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Knowledge and behavioral attitudes of the academic community of the high school and university levels towards the prevention of covid-19: a cross-sectional study in Guasave, Sinaloa

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Abstract. The COVID-19 pandemic impacts, worldwide, the daily activities of the population, in view of this, various preventive measures have been adopted to reduce the risks of contagion. In the educational field in Mexico, face-to-face classes have been suspended, adopting the use of electronic platforms; this, to avoid the risks of contagion. Measures like the aforementioned, the use of face masks, gels, healthy distance, face shields, among others, are already part of the daily routine. However, the level of perception, responsibility and behavior in the face of these measures by the various sectors of the population is unknown. In this study, the perception of high school and university students from Guasave, Sinaloa, Mexico is analyzed. To know the aforementioned aspects, a descriptive cross-sectional study was carried out using the convenience sampling technique, applying a survey made up of 18 items of Likert-type, designed on the Google Forms platform, to a sample of 940 students of both sexes, in 10 public and private schools. The results show that, more than 50% of the students of both educational levels, have a

perception that deviates from reality, they do not measure the importance of the preventive measures that the health sector recommends to reduce the contagion and lethality rate. Despite recognizing that the viral disease is contagious, they do not perceive the importance of measures such as washing hands with soap, using gels, masks, face masks, maintaining a healthy distance, among other sanitary measures. They assume the measure of confinement as necessary, although it generates stress and a decrease in their academic performance, reflected in low grades. The results found in the studied educational sector indicate that the educational authorities should strengthen the scientific learning of the students in relation to the epidemiological phenomenon of covid-19, in order to contribute to their conduct and implementation of health protection measures and prevention of this scourge.

Keywords. COVID 19, virus, high contagion, knowledge and students.

1. Introduction

Throughout the history of humanity, different diseases have arisen that have been classified as pandemics, they cause serious health problems and effects in various dimensions of social life. According to [1] pandemics appeared in humanity since man began to live and organize in a group, a situation that worsened with population growth. Thus, problems appeared such as the plague epidemic of 429 BC that killed Pericles in Athens. The Spanish flu of October 1918, which is described by De [2] indicating that 18 million people died in the world, severely affecting the population of various Mexican cities.

Among other flu is the Antonine, the Black Plague, Asian flu, Hong Kong flu, Acquired Immune Deficiency Virus (HIV), among others. Due to its impact, the most devastating for the Mexican population, is the one that occurred 500 years ago, about which Díaz del [3] indicates that, in 1520 in Cempoala, Veracruz, “Narváez came and brought a black man full of smallpox, the which infected all the Indians that were in a town called Cempoal, and from that town it spread throughout New Spain and there was a great pestilence”. This smallpox decimated the indigenous population during the Spanish conquest.

The pandemic generated by the SARS-CoV-2 coronavirus has become the largest global public health crisis in the last hundred years, affecting the socioeconomic components that influence all aspects of human development, including the education sector, which represents the engine for the economic growth of a country [4,5].

COVID 19 is caused by a recently discovered type of coronavirus, which, due to its evolutionary nature, belongs to the SARS-CoV-2 genome [6]. The World Health Organization [6] points out that coronaviruses represent an extensive family of viruses that can trigger contagious diseases, which can range from a simple cold to more serious life-threatening problems in humans. The origin of the virus that causes COVID-19 is the subject of constant debate on social networks and there has been much speculation about the case, however, the scientific community is working with solid bases to explain the emergence of this pandemic in humans [7].

To deal with this global health phenomenon, health and social care research systems focus on several multidimensional and interactive pillars with multidisciplinary approaches backed by science, beyond medicine such as political science, behavioral sciences, and social sciences such as anthropology, psychology, sociology, and media and communication studies [8].

For [9] “the appearance of a new infectious disease always supposes a complex situation, especially if it is an epidemic of significant extent or severity”. Given the severity of the pandemic, expressed by the high numbers of infected in each country and the high mortality

rates, "it will be recognized as one of the worst plagues suffered by humanity" [10]; a situation that has revealed, among governments and society, the shortcomings and strengths of the health system they have, hospital infrastructure, research, health development and effective information systems on the scope of the pandemic and its preventive care.

In response to the recent COVID-19 pandemic, each country has taken different measures to control it, resulting in huge disruptions in life. Considering that online learning helps to maintain social distance between students, the closure of schools was a significant disruption, followed by lack of physical activity and social isolation, which represents one of the main impacts to 91% or more of the student population [11–13].

This is why, [14] argue that the challenges for schools and universities, as well as for teaching staff and students, are very great, since they face a complex health phenomenon, which has represented a challenge in teaching strategies, due to the change from the face-to-face modality to a virtual environment, through the use of platforms and through a greater family commitment [15,16].

All countries of the world face serious health, social and economic challenges during the recent pandemic, due to which, the lack of knowledge of the population about the measures to face COVID-19 and the failure to follow standard operating procedures and the instructions issued by the Government could inhibit the effectiveness of the successful control of this pandemic [17]. The effectiveness of the strategies proposed by the health authorities depends, to a great extent, on the knowledge, attitude and practices of the population towards this new virus.

In the education sector, strategies were used to reduce contagion, such as the use of digital technologies, especially online technology [12] however, the perception of students about the pandemic and preventive measures to reduce the contagion and fatality rate is unknown. In the absence of this, it is difficult to evaluate and redesign a policy to contain and prevent the epidemiological phenomenon.

Based on the above, the present study aims to know the level of knowledge and responsibility of high school and university level students, categorically comparing what was expressed by each of the respondents, and thus determine the position and situation of this part of society faced with such a significant health problem.

To have better results, the participation of all areas of knowledge that are in a position to provide information is necessary so that the authorities make the best decisions that impact public health, which requires a high degree of commitment and social action [18].

2. Sampling

A descriptive cross-sectional study is presented, made up of an approximate universe of 21,543 students, of which 14,096 correspond to the upper secondary level and 7,447 of undergraduate, taking as reference available information from the 2016-2017 school year [19] students from 10 schools of both levels in the city of Guasave, Sinaloa, Mexico were consulted.

The study sample was determined according to the procedure indicated by [20] in accordance with the following formula:

The value of the elements used to calculate the sample size is shown in Table 1.



Table 1. Determination of the sample size

Parameter	Variable	High School	University
Population size	N	14096	7447
Confidence level	Z	1.96	1.96
Probability of success	P	50.0%	50.0%
Probability of failure	Q	50.0%	50.0%
Precision	D	4.12%	4.58%
Sample size	N	543.2	431.4

Substituting the data in the expression, the sample size is of 975 questionnaires, of which 543 correspond to the upper secondary level (who will be called the MS group from now on) and 432 to the college level (who will be identified as group S)

On the other hand, the schools were chosen by the social method of convenience, while the students were selected by the snowball method, involving students of both sexes who are currently pursuing their studies. Regarding the data collection, these were captured through the validated instrument called opinion on social behavior (COVID 19), made up of 18 Likert-type items with 5 response options in each of them, while the time of performance for the instrument, was between 2 and 5 minutes.

3. Results and Discussions

3.1. Statistic analysis

The total population is of 975 students, of the which 543 are from the MS group and 432 from the S group. Their age distribution is shown in table 2.

Table 2. Data of the respondents ordered by age.

Age	Population
17	249
18	132
19	106
20	91
21	64
22	16
23	15
24	4
25	7

1. Strongly disagree; 2. Partially disagree; 3. Indifferent; 4. Partially agree and 5. Totally agree

Positive responses were considered those with a value of 4 and 5 (partially agree and totally agree) and as negative responses to responses whose value is 1 and 2 (totally disagree and partially disagree). Answers with a value of 3 (indifferent) are taken into account to calculate how many students show indifference to the relevant question.

