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ORIGINAL RESEARCH

Sociodemographic Factors Associated with the Satisfaction Level of Peruvian Dental Students with Virtual Classes During the Covid-19 Pandemic: A Prospective Bicentric Study

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Background: The pandemic caused by Covid-19 impacted all areas of social, economic and educational activity. When there is a high risk of spreading highly infectious diseases, education is usually the first service to be suspended. The objective was to evaluate the sociodemographic factors associated with the satisfaction level of Peruvian dental students with virtual classes during the Covid-19 pandemic.

Methods: This observational, cross-sectional, analytical study evaluated 237 dental students from the capital city and one Peruvian province using a validated 13-item questionnaire to measure the level of satisfaction with virtual classes. Pearson's chi-square test and a logit model were used to evaluate the associated factors such as age group, sex, marital status, monthly family income, area of residence, place of origin, occupation and computer use, considering a significance level of $p<0.05$.

Results: Of all students, 50.6%, 40.1% and 9.3% presented a good, average and poor level of satisfaction, respectively, with the virtual classes received. In addition, those with a monthly family income of less than 500 US dollars were 3.15 times more likely to have poor satisfaction compared to those with a monthly family income of more than 1000 US dollars (AOR = 3.15; 95% CI: 1.23–8.05). The rest of the variables evaluated were not considered influential factors in the levels of satisfaction with the virtual classes received.

Conclusión: Of all students, 50.6% and 9.3% reported good and poor satisfaction with virtual classes during the COVID-19 pandemic, respectively. Monthly family income of less than 500 US dollars was an influential factor. In addition, the variables age group, sex, marital status, area of residence, place of origin, occupation and computer use were not found to be influential factors.

Keywords: e-learning, online learning, sociodemographic factors, satisfaction level, virtual classrooms, dentistry, Covid −19

Introduction

The COVID-19 pandemic, unlike any public health challenge, had the capacity to disrupt the delivery of many services including educational training.[1,2] The Peruvian government through Supreme Decree No. 044–2020-PCM extended by Supreme Decrees No. 051–2020-PCM, No. 064–2020-PCM and No. 075–2020-PCM agreed to take all responsible and necessary measures to prevent the spread of the coronavirus in the population,[3] decreeing mandatory social isolation for both public and private educational institutions. Therefore, face-to-face classes were suspended and alternative mechanisms such as remote or virtual classes were adopted. For this purpose, several virtual platforms, digital tools and new teaching-learning strategies were implemented.[2,4]

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In dental education, it was not a problem to continue teaching theoretical content online. However, it was a challenge to teach courses with practical content, since the syllabus requires the performance of clinical treatments on patients in order to cover certain procedural and attitudinal competencies typical of the professional profile. It was also a challenge to train professors in such a short time for the use of virtual teaching tools. Then, the same professor had to guide his students on the use of the virtual platform as well as to guarantee an optimal evaluation system and be ready to help solve possible unexpected contingencies during the development of the classes.[5] For all the above mentioned, some factors that could influence the students' perception of this teaching modality should be taken into account, such as an appropriate environment at home, exclusive access of the students to the use of the computer, access to quality Internet, knowledge and experience in the use of technological tools, among others.[4,6–9]

During the development of the present study, Peru was in the third wave of infection by COVID-19 with predominance of the SARS-CoV-2 omicron variant, which was distinguished by its high contagiousness and infectivity[10] that led to an increase of more than 50% in cases nationwide and more than 30% in the capital city. This is why it was necessary to continue with preventive measures at a general level such as the use of personal protective equipment, hand washing, vaccination and preventive measures at the academic level such as the development of remote and/or hybrid classes to mitigate the wave of contagion.[11,12]

In this context, student satisfaction with virtual classes plays an important role in motivation and commitment to the achievement of competency-based learning.[5] The good perception of online classes can constitute a basic and fundamental element that contributes to the student's efforts to develop competencies and achieve optimal training,[5] especially considering that the new consumers of online education expect it to offer benefits such as flexible schedules, greater feedback, time savings, better access to information, among others.[13]

