



## TELEDONTOLOGY IN THE CENTRAL PERUVIAN JUNGLE: QUALITY AND SERVICE SATISFACTION

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### KEYWORDS

COVID-19  
Patient satisfaction  
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### ABSTRACT

*The research analyzes the teledentistry service applied in health services during COVID-19, studying the quality of the teledentistry service and the level of satisfaction of patients treated with this care model. A sample of 341 patients was worked on, using the SERVQUAL model. The results showed a statistically significant relationship between quality of service in teledentistry and patient satisfaction ( $p < 0.05$ ), where 34.9% patients perceived low quality of service and dissatisfaction, while 33.7% were pleased with the care. We conclude that, given the dental health difficulties, the population of the Peruvian central jungle is dissatisfied with the teledentistry service.*

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## 1. Introduction

The COVID 19 pandemic plunged the world into an unprecedented health crisis that forced the World Health Organization to declare a public health emergency. The restrictions on dental care only for emergencies and emergencies due to the high risk of contagion by aerosols, placed the population with dental conditions and in need of care in serious difficulties. In view of this situation, information technologies emerged as an alternative to bring certain types of care closer to the population, incorporating teleodontology into the professional practice of the dentist as a tool in the face of health emergencies. However, there are certain controversies about its application, this health method has been shown to be a means of equity and inclusion in medical and dental care in areas of difficult geographical access and limited access to health care centers. On the other hand, it is used as a way to follow up on the care provided both in person and virtually, and it also serves to provide education on oral health care.

## 2. Approach to teleodontology.

Teleodontology is defined as the provision of real-time, off-line dental care such as diagnosis, treatment planning, consultation and follow-up via electronic transmission from different sites (Bradley et al., 2010; Chen et al. 2003). For Mariño & Ghanim (2013), the most common form of teleodontology is teleconsultation in which patients or the local health care provider seek consultation from dental specialists using telecommunications. This type of service has been valuable for consultation of patients with physical and intellectual disabilities, and patients in nursing homes and prisons (Spicack, 2020; Tynan et al., 2018).

Teleconsultation has been shown to reduce the number of referrals from primary health centers to higher centers by more than 45%. During the COVID- 19 pandemic, it helped patients to continue their therapy during mandatory quarantine (Bayaresco et al., 2020).

Telediagnosis makes use of technology to exchange images and data to make a diagnosis of an oral lesion (Carrard et al., 2018). While the use of smartphones for the detection of dental caries is well recommended; it has also served as a reliable adjunct for the detection of potentially malignant oral lesions (AlShaya et al., 2020; Vinayagamoorthy et al., 2019).

### 2.1. Teleodontology, an alternative in times of pandemic.

During the COVID-19 pandemic, researchers from Brazil illustrated on the use of WhatsApp and telemedicine to perform differential diagnosis of oral lesions (Machado et al., 2020). With most oral lesions being directly evident, telediagnosis can be performed by dental photography, which reduces the need for a thorough clinical examination (Maret et al., 2020).

Teletriage involves the safe, appropriate and timely disposition of patient symptoms via smartphone by the specialist. It has been used for remote assessment of school-aged children, allowing priority to be given to those requiring dental care without unnecessary travel, regardless of socioeconomic and geographic difficulties in many locations. (Estai et al., 2020; Kopycka et al., 2018).

Follow-up of dental patients requires frequent visits to their dentist to monitor treatment progress. The use of telemonitoring can replace frequent physical visits with virtual visits for regular monitoring of treatment outcomes and disease progression (Marino & Ghanim, 2013). In a pilot study during this pandemic, telemonitoring appeared to be a promising tool in remote monitoring of surgical and non-surgical dental patients, especially reducing costs and waiting times (Reddy, 2011). Teleodontology has the potential to improve access to oral health care, improve the delivery of oral health care and reduce its costs. It also has the potential to eliminate disparities in oral health care between rural and urban communities by being the cheapest, as well as the fastest, way to bridge the rural-urban health gap (Reddy, 2011).

## **2.2. Quality and satisfaction of the health service.**

Patient satisfaction is a measure of the extent to which a patient is satisfied with the medical care they received from their caregiver and is also one of the most important factors in determining the success of a health care facility (Manzoor et al., 2019).

Patient satisfaction is a recognized standard for assessing the effectiveness of health services provided. Currently, patients' opinions are considered a key factor in the treatment decision and delivery of healthcare services (Ganasegeran et al., 2015; Joosten et al., 2008).

