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Exploring the Scope of Teledentistry Using WhatsApp Image in Diagnosing Oral Conditions

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ABSTRACT

Objective: The objective was to evaluate the potential of teledentistry in improving oral medicine practice and patient care by collecting data from dental clinicians in two years and analyzing the accuracy of diagnoses made.

Materials and Methods: A retrospective cross-sectional study was carried out including cases from 2019 to 2021. Data from 197 patients were collected from dental professionals in Rawalpindi/ Islamabad. In almost all cases, biopsies were done to confirm the provisional diagnosis. Later the provisional and definitive diagnoses were compared to evaluate the reliability of teledentistry by calculating the discrepancy index. Percentages and frequencies were calculated for the type of lesion and the actual discrepancy between provisional and definitive diagnosis.

Results: The analysis showed that only 5.1% were misdiagnosed while 94.9% of cases had a similar teledentistry impression as that of clinicopathological assessment.

Conclusion: With only 5.1% of cases being misdiagnosed, it is evident that teledentistry is effective and can be implemented on a larger scale for better patient-centred care.

Keywords: Benign, Malignant, Oral Cavity, Telecommunication, Telemedicine

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INTRODUCTION

Technological advancements in recent decades have revolutionized all aspects of human life including healthcare. Such advancements have led to the manufacturing of improved medical equipment and tools, digital devices, and intelligent software for automated diagnosis.[1] Digital medical records can be shared remotely and therefore can be used to seek medical advice from physicians located at a distance, get a second opinion on a patient's case, and share novel findings swiftly with the rest of the world.[2]

Sharing digitized information between physicians is not

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a new practice, however, the recent pandemic has put it back in the spotlight. Nationwide lockdowns and constant states of fear encouraged patients to seek medical consultations remotely through the phone or the Internet. This allowed patients to seek medical attention for their medical concerns from the safety of their homes. These forms of consultations are categorized as telemedicine. The availability of clinical information and patient interview allows the physician to formulate a treatment plan and offer clinical advice, sometimes visual examination can also be done using cameras or by taking images of the affected region.[3,4] The avenue of remote monitoring of patients is also expanding.[5] Although physicians and patients use a variety of software and application for communication, specialized platforms that comply with patient information protection guidelines are also available.

Telemedicine is opening opportunities for patients located in rural and inaccessible areas to seek medical attention for a variety of diseases and get access to specialists that would otherwise not be available in their areas.[6] Other advantages include saving time and cost of travel and protection from hospital-acquired infections.[7]

While dental consultations have also become an integral aspect of telemedicine, their scope is limited due to the practical nature of dental work.[8] However, as far as oral medicine or clinical oral pathology is concerned, teledentistry can allow for remote diagnosis, treatment planning and appropriate management.[9,10] According to a study performed in Canada, 94-96% of patients were satisfied with the online dental consultation experience.[11]

Informal use of teledentistry in Pakistan has been in use since the introduction of smartphones. Dentists and patients have shared images through multiple applications, most popularly WhatsApp to acquire diagnosis and treatment plans. The purpose of this investigation is to determine the accuracy of the diagnosis rendered on images received through WhatsApp of oral pathologies in comparison to the actual clinical diagnosis, confirmed through histopathology.

MATERIALS AND METHODS

This study was approved by the ethical review board at Riphah International University, Islamic International Dental College (IRC/IIDC/2020/008/005). A retrospective cross-sectional study was carried out by retrieving patient records from 2019 to 2021. These records included proof of a prior WhatsApp exchange between oral surgeons, oral pathologists and oral medicine specialists where a provisional diagnosis was provided in the conversation, and a definitive diagnosis established after the clinical visit. Hence anonymous data was obtained from five dental specialists working in Rawalpindi/Islamabad. Since the record was collected from selected clinicians, their expertise and experience may differ from each other regarding diagnosis. A total of 197 patients with oral pathology from the records of 673 patients fit the inclusion criteria. Cases with missing complete clinical and histopathological records and complaints other than oral pathology or medicine were excluded from the study. The information from the patient records and the dentist's communication was entered into a preformed proforma that recorded information about the provisional diagnosis and the final histopathologic/clinical diagnosis.