Some studies of health science students reported that sociodemographic factors influenced satisfaction with virtual classes during the Covid-19 pandemic. For example, with respect to the academic year, Islam et al[14] and Sarialioglu-Gungor et al[15] found that first-year dental students had higher dissatisfaction compared to students in higher years.[14,15] On the other hand, Altawel et al and Taher et al reported that being female and being a fourth- and fifth-year student positively influenced satisfaction with virtual classes.[16,17] While Çirakoglu et al[18] reported that males were more satisfied with virtual classes than females. In addition, Islam et al,[14] reported that women showed greater dissatisfaction with virtual classes than men.[17] Other factors such as place of residence, household income and age group were positively associated with the level of satisfaction with virtual classes.[17] Whereas the use of a personal computer[17] was not an influential factor in satisfaction with virtual classes.

In view of the above, the purpose of the present was to evaluate the sociodemographic factors associated with the satisfaction level of Peruvian dental students with virtual classes during the Covid-19 pandemic. The null hypothesis was that there are no sociodemographic factors associated with the level of satisfaction of Peruvian dental students with virtual classes during the Covid-19 pandemic.

Methods

Study Design

This prospective, analytical, observational, cross-sectional study was written according to the STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) guidelines.[19] It was conducted from February to June 2022 at the Dental School of the San Juan Bautista Private University (UPSJB) based in the Peruvian capital (Lima) and with a branch in a Peruvian province (Ica).

Population and Selection of Participants

The study population consisted of 322 dental students of the San Juan Bautista Private University (UPSJB) enrolled in the 2022–1 semester. There were 121, 111 and 90 students in the third, fourth and fifth year of study, respectively. Since we were working with the entire population, no sample size calculation was required. The participants were N = 237 (68 third year, 59 fourth year and 110 fifth year) after considering the following eligibility criteria:

Inclusion Criteria

- Dental students of the UPSJB enrolled in Lima and the province of Ica, Peru.
- Dental students of the UPSJB regularly enrolled in the 3rd, 4th and 5th years of the semester 2022–1.
- Dental students of the UPSJB who agreed to participate through virtual informed consent.

Exclusion Criteria

- Dental students of the UPSJB who did not complete the virtual questionnaire.

Variables

The dependent variable was level of satisfaction with virtual classes. The independent variables were sex,[14,16–18] monthly family income,[20] computer use[21] and age group.[4,22] The possible confounding variables were marital status,[2,23] academic year,[15,17,24] area of residence,[17,25] place of origin[22,26,27] and occupation.[28]

Validation of the Instrument

A virtual questionnaire was adapted.[29] This consisted of 13 items (Q1 - Q13) with responses on a Likert scale from 1 to 5 points (from strongly disagree (1 point) to strongly agree (5 points)). The content analysis was validated by three experienced judges in education and research, obtaining an Aiken V of 0.88 (95% CI: 0.83–0.91). According to the principal components factor analysis with Varimax rotation, a dimension was identified with a determinant <0.001, a Kayser-Mayer-Olkin adequacy measure equal to 0.940 and a Bartlett's sphericity equal to <0.001, which showed acceptable metric properties.[30]

Cronbach's alpha was used to determine the internal consistency of the instrument, obtaining an acceptable reliability ($\alpha = 0.934$, 95% CI: 0.921–0.946). To evaluate the reproducibility of the instrument, 30 students were surveyed at two different times over a period of 10 days and the intraclass correlation coefficient (ICC) was applied to the total scores, obtaining 0.986 (95% CI: 0.971–0.994) which was acceptable.

The total scores of the questionnaire were categorized as 13 to 30 points (poor satisfaction), 31 to 47 points (average satisfaction) and 48 to 65 points (good satisfaction). These categories were established using the Stanones scale [mean total score ± 0.75 (standard deviation)]. The cutoff point was set based on poor satisfaction to dichotomize the dependent variable. This cut-off point was validated using Livingston's K^2 coefficient, obtaining 0.979 which is a very good value.

