

The Effect of Health Education and Screening Site on Diabetic Retinopathy Screening Compliance in A Rural Bihar Population: An Analytical Research

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Abstract

Aim: Effect of health education and screening location on compliance with diabetic retinopathy screening in a rural population of Bihar. **Methods:** The present study was conducted in the Department of Ophthalmology, Anugrah Narayan Magadh Medical College Hospital (ANMMCH), Gaya, Bihar, India for 1 year. The population is predominantly rural. The blocks were grouped as facilities A and B: screening for DR in CHCs. Health education was not imparted in A but was imparted in B. Facilities C and D: screening in PHCs. Health education was not imparted in C block but was imparted in D. The health education intervention in the two settings was delivered by Village Level Health Workers (VHWs). Blindness and visual impairment were classified as per the WHO International Classification of Diseases. **Results:** A total of 1154 people with diabetes out of 6910 registered (16.70%) were screened for DR in the four blocks over the 3-month period. The mean age of those screened was 56.9 ± 12 years and 52% were male. The uptake of screening varied by facility, the highest uptake was in the block with PHC level screening with health education and provision of transport to PHCs from villages (29.78%) while the lowest was in the block with CHC level screening without health education (9.78%). The uptake was significantly higher in the facilities with health education than in those without (17.62% and 16.06%, respectively, $P < 0.01$), and was significantly higher in blocks with PHCs level screening with provision of transport to PHCs from villages than CHCs level screening (22.35% and 12.10%, respectively, $P = <0.001$). A third of those screened had some degree of visual impairment: 7.97% (92) were blind, 6.85% (79) had severe visual impairment, 20.45% (236) had moderate visual impairment, and 64.73% (747) had mild or no visual impairment. There was not much difference in visual status between the people who did or did not receive health education. Fundus images were gradable in 87% (1004/1154) of those screened. In the gradable images, 9.18% (106/1154) had any DR and 3.81% (44/1154) had STDR. **Conclusion:** Conducting DR screening closer to the place of living at PHCs with the provision of transport and health education was more effective, resulting in an increase in the uptake of DR screening by people with known diabetes in rural Bihar.

Keywords: Diabetes, Visual Impairment, Health Education.

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Introduction

The rising prevalence of diabetes over the past 30 years presents challenging health impacts and costs to individuals, health care systems and wider society. Prevalence rates in the UK rose from 3.2 million people in 2013 to 4.7 million in 2019, and they are expected to rise to 5.5 million by 2030[1,2]. Prevalence rates are increasing more rapidly in low and middle income countries[3]. Having diabetes can involve a number of related health issues, including diabetic retinopathy (DR). DR is a major cause of vision impairment among adult's world-wide and is the second most important cause of visual loss in England and Wales[4].

In the UK, the National Health Service (NHS) eye screening programmes have offered annual screening to all people with diabetes (PWD) over the age of 12 years for around 10 years. These programmes aim to detect sight threatening diabetic retinopathy (STDR) before it affects a person's sight and when timely, effective treatment can be provided. Evidence suggests that it may be safe to screen low-risk people at longer intervals[5-11] and the interval has been extended in some countries[12,13]. However, this evidence is not conclusive and is based largely on modelling rather than experimental research. In those countries, such as the Netherlands, Iceland, and the city of Hong Kong, with extended intervals the population being covered is significantly different to the UK. The shift towards varying screening intervals is not restricted to DR. For breast cancer there are moves to identify risk-stratified screening strategies to lower the rates of over diagnosis and to prevent deaths[14]. Such directions illustrate a general move within medicine to personalised health care and potentially to reallocate resources to those most in need; in the case of DR screening focusing on non-attenders. Risk estimating equations have been developed to allow this personalisation in DR[15-17] and in other

specialties[14,18]. Nevertheless, there has been little work on the impact on PWD of changing eye screening intervals and concern amongst HCP about safety including reduced attendance and loss of diabetes control[9].

An intervention, such as changing eye screening intervals, can be considered to be implementing evidence-based practice. The aims of an intervention are to promote the uptake and optimal use of effective clinical services, along with modifications to health-related behaviour. It can be anticipated that there may be negative as well as positive outcomes from an intervention, therefore effective development and implementation is essential. Understanding enablers and barriers to change and then putting in place effective strategies to encourage or mitigate against their effect is crucial. Models of behaviour change can be a useful theoretical lens to explore behaviour and how to effect positive change. Such models have been used extensively within clinical and public health arenas to understand illness and health-seeking behaviours[19-21]. There have been moves away from a deficit model, where primarily patients are perceived as lacking in their understanding and simply needing "more education" about their condition to resolve any issues. The Behaviour Change Wheel (BCW) is cognisant of the many components involved in changing health related behaviours, it recognises that the sources for behaviour can be found within three areas and usefully applied to changing eye screening intervals: capability (is the individual able to attend eye screening?); opportunity (does the eye screening service make it as easy as possible to attend an appointment?); and motivation (can an individual manage any changes to their eye screening appointment?)[22]. The BCW approach also offers screening service commissioners and providers a range of interventions and policy approaches to

align with PWD and HCP capability, opportunity and motivation to change eye screening intervals. The BCW has been successfully used in a number of other clinical arenas[23,24].

