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PATIENTS' PERCEPTION OF ARTIFICIAL INTELLIGENCE IN CLINICAL PRACTICE OF DERMATOLOGY

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ABSTRACT

Object: This study aimed to explore patients' perceptions of artificial intelligence (AI) being used in clinical dermatology practice. **Background** Skin diseases are prevalent globally, affecting nearly 2 billion individuals. Dermatology has embraced AI for tasks like identifying skin lesions and improving clinical decision-making. However, patient acceptance of AI in clinical settings depends on their attitudes and perceptions. **Method** This cross-sectional study recruited 368 participants aged 18-45 years with non-cancerous skin diseases at outpatient dermatology setups in Karachi, Pakistan. A structured questionnaire assessed demographics and perceptions towards AI in dermatology on a Likert scale. Data analysis included descriptive statistics, chi-square tests, and composite perception scores. **Result** The median age was 27 years, with a majority being female (81.5%). Most participants (47%) were illiterate and housewives (57.6%). Overall, 52.7% had a positive perception of AI in dermatology. Patients believed AI could improve diagnostic accuracy (77.7%) and expedite treatment processes (79.6%). Interestingly, opinions were divided regarding trusting AI over human dermatologists (43.8% neutral) and AI replacing dermatologists (49.2% neutral). Data privacy concerns also remained neutral for 45.4% of participants. Notably, 45.4% disagreed with AI in medicine causing fear. **Conclusion** Patients showed a slight positive view of AI in dermatology, but many lacked understandings of its workings. Trust in AI diagnoses was conditional on exceeding dermatologist accuracy. Patients preferred AI to collaborate with, not replace, dermatologists. The study highlights the need for patient education to improve comfort levels with AI in dermatology.

BACKGROUND

Globally, almost 2 billion individuals are affected by skin diseases.[1] These diseases can cause significantly high morbidity but apparently less mortality.[2] Skin diseases can vary from country to country and even within a country due to different genetics, ecological factors, social customs, and hygienic standards.[2] In Pakistan, scabies is the most common skin disease (46%), followed by eczema (18%), fungal infection (13%), acne (3%), and psoriasis (1%).[3-5]In the present era, the integration of artificial intelligence (AI) in different fields of healthcare has gained popularity because of its potential to revolutionize diagnostic and treatment processes.[6] Dermatology has also

witnessed the introduction of AI technologies aimed at identifying skin lesions, predicting clinical outcomes and improving clinical decision making. A recent study showed that AI assistance was highly associated with an agreement with the diagnosis made by panel of dermatologists and found outcomes that benefit one out of every 8 to 10 patients.[7-9] However, despite the potential advantages, the integration and acceptance of AI technologies in clinical practice depends upon the attitudes and perceptions of the patients.[10-12] Dermatology is embracing AI's potential to improve diagnosis and workflow, but creating reliable and fair AI tools requires clear standards for development and testing. These standards are crucial for ensuring the safety and effectiveness of AI in skin care. AI's problem-solving and pattern recognition skills are making waves in medicine, especially dermatology. Machine learning, a powerful AI tool, allows computers to learn from data and improve algorithms on their own. This is perfect for dermatology, where vast image databases exist for training and analysis. While diagnosing skin disease with machine learning is well-explored, predicting long-term outcomes remains a frontier. Research in this area could be a game-changer, helping doctors choose the best treatments, saving patients time and money, and reducing trial-and-error approaches. Understanding the perceptions of patients regarding AI in dermatological practice is important as it will help healthcare providers in gaining invaluable insights into how to effectively integrate AI into dermatological care while addressing patient concerns.[13-15] Therefore, the aim of current study is to explore patient's perceptions of AI in the clinical practice of dermatology, shedding light on their expectations, concerns, and willingness to embrace AI-driven dermatological care. The aim of this study was to explore patients' perceptions of AI in the clinical practice of dermatology in outpatient dermatology setups.[16]Recent advancements in artificial intelligence (AI) have shown promise in dermatology. Deep learning algorithms can achieve accuracy on par with dermatologists in identifying common skin concerns like melanoma and keratinocyte carcinomas. As AI integration into dermatology practice becomes a possibility, understanding patient perspectives on this change is crucial.[17-20]

METHODOLOGY

This was a cross-sectional study, conducted among patients of age 18 to 45 years of either gender having non-cancerous skin diseases at presentation. Patients having pregnancy, mental disorders, or any chronic illness were excluded from the study. The study was conducted at outpatient dermatology setups in Karachi, Pakistan for a duration of six months. Non-probability consecutive sampling technique was used for data collection from sample of 309≈310 participants, that was estimated using Open Epi sample size calculator, by taking statistics of patients' perception of AI as superior tool than human's experience=27.8%[21], bond on error=5% and 95% CI. Ethical approval was obtained from Center of International Research Sciences (ERC-CRIS-2023-601). Written informed consent was obtained from all the eligible participants after explaining them the objective of the study and addressing all concerns. A structured questionnaire was designed and validated on pilot scale before study initiation. The questionnaire was used to assess demographic factors and perception of patients regarding AI in dermatology. Responses for perception of patients were assessed on Likert scale. Data was analyzed using SPSS version 25. Descriptive statistics (frequencies, means, and percentages) were used to summarize participants' responses. Cross-tabulations and chi-square tests were used to explore relationships between demographic variables and perceptions.