Procedure

The web link led immediately to the informed consent form with the institutional e-mail address, telephone number and full name of the principal researcher. The participant also had access to the e-mail address and name of the institutional ethics committee president. If they accepted to participate by means of the consent form, they were automatically directed to the next page where the questionnaire was found with instructions on how to complete it. Participants had the full right to decline the invitation or not to complete the questionnaire if they so wished. Only the principal researcher had access to the data. To ensure the confidentiality of all data, they were stored on a digital device with a security password. Only one complete response per student was accepted. To avoid repetition of responses, the virtual survey was configured to accept one response per associated email. In addition, students were asked to initial their first and last name along with their age (eg, EAP46) to filter out repetitions in case someone accessed the web link from two different emails. The invitees did not receive any incentive for their participation and had access from February 1 to June 30, 2022.

Data Analysis

The data were analyzed with the Stata statistical package (College Station, Texas, USA) version 17.0. For the descriptive analysis of the qualitative variables, absolute and relative frequencies were used. For the quantitative variable "age" the mean was used as a measure of central tendency and the standard deviation as a measure of dispersion. The test for association was used to compare the ordinal variables. To establish the association of the independent variables with the questionnaire items, Pearson's Chi-square test was used to verify whether the distribution of the observed response was random or significantly associated with an independent variable.[2] For multivariate analysis, risk factors were evaluated

under a logistic regression model (logit model) using AOR (Adjusted Odds Ratio) with the stepwise technique. All analyses were performed with significance set at $p<0.05$.

Ethical Aspects

The present study respected the bioethical principles of the Declaration of Helsinki related to respect, freedom, nonmaleficence and confidentiality.[31] It also had the approval of an Institutional Research Ethics Committee of the UPSJB with approval resolution No. 12–2022-CIEI-UPSJB and dated January 17, 2022. In addition, students who decided to participate were asked to give their voluntary informed consent on the first page of the virtual questionnaire.

Results

The majority of the 237 participants (54.4%) were younger than 25 years although the mean age was 25.5 ± 5.6 years. The predominant sex was female with 67.9%. The 78.5% were single. Forty-three percent had a monthly family income of less than 500 US dollars. The vast majority of students (83.5%) lived in the central urban area and 59.1% were originally from the capital. Of the total number of students, 70.9% worked and studied at the same time, and 73% had a computer for personal use. Finally, the majority were 5th year students (46.4%) (Table 1). On the other hand, 9.3% of the total number of students showed a poor level of satisfaction, while 40.1% showed average satisfaction, and 50.6% reported a good level of satisfaction (Figure 1).

The level of satisfaction was significantly associated with the academic year of the participants ($p = 0.024$). Age group, sex, marital status, monthly family income, area of residence, place of origin, occupation, and personal or shared computer use were not associated with students' level of satisfaction ($p> 0.05$) (Table 2).

There were statistically significant associations between age group and Q5 (I think that combined classes (virtual/face-to-face) would allow me to learn better.), Q9 (I am satisfied with the internet connection during the virtual classes.) and Q12 (The professors' response to my queries in the virtual environment was timely.) ($p = 0.035$, $p = 0.009$ and $p =$

Table 1 Sociodemographic Variables of Dental Students at a Peruvian University

Variable	Category	Frequency	Percentage
Age group	< 25 years	129	54.4
	≥ 25 year	108	45.6
Sex	Female	161	67.9
	Male	76	32.1
Marital status	Single	186	78.5
	Married or cohabiting	51	21.5
Monthly family income	< 500 US dollars	102	43
	500 to 1000 US dollars	91	38.4
	> 1000 US dollars	44	18.6
Area of residence	Central urban	198	83.5
	Marginal urban	39	16.5
Place of origin	Capital	140	59.1
	Province	97	40.9
Occupation	Studying	69	29.1
	Studying and working	168	70.9
Computer use	Personal	173	73
	Shared	64	27
Academic year of study	3rd year	68	28.7
	4th year	59	24.9
	5th year	110	46.4
Age	**Mean**	**Median**	**SD**
	25.5	24	5.6

Abbreviation: SD, Standard Deviation.

