab7BRBAEiwAapqpTLh2doxH9ClS9_0uD1oPP_1rjzSm3GU8yjQrrgbM9CbO87K6BxRoCt7UQAvD_BwE

World Health Organization. (2020b). Rational use of personal protective equipment for coronavirus disease 2019 (COVID-19): Interim guidance 27 February 2020. Retrieved from https://apps.who.int/iris/bitstream/handle/10665/331215/WHO-2019-nCov-IPCPPE_use-2020.1-engpdf?sequence=1&isAllowed=y

World Organisation for Animal Healt. (2020). Questions and answers on COVID-19. Retrieved May 6, from https://www.oie.int/en/scientific-expertise/specific-information-and-recommendations/questions-and-answers-on-2019novel-coronavirus/

Zhang, W., Du, R. H., Li, B., Zheng, X. S., Yang, X. L., Hu, B., ... Zhou, P. (2020). Molecular and serological investigation of 2019-nCoV infected patients: Implication of multiple shedding routes. *Emerging Microbes & Infections, 9*(1), 386-389. https://doi.org/10.1080/22221751.2020.1729071