RESULTS

To validate the questionnaire, reliability analysis was performed on a pilot data set comprising 30 samples, yielding Cronbach's alpha value of 70.1%. This suggests a moderate level of internal consistency among the items. To address missing or incomplete data, the total sample size was increased by 20%. Consequently, the inflated sample size reached approximately 372≈375 participants. However, seven participants had incomplete data and were subsequently excluded from the final analysis. As a result, the final analysis included 368 participants. The distribution of age of participants was non-parametric (Shapiro Wilk test value=0.89, p=0.001). The median age was 27

years (IQR=20 to 35 years). Of 368 participants, 81.5% were females and 18.5% were males. About 69% of the participants were Urdu Speaking, 7.9% were Punjabi, 5.7% were Pashto, 4.9% were Sindhi and 0.8% were Balochi. Regarding educational and occupational backgrounds, a large portion of the participants were categorized as illiterate (47%) and housewives (57.6%). Interestingly, the majority had not visited a dermatologist's clinic within the past year. Furthermore, only 6.5% demonstrated knowledge regarding the application of AI in dermatology clinics (Table 1). Among the 368 participants, most of the participants expressed positive opinions towards the potential benefits of AI in healthcare. Specifically, 77.7% agreed that AI could enhance the accuracy of diagnoses and treatment, while 79.6% believed it could reduce the time required for these processes. Additionally, 61.4% believed the integration of AI could positively impact the patient-doctor relationship. Interestingly, opinions varied in certain aspects. Approximately 43.8% remained neutral regarding placing more trust in human dermatologists compared to AI. Similarly, 49.2% remained neutral on the proposition that AI technology might replace dermatologists in the future, and 45.4% remained neutral on the proposition that concerns data confidentiality associated with AI usage. Furthermore, it is noteworthy that 45.4% of the participants disagreed with the notion that the influence of AI on medical treatment instilled fear in them. The composite perception score, derived from the sum of 7 items, was utilized to assess participants' overall perception. The distribution of this perception score was found to be non-parametric, as indicated by the Shapiro-Wilk test (value=0.966, p=0.001). The median overall perception score was 16, with an interquartile range (IQR) spanning from 14.25 to 17. A perception score equal to or greater than 16 was considered positive, while a score less than 16 was deemed negative. Among the 368 participants, 52.7% exhibited a positive perception of AI in dermatology clinics, while 47.3% held a negative perception. The examination of socio-demographic factors in relation to perception revealed a lack of statistically significant associations. Specifically, age, gender, ethnicity, education, and occupation did not exhibit a meaningful relationship with perception, as evidenced by p-values exceeding 0.05. (Table 3)

DISCUSSION

This study included 368 participants, with a median age of 27 and a majority being female (81.5%). A significant portion (47%) identified as illiterate and housewives (57.6%) and Urdu was the most common spoken language (69%). Patients expressed generally positive views towards AI in dermatology. 77.7% agreed that AI could improve diagnostic accuracy and treatment. 79.6% believed that AI could expedite diagnosis and treatment processes. 61.4% felt that AI could positively impact the patient-doctor relationship. However, some opinions remained divided. 43.8% were neutral on trusting AI over human dermatologists. 49.2% were neutral on AI replacing dermatologists. 45.4% were neutral on data privacy concerns with AI use. Interestingly, 45.4% disagreed with AI in medicine causing fear. An overall perception score indicated: 52.7% of participants held a positive perception of AI in dermatology and 47.3% held a negative perception. Sociodemographic factors (age, gender, ethnicity, education, occupation) did not significantly influence perception. This study offers valuable insights into patient perspectives on AI in dermatology. The positive views on potential benefits for diagnosis, treatment speed, and even the doctor-patient relationship suggest a level of openness towards this technology. However, the neutral stances on trusting AI over human expertise, potential job displacement of dermatologists, and data privacy concerns highlight the need for open communication and education. Interestingly, the lack of fear associated with AI is encouraging for future adoption.

CONCLUSION

Our results suggest that although patients have a slightly positive view of AI, while patients are somewhat open to AI in dermatology, many don't quite grasp how it works. Interestingly, they had only trust an AI diagnosis if it were more accurate than a dermatologist. Current AI models for skin disease detection aren't quite there yet, with accuracy ranging from 57% to 75%, compared to 75% to 85% for dermatologists. This means there's a gap to bridge before patients would trust AI alone.

Our study also found patients prefer AI to work alongside dermatologists, not replace them. The more familiar patients were with AI, the more positive their perception and the stronger their belief in AI assisting dermatologists. This suggests that educating patients about AI could significantly improve their comfort level with its use in dermatology.

