

E-Health system: A tool for investigating pattern of dermal diseases in remote beneficiary network of telemedicine under Mayo hub

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Abstract

Objective To analyze pattern of skin diseases in remote areas of Punjab diagnosed by telemedicine network.

Methods Rural centers at the district and tehsil levels (Rajanpur, Dera Ghazi Khan, Khushab, Sahiwal, Gujrat and Jhang regions of Punjab) were connected to tertiary care centers with specialized telemedicine equipment. The images were transmitted live. Prescriptions were written and duly forwarded. Patients were called to the tertiary care center for further investigations and examination if needed.

Results A total of 11,892 patients were treated. Acne was the commonest disorder (42%), followed by dermatophytosis (28%), scabies (22%) and eczemas (18%). Infestations and infections are common in patients from poor socio-economic strata.

Conclusion Telemedicine is beneficial for providing services to remote areas and can be used as a preventive measure by educating people.

Key words

Tele dermatology, e-Health, Pakistan.

Introduction

With the incorporation of information technology in medicine, new therapies are being introduced rapidly. Communication technology is developing at an extremely fast pace. Telemedicine is the epitome of this technology. Telemedicine means 'the use of telecommunications to diagnose and treat disease and ill-health' as opposed to the broader term 'tele-health' which includes 'surveillance, health promotion and public health functions'.¹

Several taxonomies have been proposed to

describe the telemedicine applications, including the relevant clinical specialties, the connectivity technology being used and the care model supported.² With the evolution of Information and Communication Technology (ICT), the term now encompasses telemedicine (telehealth), networking of ICT (e-health) and personalization of e-health (m-health and u-health).²

Visualization of images in medicine has proved invaluable in formulating patient diagnosis and obtaining opinion from qualified personnel who, though might not be present at site, can still offer professional advice and/ treatment from far away.³ The two methods used are store-and-forward and live-interactive. The effectiveness of the approach depends closely on the quality

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and acquisition characteristics of the imagery. Technical aspects, such as image resolution, focus, and depth-of-field, as well as, lighting, position of camera relative to the subject, and colour are all important to ensure enough information for accurate clinical assessment.³

It is imminent that teledermatology will be increasingly incorporated into conventional dermatology, often appreciated because of its instantaneous nature of diagnosis and treatment. It also has educational value for the primary care physician. Store-and-forward systems give high diagnostic accuracy and are cheaper and convenient for the physician.⁴

The developing world has a dire shortage of doctors and specialists. Disparities in access in all facets of health care exist, especially in rural areas. Factors contributing to the disproportionate impact of disease in these resource-poor settings are poverty, disease stigma, cultural and social barriers to testing and treatment, insufficient healthcare infrastructure for patient pool, lack of health literacy, limited provider training, inadequate medical equipment, scarce manpower, and few qualified laboratory facilities. Therefore, affordable, easy-to-use technologies like teledermatology are imperative for facilitating patient care and providing educational opportunities for healthcarers.⁵

In the developed countries, the uses are mostly consultation and access to population unable to avail healthcare e.g. older populations. In developing countries with poor infrastructure, non-availability of specialized healthcare personnel, and lack of good tertiary care centers put the burden on primary care facilities. Patients can be linked directly to highly trained professionals through telemedicine.

In developing countries, dearth of trained

healthcare providers is a significant resource limitation.⁶ In 2004, out of 7.7 million physicians practicing worldwide, half were catering to less than one-fifth of the world's population. An estimated 3.4 billion people in 300 developing countries are living with little to no access to basic dermatological care.^{7,8}

In Pakistan, a large majority is living in rural areas and access to tertiary care is difficult due to poor road infrastructure making it both expensive and inconvenient.⁹ The telecommunication industry is showing promise as annual cellular subscribers have reached 134,411,877 in 2016 from 34,506,557 in 2005. Total teledensity has increased from 11.89% to 71.08% in the same period.¹⁰ Different projects have attempted to take advantage of this rapid growth via telemedicine.¹¹

With digital photography and internet, basic health centers at the district (DHQ) and tehsil headquarters (THQ) could connect to tertiary care centers and thus benefit from the expertise of consultants. Examples of successful use include Egypt, where comparison between face-to-face technique and teledermatology showed high diagnostic accuracy.^{12,13}

While it is a useful technique for clinical problems, the focal point of future research should be on clinical outcomes using disease status as outcome measures, development of reliable and teledermatology-specific instrument surveys and economic analysis that assess cost-effectiveness.