Service quality is a unique and abstract concept. Researchers have provided different definitions. It has been described as the overall judgment or attitudes of clients toward the services provided and refers to the differences and mismatches between clients' expectations and their perceptions of service performance (Camilleri & O'Callaghan, 1998). Quality in health services includes technical (clinical) quality and functional (non-clinical) quality. The former focuses on skills, procedural accuracy and medical diagnosis, while the latter refers to the way health services are delivered to patients (Alhassan et al., 2015).

## **2.3. History of quality and satisfaction of teleodontology.**

Given the high demand for care in health centers in general, patients are highly dissatisfied with the deficiencies in the health system, so that the development and application of different methods for measuring quality are essential for making decisions within a context of continuous improvement of the quality of care in health services.

In this regard, Cheuk et al. (2023) evaluated the perceptions and practices of teleodontology in 446 Canadian dentists during the COVID-19 pandemic, who identified patient selection, consultation and patient education as the three most important uses of teleodontology, concluding that teleodontology is reliable for patient care and follow-up, however, more education and dissemination about its application is needed to encourage its use, within an ethical and legal framework which may lead to greater acceptance by dental surgeons. While Hung et al. (2022), examined the implementation, challenges, strategies and innovations related to teleodontology during pandemic confinement finding that teleodontology was used both synchronously and asynchronously for virtual consultations, concluding that this service method can complement dental care systems.

Bhanushali et al. (2020) recommended infection control strategies and patient management protocols to provide optimal dental care while preventing nosocomial infection in dental settings. Concluding teleodontology can be of great help not only in situations such as the pandemic, in the sense that new technologies have not only improved the quality of dental patient management, but have also made possible their partial or complete remote management. In that vein, Sa et al. (2021) evaluated the experiences of patients in the dental office during the pandemic and the protocols that were used to resume clinical activities after the outbreak, concluding that teleodontology was used to provide care to patients with non-emergency needs.

On the other hand, Telles et al. (2020) determined the effectiveness of teleodontology support in oral care during the COVID-19 pandemic context, concluding that this does not replace face-to-face consultation and has as its main objective to support the public health system and that whenever physical consultation is required after teleorientation, the health measures of regulatory agencies should be followed.

Yang et al. (2020) determined the health service delivery status of public dental hospitals during the COVID-19 epidemic in China and evaluated the regional difference of tele-dentistry. Thirty-eight public dental hospitals participated, the status of non-emergency dental services, emergency dental services, online professional consultation and geographical distribution of hospitals were recorded and analyzed. Ninety percent of them reported changing dental services online and 69% of them offered free online professional consultation. The penetration rate of online technology was significantly higher in the eastern region than in the central and western regions. It is concluded that there was a significant change in health service delivery during the COVID-19 epidemic and a wider use of tele-dentistry in the eastern region.

Since teleodontology is a method of delivering dental services at a distance that is little known and used by dentists, its sudden and urgent application during the pandemic provides the opportunity to

evaluate the quality of this method of service in the Primary Care Center I of Pichanaki in the central jungle of Peru, establishing its effectiveness from the perception of the satisfaction of the user, who is the patient himself. Its social relevance lies in being able to identify its value to bring oral services not only in disaster circumstances, but its application as a service and work tool for both public and private health services. The purpose of this study is to establish the relationship between the quality of service and the level of satisfaction with teleodontology.

### 3. Methodology

A descriptive correlational and cross-sectional design was used (Hernandez et al., 2014). A sample of 341 patients treated by teleodontology during the COVID-19 pandemic was used, including those patients who signed the informed consent form.

For the measurement of the service quality variable, a survey based on the SERVQUAL model was used, which allows measuring service quality, knowing the expectations of customers and how they appreciate the service (Matsumoto, 2014). This model allows to analyze quantitative and qualitative aspects of customers. It allows to know uncontrollable and unpredictable factors of customers. SERVQUAL provides detailed information about; customer opinions about companies' service, customer comments and suggestions for improvements in certain factors, employees' impressions regarding customers' expectation and perception. Also this model is a tool for improvement and comparison with other organizations (Matsumoto, 2014).

For the measurement of the satisfaction level variable, a survey based on the SERVQUAL model was also used, which is known worldwide for measuring the level of satisfaction and expressing whether the patient is dissatisfied, satisfied or pleased (Matsumoto, 2014). An adaptation of the SERVQUAL model was made for application to teleodontology to measure both variables.

