



## Awareness, Attitude and Perception Towards Tele-optometry Among Optometrists

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### Abstract

**Background:** Tele-optometry can help improve eye health in this changing world by providing better, quicker accessible eye care, especially for the elderly, those with disabilities, and those who live in rural areas.

**Purpose:** This study is aimed at identifying the awareness, attitude, and perception towards tele-optometry among optometrists.

**Methods:** A pilot, online survey was sent to optometrists in Tamil Nadu via Google Forms. A published survey containing 34 questions, modified by obtaining expert opinions was used. It contained four sections: a consent form, demographic details, questions on awareness and knowledge of tele-optometry, attitude and perception towards tele-optometry. Descriptive analysis was carried out.

**Results:** Among the 95 respondents, 70 were females and 25 were males. 76% had undergraduate degrees and 20% had completed their post-graduation. The majority of respondents (55%) worked in hospitals and 19% of the respondents were into academics. 80% of them had heard about tele-optometry but 71.6% were unfamiliar with the tools used in tele-optometry. 49.4% agreed that it provides more comprehensive health services but reported unfamiliarity with technique, accuracy of the data, not having trained staff available, and poor connectivity issues were reported as barriers to using the services.

**Conclusion:** Over 80% of optometrists had "Awareness, Attitude, and Perception" of tele-optometry, however, their practice was limited owing to unfamiliarity with the technologies employed in it.

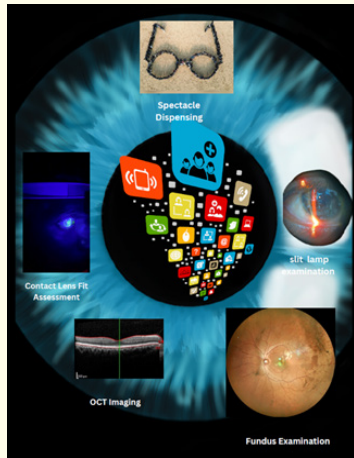
**Keywords:** Tele-optometry; Awareness; Attitude; Perception

### Introduction

A promising and preferred method of connecting doctors and patients to provide healthcare to people with limited access and resources is telehealth. Telehealth can take many different forms, from video consultations to outreach clinics that provide test findings for physician interpretation to monitoring through mobile phone apps. The common online platforms used in Telehealth include Opternative, Facetime, Google Meet, Zoom, Skype, and Google Hangout [1]. High-speed internet and ongoing software and equipment advancements in the eye care industry support the growth of telehealth as tele-ophthalmology or tele-optometry. By eliminating obstacles, such as long travel distances and high trip expenses, telehealth can improve access to medical treatment for underprivileged populations [2]. The most popular method of tele-ophthalmology is the collaboration of ophthalmologists with optometrists where the ophthalmologists consult the patients remotely with the help of optometrists.

Tele-ophthalmology services have been provided by Sankara Nethralaya Medical Research Foundation (Chennai), Aravind Tele-ophthalmology Network, Madras Diabetic Research Foundation (MDRF) in collaboration with the World Diabetes Foundation (WDF) as the Rural India Diabetes Prevention Project. All have concluded that "Tele-ophthalmology can be a very effective model for improving eye care delivery systems in rural and underserved areas of India" [3]. The length of time spent at the doctor visit (includes wait time and assessment time) was reduced with tele-glaucoma services being 78 minutes as tele-consultation whereas with in-person care it took 115 minutes [4]. Tele-ophthalmology was found to play an important role in eye care needs of all diabetics, with optometrists' clinics having digital retinal cameras, a programme was started in 2004 to more effectively triage referrals [5]. Tele-ophthalmology using digital imaging, both stereoscopic and mydriatic reduced average travel distance and time by 219.1 km and 2.7 hours, respectively for all 190 participants. It also reduced

office visits to the retina specialist by 48% [6]. Patient satisfaction among older age groups was found to be between 88% - 98% as reported in a review by Sreelatha., *et al.* It not only saves time by having options of home services and near-by clinics, but also gives more time to patient-practitioner interaction [7].



**Image 1:** Modes of tele-consultation used in eye care: Fundus photography, Slit lamp imaging, OCT imaging, Contact Lens fit assessment.

