COMPARISON OF STORE AND FORWARD METHOD OF TELEDERMATOLOGY WITH FACE-TO-FACE CONSULTATION

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Background: To compare the accuracy of store and forward method of teledermatology with the traditional face-to-face consultation. **Methods**: The comparison was done between Institute of Dermatology King Edward Medical College Lahore that served as teledermatology center and Dermatology Department of Pakistan Institute of Medical Sciences Islamabad from where patients were selected. TelmedpakÒ provided the technical support. Thirty three patients were selected from outpatient department of PIMS and images were taken using a digital camera. Images were stored in computer and were sent to Institute of Dermatology via email for Teleconsultation along with a short history and examination findings. Diagnosis of consultant after face-to-face consultation was then compared with the image based diagnosis that is after teleconsultation. **Results**: In 81% of the cases the diagnosis on face-to-face consultation was same ($p<0.05$) while in 18% of the cases the two diagnoses differed. In 9% (n=3) of the cases, image resolution was not good but out of these three, diagnosis was same in two and differed in one case. **Conclusion**: This study concludes that store and forward method of teledermatology is reliable and can provide a means of increasing access to dermatological care in rural and under-served areas.

Keywords: Teledermatology, Teleconsultation, Telemedicine

INTRODUCTION

Telemedicine applications in dermatology (teledermatology) hold great promise as an alternative means of health care delivery. Teledermatology's potential benefits, however, can only be realized if it functions as a reliable and accurate substitute for traditional clinic based consultations, the standard method of health care delivery[1]. All over the world teledermatology is applied by two ways: one is video conferencing and other is the store and forward method[2]. There are many consultations for skin diseases in general practice and it is same all over the world. There is always an increasing demand for the dermatological services[3]. With the exception of melanoma skin cancer few diseases are life threatening, yet they frequently cause more distress to people than other serious medical disorders[4]. These disorders do not need emergency consultation most of the time so it can be practiced at distance by store and forward method using digital device.

In Pakistan teledermatology is very useful method for providing dermatological care where a large number of people live in rural areas and the number of qualified dermatologists is very low. Teledermatology can provide means of increasing access to dermatological care in rural and under-served areas. Patients in these areas can receive care without having to travel long distances. But this method of providing care should be reliable, accurate and cost effective. Many studies have been done internationally to determine the accuracy and

cost effectiveness of different methods of teledermatology and it is being practiced in many parts of world with success. We conducted this small study to see the accuracy of diagnosis by store and forward method of teledermatology, in our setup.

MATERIAL AND METHODS

We conducted this comparative study in two centers. Teledermatology center was the Institute of Dermatology, King Edward Medical College in Lahore and patients were selected from the OPD of Dermatology Department at Pakistan Institute of Medical Sciences (PIMS) Islamabad. The distance between two centers is about 300 kilometers. The coordinating center between the two was TelMedPak Islamabad.

Patients were selected through Department of Dermatology PIMS during the course of their face to face visit. Because of heavy OPD not all patients seen on any particular day were enrolled. A total number of 33 patients were enrolled for the study, using convenient sampling. Patients with common conditions such as acne and melasma were excluded from the study.

Short history of patient was taken regarding location of lesion, course, any related symptoms and any medication used. A trainee doctor took images of the patient with the digital camera. No lighting protocols were performed before imaging. The diagnosis of consultant after face-to-face consultation with the patient was noted.

Images of the lesion were taken with Kodak DC-210 digital camera. This camera is capable of displaying 640 x 480 pixels resolution. Images from the camera were transferred to computer by means of a cable and a small modification of images was carried out using Adobe Photoshop software for Windows.

Histories and images along with the diagnosis after face-to-face consultation were stored in the computer at Telmedpak. These images along with a clinical data were then sent to teledermatology center for the opinion of teleconsultant, using a standard email method. A consultant teledermatologist at the other side, reviewed each case. Diagnosis was recorded and sent back along with the comments on image quality.

Descriptive statistics (like mean and median) were calculated. Cross tabulation was carried out for finding correlation among different variables. Univariate analysis was done and p-values were calculated using Fischer Exact test, to find out the strength of the association between various variables. The statistical analysis was done on SPSS windows package. P value less than 0.05 was considered significant.

RESULTS

A total number of 26 skin conditions in 33 patients were included in the study. Both adults and children participated. In 27 out of 33, i.e., 81% cases the diagnosis after face-to-face consultation and diagnosis of teleconsultant were same. In 6 out of 33 cases, i.e., 18%, diagnosis of two methods of consultation differed. In 2 out of 6 cases in which exact diagnosis was not made the differential diagnosis was given and skin biopsy advised. These two cases were those, which were confirmed on skin biopsy and even on face to face consultation, there was no single

diagnosis. In 3 out of 33 cases, image resolution was not good and out of those cases, diagnosis of face-to-face consultation and tele-diagnosis matched in two cases and in one case differential was made. These results are statistically significant ($p<0.05$).