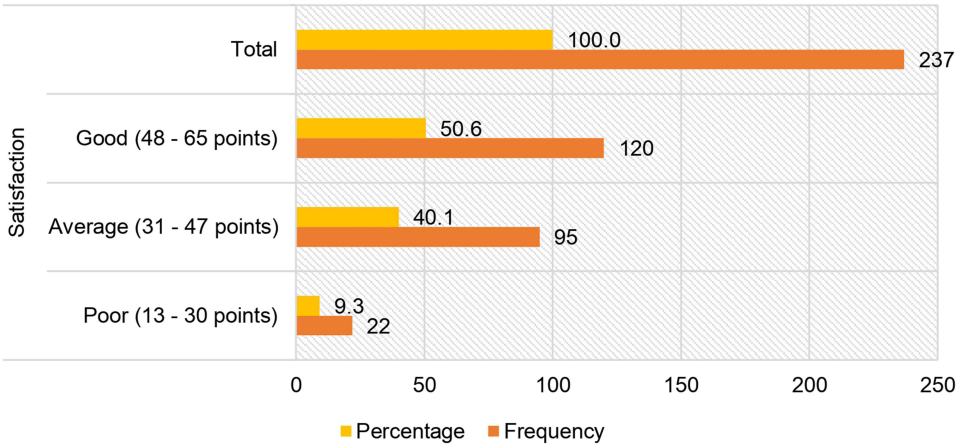

Figure 1 Absolute and relative frequency of dental students' level of satisfaction with virtual classes.

0.024; respectively). Sex was significantly associated with Q1 (Virtual classes allow me to learn as much as in-person classes.) and Q2 (Teachers provide feedback on tests and assignments.) ($p = 0.001$ and $p = 0.004$; respectively). Marital status was significantly associated with Q6 (I am satisfied with my practical or laboratory activities during the virtual classes.), Q9 and Q12 ($p = 0.023$, $p = 0.002$ and $p = 0.019$; respectively). Monthly family income was significantly associated with Q9 ($p = 0.044$). Area of residence was significantly associated with Q6 and Q10 (The virtual classes allow me to broaden my theoretical knowledge.) ($p = 0.038$ and $p = 0.041$; respectively). Finally, occupation was significantly associated with Q3 (I am satisfied with the virtual platform(s) used in classes.), Q9 and Q10 ($p = 0.005$, $p = 0.015$ and $p = 0.028$; respectively) (Table 3).

Table 2 Level of Satisfaction About Virtual Classes Associated with Students' Sociodemographic Factors

Variable	Category	Satisfaction			p*
		Poor	Average	Good	
Age group	< 25 years	9 (7.0)	51 (39.5)	69 (53.5)	0.350
	≥ 25 years	13 (12.0)	44 (40.7)	51 (47.2)	
Sex	Female	16 (9.9)	65 (40.4)	80 (49.7)	0.848
	Male	6 (7.9)	30 (39.5)	40 (52.6)	
Marital status	Single	16 (8.6)	69 (37.1)	101 (54.3)	0.098
	Married or cohabiting	6 (11.8)	26 (51.0)	19 (37.3)	
Monthly family income	< 500 US dollars	15 (14.7)	39 (38.2)	48 (47.1)	0.134
	500 to 1000 US dollars	6 (6.6)	38 (41.8)	47 (51.6)	
	> 1000 US dollars	1 (2.3)	18 (40.9)	25 (56.8)	
Area of residence	Central urban	19 (9.6)	82 (41.4)	97 (49.0)	0.522
	Marginal urban	3 (7.7)	13 (33.3)	23 (59.0)	
Place of origin	Capital	11 (7.9)	52 (37.1)	77 (55.0)	0.250
	Province	11 (11.3)	43 (44.3)	43 (44.3)	
Occupation	Studying	5 (7.2)	25 (36.2)	39 (56.5)	0.481
	Studying and working	17 (10.1)	70 (41.7)	81 (48.2)	
Computer use	Personal	14 (8.1)	76 (43.9)	83 (48.0)	0.120
	Shared	8 (12.5)	19 (29.7)	37 (57.8)	
Academic year of study	3rd year	10 (14.7)	25 (36.8)	33 (48.5)	0.024*
	4th year	2 (3.4)	18 (30.5)	39 (66.1)	
	5th year	10 (9.1)	52 (47.3)	48 (43.6)	