Tele-optometry has developed into a field where patients may receive low-vision treatments, subjective refractions, contact lens consultations, and other optometric care [2] (Image 1). Tele-optometry is even attempted for consultation on contact lens problem cases. Video-based observations were suggested for evaluating contact lens fit, and experts assessed changes in lens parameters. There was 78% agreement between live and video based evaluators suggesting the feasibility of contact lens fit evaluations with tele-optometry [8]. Roe., *et al.* reported qualitatively that patients who underwent telehealth video vision therapy were just as likely to experience a resolution of binocular vision problems as those who underwent in-office vision therapy [9]. According to Saleem., *et al.* 74% of patients were not aware of the telehealth eye care approach; however, due to the pandemic, its utilization has grown by 257% to 700% [10]. In Western Australia, the proportion of remote and very remote patients increased significantly, with 79.0 % in the on-call service compared to 26.1%. The most frequent diagnosis was cataract (40.9%). Of the on-call telehealth, 3.5% required immediate transfer for further management and another 24.5 % required surgical management [11]. A study in India also brought to light that daily wage workers, between age groups 21 – 40 years of age, were reluctant to leave their jobs and report for an eye examination, where the majority of them (61.28%) required surgical intervention, 12.8% of patients could be treated remote-

ly [12]. This brings out the importance of tele-consultation being available at their services. The number of people who were practicing tele-optometry during COVID lockdown was in India found to be 50.94% (n = 691) through telephones, video or social media [13]. However, there is less information about tele optometry services in the post-COVID scenario. Tele-optometry aims to improve access to eye care services, reaches remote regions, allows for more flexible scheduling, and saves patients time and money. This would result in decreasing the burden of preventable visual impairment. Evidence for the benefits of therapy, safety, and results of tele-optometry enabled by optometry is scarce [2].

This creates an interest to know the awareness level among Indian optometrists on awareness, attitude, and perception towards tele-optometry. Hence the present study aims to understand the awareness, attitude and perception towards tele-optometry among optometrists.

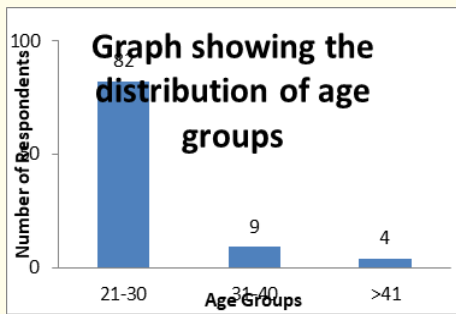
### Materials and Methods

A pilot, online survey was sent to optometrists in Tamil Nadu via Google Forms. The published survey contains 34 questions, modified for the current study by expert opinion [14]. It has four sections including a consent form, 11 questions on demographic details; 10 questions on awareness and knowledge of tele-optometry, 4 questions on attitude, and 9 questions on perception towards tele-optometry. Awareness is the knowledge that something exists. Attitude is a mind-set or tendency of acting toward something in a certain way according to personal experiences. Perception is the process by which individuals organize and interpret their impressions toward any kind of information in the environment [15]. This study helps to bring out these aspects of optometrists towards tele-optometry. Those who had completed their optometry (B.Sc, M.Sc, M.Phil, PhD, Fellowship, or Diploma) and above 21 years of age were included. Those who were pursuing their under-graduation in optometry were excluded. Analysis was done using SPSS software version 26. Descriptive statistics were reported.

### Results

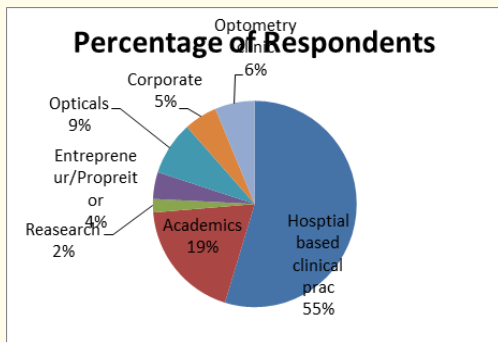
The current study had responses from 95 optometrists among which seventy were females and twenty five were males. The respondents were further classified into three age groups and majority of them were between 21-30 years of age (Graph 1).

76% had undergraduate degree and 20% had completed their post-graduation. They were further categorized based on their workplace like hospital-based clinical practice, Academics, Research, Entrepreneur/Proprietor, Optical, Corporate, and Optom-



**Graph 1:** Graph showing the distribution of age groups among the data (n = 95).

etry clinic (Figure 1). Most respondents (55%) worked in hospitals and 19% of the respondents were into academics. A small number stated that they had been in practice for more than twelve years whereas 50% were in practice between 1-4 years.