In the first and second lines of Table 3, the ages of the students and the number of them who answered positively (4 or 5) each of the questions are indicated respectively. For example, out of a total of 249 17-year-old students, 179 answered question 1 positively and 50 answered question 18.

Table 3. Positive accumulated values (value 4 and 5) for each item.

Age	17	18	19	20	21	22	23	24	25
TOTAL:	249	132	106	91	64	16	15	4	7
1.- Covid-19 is a disease caused by the SARS-COV2 virus.	179	71	65	59	49	8	8	2	5
2. Covid-19 can cause death to the infected.	211	108	84	74	52	13	13	3	5
3. The Covid-19 disease is acquired by contagion.	237	122	97	89	59	15	13	4	7
4. The use of a mouth cover in public places protects the infection of Covid-19.	225	113	89	74	56	15	11	4	6
5. I believe that healthy distance protects the infection of Covid-19.	225	116	94	82	58	14	11	4	7
6. The mask protects against the contagion of Covid-19.	223	112	91	79	53	14	11	4	5
7. Taking temperature and using gel when entering a public place protects the contagion of Covid-19.	206	96	81	71	46	14	10	3	5
8. Staying at home is effective in preventing the spread of Covid-19.	221	116	92	86	53	15	10	4	6
9. Frequent hand washing using soap eliminates the Covid-19 virus.	206	110	90	80	52	14	12	4	4
10. The person who has symptoms of Covid-19 should be immediately screened for the SARS-COV2 virus.	216	110	87	84	54	16	14	4	4
11. If the presence of the SARS-COV2 virus is detected, the infected person should be cared for in a hospital or at home.	202	113	83	79	53	14	12	3	4
12. Once the VACCINE against Covid-19 is applied, life will return to normal.	105	49	40	39	31	6	9	1	6
13. Not being able to attend the places I attended before the pandemic causes me stress.	168	92	74	58	40	11	12	3	5
14. I feel sad that I cannot meet my friends and family as I did before the pandemic.	217	104	86	81	52	14	13	3	6
15. The person who knows is infected by Covid-19 and nevertheless does not use mouth covers, gel, hand washing or respect the healthy distance. That person must be isolated against their will, even with the use of public force.	199	110	86	79	51	10	10	4	4
16. Face-to-face classes can become a means to spread the Covid-19 virus	156	87	69	58	42	6	9	3	4
17. The SARS-COV2 Virus (Covid-19) has had an impact on my academic life	213	109	94	75	49	14	13	4	6
18. Classes in the virtual mode have been satisfactorily supplied as they would be presented in the face-to-face mode.	50	36	27	31	27	4	4	2	2

Table 4 shows the relation obtained by dividing the number of students who answered positively by the total number of students (positive/total), this for each age. For example, for the 179 17-year-old students who answered question 1 out of a total of 219, the proportion is obtained by dividing 179/219, obtaining 0.72.

In questions 12 and 18 of table 4, it can be seen that they do not follow the trend of the rest of the questions, this is because these questions must be analyzed for values 1 and 2. Questions 1, 2, 4, 8, 9, 11, 14 are not affected by age, it can be said that their values are constant with respect to the age of the respondents. The trend in number 6 decreases slightly with respect to the increase in ages and there is a linear increase with respect to age in question number 13.

Table 4: Percentage of the population that answered positively (answers 4 and 5).

Age	17	18	19	20	21	22	23	24	25	Average
Pregunta 1	0.72	0.54	0.61	0.65	0.77	0.50	0.53	0.50	0.71	0.62
Question 2	0.85	0.82	0.79	0.81	0.81	0.81	0.87	0.75	0.71	0.80
Question 3	0.95	0.92	0.92	0.98	0.92	0.94	0.87	1.00	1.00	0.94
Question 4	0.90	0.86	0.84	0.81	0.88	0.94	0.73	1.00	0.86	0.87
Question 5	0.90	0.88	0.89	0.90	0.91	0.88	0.73	1.00	1.00	0.90
Question 6	0.90	0.85	0.86	0.87	0.83	0.88	0.73	1.00	0.71	0.85
Question 7	0.83	0.73	0.76	0.78	0.72	0.88	0.67	0.75	0.71	0.76
Question 8	0.89	0.88	0.87	0.95	0.83	0.94	0.67	1.00	0.86	0.87
Question 9	0.83	0.83	0.85	0.88	0.81	0.88	0.80	1.00	0.57	0.83
Question 10	0.87	0.83	0.82	0.92	0.84	1.00	0.93	1.00	0.57	0.87
Question 11	0.81	0.86	0.78	0.87	0.83	0.88	0.80	0.75	0.57	0.79
Question 12	0.42	0.37	0.38	0.43	0.48	0.38	0.60	0.25	0.86	0.46
Question 13	0.68	0.70	0.70	0.64	0.63	0.69	0.80	0.75	0.71	0.70
Question 14	0.87	0.79	0.81	0.89	0.81	0.88	0.87	0.75	0.86	0.84
Question 15	0.80	0.83	0.81	0.87	0.80	0.63	0.67	1.00	0.57	0.78
Question 16	0.63	0.66	0.65	0.64	0.66	0.38	0.60	0.75	0.57	0.61
Question 17	0.86	0.83	0.89	0.82	0.77	0.88	0.87	1.00	0.86	0.86
Question 18	0.20	0.27	0.26	0.34	0.42	0.25	0.27	0.50	0.29	0.31

Lastly, the percentage of the same population that answered positively two or more questions was calculated. The most notable was the population that answered positively question 13 related to sadness and question 17 related to their academic performance (see figure 10).

There are 428 students in the MS and S group who feel stress from not being able to get out and have lowered their grades. Only 35 students shown in group A of the Venn diagram say they feel stressed about not being able to get out, but that their grades have not been affected by the new reality of virtual classrooms. Another group of 149 students say they do not feel stress from virtual classes, but that their grades have dropped during the COVID-19 pandemic. In this regard, [21] point out that the affective component is oriented to the feelings and emotions that an individual has towards education.

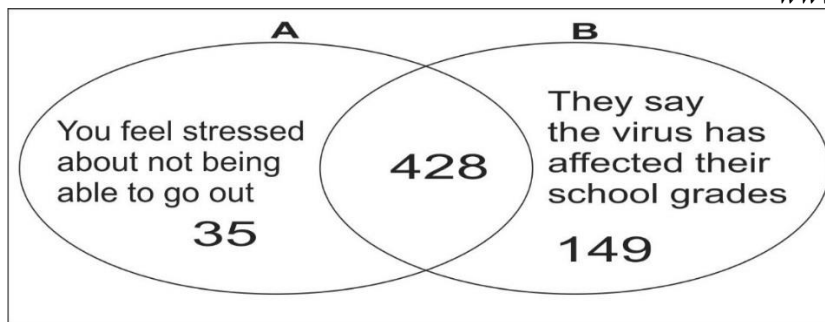


Figure 1. Venn diagram that shows that in group A 463 students, Group B 577 students and the intersection of both groups are 428 students.

The current COVID-19 pandemic has posed significant challenges for education systems in terms of teaching, learning, research collaborations and institutional governance. This represents an excellent opportunity for education authorities to reconsider and even redesign higher education with an effective risk management plan to increase the sustainability and resilience of this sector in the future, inviting us to participate in a critical review of the existing literature when analyzing students in international contexts [22].

Table 5. Knowledge about the disease.

Covid-19 is a disease caused by the SARS-COV2 virus.	
High School	University
47.15% Totally agree	39.58% Totally agree
17.13% Partially agree	21.76% Partially agree
27.07% Indifferent	28.01% Indifferent
3.68% Partially disagree	3.70% Partially disagree
4.97% Strongly disagree	6.94% Strongly disagree

Source: Own elaboration with information from the study

It can be observed that the students of the MS group show greater knowledge than those of the S group in relation to the cause of Covid-19.