Diagnostic discrepancies were classified into major discrepancies and minor discrepancies. Major discrepancies were defined as those that could lead to a significant change in clinical management, with ensuing under- or over-treatment, as also which had an impact on the prognosis of that particular lesion. Minor discrepancies were those in which the discrepancy was not thought to provoke significant change in the management of the lesions. The results were analyzed using SPSS version 25.0. The data was presented using frequencies and percentages. The provisional diagnosis based on the information required through the application and from the actual clinical evaluation was compared and presented as a discrepancy index.

RESULTS

A total sample size of 197 cases met the clinical and histopathological inclusion criteria of the study. The provisional and final diagnoses were broadly classified as benign or malignant. These lesions were further classified as; traumatic, infective, preneoplastic, malignant, benign, autoimmune, non-pathologic, non-diagnostic and congenital as shown in Table 1.

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Table 1: Type of Lesions

Type of Lesion	Percentage % (n)
Traumatic	11.2 (22)
Infective	7.1 (14)
Neoplastic/ Malignant	43.1 (85)
Benign	27.9 (55)
Autoimmune	2.0 (4)
Non Pathologic	7.6 (15)
Congenital	1.0 (2)

Out of 197 patients, 112 (56.8%) were diagnosed with benign lesions and 85 (43.1%) were diagnosed with malignant lesions. Out of the total number of cases evaluated, 41 cases showed discrepancies in their clinical and pathological diagnosis. The discrepancy index was calculated by using the formula:

$$DI = \frac{Number\ of\ incompatible\ cases\ x\ 100}{Total\ number\ of\ cases\ included\ in\ the\ study}$$

The total discrepancy index value obtained was 20.8%. The analysis showed that only 20.8% were misdiagnosed while 79.2% of cases had a similar teledentistry impression as that of clinicopathological assessment. The sensitivity and specificity of the study were 93.8% and 94.9% respectively. Positive and negative predictive values obtained were 92.6% and 95.7% respectively. The diagnostic accuracy of the study obtained by the test was 94.4%. Out of the total 41, cases, 9 cases (4.6%) showed major discrepancies and 32 cases (16.2%) showed minor discrepancies as shown in Fig 1.

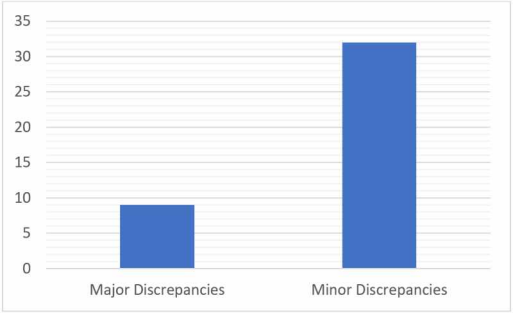

Figure 1: Number of Cases Revealing Major and Minor Discrepancies

The misdiagnosed benign and malignant oral conditions are mentioned in Table 2. 56.3% had both the provisional and definitive diagnosis of a benign lesion, 2.5% had a provisional diagnosis of a benign lesion but their definitive diagnosis proved to be a malignant lesion, 38.1% had both the provisional and definitive diagnosis of malignancy and again 3% had a provisional diagnosis of a malignant lesion but their definitive diagnosis proved to be a benign lesion as shown in Fig 2. Most of the patients were provided with timely treatment according to the diagnosis. Excision was done as a treatment for 42.1% of cases.