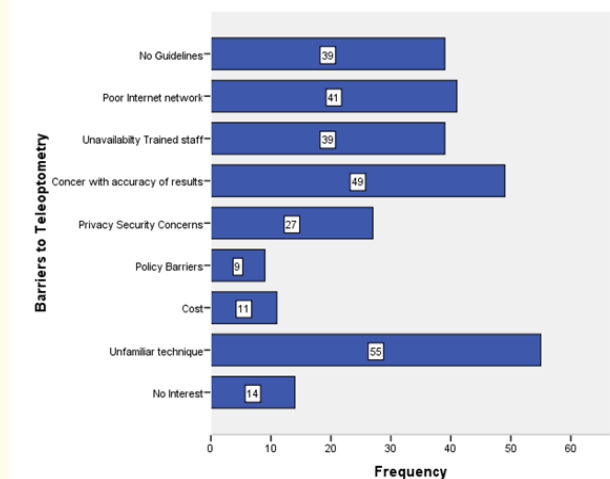
**Figure 1:** Pie chart depicting the categories of workplace of the participants (n = 95).

82% defined tele-optometry as “The remote diagnosis and treatment of patients by means of telecommunication technology”. Most of the participants were using EMR at their workplace. They reported that they could make use of tele-optometry services but were unfamiliar with the tools it involves. Only 9 out of 95 had received training in tele-optometry and awareness about the platforms of tele-consultation was found to be only 15.8% (Table 1). Though the participants were aware of tele services their “knowledge and awareness” on its usage was only 43.3%. Almost 95% of the participants felt tele-optometry could be beneficial if incorporated in regular practice (Table 2). 67.4% gave a neutral response on whether tele-optometry would induce medical errors and 49.4% agreed that it provides more comprehensive health services. 45 of them were not sure if tele-optometry would improve clinical services.

**Table 1:** Table showing participants “Awareness and Knowledge” about Tele-optometry.

		Frequency	Percentage (%)
Is EMR Used at your workplace?	Yes	62	65.3%
	No	33	34.7%
Heard about tele-optometry or telemedicine before?	Yes	76	80.0%
	No	19	20.0%
Have you ever used teleptom-etry before?	Yes	23	24.2%
	No	72	75.8%
Can you make use of tele-optometry?	Yes	76	80.0%
	No	19	20.0%
Are you familiar with the tools used in tele-optometry?	Yes	27	28.4%
	No	68	71.6%
Have you received training on tele-optometry?	Yes	9	9.5%
	No	86	90.5%
Are you aware of any plat-forms or software’s used in tele-optometry?	Yes	15	15.8%
	No	80	84.2%

All participants had different opinions regarding barriers (Graph 2) to practicing tele-optometry, being concerned majorly about the technique, accuracy of the data, not having trained staff available and poor connectivity issues.



**Graph 2:** Bar graph showing the various reasons listed as barriers to tele-optometry services.

In perception-related questions, majority of them were positive about tele-optometry creating a good impact on the clinical services (Table 3). There was good awareness (88.4%), good attitude (94.7%) and average perception (71.6%) towards tele-optometry.

**Table 2:** Table showing participants "Attitude" towards tele-optometry.

		Frequency	Percentage (%)
Would you be interested to try mobile-app based optometry?	Yes	83	87.4%
	No	12	12.6%
Would you incorporate tele-optometry in you practice?	Yes	77	81.1%
	No	18	18.9%
Is Tele-optometry is feasible in TN?	Yes	46	48.4%
	No	1	1.1%
	Maybe	48	50.5%
Is tele-optometry beneficial?	Yes	90	94.7%
	No	5	5.3%