Regarding the statement, Covid-19 can cause death to the infected. 58.01% of the MS group answered that they totally agreed. In group S, a 54.17%. That is, slightly more than half of both groups agree on the potential lethality of Covid-19 (see figure 2).

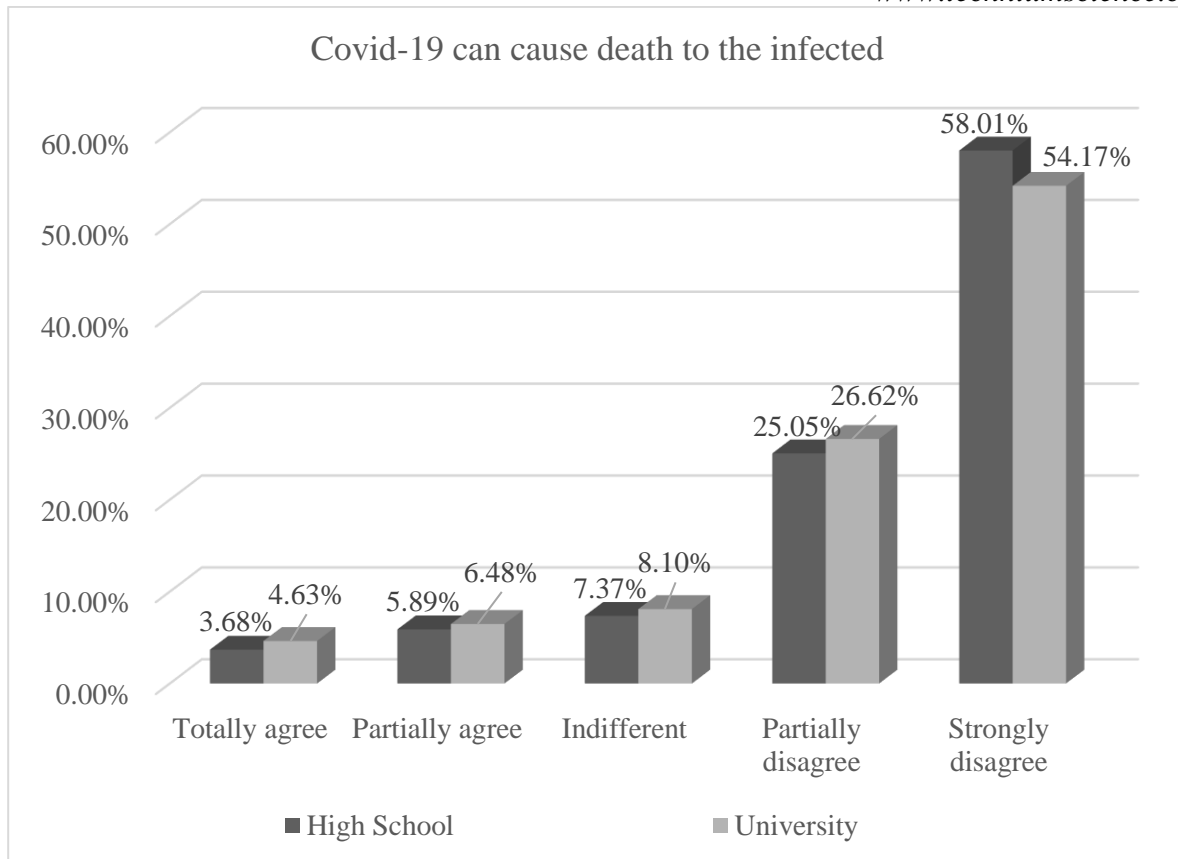


Figure 2. Identification of the disease as a cause of death

According to the Centers for Disease Control and Prevention (CDC), "COVID-19 is believed to spread primarily through close person-to-person contact, including between people who are physically close to each other." [23]. Regarding the study, it can be observed in figure 3 that 80.11% of the MS group fully agreed with the statement, while of the S group it was of 74.31%. The foregoing shows that most of the population knows that the disease is highly contagious, but when relating this to the data in the previous graph, where it was stated that just over half of the population knows that it can cause death, in other words, it is contagious but not as lethal for the surveyed group.

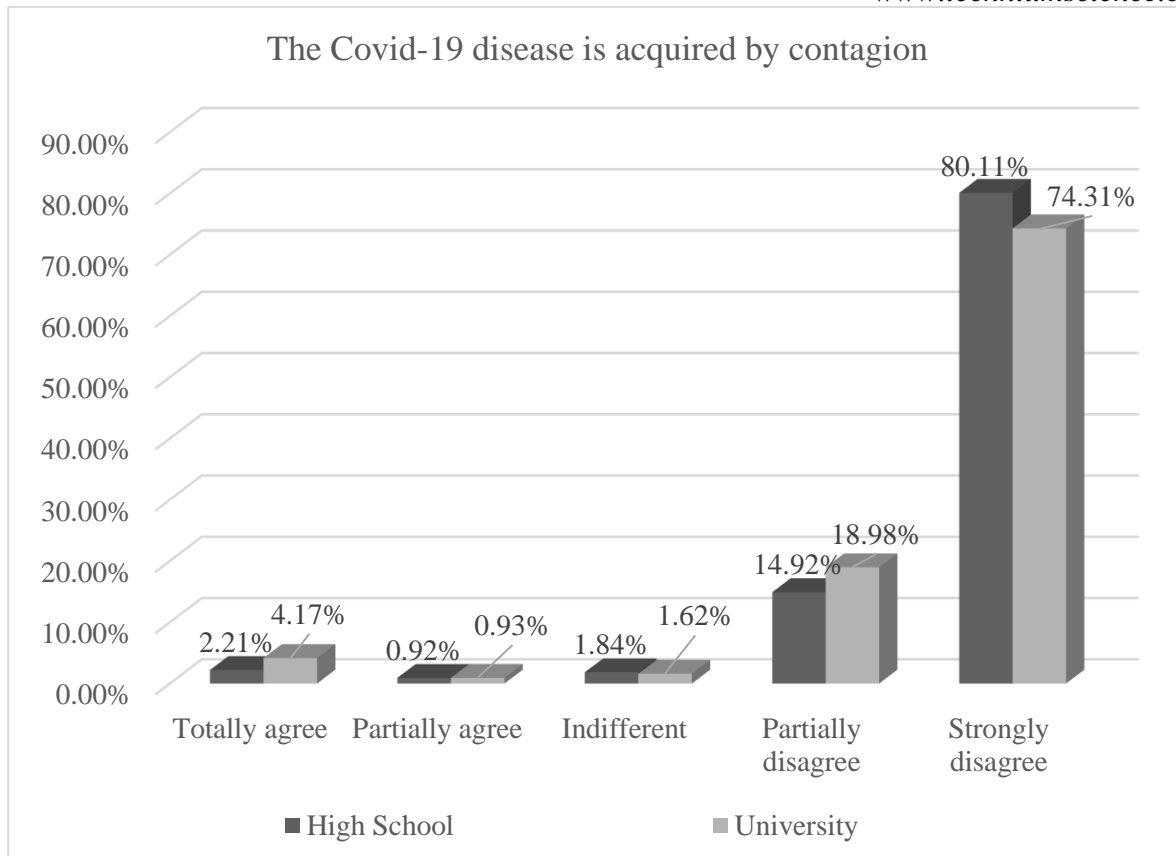


Figure 3. Form of acquisition of Covid-19 disease

Regarding *the use of the face mask in public places to avoid contagion*, 50.46% of the MS group considered the mask as a protection against contagion and 45.83% of the S group in the same sense. 36.28% of the MS group and 38.89% of the S group partially agreed with the level of protection of the face mask for this disease. These results are low and contrast with the WHO recommendation that considers the use of a face mask as one of the main measures to avoid the spread of this disease, in addition to keeping distance and washing hands [24].