Note: *Based on Pearson's Chi-square, $p<0.05$ (significant association).

Table 3 Satisfaction Scale of Dental Students' Virtual Classes Associated with Their Sociodemographic Variables

Question	SD	D	N	A	SA	Age Group	Sex	Marital Status	Monthly Family Income	Area of Residence	Place of Origin	Occupation	Computer Use	Academic Year of Study
	f (%)	f (%)	f (%)	f (%)	f (%)	f (%)	p*	p*	p*	p*	p*	p*	p*	p*
Q1. Virtual classes allow me to learn as much as in-person classes.	4 (1.7)	53 (22.4)	32 (13.5)	111 (46.8)	37 (15.6)	0.223	0.001*	0.316	0.533	0.137	0.183	0.104	0.516	0.527
Q2. Teachers provide feedback on tests and assignments.	4 (1.7)	46 (19.4)	33 (13.9)	122 (51.5)	32 (13.5)	0.201	0.004*	0.215	0.281	0.644	0.291	0.093	0.660	0.324
Q3. I am satisfied with the virtual platform(s) used in classes.	6 (2.5)	56 (23.6)	34 (14.3)	114 (48.1)	27 (11.4)	0.548	0.151	0.607	0.787	0.151	0.939	0.005*	0.193	0.322
Q4. I am satisfied with the virtual class schedule.	8 (3.4)	41 (17.3)	34 (14.3)	126 (53.2)	28 (11.8)	0.567	0.078	0.268	0.487	0.482	0.347	0.379	0.408	0.436
Q5. I think that combined classes (virtual/face-to-face) would allow me to learn better.	7 (3.0)	31 (13.1)	35 (14.8)	128 (54.0)	36 (15.2)	0.035*	0.422	0.900	0.385	0.467	0.725	0.134	0.533	0.250
Q6. I am satisfied with my practical or laboratory activities during the virtual classes.	5 (2.1)	42 (17.7)	33 (13.9)	131 (55.3)	26 (11.0)	0.116	0.073	0.023*	0.747	0.038*	0.892	0.060	0.282	0.466
Q7. I am satisfied with what I have learned in virtual classes and I am confident to apply it into practice with patients.	4 (1.7)	32 (13.5)	31 (13.1)	139 (58.6)	31 (13.1)	0.248	0.421	0.818	0.597	0.155	0.445	0.053	0.291	0.373
Q8. I am satisfied with the experience gained through virtual courses or training prior to the pandemic.	5 (2.1)	37 (15.6)	44 (18.6)	118 (49.8)	33 (13.9)	0.533	0.153	0.399	0.149	0.568	0.268	0.269	0.413	0.850
Q9. I am satisfied with the internet connection during the virtual classes.	18 (7.6)	52 (21.9)	32 (13.5)	111 (46.8)	24 (10.1)	0.009*	0.051	0.002*	0.044*	0.905	0.515	0.015*	0.259	0.278
Q10. The virtual classes allow me to broaden my theoretical knowledge.	7 (3.0)	26 (11.0)	29 (12.2)	141 (59.5)	34 (14.3)	0.215	0.721	0.061	0.272	0.041*	0.718	0.028*	0.291	0.163
Q11. The virtual classes allow me to obtain clinical and/or practical skills.	56 (23.6)	65 (27.4)	27 (11.4)	77 (32.5)	12 (5.1)	0.088	0.113	0.206	0.320	0.210	0.289	0.500	0.299	0.258
Q12. The professors' response to my queries in the virtual environment was timely.	14 (5.9)	32 (13.5)	26 (11.0)	134 (56.5)	31 (13.1)	0.024*	0.892	0.019*	0.558	0.574	0.118	0.285	0.623	0.204
Q13. I am confident to take exams after taking online classes.	22 (9.3)	22 (9.3)	25 (10.5)	113 (47.7)	55 (23.2)	0.405	0.328	0.581	0.283	0.702	0.147	0.693	0.687	0.361