**Table 3:** Table showing participants "Perception" towards tele-optometry.

		Frequency	Percentage (%)
Do you agree that tele-optometry would induce medical errors?	Strongly Agree	4	4.2%
	Agree	20	21.1%
	Neutral	64	67.4%
	Disagree	2	2.1%
	Strongly Disagree	5	5.3%
Do you agree that tele-optometry enables to complete task faster?	Strongly Agree	8	8.4%
	Agree	44	46.3%
	Neutral	33	34.7%
	Disagree	7	7.4%
	Strongly Disagree	3	3.2%
Does Tele-optometry provide more comprehensive health services?	Strongly Agree	10	10.5%
	Agree	37	38.9%
	Neutral	37	38.9%
	Disagree	11	11.6%
	Strongly Disagree	0	.0%
Would Tele-optometry improve clinical decisions?	Strongly Agree	3	3.2%
	Agree	28	29.5%
	Neutral	45	47.4%
	Disagree	12	12.6%
	Strongly Disagree	7	7.4%
What is the most important benefit of tele-optometry	Could replace traditional method of services	9	9.5%
	Facilitate patient's doctor relationship	13	13.7%
	Saves a lot of time	21	22.1%
	Saves money and resources	11	11.6%
	Readily available and accessible	41	43.2%
Can tele-optometry be used for all conditions?	Yes	15	15.8%
	No	80	84.2%
Do you think all ages should be consulted via tele-optometry?	Yes	35	36.8%
	No	60	63.2%

## Discussion

Tele-optometry in primary eye care can reduce logistical barriers of vulnerable patients. Optometrists can virtually co-manage glaucoma, reduce the need for patients to attend in-person consultations with ophthalmologists and reduce the indirect costs of care. The current study also reports 43% of participants believe that tele-optometry makes eye care readily available and accessible [2]. There was a low level of knowledge with a high positive attitude towards tele-optometry reported by Ezinne N [14], the major concerns being on privacy/security and the accuracy of test results performed. The current study lists unfamiliarity with the technique, concern over accuracy of reports and internet connectivity issues as major drawbacks to practice tele-optometry. A study done in Chattisgarh, India reports the lack of infrastructure and proper guidelines to make use of tele-medicine, [16] which is very similar to our results also. The current study had only 95 respondents and majority being from the hospital setup, the use of tele-optometry at various categories of workplace could not be studied in detail. The participants have not received any training in tele-optometry and are not aware of softwares used for tele-optometry, which could be a reason for many “neutral” responses in the perception segment of the questionnaire. The present study brings about the fact that optometrists are ready to incorporate tele-optometry in their services, the major concern being inexperience of the technique.

Telemedicine addresses two major problems – inadequate access and uneven resource distributions. It is a holistic approach towards medicine with path breaking innovations using robotics, virtual reality and artificial intelligence [17]. The use of software to connect with patients, elicit a history, and conduct a limited physical exam has proven to be invaluable tools to aid our healthcare workers [18]. New in ophthalmology is “Home-Tele-ophthalmology” (HTM). It is the use of information, communication, and monitoring technologies that allow healthcare providers to remotely evaluate eye status, give educational intervention, or deliver eye care and social care to patients in their homes. Smartphones can assist in self-screening of vision, remote patient monitoring of visual field defects in ARMD, scheduling appointments, reminding prescription refills, and educating patients. Vision screening can be done using smartphone applications such as PEEK Acuity, Kay iSight, and Amsler’s grid. EyeNetra, a web-based refraction system can unlock new areas in telemedicine in community eye health. Home-tele-ophthalmology has the potential to solve the inequitable distribution of eye care by reaching remote areas. Tele-ophthalmology has expanded from vision centers to homes, bringing in an entirely novel form of ophthalmic healthcare delivery that is capable of reaching those in need [19]. A low level of knowledge

about telemedicine has been reported among other but this study brings about the fact that awareness and attitude is higher among optometrists when compared to perception towards tele-optometry. Sharma, *et al.* reported that 59% (n = 58) of ophthalmologists had low confidence in providing opinion on remote consultation. Their survey revealed an interest in practicing tele-consultations by younger ophthalmologists but emphasizing the requirement for good telemedicine platforms [20]. Similar results were also reported in the present study, where the optometrists are keen to take up tele-consultation modes but are unaware of the platforms or training available. Recommendation of integrating telemedicine education and training in medical schools, residency programs, and optometry programs will enhance modes to practice tele-optometry as also reported by Antoinette, *et al.* Improving the knowledge on telemedicine with providing formal training will build the confidence of practitioners [21].

## Conclusion

More than 80% of the optometrists had “Awareness, Attitude and Perception” on tele-optometry but their practice was limited due to unfamiliarity with the tools used in it. To ensure that practitioners continue to provide services, especially to remote communities, there is a need for training on how to incorporate tele-optometry in their practices, and the available platforms to use.

## Conflicts of Interest/Financial Disclosures

None.

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