The service quality survey consists of 22 items, with 07 response alternatives on a scale of 1 to 7, the last one being the highest value. The variable is measured with the indicators High (122-154), Regular (89-121), Low (22-88).

The satisfaction level survey consists of 10 items, with 06 alternative answers on a scale of 1 to 6, the last one being the highest value. This variable is measured with the indicators Dissatisfied (10-40), Satisfied (41-50), Pleased (51-60).

The instrument was validated by means of expert judgment. The reliability of the instrument was determined by applying a pilot test to 20 patients and was established by Cronbach's alpha with a value for the Patient Satisfaction instrument of 0.840 and for the Quality of Service instrument of 0.984, values of high reliability.

The survey was digitized using Google Forms and a link was obtained for sharing. Subsequently, the link to the survey was sent to them via the WhatsApp application. The duration in the resolution of this instrument is approximately 10 minutes. The data recorded in the corresponding questionnaires were processed automatically with the support of the SPSS-26 statistical package, and the results were then reported in single- and double-entry statistical tables, according to the proposed objectives. In the statistical analysis, the chi-square test was used, considering that the relationship is significant if the probability of error is less than 5% ( $p < 0.05$ ).

The Research Ethics Committee of the Faculty of Stomatology of the UNT approved the execution of this research. The principles of the Declaration of Helsinki (De La Amm, 2013) were followed in the execution of the research, respecting the ethical principles: protection of persons, beneficence and non-maleficence, justice, scientific integrity and informed and express consent; the principle of free participation and informed consent was respected, as well as the principle of care for the environment and biodiversity. Likewise, the ethical and deontological responsibility of good practices of the researcher was respected, proceeding with scientific rigor ensuring the validity, reliability and credibility of the methods, sources and data used in this research (CONCYTEC, 2019).

### 4. Results

The objective of this study was to determine the relationship between the quality of service in teleodontology and the level of satisfaction in patients attended in health services during the COVID-19

pandemic, in a sample of 341 patients attended by teleodontology in the Primary Care Center I Pichanaki, in the district of Pichanaki, department of Junín.

When relating the quality of service in teleodontology with patient satisfaction, a statistically significant relationship was found ( $p < 0.05$ ), 34.9% (119) of patients perceived a low quality of service and were dissatisfied with the service, while 33.7 (115) perceived a high quality of service and were pleased with the care (Table 1).

**Table 1:** Relationship between quality of service in teleodontology and the level of satisfaction in patients seen in health services during the COVID-19 pandemic.

Level of satisfaction	Quality of service						Total		Test
	Under		Regular		High		n	%	
	n	%	n	%	n	%			
Dissatisfied	119	34.9	1	0.3	0	0.0	120	35.2	$\chi^2 = 484.842$ $p = 0.000$
Satisfied	0	0.0	66	19.3	37	10.9	103	30.2	
Pleased	0	0.0	3	0.9	115	33.7	118	34.6	
<b>Total</b>	119	34.9	70	20.5	152	44.6	341	100.00	

Source: Ríos-Caro et al., 2022.

The quality of teleodontology service was high in 44.6% (152), low in 34.9% (119) and fair in 20.5% (70) (Table 2).

**Table 2:** Quality of service in teleodontology during the COVID-19 pandemic in patients from Pichanaki, Junín, 2022.

Quality of service	n	%
Under	119	34.9
Regular	70	20.5
High	152	44.6
<b>Total</b>	341	100.0

Source: Ríos-Caro et al., 2022.

In satisfaction with teleodontology, patients were found to be 35.2% dissatisfied (120), 34.6% pleased (118) and 30.2% satisfied (103) (Table 3).

**Table 3:** Level of satisfaction in teleodontology during the COVID-19 pandemic in patients seen in Pichanaki, Junín, 2022.

Level of satisfaction	n	%
Dissatisfied	120	35.2
Satisfied	103	30.2
Pleased	118	34.6
Total	341	100.0

Source: Ríos-Caro et al., 2022.

Regarding the sociodemographic characteristics of the study population, 53.7% (183) were male and 46.3% (158) were female. 32.3% (110) were between 18 and 29 years of age, 35.4% (121) were between 30 and 59 years of age and 32.3% (110) were 60 years of age or older. Only 1.5% (5) indicated no educational level, 11.1% (38) indicated they had completed primary school, 53.7% (183) indicated they had completed secondary school and 33.7% (115) indicated they had completed higher education (Table 4).