Methods

In Pakistan, teledermatology services have been provided by different projects. In Mayo Hospital, Lahore, the project was run by Health Net, Suparco and MoIT from 2007-2010¹⁴ where three tertiary care centres were connected with

twelve rural centres. Mayo Hospital was connected with Gujrat, Jhang, Sahiwal, Rajanpur and Dera Ghazi Khan.

Patients were examined with the help of telemedicine equipment and facilitated by the doctor present at the other end. Patient's name, age, gender and location were noted and examined skin condition was duly noted. Patient's socio-economic status and audiovisual quality was noted. Patients were examined live at the tertiary care center and treatment prescribed. Patients were called to the tertiary care center for detailed examination and laboratory investigations, when needed.

Results

Through this project a total of 11,892 patients were provided consultation from 2009 to 2011. Out of these, the highest number of patients was seen in the Rajanpur area, followed by Gujrat, Jhang, DG Khan, Khushab and Sahiwal (**Figure 1**). The age groups commonly involved in these patients was 20-40 years (**Table 1**).

There were 42% males and 58% females. The male to female ratio was 1:1.3. The most

frequent disease was acne (42%), followed by infestations like tinea (28%), scabies (22%), eczemas (18%) infections like bacterial (11%) and viral (9%), hirsutism (4%) and autoimmune disorders (2%), psoriasis etc. as shown in **Table 2**. Amongst the fungal infections, the commonest were tinea capitis (35%), followed by tinea corporis (29%), tinea cruris (14%), tinea incognito (10%), tinea faciei (7%) and tinea manuum (5%), respectively (**Figure 2**).

Among the viral infections, the commonest causes were viral warts, herpes simplex, and

Table 1 Age distribution.

Age groups	N (%)
<20 years	3329 (28)
20-40 years	4637 (39)
40-60 years	2498 (21)
>60 years	1428 (12)

Table 2 Frequency of different dermatoses.

Dermatoses	Frequency
Acne	4994
Tinea	3329
Scabies	2616
Eczemas	2140
Infections	1070
Hirsutism	476
Autoimmune	238

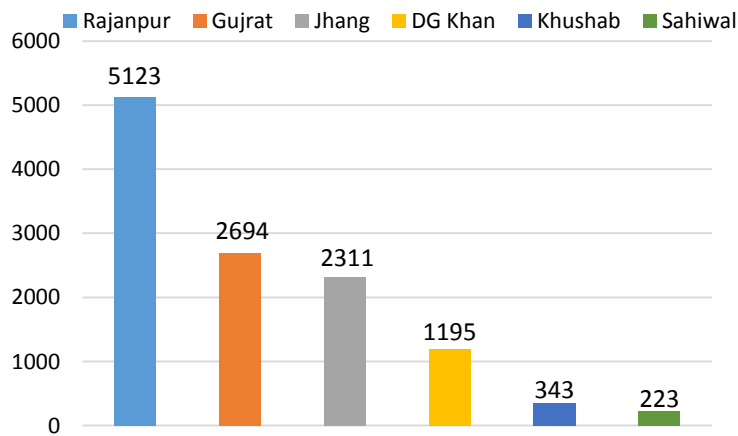


Figure 1 Distribution of patients by area.

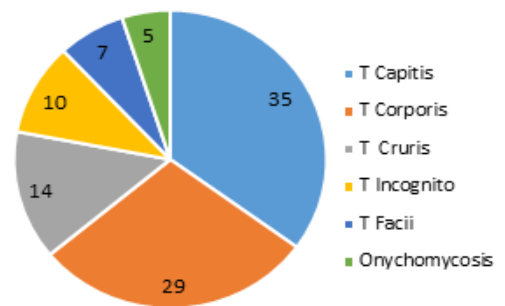


Figure 2 Distribution of fungal infection.

herpes zoster. The bacterial infections comprised folliculitis, impetigo, furunculosis and cellulitis.

Discussion

These results depict the demographic distribution of not only the diseases, but also the healthcare facilities. Areas with larger number of patients are also poorly developed, with higher illiteracy and lack of facilities (educational and healthcare) as compared to other areas. There is also lack of qualified personnel which makes these areas more vulnerable to skin ailments when treated by non-qualified personnel.

The age group most frequently affected was from the second decade. This is similar to the study by Tameezudin *et al.*¹⁵, the age group most commonly affected is 21-30 years (19.5%), followed by 31-40 years. Rest of the age groups contributed less than this.