The data of the study confirm that a significant percentage of the young population with studies, does not consider the face mask efficient when protecting them against this serious health problem, a situation that draws attention, since it is a social group whose years of schooling exceeds the average of the population of Guasave, Sinaloa.

When asking young people, the statement that *healthy distance protects people from the contagion of Covid 19*, it was found that 59.67% of the MS group and 58.10% of the S group totally agreed. 30.76% of the MS group and 30.56% of the S group partially agreed. 6.28% of the students considered healthy distance unnecessary against the disease. This contrasts with the agreement of the IMSS of the Mexican Government whereby “the main recommendations to prevent Covid-19 are: maintain a healthy distance of 1.5 meters, wash hands with soap and water for 40 seconds, use alcohol-based gel when 70 percent several times a day and wear a face mask during working hours” [25].

On *the use of a face mask as a protector against the disease*, 50.28% of the MS group and 45.53% of the S group agree. In the same order of the groups, 36.65% and 38.19 partially agree. The rest are between indifference and totally disagree (see figure 4).

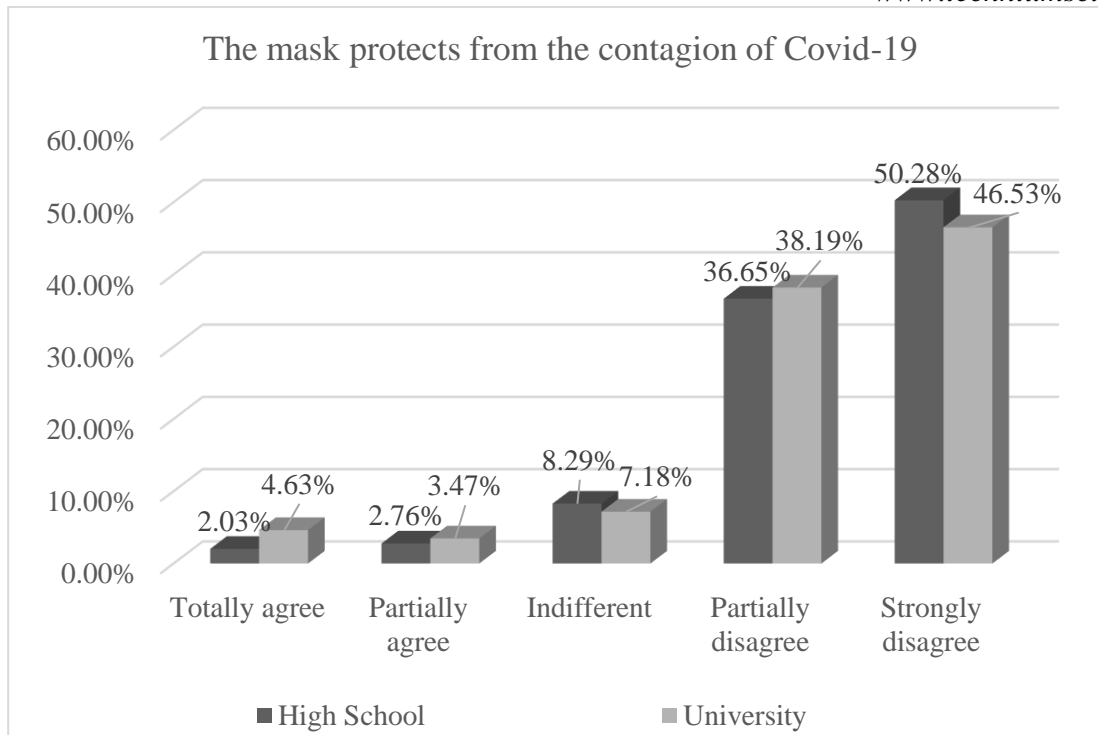


Figure 4. Protection from contagion of Covid 19 with a face mask

Regarding the protection of the person, when taking their temperature and using antibacterial gel when entering public places, 8.73% (MS and S group) considered these actions as unnecessary, 22.17% (MS and S group) of the youngsters was indifferent to this measure. On the other hand, only 44.20% of the MS group fully agreed with these measures. In group S, only 37.04% (see figure 5).

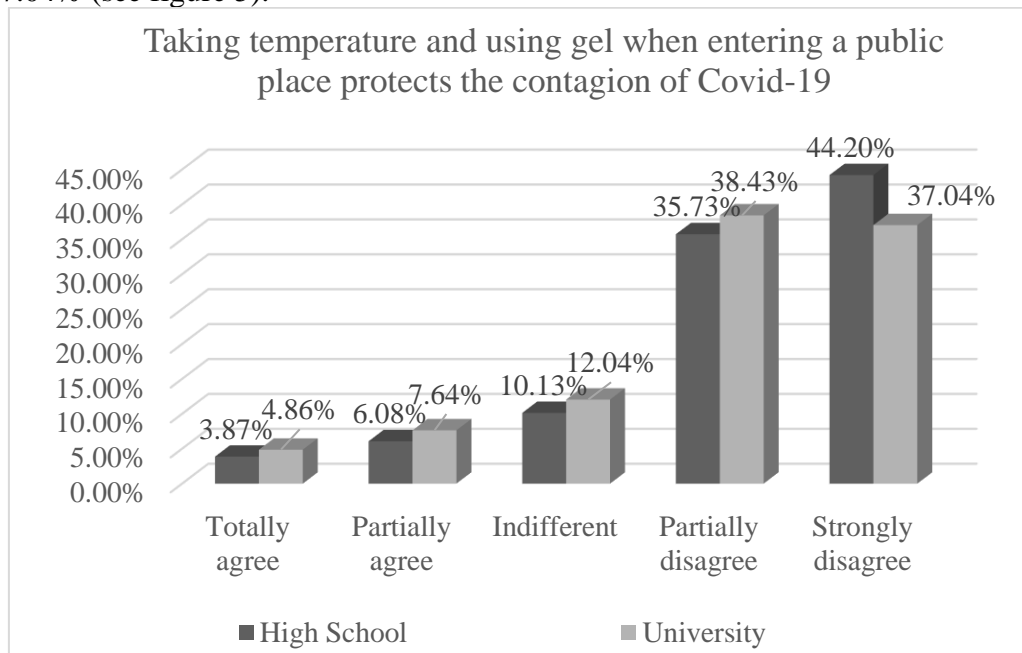


Figure 5. Temperature measurement and use of antibacterial gel as protection measures against Covid 19

Regarding *staying home as a protection measure against Covid 19*, at both levels of study (MS and S group) it was observed that the majority know that staying home is an efficient measure against the disease (72.38% and 67.82%). The rest of the youngsters were between partially in agreement and totally in disagreement with the statement, with percentages of less relevance (see figure 6). In this regard, the United Nations news website points out that staying home is an efficient strategy to avoid spreading the virus, since the levels of contagion are very high [26].