Notes: f: Absolute frequency; *Based on Pearson's chi-square, ($p<0.05$, significant association).
Abbreviations: SD, Strongly disagree; D, Disagree; N, Neutral; A, agree and SA, Strongly agree.

Table 4 Multivariable Logistic Regression Model of Dental Students' Satisfaction with Virtual Classes According to Their Sociodemographic Factors

Variable	Category	Crude Model					Adjusted Model				
		β	OR	95% CI		p	β	AOR	95% CI		*p
				LL	UL				LL	UL	
Age group	< 25 years	−0.49	0.61	0.20	1.86	0.388					
	≥ 25 years		*Ref.*								
Sex	Female	0.12	1.13	0.39	3.28	0.826					
	Male		*Ref.*								
Marital status	Single	0.06	1.06	0.32	3.49	0.921					
	Married or cohabiting		*Ref.*								
Monthly family income	< 500 US dollars	1.87	6.51	0.78	54.00	0.083	1.15	3.15	1.23	8.05	*0.016
	500 to 1000 US dollars	1.05	2.85	0.32	25.19	0.346					
	> 1000 US dollars		*Ref.*				*Ref.*				
Area of residence	Central urban	0.79	2.21	0.56	8.70	0.258					
	Marginal urban		*Ref.*								
Place of origin	Capital	−0.48	0.62	0.23	1.63	0.330					
	Province		*Ref.*								
Occupation	Studying	−0.28	0.75	0.23	2.48	0.641					
	Studying and working		*Ref.*								
Computer use	Personal	−0.42	0.66	0.24	1.81	0.417					
	Shared		*Ref.*								
Academic year of study	3rd year	0.55	1.73	0.63	4.75	0.288					
	4th year	−1.06	0.35	0.07	1.75	0.200					
	5th year		*Ref.*								
Model constant		−3.62	0.03	0.002	0.41	0.009	−2.91	0.05	0.03	0.12	<0.001

Notes: *Logit model adjusted under the stepwise technique for all variables; *p<0.05 (significant association). The Pseudo R^2 of the model was 0.111. β: determination coefficient.

Abbreviations: OR, Odds ratio; AOR, Adjusted Odds ratio; 95% CI, 95% confidence interval.

In the multivariable analysis the dependent variable was satisfaction about virtual classes. It was considered as poor = 1 and as average/good = 0 since the category of interest was poor satisfaction. Therefore, after performing the adjusted model with the stepwise technique, it was observed that dental students who received a monthly family income of less than 500 US dollars were 3.15 times more likely to have poor satisfaction compared to those whose monthly family income was greater than 1000 dollars (AOR = 3.15; 95% CI: 1.23–8.05), significantly (p = 0.016). The variables age group, sex, marital status, monthly family income, area of residence, place of origin, occupation and computer use were not considered influential factors in the dental students' level of satisfaction with the virtual classes (Table 4).

Discussion

The COVID-19 pandemic produced changes in the health, economic, social, labor and educational sectors. In the educational sphere, most universities were forced to suspend their face-to-face activities and seek alternatives to guarantee the continuity of teaching. For this reason, learning migrated to a virtual modality. This change posed challenges for professors and students since most of them were not prepared for the use of technological tools. However, it should be recognized that for many dental students this situation meant time savings, cost reduction, online consultations, patient referrals, health promotion, among others.[32–34]

It is known that the dental education is not designed to be developed completely through distance or virtual education. This could cause concern for students in acquiring manual skills and competencies that will allow them to practice their profession in an ideal way.[5] Therefore, the purpose of the present study was to evaluate the sociodemographic factors

associated with the satisfaction level of Peruvian dental students with virtual classes during the Covid-19 pandemic. As a result, the null hypothesis was rejected.