**Table 4:** Sociodemographic characteristics of the study population.

Feature	n.º	%
<b>Genre</b>		
Male	183	53.7
Female	158	46.3
<b>Age (years)</b>		
18 - 29	110	32.3
30 - 59	121	35.4
60 and over	110	32.3
<b>Level of education</b>		
No level	5	1.5
Primary	38	11.1
Secondary	183	53.7
Superior	115	33.7
<b>Total</b>	<b>341</b>	<b>100.00</b>

Source: Ríos-Caro et al., 2022

The relationship between quality of service in teleodontology during the COVID-19 pandemic and socio-demographic characteristics, we can observe that there is no significant relationship between quality of service and gender of patients ( $p>0.05$ ), however, there is a significant relationship between quality of service in teleodontology with age ( $p=0.000$ ) and educational level ( $p=0.000$ ) (Table 5).

**Table 5:** Relationship between quality of service in teleodontology during the COVID-19 pandemic and socio-demographic characteristics in patients from Pichanaki, Junín, 2022.

Feature	Quality of service						Total		Test
	Under		Regular		High		n	%	
	n	%	n	%	n	%			
<b>Genre</b>									
Male	62	33.9	39	21.3	82	44.8	183	100.0	$\chi^2 = 0.240$ p = 0.887
Female	57	36.1	31	19.6	70	44.3	158	100.0	
<b>Age</b>									
18 - 29 years old	0	0.0	5	4.5	105	95.5	110	100.0	$\chi^2 = 392.601$ p = 0.000
30 - 59 years	11	9.1	63	52.1	47	38.8	121	100.0	
60 to + years	108	98.2	2	1.8	0	0.0	110	100.0	
<b>Level of education</b>									
No level	4	80.0	1	20.0	0	0.0	5	100.0	$\chi^2 = 28.513$ p = 0.000
Primary	20	52.6	14	36.8	4	10.5	38	100.0	
Secondary	61	33.3	29	15.8	93	50.8	183	100.0	
Superior	34	29.6	26	22.6	55	47.8	115	100.0	
<b>Total</b>	119	34.9	70	20.5	152	44.6	341	100.0	

Source: Ríos-Caro et al., 2022.

The level of patient satisfaction during the COVID-19 pandemic and the socio-demographic characteristics, we can observe that there is no significant relationship between the quality of service and the gender of the patients ( $p > 0.05$ ), however, there is a significant relationship between the level of patient satisfaction with age ( $p = 0.000$ ) and educational level ( $p = 0.000$ ) (Table 6).



**Table 6:** Relationship between the level of satisfaction in teleodontology during the COVID-19 pandemic and socio-demographic characteristics in patients from Pichanaki, Junín, 2022.

Feature	Level of satisfaction						Total	Test	
	Dissatisfied		Satisfied		Pleased				
	n	%	n	%	n	%	n		%
<b>Genre</b>									
Male	62	33.9	58	31.7	63	34.4	183	100.0	$\chi^2 = 0.486$ $p = 0.784$
Female	58	36.7	45	28.5	55	34.8	158	100.0	
<b>Age</b>									
18 - 29 years old	0	0.0	5	4.5	105	95.5	110	100.0	$\chi^2 = 520.666$ $p = 0.000$
30 - 59 years	11	9.1	97	80.2	13	10.7	121	100.0	
60 to + years	109	99.1	1	0.9	0	0.0	110	100.0	
<b>Level of education</b>									
No level	4	80.0	1	20.0	0	0.0	5	4	$\chi^2 = 19.454$ $p = 0.003$
Primary	20	52.6	15	39.5	3	7.9	38	20	
Secondary	61	33.3	52	28.4	70	38.3	183	61	
Superior	35	30.4	35	30.4	45	39.2	115	35	
<b>Total</b>	120	35.2	103	30.2	118	34.6	341	100.0	

Source: Ríos-Caro et al., 2022.

#### 4. Results

Teleodontology is an innovative method that emerged from COVID-19 confinement as the best alternative for patient care. The main objective of world sanitary norms was to avoid person-to-person contact and teleodontology was able to satisfy the need for social distancing by the authorities. In this sense, the present research aimed to determine the relationship between the quality of service in teleodontology and the level of satisfaction in patients attended in health services during the COVID-19 pandemic.