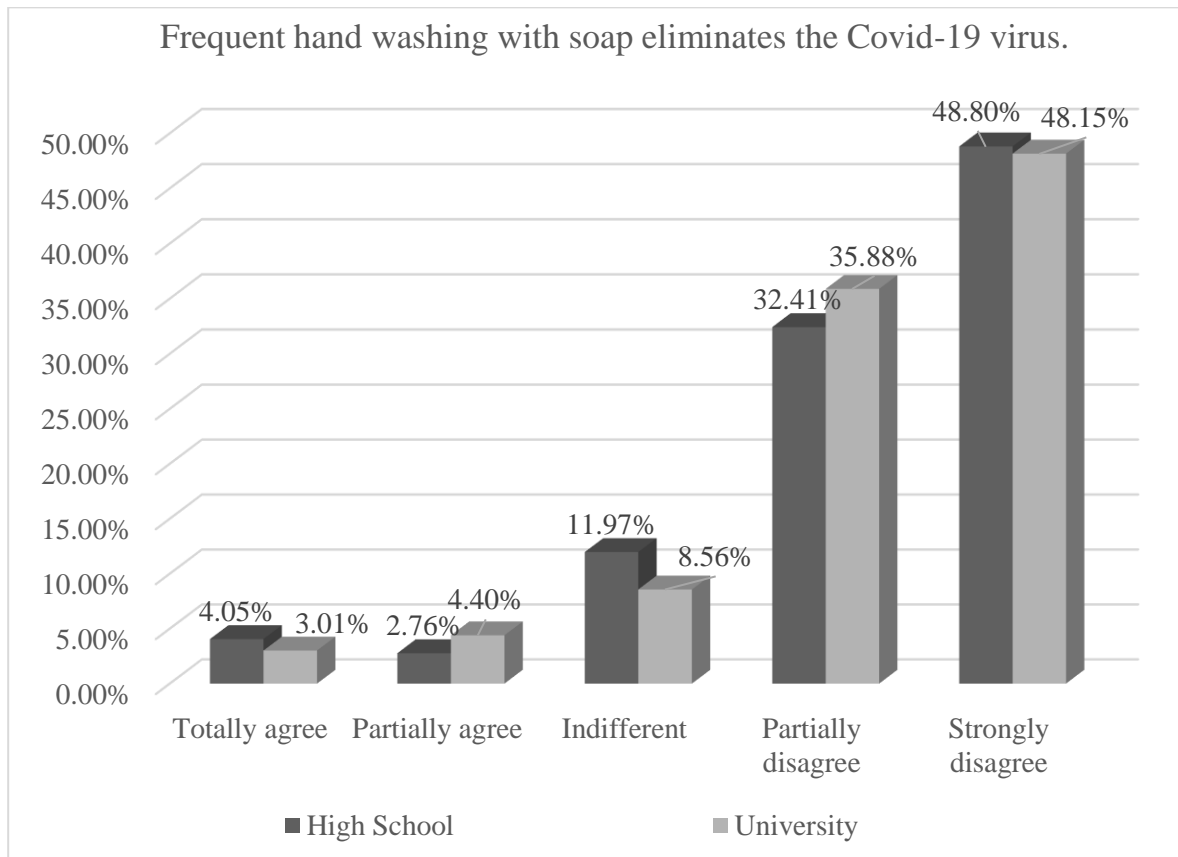


Figure 6. *Student's attitude to stay at home as an effective means to avoid the spread of Covid 19.*

One of the recommendations that is most promoted is frequent hand washing with soap [25,26] stating that this action eliminates the virus, and presents it to young people, only about half of the respondents from the MS and S groups fully agreed (48.80% and 48.15%, respectively). It is an implausible percentage given the contagiousness of the disease and the effectiveness of this measure (see figure 7).

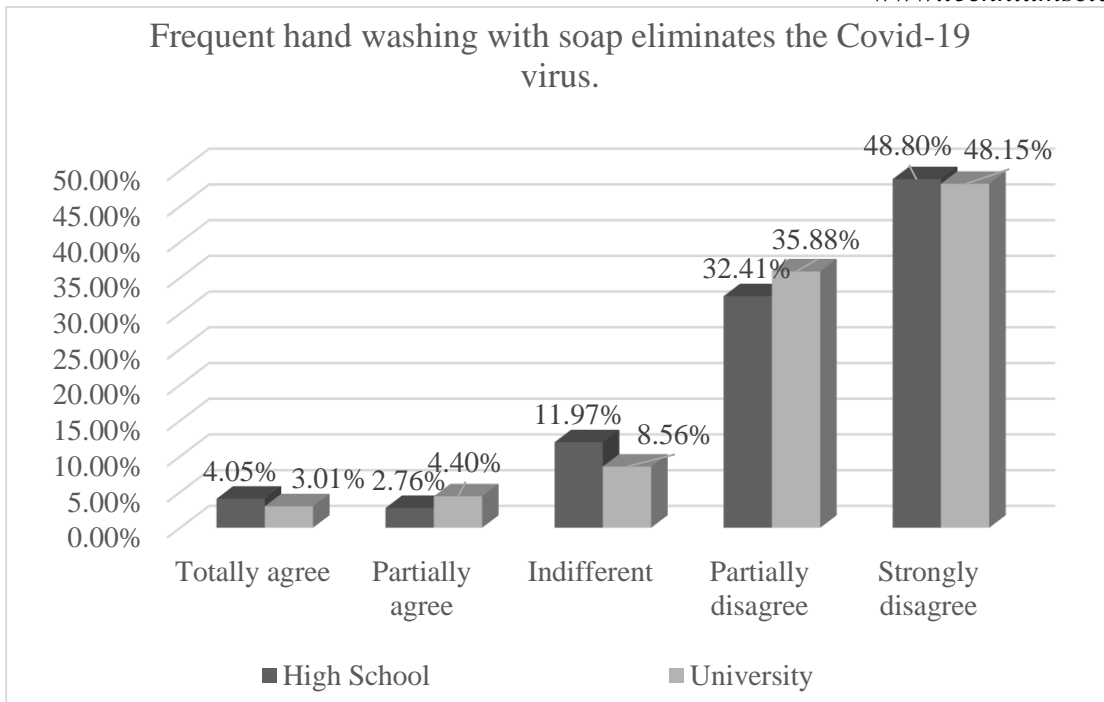


Figure 7. Student's perception of hand washing with soap to eliminate the Covid-19 virus.

Regarding the tests to detect the disease, on the part of people who present symptoms, in figure 8 it can be seen that 68.51% of students from the MS group considered this as a good action and, 60.88% from the S group affirmed the same (see figure 8).