DISCUSSION

The purpose of this study was to determine whether Telemedicine can provide accurate diagnosis and this has been proven in our study. Use of digital imaging systems in medically under-served areas may be extremely helpful in providing care to patients who might not otherwise have an access to a dermatologist[5] especially in Pakistan, where number of qualified dermatologists is very low.

Table-1: Types & frequency of dermatologic conditions comprising the study population

Conditions	No.	%
Leprosy	1	3
Systemic scleresosis	1	3
Kerato acanthoma	1	3
Pemphigus vulgaris	1	3
Keratosis pilaris	1	3
Seborrhoeic wart	1	3
Atrophoderma	1	3
Eczemas (multiple types)	4	12
Neavus sebaceous	2	6
Fixed drug eruption	1	3
Lichen planus	4	12
Erythema- multiforme	1	3
Impetigo	1	3
Alopecia areata	1	3
Urticaria	1	3
Icthyosis	1	3
Deep mycosis	2	6
H. Zoster	2	6
Pityriaisis rubra pilaris	1	3
Onychomycosis	1	3
Chill blains	1	3
Chicken pox	1	3
T. Capitis	1	3
P. Rosea	1	3

Many international studies also prove the accuracy and reliability of teledermatology. One study was done at Minnesota in Mayo hospital in which accuracy of store and forward teledermatology consultation was assessed. It concluded that digital technology can be used to construct a clinically accurate and affordable store and forward teledermatology system[6]. In another study reliability was defined as simple agreement-if a diagnostic test is performed on the same subject twice and the same answer is obtained, then the results are reliable. Accuracy refers to whether the diagnostic test yields a correct or incorrect answer by comparing the test result with the truth, represented by a reference standard. This study also concludes that digital image consultations result in reliable and accurate diagnostics outcome[1]. Other smaller and less detailed studies similarly suggest that a variety of store and forward systems can work and can provide cost effective teledermatology to rural patients[7,8].

Another multi-center trial was done in England, which compared real time dermatology with outpatient dermatology in terms of clinical outcomes, cost benefits, and patient re-attendance. It concluded that real time dermatology was clinical feasible but not cost effective compared with conventional out-patient dermatological care[9].

Table-2: Comparison of teledermatology and face-to-face diagnosis

Face to face diagnosis	**Image diagnosis**
Leprosy	Granuloma annulare
Systemic scleresosis	**Systemic sclerosis**
Kerato acanthoma	Differential: BCC, DLE, lupus vulgaris Image not clear
Pemphigus vulgaris	**Pemphigus vulgaris**
H. Zoster	**H. Zoster**
Seborrhoeic wart	**Seborrhoeic wart**
Atrophoderma	**Morphoea**
Chronic eczema	**Lichenified chronic eczema with d/d of lichen hypertrophicus**
Chill blains	**Chill blains**
Chicken pox	**Chicken pox**
Actinic LP	Macular amyloidosis Examination of patient required
Nummular eczema	**Nummular eczema**
Fixed drug eruption	**Poikiloderma**
Deep mycosis	Lupus vulgaris with d/d of pyoderma gangrenosum
Lichen planus	**Lichen planus**
Erythema multiforme	**Erythema multiforme**
Neavus sebaceous	Diagnosis not matched
T. capitis	**T. capitis**
Neavus sebaceous	**Neavus sebaceous**
Photo contact dermatitis	**Photo contact dermatitis**
Lichen planus	**Lichen planus**
H. zoster	**H. zoster**
Pityriaisis rubra pilaris	**Pityriasis rubra pilaris**
Keratosis pilaris	**Keratosis pilaris d/d phrynoderma**
Onychomycosis	**Onychomycosis**
Lichen planus	Lichenoid eruption Image resolution not proper
Alopecia areata	**Alopecia areata**
Urticaria	**Urticaria – poor resolution**
Impetigo	**Impetigo**
Icthyosis	**Icthyosis**
Photocontact dermatitis	Polymorphic eruption d/d actinic prurigo
Deep mycosis	Deep mycosis
P. rosea	P. rosea

So considering the cost, store and forward teledermatology is better then real time especially in our country with few resources where we can practice this method with inexpensive digital camera and computer equipment. But there are many factors that need to be evaluated to test the viability of a telemedicine system[10]. First the system must allow for quality care. 81% of cases in our small study were able to be accurately diagnosed which means this technology can provide quality images for accurate diagnosis. Similar study in the nursing home gave 85% results for this method[11]. Another important thing which helps in diagnosis is proper description of lesion and the relevant clinical data. So for this, the person at the rural end who is seeking advice must be trained so that he can describe the lesion properly.

The second thing for the tele-dermatology system is that it must be easy to use for all medical personnel and the system used in study is easy which involve digital imaging storing that image in computer modifying it and sending it through email. It can be easily learnt by every one. So we can apply this system to improve health care but it is a change in practice patterns and will take a little time to get established.

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