Abstract

Care for eye health in developing countries like India is always challenging. Rural population is at risk of poor eye care services and there is a significant increase in use of self-medication practices for eye ailments due to a lack of awareness/self-efficacy in rural areas. Telemedicine is a promising technology for addressing the gap in primary eye care service delivery. It can be used in diverse applications for the benefit of ocular health of an individual. In public health perspective, use of artificial intelligence has been explored in various fields of ocular health, prevention of ocular ailments and infection control. The primary focus of these technologies are currently limited to use in a few clinical applications focused on areas like differential diagnosis, prediction, early detection, tele-ophthalmology, collecting and safekeeping of electronic health records. In the advent of newer technologies like artificial intelligence and deep learning, we can harness this improving technology to create a positive change in the life of each and every individual of our community who are staying at remote locations, far from densely populated eye care service providers. With the use of technology, we can devise a tool targeting rural, underprivileged populations to provide a bridge to diagnose, differentiate and reorient the economy, cast, location for all the developing countries is very much needed.

Key words: Health informatics, Diabetic retinopathy, Tele-Ophthalmology, Public health, Artificial intelligence, Deep learning.

Key Messages: Information technology and artificial intelligence have numerous applications in the field of public health. This article briefs us about the necessity of using health informatics and technology in the field of community eye care. Keeping patient centric perspective into reflection for the near future.

Introduction

The concept of Public health is very familiar for Indians since ancient times. There were descriptions of the concept ‘world is one family’ is seen in ancient Hindu text name Hitopadesha which encourages the young minds to adopt this philosophy. If we consider the world as our family, we will certainly help the population at times when they are in need. Modern concept of public health came in to existence when Professor Wilson defined it in 1920. The definition emphasis on promoting health, prevention of disease and prolonging life. After the concept of public health became clearer, health care professionals started developing various strategies to cope up with the demand and supply of health care services by adopting different methods to serve the under privileged and rural communities in India. Adopting the concept of eye camps and NGO started and eye care providers, information technology is advancing in quick steps and giving a platform to the rural parts of India by public private partnerships to effectively reduce the eye disease burden and ocular morbidity.

Being a developing country India has several challenges like low ophthalmologists to patient ratio, underdeveloped infrastructure and lack of funding from the government to organise and serve the community and relieve their ocular problems. Cataract emerged as a bigger issue slowly due to its nature being multifactorial in nature is a complex condition and primary effect on transparent and avascular structure of eye. Retinal diseases like age related macular degeneration and diabetic retinopathy are effectively screened with new, exiprienced optometrists and ophthalmologists with ease using artificial intelligence can diagnose and grade the conditions and effectively manage them with confidence in clinical practice due to matured machine learning algorithms adopted in the recent technologies.

Predictions & prognosis of eye diseases

Detection and grading of age related macular degeneration action before prominent signs and symptoms are detected. Deep neural network principles with multiple layers are applied on the data to determine if the person is more susceptible to specific disease or condition helping us take a prophylactic measures. Myopia being its propagation and its awareness in the recent trends, there is a need for new prediction or detection to subject the child under suitable myopia control strategy before it reaches -5.00DS to ensure the child to be matured and not to impact the child vision.

Detection of amblyopia for young children during their plastic age very crucial to undertake vision therapies for their vision improvements. Predicting the recurrence of amblyopia can be effective using quality data analytics. This new age technology is the game changer for the modern lifestyle. Matured machine learning algorithms inducted in the recent technologies.

Corneal ectatic disorders are very unpredictable and more likely to cause unstable vision unless given a speciality contact lens. A specialized set of algorithms are used to predict the need or surgical interventions like keratoplasty for the management of underlying corneal conditions based on anterior segment optical coherence tomography imaging. Integrated analysis of imaging into the device is now possible by combining artificial intelligence with automated analysis of imaging biomarker showing the number of corona virus cases in real time, country wise and worldwide or from a private website like worldometers which are few typical examples of public health informatics. Indian government also display the epidemiology and hotspots information in their web portal giving no scope for ambiguity about covid19 numbers.

Patient care

History Taking is an integral part of ocular examination which is usually considered while starting the ocular examination. It is slightly time consuming and a series of questions in a designated sequence, based on the condition are asked by an optometrist, intern or other support staff to collect useful and relevant information about the patient and his condition when he visits a clinical setup. There is a concept of self- Anamnesis by using an application developed and trained to collect relevant information from the patient in the form of an interactive chat and the summary of the chat is refined using artificial intelligence and consolidated in to electronic health records for the consultant to review the patient saving significant amount of time. Patient registration process and natural language processing duringadiagnosis are integrated by an app named Manly

Ocular diseases detection and diagnosis

Detection and diagnosis is vital in managing a patient suffering from ocular ailment. Detection and grading of conjunctival hyperemia is the first aspect to use computer assistive tool reducing inter and intra observer variability providing a expert equal uniform grading with machine learning. Dry eye disease being multifactorial in nature is a complex condition and primary effect on transparent and avascular structure conj Orange to the adverse effects of dry eye on it. Screening tool based on artificial intelligence for detection of superficial punctate keratitis is found to be very effective for efficient dry eye diagnosis.

Recently deep learning principles are applied on suitable candidates for refractive surgery using pentacam corneal tomography reports helps in classifying the conditions and in identifying of risk before surgery in Asian patients was found to be preferable tool. Grading congenital and senile cataracts is quite challenging sometimes due to variable pupil size, pigmentation and strengthens in grading subjectively. Few artificial intelligence techniques are applied for helping the physcian with a uniform, universal acceptable grading for cataract.

Diagnosing and screening for glaucoma in all the patients above forty years of age is more effective and sensitive with artificial intelligence using fundus photography. The variable quality obtained by different sources are used and the results are promising. Study using random sampling of fundus photographs is capable of detecting glaucoma more effectively making it easy for diagnosis.

Conclusion and Future implications

Technology current advancements are more focussed on practitioner centric. Detecting a range of conditions from minor eye defects, differential diagnosis of conditions like dry eye, dry, Glaucoma, AMD, Diabetic retinopathy and other retinal pathologies are there is a need to screen the retinal spectral domain optical coherence tomography reports suggest that there is a way to predict the outcome of diabetic macular edema treatment with anti vascular endothermal growth factor therapy using computational image analysis.

References

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