During the COVID-19 pandemic, teleodontology helped prevent delay and disruption of dental care. Virtual encounters helped patients, especially the elderly and immunocompromised, access dental care without leaving the safety of their homes, reducing their potential exposure. Initial and follow-up teleodontology visits helped increase patient compliance and establish a stronger patient-dental surgeon relationship. However, despite the feasibility reports and evidence-based research related to teleodontology, it has always been a concern that the quality of service is adequate.

In this regard, the results of the present research evidenced that the quality of service was high for the most part, which disagrees with the findings of Tiwari et al. (2022), which shows that teleodontology cannot be of quality because they consider that it has limited value for true dental emergencies, it simply does not apply to dentistry, because a proper clinical examination is not performed. This is due to the difference in needs and culture. To put in context, the present investigation was carried out in the city of Pichanaki in the Junin region in the central jungle of Peru, which is a less developed area, during the confinement and quarantine, teleodontology helped the patients to appease the symptoms of their dental emergencies through medication and this is reflected because the patients had a perception of having obtained a high quality of teleodontological service. Although teleodontology is an option, it cannot replace the actual examination in which the patient is present in the same environment as the dental surgeon. Satisfaction is a person's feeling of pleasure, which comes from a comparison between



the pleasure in an activity and a product with expectations. In this regard, the results of the present investigation show that most of the patients were dissatisfied. This is consistent with Cheuk et al. (2023) and is due to the fact that although they have a perception of high quality of service, it does not meet their long-term treatment needs. Hung et al. (2022), include the lack of acceptance of teleodontology by patients and this is because they are unfamiliar with the devices, and those with communication difficulties, either due to language barriers or understanding, may have difficulty adapting to this service model. On the other hand, Amtha et al. (2021), demonstrate that all patients included in their study were satisfied and very satisfied with teleodontology services during the COVID-19 pandemic due to their improved comfort, convenience and communication components between patients and dental surgeons. However, the most important point is that a fee was charged for the tele-dentistry service which refers to the fact that if the patient pays for the service he/she values it more and in most cases strives to get the most out of it. Similarly, Rahman et al. (2020) report high patient satisfaction with their experience of the teleodontology service, as their opinions were positive about teleodontology in terms of ease of use, effectiveness, reliability of the teleodontology system and usefulness.

This method of service can be very valuable for future service preparation planning whereby new patient referrals can be seen for the initial stages of obtaining history and consent. Thus, a second appointment could include a face-to-face visit in which the examination, diagnosis and possible treatment can be completed in a single visit. If adopted by health care providers, this would allow elective practice recovery and reduce the number of patient appointments in hospitals which would also reduce costs in dental health services.

The relationship between sociodemographic variables, quality of service and level of patient satisfaction was evaluated and it was found that there is a significant influence between the sex of the patient and their perception of the services; this is in agreement with the study by Tiwari et al. (2022), and is basically due to the principle of gender equality, which explains that both men and women are in equal conditions for their personal, emotional and health development. On the other hand, the study found a relationship between age and their perception of the services, finding that individuals aged 18 to 29 years perceived a better quality of service; on the contrary, Tiwari et al. (2022) express that regardless of age, teleodontology was a quality service with a high degree of satisfaction and this is due to the fact that in a more developed country such as the United States, there is a high use of technology in people over 59 years of age, which makes it easier for them to use technologies. One of the outcomes of the enhanced use of teleodontology during the pandemic is that it will likely contribute to a lasting and broader role in the future. Although teleodontology has many advantages, there are also some notable limitations. It is not a substitute for primary dental care but rather a modality for improving access to primary dental services. Often, the quality of care depends on the quality of the technology available. This research supports the value of teleodontology and suggests that further development of this modality can contribute to improving oral health in terms of education, prevention and preliminary practices to mandatory face-to-face clinical care for the resolution of dental problems requiring invasive treatment.

## 5. Conclusions

The research highlights the serious dental health difficulties that the population experienced during the pandemic, which is very important given the type of population and the geographic location in the central jungle of Peru, where access to dental services is difficult. In this sense, the study reveals that the population is dissatisfied with the tele-dentistry service, which is a constant due to the characteristics of long-term appointments, long waiting times, etc., and that during the pandemic this was increased by the lack of attention due to the confinement. However, they considered that there was a high quality of service, establishing a significant relationship between both variables. On the other hand, a relationship between the quality of teleodontology service, level of education and age is evidenced, as follows and between the level of satisfaction, level of education and age of patients seen in health services during the COVID-19 pandemic.

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UNDER INVESTIGATION

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