The results of the present study showed that 50.6% of participants had a good level of satisfaction, differing from that reported by Alvarado et al[35] who found that 28.0% of Peruvian students had good satisfaction. This may be attributed to the fact that the present study was carried out in dental students from a private university unlike the study by Alvarado et al[35] which was developed in students from a public university. It is known that in these public institutions the policies to adopt the virtual modality implied complex and bureaucratic administrative processes due to the lack of technical personnel to allow the efficient functioning of the virtual classroom for the participants, which led to a series of difficulties for the development of the virtual classes.[36] Likewise, these results did not agree with those reported by Al-Taweel et al[16] who indicated that 39.2% of dental students had good satisfaction with virtual classes. This could be due to the fact that those surveyed by Al-Taweel et al[16] developed their classes in the first stage of the pandemic (year 2020), a time of little training and experience in the management of virtual tools, in addition to the fact that the students were still accustomed to the in-person dynamics.[14,34,37] All of the above added to the anxiety and uncertainty about the educational process during the pandemic[2,34,38] could have contributed to a lower level of satisfaction. The present study was conducted two years after the beginning of the pandemic (year 2022) and possibly with the passage of time the conditions and the educational environment improved, providing better learning.[39] The results obtained are not similar to those reported by Herr et al[34] who found that 74.1% of students showed good satisfaction. This may be explained by the fact that this study was conducted only in third year dental students. In that academic year, oral health promotion practices are performed on patients. At that time, dental professionals and students were in the category of "very high risk of exposure" because they came into contact with potentially contaminated bioaerosols during dental procedures.[2,40,41] Possibly not coming into contact with potentially infected patients or biocontaminated aerosols could have influenced the good satisfaction presented by feeling at ease developing virtual classes without the risk of becoming infected and putting their vulnerable family members at risk.[4]

The present study showed that the level of satisfaction was significantly associated with the academic year of the participants, as it was observed that 10% of 4th and 5th year students showed a poor level of satisfaction, in contrast to 3rd year students, where almost 15% of students showed a poor level of satisfaction. These findings are similar to those reported by Al-Taweel et al who found that satisfaction with online classes was associated with the year of study.[16] This may be because students in their final years have advanced computer skills and some online learning experience in addition to extensive clinical experience gained in years prior to the pandemic, which gave them a greater sense of security, confidence and competence.[16,42] However, although year of study was associated with level of satisfaction with virtual classes, it was not considered as an influential factor under logistic regression analysis. This shows that the association of variables does not always necessarily indicate causality or influence.[43,44] The academic year may not have been a determining factor for complete satisfaction with the virtual study modality because the dental students considered that direct contact with patients and the possibility of having in-person guidance from the professor were important factors for improving manual skills when performing clinical procedures inherent to their profession.[34,42,45–48]

The results indicated that dental students with a 500 US dollars were 3.15 times more likely to have poor satisfaction with virtual classes compared to those with a monthly family income of more than 1000 US dollars. This could be due to the fact that during the context of the pandemic in Peru, employment rates were reduced, affecting the source of income and access to basic services for students and their families.[49,50] This situation forced many of these young people to carry out various activities such as helping with household chores, caring for affected family members and working, depriving them of sufficient time to train in virtual education and affecting their perception of the use of these tools.[51,52] Likewise, the lack of economic resources made it difficult for some students to access virtual education because they did not have sufficient means to acquire adequate digital devices, optimal broadband connections, permanent electricity supply, and at the same time meet the obligation of payment to the university.[15,16,53] This situation led many students to acquire financing, credit extensions and personal loans to continue their studies, and many of them even suspended their studies temporarily,[51] which may have led to their frustration turning into a negative perception of virtual education.[41,50]