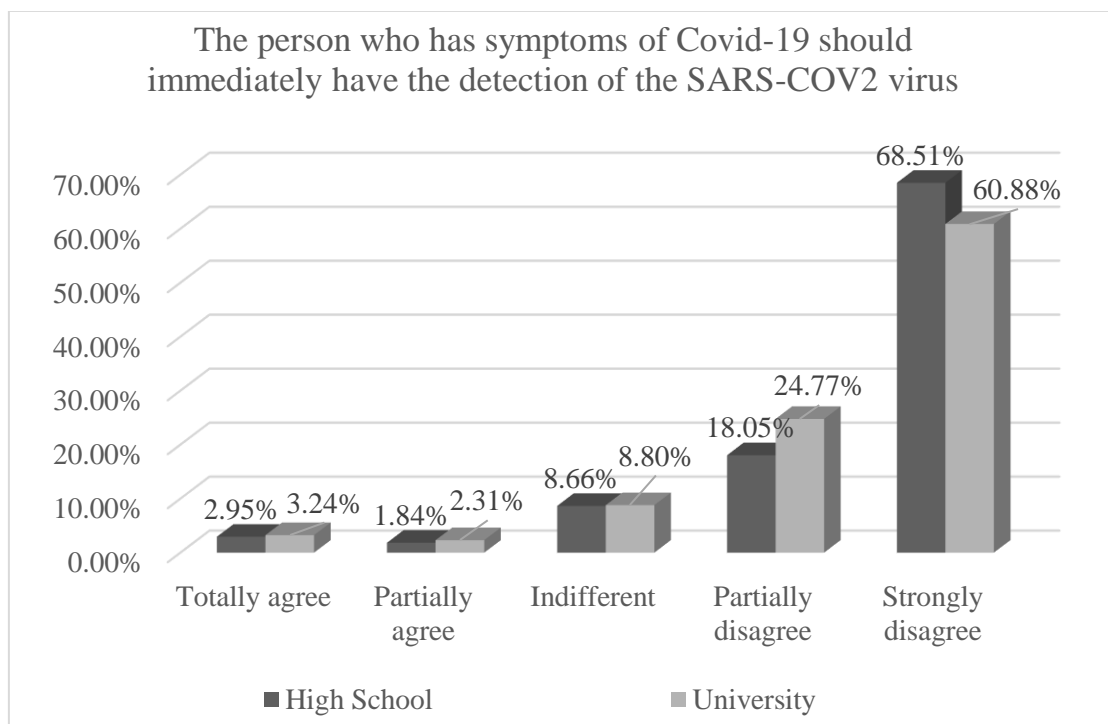


Figure 8. People with symptoms of Covid 19 should be tested for the disease

Regarding the care that the person should have, at home or in a hospital, if Covid 19 is detected positive. 64.27% of the MS group and 59.72% of the S group agree on this. 14.55% and 13.43% said they were indifferent to this statement, that is, they do not care where an infected person can be treated.

Regarding the statement *once the vaccine is applied, against Covid 19 life will return to normal*. Unlike the other statements, the responses were distributed among the five scales. 11.42% of the MS group and 13.19 of the S group agree that normality will return. Following the order of the groups, 27.44 and 28.44% partially agreed, 37.38% and 34% were indifferent, 14.55% and 13.89% partially disagreed, and 9.21% and 7.64% considered that the vaccine won't help you get back to normal (see figure 9). The low acceptance that the vaccine will return life to normal is striking, indifference predominates.

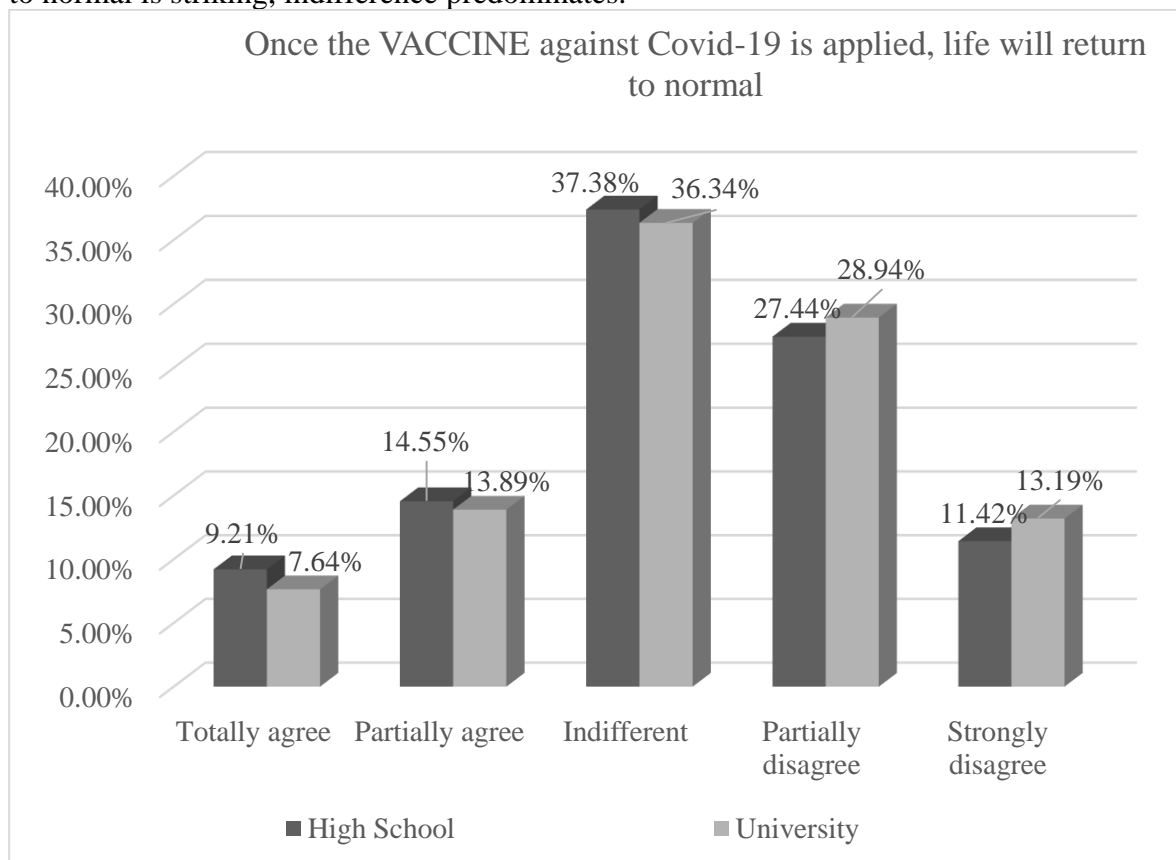


Figure 9. Life after the vaccine

By stating: Not being able to attend the places I attended before the pandemic causes me stress. The responses issued were divided as follows: 7.37% of youngsters from the MS group did not agree with it, that is, this does not cause them stress, as did 7.18% of the young people from the S group; relatively low percentages, comparing with 47.51% and 40.28% respectively between levels, that the confinement causes stress to them. On the other hand, both levels showed indifference just above 15% on this statement, that is, they do not care to be at home or not (see table 6). The foregoing clearly expresses that the young population misses the social life before the pandemic, especially the younger ones, a situation that is corroborated by the following data obtained when the respondents express their feelings about the lack of coexistence with friends and family.

Table 6. *Feeling of stress due to not being able to attend certain places due to the pandemic*

Not being able to attend the places I attended before the pandemic causes me stress

High School	University
47.51% Totally agree	40.28% Totally agree
21.55% Partially agree	27.78% Partially agree
15.10% Indifferent	15.50% Indifferent
8.47% Partially disagree	9.26% Partially disagree
7.37% Strongly disagree	7.18% Strongly disagree