Material and methods

The present study was conducted in the Department of Ophthalmology, Anugrah Narayan Magadh Medical College Hospital (ANMMCH), Gaya, Bihar, India for 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

Methodology

Four blocks (in two blocks at CHCs level and in other two blocks at PHCs level with the provision of transport from village to PHCs), in Bihar. In each group of blocks, one was randomly selected for the health education intervention. The population is predominantly rural. The blocks were grouped as facilities A and B: screening for DR in CHCs. Health education was not imparted in A but was imparted in B. Facilities C and D: screening in PHCs. Health education was not imparted in C block but was imparted in D. The health education intervention in the two settings was delivered by Village Level Health Workers (VHWs). VHWs, including accredited social health activist (ASHA) were trained who in turn provided health education to people with diabetes in their villages using written information (posters and leaflets) in the local languages (Hindi) which explained DM and DR. VHWs have list of diabetic patients in their villages and health education focused on people with diabetes and their care providers was provided.

The following procedures were performed in all four blocks. Demographic details linked to their unique identification (UID) (Aadhar number) of all people with diabetes undergoing screening were entered in tablets using DRROP software. Presenting visual acuity was measured using an ETDRS chart at 4 m under standard lighting conditions. Refraction was performed and

spectacles prescribed where required.

Blindness and visual impairment were classified as per the WHO International Classification of Diseases 11 (2018)[25]. Single-field fundus photograph[26], one for each eye capturing disc and macula, was taken by PMOAs, supervised by the ophthalmology residents from the base hospital during the study period. Images were uploaded on cloud and remotely graded by trained ophthalmologists at the base hospital. Using tele ophthalmology software, the report was shared with the people after screening. Medical social workers counseled patients in the facility about the need for repeat annual screening or where to go if referred for further management. The following patients were referred to the base hospital for further investigations and appropriate management: those with DR in one or both eyes or ungradable images or patients with best corrected visual acuity $<6/60$ in either eye.

DR was graded using the International Clinical Diabetic Retinopathy and Diabetic Macular Edema disease severity scales[27]. Any grade worse than moderate non proliferative DR (NPDR) or diabetic macular edema (DME) in one or both eyes was classified as STDR.

The minimum sample size required was 309 people with diabetes in each group. To account for clustering in this trial, a design effect of two was used, increasing the size of the sample to be included in each facility to 618.

Analysis

For statistical analysis significance of both interventions was analyzed separately by the z test.

Results

The number of people registered with diabetes in the NCD clinics in all four blocks varied, ranging from 675 in one of the blocks at PHCs screening to 1636 in one of the blocks with CHC screening (Table 1). The number of people screened in both blocks with PHCs screening was similar

(492 and 201) and higher than in the blocks with CHC screening (160 and 301). A total of 1154 people with diabetes out of 6910 registered (16.70%) were screened for DR in the four blocks over the 3-month period (Table 1). The mean age of those screened was 56.9 ± 12 years and 52% were male (Table 2). Characteristics of patients screened in each of the four blocks were not significantly different with respect to gender, age, duration of diabetes, and visual acuity.

The uptake of screening varied by facility (Table 1a and b); the highest uptake was in the block with PHC level screening with health education and provision of transport to PHCs from villages (29.78%) while the lowest was in the block with CHC level screening without health education (9.78%). The uptake was significantly higher in the

facilities with health education than in those without (17.62% and 16.06%, respectively, $P < 0.01$), and was significantly higher in blocks with PHCs level screening with provision of transport to PHCs from villages than CHCs level screening (22.35% and 12.10%, respectively, $P = < 0.001$).

A third of those screened had some degree of visual impairment: 7.97% (92) were blind, 6.85% (79) had severe visual impairment, 20.45% (236) had moderate visual impairment, and 64.73% (747) had mild or no visual impairment. There was not much difference in visual status between the people who did or did not receive health education (Table 3).

Fundus images were gradable in 87% (1004/1154) of those screened. In the gradable images, 9.18% (106/1154) had any DR and 3.81% (44/1154) had STDR

Table 1a: Uptake of screening for diabetic retinopathy by health education status and location of screening

Group/Block	Intervention	Health education	DM patients enrolled	n	Screened for DR % (95% CI)
A	CHC	No	1636	160	9.78% (7.4-9.7)
B	CHC	Yes	2174	301	13.85% (10.9-13.3)
C	PHC	No	2425	492	20.29% (17.4-20.8)
D	PHC	Yes	675	201	29.78% (28.2-33.2)
Total			6910	1154	16.70% (14.7-16.2)

CHC=community health center; PHC=primary health center, DM=diabetes mellitus, DR=diabetic retinopathy, NCD=non communicable disease