The results showed that age group, sex, marital status, area of residence, place of origin, occupation and computer use were not considered influential factors in satisfaction with virtual classes. These results are consistent with studies that

also indicate that age group,[26] sex,[24,36,54] marital status,[55] area of residence,[32] place of origin,[56] occupation[57] and computer use[14] are not influential factors in satisfaction with virtual classes. These results could be due to the fact that the majority of dental students, regardless of where they lived or whether they used a personal or shared computer, had already adapted to online education thanks to the constant training provided by the universities in the use of information and communication technologies and in the improvement of teaching and learning strategies.[46,58]

It is important to know student satisfaction in relation to virtual classes because the digital transformation and implementation of distance learning due to the pandemic gained immense attention in the field of health sciences and could have a positive effect on future dental education.[34,59] Furthermore, since e-learning was the dominant method of academic activities among health science students, it is critical to evaluate student satisfaction because it allows for identifying failures, improving educational quality, reviewing policies from the student's perspective, and establishing new educational technologies that can be effectively applied in new waves of contagion or future pandemics that cause mandatory confinement.[29,48]

Among the limitations we mention the inability to compare the satisfaction of the students of the private university considered in the study on virtual education with students of Peruvian public universities because the virtual platforms were not homogeneous in these universities. Another limitation was that the cross-sectional design did not allow us to evaluate the dynamism and sustainability over time of satisfaction with virtual classes. As a strength, we can mention the fact that not only a bivariate analysis was performed, but also a multivariate statistical analysis to evaluate possible determining factors in the level of satisfaction with virtual classes. In addition, this study was carried out in a private university with two sites, one in the capital city and the other in a province, in order to control the variable "curricular plan" since Peruvian universities have different curricular plans for dental education.

It is recommended that educational authorities reinforce or implement policies that guarantee that students can have access to broadband Internet and adequate digital equipment, not only for students at public universities but also for students at private universities in cases of severe global economic crisis.[48,52] It is also recommended to establish evaluation instruments to adopt new ways of evaluating learning, as well as to provide constant training to professors and students on available technological tools, since many universities are using virtual education in a complementary way.[48] Finally, it is recommended that academic managers carefully evaluate the possibility of adapting theoretical subjects to e-learning, since this would allow the optimization of resources and time, in addition to facilitating access to students living in remote areas.[60]

Conclusion

Recognizing the limitations of this cross-sectional study, it can be concluded that 50.6% and 9.3% of students reported a good and poor level of satisfaction with virtual classes during the COVID-19 pandemic, respectively. Monthly family income of less than 500 US dollars was an influential factor. This was possibly due to the fact that many students during the pandemic were forced to work to cover their family needs and at the same time finance the continuation of their studies at a private university, which left them without the necessary time to be adequately trained in the use of virtual tools, negatively affecting their level of satisfaction with virtual classes. On the other hand, the variables age group, sex, marital status, area of residence, place of origin, occupation and computer use were not found to be influential factors.

Abbreviations

AOR, Adjusted Odds Ratio; CI, Confidence interval; COVID-19, Coronavirus disease 2019; KMO, Kaiser-Mayer-Olkin; SARS-CoV-2, severe acute respiratory syndromes due to coronavirus 2; SD, Standard deviation; STROBE, STrengthening the Reporting of OBservational studies in Epidemiology.

Data Sharing Statement

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Ethic Approval and Consent to Participate

The present study respected the bioethical principles for medical research on human beings of the Declaration of Helsinki, related to confidentiality, freedom, respect and non-maleficence. It was also approved by the Institutional Research Ethics Committee of the UPSJB with approval resolution No. 12-2022-CIEI-UPSJB and dated January 17, 2022. In addition, students who decided to participate were asked to give their voluntary informed consent on the first page of the virtual questionnaire.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors declare that they have no conflicts of interest in this work.

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