Human Analogue for Screening Diabetic Retinopathy: Indian Perspective

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ABSTRACT

This article explores the utility of using human resource for screening diabetic retinopathy. AI (atificail Intelligence) based tools are getting available for DR (Diabetic retinopathy) screening. There methodology and limitations are deciphered by doing literature survey and exploring the AI sites.

Outcome: Diabetic retinopathy is a major cause of preventable blindness in India. Screening population reduces the burden of diabetic retinopathy induced blindness. Simplified identification criteria would facilitate the process of getting trained human resource

STDR*(Sight threatening diabetic retinopathy)* / VTDR *(Vision Threatening Diabetic retinopathy)* were considered a criterion for reference to a specialist. MTM DR (More than mild diabetic retinopathy) is an easier criterion and has been taken by modern AI as the criterion for deciding whether a person would need referral or not. Training with easier criterion would facilitate the process of generating human resource and thus a Human Analogue is formed.

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MAIN ARTICLE:

When we do active screening for diabetic retinopathy, the incidence of DR induced blindness goes down1.We also know that for Indian population of 1.4 billion, the prevalence of diabetes is 11.8%. 16.9% of these patients would have diabetic retinopathy & 3.6% of patients would have STDR features of diabetic retinopathy many of them with high risk characters 2.

Thus, like the whole world DR induced blindness, though preventable remains a big challenge to us in India. Active screening would enable ophthalmologists, early detection. Similarly this would reduce the treatment burden and patient agony 3. The BIG question is How & When!

Why Human Analogue: In the last decade, the AI has made strides into the field of DR Screening. Few devices viz- Idxdr, Eye Art, have received FDA approval. Besides these, other software and devices are also available. The field still remains open. The issues of dependability, selection criteria, affordability, availability, standardization etc. still remain to be answered. The ultimate target for an AI Based DR screening tool would be, a selfie based app dependable identification! Until then the human intervention and involvement would pertinent!

The concept: we need to learn how engineers have taken the field from medicine. Let's take it back by understanding there modus operandi! While teaching the students, we should make the disease presentation simple and easy to understand. Undoubtedly for a specialist, it is important to nosedive into deep intricacies of the disease but for rest, the detection criteria and understanding has to be simplified. These criteria should be easily available too.

The AI tool uses photo identification and the net output is to identify referable DR. For example the current devices would take a retinal photograph, preferably post dilatation

photograph and in short time will give 2 options, first, need referral for further evaluation; or second, to come after 1 year (in case of no DR).4

Let's learn from this. We need to identify ONE SINGLE criteria to identify whether the person in question would need further evaluation or not! Earlier we were of the opinion that this criteria should be VTDR i.e. vision threatening diabetic retinopathy.

(VTDR features):

A) Severe NPDR (Non Proliferative Diabetic Retinopathy): Retinal hemorrhages in 4 quadrants,Venous beading in 2 Quadrants, IRMA (intra retinal microvascular abnormality) in 1 quadrant

B) PDR (Proliferative Diabetic Retinopathy): NVD (Neo vascularization on Disc) or NVE(Neo-vasclarization elsewhere) or presence of pre-retinal hemorrhages or Vitreous hemorrhage.

C) Macular edema near or involving center of macula.

With time it was realized that identification criteria for referable diabetic retinopathy may be further simplified.

- To further simplify the criteria another term evolved i.e. MTM-DR - More than mild diabetic retinopathy.

- To identify MTMDR, reference of ETDRS charts is considered. Chart number 35 or higher would qualify for screening 5.

If we see this photograph carefully, it just has few superficial retinal hemorrhages, and this is a simple 5 field montage of retinal photograph.

Computer is given a task to identify a retinal photograph being like this or worse. Patient with this feature would qualify for further evaluation.

The Human Analogue: If we teach humans same as we teach computers, it would be easy for them to identify referable DR. This is *HUMAN Analogue!*

What we need is to give our fraternity is a picture and ask them to see if retina is looking like this or worse. To make it simpler, on retina examination posterior to equator if someone sees superficial hemorrhages, refer!

Training to see central retina with indirect ophthalmoscope in modern ophthalmic residency is very easy step.

Screening Scope: When we talk about eradication and demography with regards to a disease, entire population should be screened. This is the IDEAL Gold Standard Goal! We can ease this out by altering the target to: **Acceptable**

standard!! We mean that all patients visiting diabetic clinics should be screened for diabetic retinopathy, and if they are having superficial retinal hemorrhages, should be referred to retina specialist for further evaluation.

To simplify further, share ETDRS 35 level photograph with all the ophthalmologists, let them screen all the patients visiting to their clinics with history of diabetes & if they find anything like this picture or worse, refer.

ETDRS-DRSS Levels 35/43: Mild
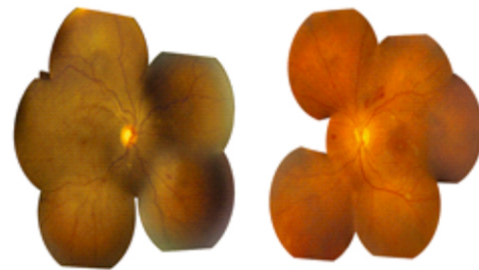
According to 2020 WHO guideline for Screening DR, our target trainees will not only be ophthalmologists but also optometrists, ophthalmic assistants, physicians, interns and all paramedic staff 3. Coupled with this, the fact that retinal photography is now more commonly available, it may also be included to the crusade of identifying referable diabetic retinopathy. The best thing is that the existing facilities will be used, non-retina specialist would get better equipped, retina work flow would enhance and the misery to disease would start to sublimate !

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3. https://iris.who.int/bitstream/handle/10665/336660/9789289055321-eng.pdf Diabetic retinopathy screening: a short guide Increase effectiveness, maximize benefits and

4 https://www.eyenuk.com/en/products/eyeart/

5 https://www.accessdata.fda.gov/cdrh_docs/reviews/DEN180001.pdf minimize harm https://iris.who.int/bitstream/handle/10665/336660/9789289055321-eng.pdf