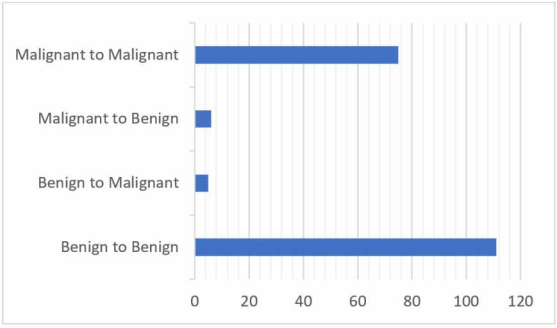

Figure 2: Provisional and Definitive Diagnosis of Malignant and Benign Lesions

Table 2: Malignant and Benign Misdiagnosis

Provisional Diagnosis	Definitive Diagnosis	Number of Cases
Benign to Malignant		
Ameloblastoma	Squamous Cell Carcinoma	1
Vascular Lesion	Mucoepidermoid Carcinoma	1
Vascular Lesion	Adenocystic Carcinoma	2
Traumatic Ulcer	Salivary Gland Neoplasia	2
Pyogenic Granuloma	Low Grade Advancing Carcinoma	1
Malignant to Benign		
Squamous Cell Carcinoma	Traumatic Ulcer	1
Malignant Lesion	Actinomycosis	1

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DISCUSSION

Technology has improved patient-centred care. Digitalization in the modern era has opened new horizons in the field of dentistry. Awareness of teledentistry among healthcare professionals and patients is essential for this newly developed method to flourish. Execution of teledentistry requires proper training and familiarization with the digital system.[12] A study conducted in 2021 among Brazilian dentists showed their inadequacy in the implementation of teledentistry as they were not trained for patient record acquisition, management, sharing and storage of information.[13]

The present study focused on the evaluation of the effectiveness of teledentistry and revealed that teledentistry has promising results in diagnosing oral lesions and other dental non-pathologic problems. Only a 5.1% discrepancy occurred between provisional and definitive diagnosis, with 94.9% accurate diagnosis via teledentistry. This shows that teledentistry has great potential to uplift patient care as well as dental education. Similarly, another Brazilian study showed an 80% accurate diagnosis of oral diseases by consultants through teledentistry.[14] A systematic review on the validity of teledentistry showed high sensitivity and specificity of this newly designed modality. It concluded that teledentistry is comparable to face-to-face oral screening and can be used for the identification of oral diseases, referrals and teleconsultations.[15] A study conducted at the University of Zurich, Switzerland, validate remote screening using intraoral scans to be an efficient way of assessing patients in need of dental treatment.[16] Al Shaya et al. also favoured teledentistry as it is a reliable way to detect dental caries, showing good specificity and sensitivity when compared to regular dental examinations.[17]

A local study conducted in Karachi demonstrated a positive attitude of dental professionals towards the use of teledentistry. E-health makes communication between a dentist and a patient easier and more convenient.[18] Summerfelt FF et al. devised a teledentistry-assisted dental hygiene model at Northern Arizona University, providing oral healthcare to underserved populations.19 In Pakistan, one dentist is for 8470 persons, revealing an increased underserved population. This shortage of dentists and inability to provide oral health care to so many people at a time can be overcome by the proper use of teledentistry. 70% of Saudi dental professionals showed willingness for the use of teledentistry as it will improve dental practice by enhancing communication with peers, guidance and referral system.[20] Rahman N et al. conducted a study to assess the patient's perspective of teledentistry during times of COVID-19. Patients using virtual clinics and telephonic consultations reported 97% and 94% satisfaction with their experience, respectively.[21]

There are a few pitfalls in teledentistry. It can be only used for preventive and diagnostic purposes. For dental treatment of any pathology, patients need to visit the dental clinic. A dentist is required to have skills in using the digital system. Patient data confidentiality is a concern with the use of teledentistry. The quality of images and radiographs can hamper the accuracy of the diagnosis.[22]

The limitation of this study includes a small sample size and the diagnostic expertise of the five dental consultants was not evaluated as it was beyond the scope of this study. Further studies on a larger sample size can be conducted to validate the use of teledentistry. Studies on devising a business model and application of teledentistry should be done to increase the value and use of teledentistry among dental healthcare professionals and to facilitate patient care as much as possible in rural areas as well.

CONCLUSION

With only 5.1% of cases being misdiagnosed, it is evident that tele-dentistry is effective and can be implemented on a larger scale for better patient-centred care.

DISCLAIMER

None to declare.

CONFLICT OF INTEREST

There is no conflict of interest among the authors.

ETHICAL STATEMENT

Ethical approval was provided by the Ethical Review Committee at Riphah International University, Islamic International Dental College (IRC/IIDC/2020/008/005).

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