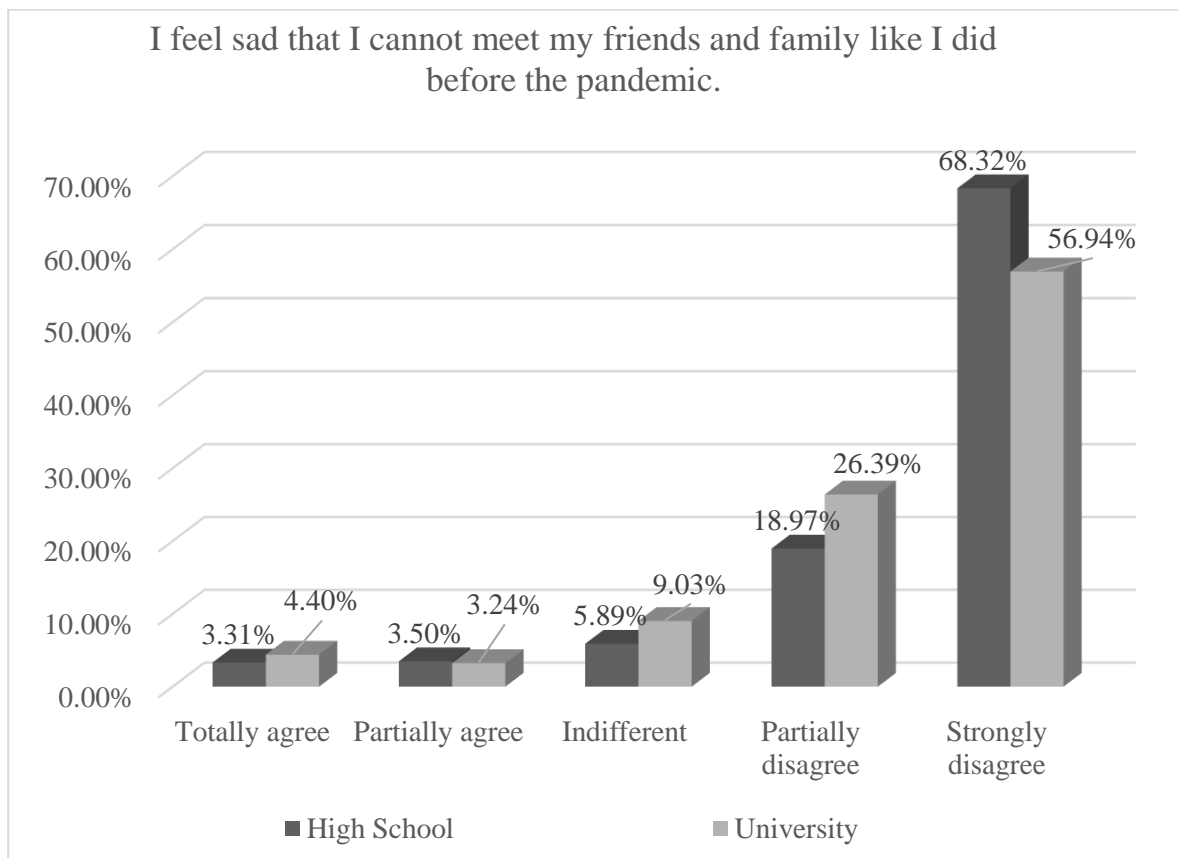


Figure 10 shows the feelings of sadness due to lack of coexistence with friends and family, where it is clearly observed that most young people miss social action between friends and family.

Figure 10. Feeling of sadness due to lack of conviviality with friends and family. Regarding the statement, the person who knows is infected by Covid-19 and nevertheless does not use a face mask, gel, hand washing or respect the healthy distance. The said person must be isolated against his will, even with the use of public force. 60.22% of the MS group and

59.95% of the S group were in favor of involuntary isolation. 4.79% and 4.63% of the same levels do not agree on forced confinement (see figure 11).

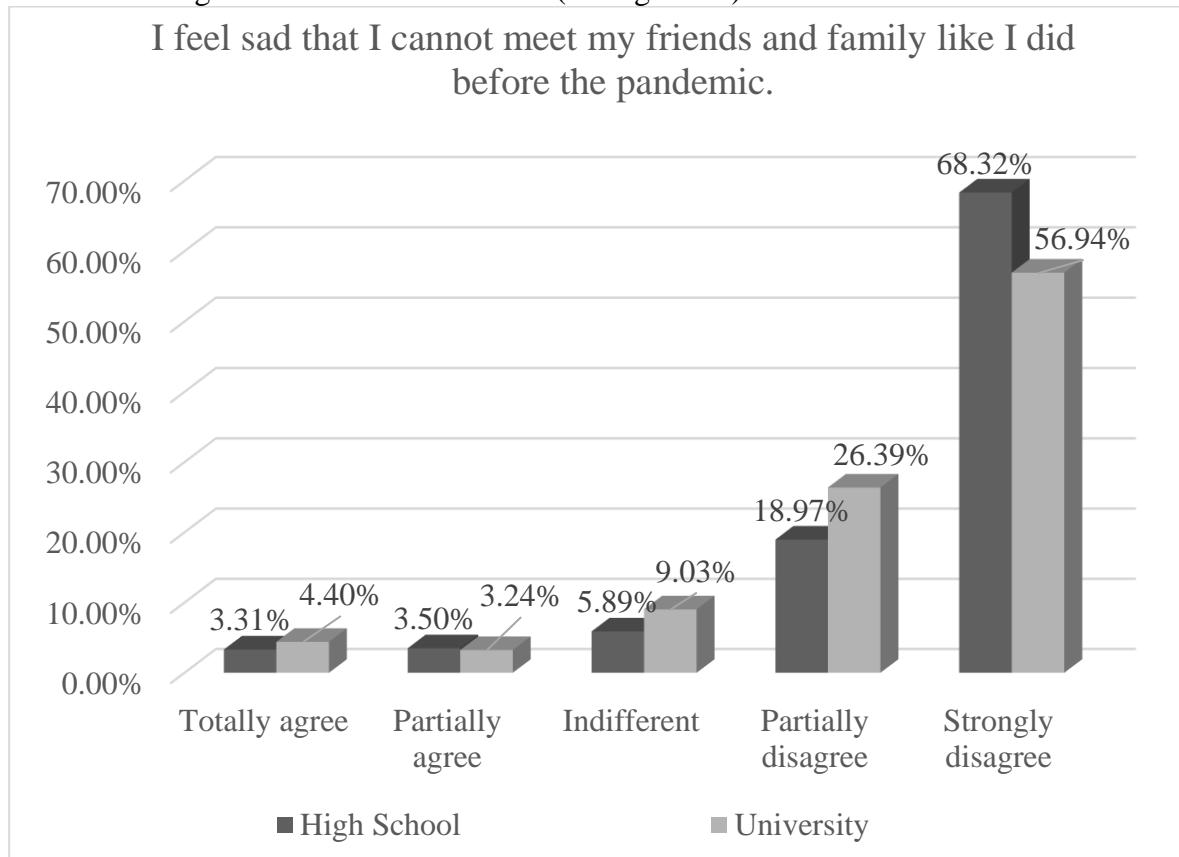


Figure 11. *Opinion on the isolation of infected people who do not use face mask, gel, hand washing or respect the healthy distance.*

By asking if face-to-face classes can become a means of spreading the virus. 34.07% and 34.72% (MS and S groups) agree on this, the rest are between partial and total disagreement, that is, youngsters do not consider that face-to-face classes can be a means of contagion, perhaps that answer is motivated from being estranged from socializing with young people of the same age.