In the study by Memon *et al.*¹⁶, the age group most commonly affected was 0-10 years (41.8%), followed by the age group of >20 years (36.9%). In a study in Allahbad,¹⁷ the most commonly affected age group was <10 years (67%), followed by 11-20 years (31%). In a study in Kolkata,¹⁸ the most affected age group was from 15-24 years, followed by 25-34 years, while in the study carried out in Muzaffarabad,¹⁹ the mean presenting age group was 23 years.

In our study, the male to female ratio was 1:1.3. In the study carried out in India by Rao *et al.*²⁰ the male to female ratio as 1.7:1, while in another study, males comprised 48% and females 51.5% of the patient population. In the study carried out in the outpatient department in Karachi²¹ 54% of the patients were females, while males were 46%. A similar pattern is observed in the study by Agarwal *et al.*,²² where the male to female ratio was 1.8:1.

The higher preponderance of females in our study could be due to higher awareness of females in our population regarding appearance and also the injudicious use of steroids in females contributing to acne as the commonest presenting complaint.

Among the non-infective dermatoses, acne was prominent (6221, 52%). This disorder was also seen commonly in other studies in this region with acne being the second commonest disorder. (10.69%) of the patients.²³ Topical steroid use is a major problem in the Pakistani population as evidenced in the study by Chohan *et al.*²³ The cause for acne being a prominent disorder may be the injudicious use of whitening creams and the use of hakeem medications for multiple ailments, both topical and systemic.

This is in contrast to other studies where eczemas predominated.²¹ Similarly, in another study conducted in India, infective dermatoses predominated with fungal infections being the commonest at 18.74%, followed by bacterial at 6.74%.²⁴ Acne was the second commonest disorder (12%)¹⁹ preceded by scabies (20%). In a study in Karachi²¹ the commonest complaint observed were eczemas (18%), followed by scabies (16%) and acne (13%). Similar to our study, in the study by Patel and Patel²⁵ acne was the commonest disorder, being found in 14% of the patients.

Fungal infections were the second commonest disorder with a prevalence of 28%. The high prevalence rate could be due to high humidity and increased population density, compared to other studies²¹ where the incidence of fungal infections was relatively low. This could be attributed to a lower density and a drier weather compared to this population. In another study in India,²⁰ fungal infections comprised 10% of diseased population. The presence of tinea incognito shows the injudicious use of steroid

used to treat a skin ailment which is a common practice in area with poor quality basic healthcare where quackery is rampant.

Scabies was the third prominent disorder in this study (14.7%). In another study by Memon *et al.*,¹⁶ scabies was the commonest disorder (45%), and fungal infections were 13%. The difference between the prevalence of scabies and fungal infections can be due to the changes in climate. Also water inadequacy and poor hygiene are associated with these conditions.¹⁶ There is also a preponderance of these dermatoses in family members, showing the close contact among family members and proximity of sleeping quarters. These problems have to be dealt with by using a community approach and spreading awareness as opposed to treating individual patients.

Eczemas constituted the fourth prevalent dermatosis with 18%. In the study by Asokan *et al.*,²⁴ eczemas constituted 23% of the diseases. This is similar to the study in Karachi by Maryum *et al.*²¹ eczemas comprised 18% of diseases. While in the study by Patel and Patel²⁵ eczemas contributed 8% of the total disease burden.

In the lower income groups, after the fungal infections, the frequent ones were viral and bacterial.

Among the viral infections, the commonest were viral warts. This is similar to the study in India,²² where the incidence of viral warts was the highest, followed by herpes zoster and varicella. In this study, however, after verruca vulgaris, the common infections were herpes zoster and herpes simplex.

In the bacterial infections, the commonest were folliculitis, impetigo and furunculosis. In the study by Memon *et al.*,¹⁶ incidence of folliculitis

was 4.4% and impetigo 3.4%. In the study by Maryum *et al.*²¹ the incidence of furunculosis was 4% and impetigo 3%. These were more prevalent in low-income families and with large number of family members. Also these are areas without proper sanitation facilities and practices like infrequent hand washing aggravate that problem.

Comparison of disease by class showed infections being commoner in the lower socio-economic strata, while autoimmune disorders like discoid lupus erythematosus predominate in the middle-income group, followed by hirsutism.

Conclusion

Telemedicine has immensely helped in the diagnosis and treatment of people living in far-flung areas. However, connectivity was a problem at times. Quality of equipment, training of concerned personnel (general practitioners) and good quality, high speed connection play an essential role in the prompt delivery of services.

In addition to diagnosis and management, this facility can also be used for educating patients regarding hygiene and prevention of communicable diseases

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