LIMITATIONS OF OUR STUDY

Limitations of our study include the use of a non-validated survey, limited or few-institution nature, lack of highly educated patient population, and focus on a single use of AI as a tool to evaluate patient-acquired photographs and provide diagnoses. Further research should be aimed at validating patients' accuracy requirements for AI implementation in various settings. AI algorithms trained on datasets with limited patient diversity might miss variations in how diseases present themselves in different populations. Deep learning algorithms require vast amounts of well-labeled data to function effectively. The International Skin Image Classification (ISIC) archive is a crucial resource, but it needs to be expanded further. Collaboration with frontline physicians is essential to gather a more diverse and representative dataset. After all, the quality of the data ultimately determines the quality of the AI's performance.

FUTURE DIRECTIONS

Larger, more diverse studies are needed to confirm these findings across different populations. Research should explore patients' preferred communication methods regarding AI's role in dermatology. Educational campaigns can address concerns about AI replacing dermatologists and data privacy. This study provides a foundation for further investigation into patient perceptions of AI in dermatology. By understanding these perspectives, healthcare professionals can promote trust and optimize the integration of AI into clinical practice for the benefit of patients.

DISCLOSURE

This study received AI technology support from Martin Dow Limited for provision of AI based software "MD Aider" and image capturing equipment which was used for demonstration and experiencing the process of AI in clinical practice of dermatology.

Table 1: Baseline characteristics of study participants (n=368)

Age (years)	27 (20-36)
Gender	
Male	68 (18.5)
Female	300 (81.5)
Ethnicity	
Urdu Speaking	254 (69)
Sindhi	18 (4.9)
Punjabi	29 (7.9)
Pashto	21 (5.7)
Balochi	3 (0.8)
Others	43 (11.7)
Education	
Illiterate	172 (46.7)
Matric	96 (26.1)
Intermediate	69 (18.8)
Graduate	26 (7.1)
Postgraduate	5 (1.4)
Occupation	
Student	81 (22)
Housewife	212 (57.6)
Self-employed	55 (14.9)
Businessman	15 (4.1)
Retired	3 (0.8)
Unemployed	2 (0.5)

Visit at dermatologist's clinic in a year	
Less than once a year	63 (17.1)
1-2 times a year	56 (15.2)
3-4 times a year	24 (6.5)
More than 4 times a year	49 (13.3)
Never visited	176 (47.8)
Awareness regarding use of AI in dermatology clinics	
Yes	24 (6.5)
No	344 (93.5)
Data presented as Median (IQR) or n (%)	

Table 2: Perception regarding the use of AI in dermatology clinics (n=368)

S.no.	Items	Agree	Neutral	Disagree	Median (IQR)
1	AI can improve the accuracy of diagnosis and treatment in dermatology	286 (77.7%)	70 (19%)	12 (3.3%)	3 (3-3)
2	AI could reduce the time it takes for diagnosis and treatment	293 (79.6%)	66 (17.9%)	9 (2.4%)	3 (3-3)
3	I have more trust on human dermatologists than AI	111 (30.2%)	161 (43.8%)	96 (26.1%)	2 (1-3)
4	AI technology can replace dermatologists in the future	34 (9.2%)	181 (49.2%)	153 (41.6%)	2 (1-2)
5	The use of AI in dermatology could positively impact the patient-doctor relationship	226 (61.4%)	104 (28.3%)	38 (10.3%)	3 (2-3)
6	I have concerns about my data privacy and security when AI is involved in dermatology care	113 (30.7%)	167 (45.4%)	88 (23.9%)	2 (2-3)
7	The influence of AI on medical treatment scares me	78 (21.2%)	123 (33.4%)	167 (45.4%)	2 (1-2)

Table 3: Comparison of socio-demographic factors and perception of participants regarding use of AI in dermatology (n=368)

	Perception		
	Positive	**Negative**	**p-value**
Age groups			
<=25 years	90 (51.4%)	85 (48.6%)	
>25 years	104 (53.9%)	89 (46.1%)	0.637
Gender			
Male	37 (54.4%)	31 (45.6%)	
Female	157 (52.3%)	143 (47.7%)	0.757
Ethnicity			
Sindhi	8 (44.4%)	8 (55.6%)	
Urdu Speaking	140 (55.1%)	114 (44.9%)	
Punjabi	15 (51.7%)	14 (48.3%)	
Balochi	2 (66.7%)	1 (33.3%)	
Pashto	7 (33.3%)	14 (66.7%)	
Others	23 (53.5%)	20 (46.5%)	0.451
Education			
Illiterate	86 (50%)	86 (50%)	
Matric	54 (56.3%)	42 (43.8%)	
Intermediate	38 (55.1%)	31 (44.9%)	
Graduate	13 (50%)	13 (50%)	
Postgraduate	3 (60%)	2 (40%)	0.857
Occupation			
Student	43 (53.1%)	38 (46.9%)	
Housewife	112 (53.1%)	99 (46.9%)	
Self-employed	28 (50%)	28 (50%)	
Business man	9 (60%)	6 (40%)	
Retired	0	3 (100%)	
Unemployed	2 (100%)	0	0.343

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