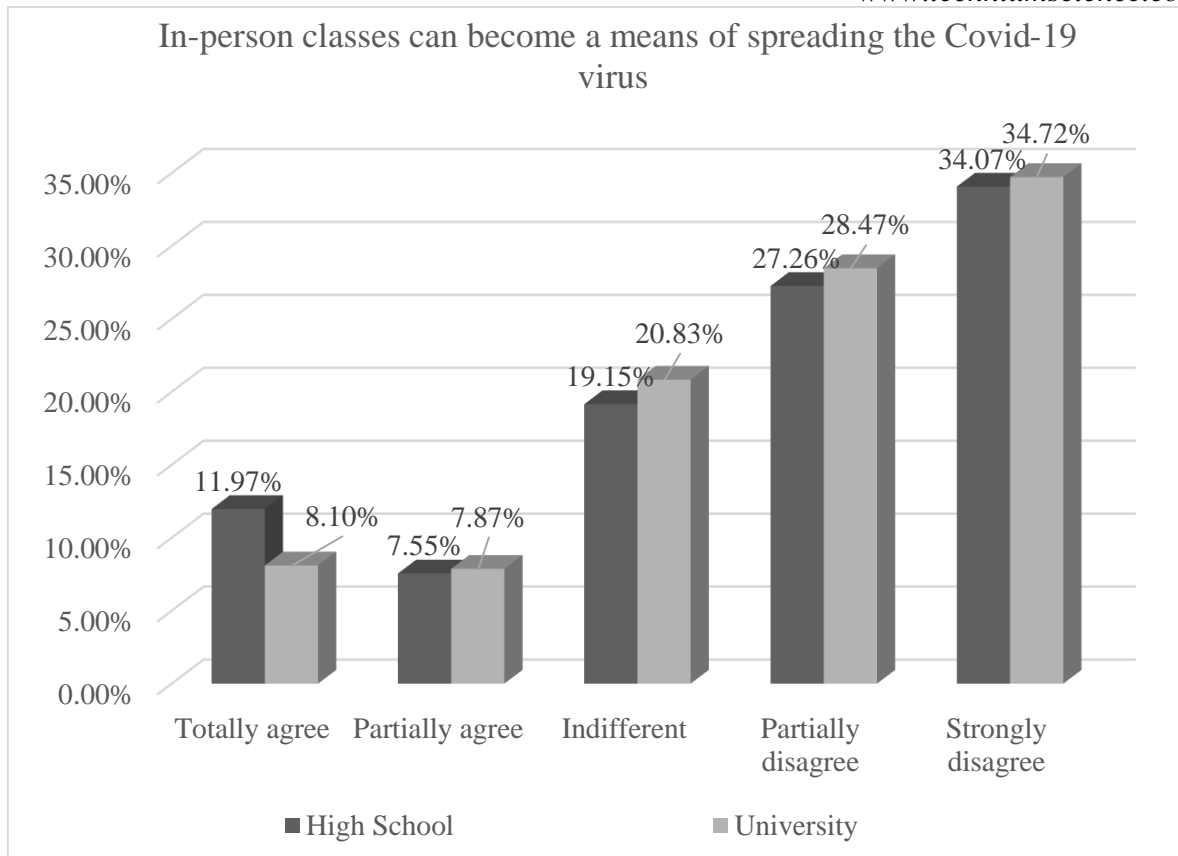


Figure 12. Face-to-face study modality as a means of spreading the disease

Regarding the statement *Covid 19 disease has affected his academic life.*

65.38% of the MS group and 59.49% of the S group share being affected in their academic life. 3.50% and 3.70% of the same levels, considered the opposite.

In a study carried out by the International Labor Organization (ILO) on young people and Covid 19, 73% of those surveyed expressed affection due to the closure of educational centers, of these 79% expressed affection in their studies [27].

In this study [27] Nadia Minhas states:

For me the biggest problem is the impact on my university. The alternative exams are different from what we would have done in our normal courses. I find it difficult to study and therefore get good results in these exams, which will affect my future career. Also, my apprenticeship contract was canceled, which means that I will have no training or experience when I graduate. (p.30)

In this sense, [28] make mention of different factors that affect online learning, such as inappropriate teaching and evaluation methods, and the inappropriate timing of online conferences and exams, among others.

Regarding the statement *The classes in the virtual modality have been satisfactorily supplied as they would be presented in the face-to-face modality.* 48.25% of the MS group and 34.03% of the S group agree with this statement. Following the order of the groups, 11.60% and 11.81% of the students consider that the virtual modality has satisfactorily met expectations. The 12.71% and 16.44% remained indifferent (see figure 13). These results indicate that the virtual modality has challenges to overcome.

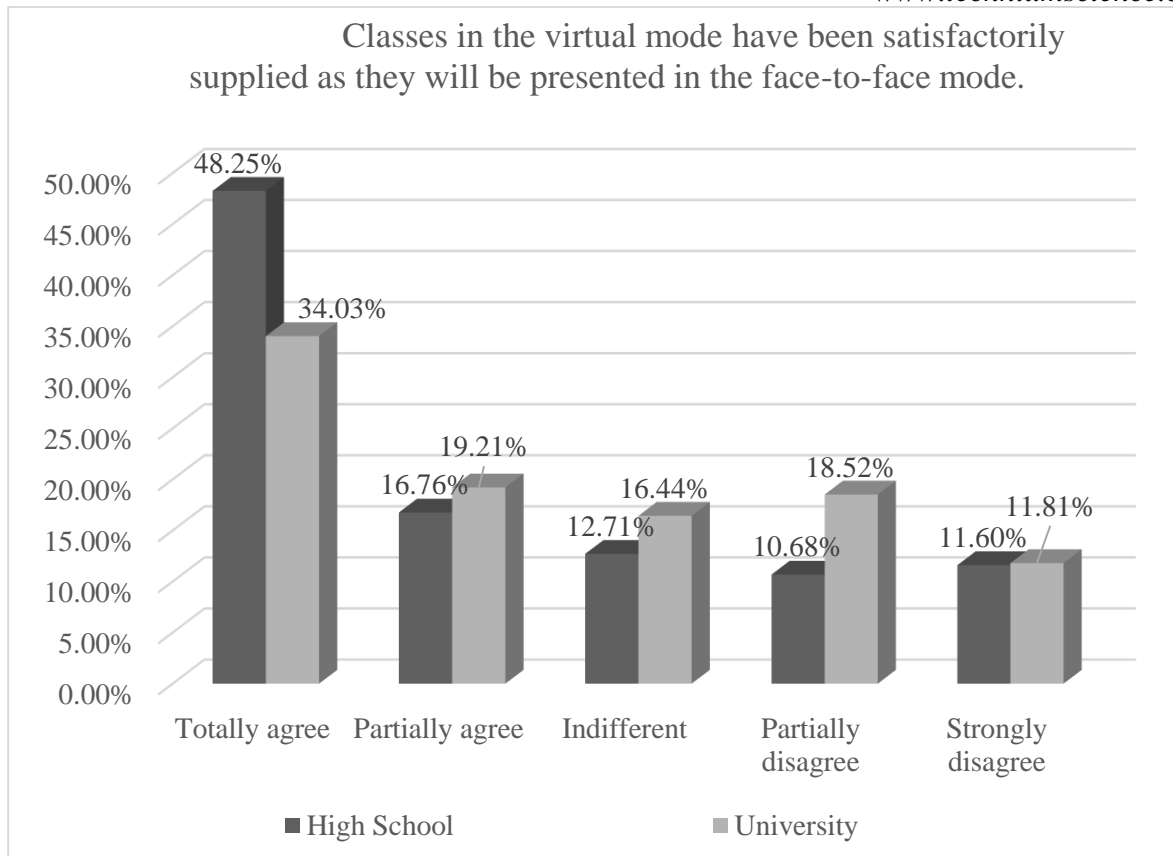


Figure 13. Preference for virtual or face-to-face modality due to the experience of the pandemic

Students prefer face-to-face instruction to the online system, as indicated in the study carried out by Aguilera-Hermida (2020), who refers to the importance of comparing students' perceptions about the use and acceptance of online learning between different countries, as a way to develop effective strategies.

4. Conclusions

In the face of the covid-19 pandemic, one of the major concerns of governments worldwide has been to maintain educational activities due to its importance in human development. Education, for the most part, is taught virtually, as is the case studied in Guasave, Sinaloa. The cross-sectional study shows that students are stressed by the change in the learning modality, from face-to-face to virtual. They also consider that their academic performance has decreased by 50%.

Young people want to return to normality, this situation is desirable, however, it will not happen without the responsible participation of all, assuming preventive measures that reduce the rate of infections, deaths and, above all, hospital occupation. In contrast to desire, the results show that students at both educational levels show low acceptance of the preventive measures recommended by the specialized medical sector.

The respondents perceive the contagion capacity of the virus, however, they consider that it does not have a lethal potential, nor do they consider important the use of a face mask, mask, gel, hand washing, healthy distance and temperature measurement; likewise, they doubt about the efficacy of the vaccine to return to normality.

These results reveal that it is important that educational authorities reinforce scientific learning strategies that raise awareness in young students about the importance of preventive

measures to reduce the risk posed by covid-19 for all, in addition to the multiple negative externalities in social life.

The population under study refers to the negative emotional aspect represented by the confinement measures imposed by the authorities on the education sector. This point is important to note, as this can significantly influence the success of educational programs.

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