Table 1b: Uptake of screening for diabetic retinopathy by health education status and location of screening

Intervention	Group	DM patients enrolled in NCD register	Proportion	Screened for DR	Significance
			n	% (95% CI)	
Screening location					
CHC	A+B	3810	461	12.10% (10.6-12.3)	Z test=14.13, P<0.0001
PHC	C+D	3100	693	22.35% (23.0-25.9)	
Health education					
NO	A+C	4061	652	16.06% (13.4-15.4)	Z test=5.73, P<0.0001
YES	B+D	2849	502	17.62% (17.6-19.9)	
Total		6910	1154	16.70% (15.7-17.2)	

CHC=community health center, PHC=primary health center, DM=diabetes mellitus, DR=diabetic retinopathy, NCD=non-communicable disease

Table 2: Age and duration of diabetes in people screened for DR, by location of screening

	Group A (CHC)	Group B (CHC)	Group C (PHC)	Group D (PHC)	PHCs	CHCs	All
Screened for DR	160	301	492	201	691	461	1154
Male	90(56.25)	161(53.49)	262(53.25)	111(55.22)	361(52.24)	241 (52.2)	600 (52)
Female	70 (43.75)	140(46.51)	230(46.75)	90(44.78)	330 (47.76)	220 (47.72)	554(48)
Age in Years (Mean±SD)	57.4±12.3	57.6±11.8	56.4±12.2	57.1±11.9	57.2±12.3	56.7±11.8	56.9±12.0
No health education	57.4±12.3	NA	56.4±12.2	NA	56.4±12.2	57.4±12.3	56.7±11.8
Health education	NA	57.6±11.8	NA	57.1±11.9	57.1±11.9	57.6±11.8	57.3±11.8
Duration of DM (±SD), yrs	4.81±4.81	4.15±4.2	4.33±4.4	4.46±4.4	4.39±4.4	4.36±4.4	4.41±4.5
No health education	4.71±4.81	NA	4.23±4.38	NA	4.33±4.4	4.71±4.8	4.4±4.6
Health education	NA	4.1±4.2	NA	4.46±4.4	4.46±4.4	4.15±4.2	4.3±4.3

Table 3: Visual status of diabetic patients screened by health education

Vision category	Overall (n)	Health education not imparted	Health education imparted
Blind	7.97% (92)	8.44% (55)	7.38% (37)
Severe visual impairment	6.85% (79)	7.52% (49)	5.98% (30)
Moderate visual impairment	20.45% (236)	20.86% (136)	19.92% (100)
Mild or no visual impairment	64.73% (747)	63.19% (412)	66.73% (335)
Total	100% (1154)	100% (652)	100% (502)

Discussion

DR can lead to potential sight-threatening complications, which can be prevented by regular dilated fundus examination and referral when required[28]. The importance of early diagnosis and screening in diabetes care facilities is recognized[29]. The screening was done with a non-mydratic fundus camera, proven for quality DR screening[30,31]. Universal coverage is feasible when screening is cost-effective, reaches the target population, and is accepted by the people[32]. A cost-effective DR screening in rural India is possible with the currently used and emerging technology of telemedicine[33].

Improving patient engagement with preventive services requires persistent effort and innovation from the service providers[34]. In the present study, two different methods were investigated the proximity of care with transport to and from the facility and health education. Earlier studies have identified the following barriers to good uptake of DR screening; these factors are lack of awareness, accessibility, affordability, poor infrastructure, lack of skilled manpower and outdated technology[35-38]. Imparting health education, bringing the point of care to nearer PHC, the use of PMOAs in screening, and the use of non-mydratic cameras addressed these difficulties.

The study showed that the involvement of ASHAs in providing health education to the people with diabetes enhanced DR screening uptake. ASHAs can act as local change agents, role models, and mentors, task sharing helps[39]. Similarly, delivery of care closer to the people is equally important as seen in this study that there was more acceptance for DR screening in the PHC located closer to the residence with the provision of transport from village to PHC than the CHC which was farther from the residence; but this is possible only with adequate increase in both infrastructure and skilled manpower.

A weakness of the study was that the sample

size of 2,456 required for detailed analysis was not achieved during study duration, and less than 20% of people registered in the NCD clinic were screened. As the sample size was inadequate for statistical analysis for four individual groups, both interventions were analyzed separately by combining two blocks in each group (Table 1b). While the study demonstrated that the care given closer to residence and advocacy improves the screening uptake in the short project period of 3 months, the long-term impact of these strategic decisions needs to be evaluated.

The strength of the study lies in the extension of DR screening beyond the NCD clinics. This is technically possible only with increased allocation of material and manpower resources. In the absence of one or both resources, advocacy and community participation are key to success for improving uptake of this important community program.

Conclusion

Conducting DR screening closer to the place of living at PHCs with the provision of transport and health education was more effective, resulting in an increase in the uptake of DR screening by people with known diabetes in rural Bihar.

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