Original research article

The Impact of Health Education and Screening Site on Diabetic Retinopathy Screening Compliance

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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, NMCH, Patna, 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: The number of people screened in both blocks with PHCs screening was similar (530and 250) and higher than in the blocks with CHC screening (170 and 320). A total of 1270 people with diabetes out of 7310 registered (17.37%) were screened for DR in the four blocks over the 3-month period. The highest uptake was in the block with PHC level screening with health education and provision of transport to PHCs from villages (29.03%) while the lowest was in the block with CHC level screening without health education (9.79%). The uptake was significantly higher in the facilities with health education than in those without (18.69% and 16.43%, 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 (23.64% and 12.22%, respectively, P = <0.001). A third of those screened had some degree of visual impairment: 8.03% (102) were blind, 6.30% (80) had severe visual impairment, 20.08% (255) had moderate visual impairment, and 65.59% (833) 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 81.50% (1035/1270 of those screened. In the gradable images, 14.57% (185/1270) had any DR and 9.94% (50/1270) 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: impairment, screening, rural area

Introduction

Health screening is defined as 'the application of a test on people who are not exhibiting symptoms and the classification of those people based on their likelihood of having a particular disease'.[1] The philosophy of screening is widely used in the management of health issues to lead to a more favorable prognosis if treatment is initiated prior to severe clinical manifestation.[2] This is especially true for some diseases including diabetic retinopathy (DR). DR is a potentially blinding complication of diabetes mellitus. Microvascular changes due to diabetes result in hypoxia, neovascularization and proliferative fibrovascular changes in the retina, vitreous and iris. The main stages of DR are early and severe non proliferative (NPDR), proliferative diabetic retinopathy (PDR) and diabetic macular edema (DME).[3] An individual with NPDR may be asymptomatic and screening can help both patients and caregivers focus on primary prevention and control of risk factors. This proactive approach will result in regression of early DR changes and even delay the progression of the sight-threatening stages of DR (STDR).[4,5] Applying panretinal photocoagulation (PRP) to treat STDR and a focal laser to treat the leaking vessels, in addition to the pharmacotherapy to treat DME, will delay blindness and serious morbidities such as vitreous hemorrhage and tractional retinal detachment.[6,7] Thus retinal examination to determine stage of the disease could be considered a valid screening tool for early signs of DR as 'no symptom' due to complications of DR could be present at that time. If STDR is detected during screening, laser treatment, medications and surgeries could be offered in a timely fashion in addition to the primary prevention measures. Additionally, the cost of advanced treatment and surgeries could be reduced.

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 treat- ment can be provided. Evidence suggests that it may be safe to screen low-risk people at longer intervals[8-11] 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 re- search. 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 re-allocate 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, there- fore 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 re-solve 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 use- fully 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, NMCH, Patna, Bihar, India, for 1 year, after taking the approval of the protocol review committee and institutional ethics committee. 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 counselled 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.

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 775 in one of the blocks at PHCs screening to 1736in one of the blocks with CHC screening [Table 1]. The number of people screened in both blocks with PHCs screening was similar (530and 250) and higher than in the blocks with CHC screening (170 and 320). A total of 1270 people with diabetes out of 7310 registered (17.37%) were screened for DR in the four blocks over the 3‑month period [Table 1]. The mean age of those screened was 57.9 ± 12 years and 54.88% 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 (29.03%) while the lowest was in the block with CHC level screening without health education (9.79%). The uptake was significantly higher in the facilities with health education than in those without (18.69% and 16.43%, 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 (23.64% and 12.22%, respectively, P = <0.001).
A third of those screened had some degree of visual impairment: 8.03% (102) were blind, 6.30% (80) had severe visual impairment, 20.08% (255) had moderate visual impairment, and 65.59% (833) 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 81.50% (1035/1270 of those screened. In the gradable images, 14.57% (185/1270) had any DR and 9.94% (50/1270) had STDR.

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

Group/	**Intervention**		**DM patients enrolled**		**Screened for DR**
Block	Screening location	Health education	in NCD register	**n**	**% (95% CI)**
A	CHC	No	1736	170	9.79% (7.4-9.7)
B	CHC	Yes	2274	320	14.07% (10.9-13.3)
C	PHC	No	2525	530	20.99% (17.4-20.8)
D	PHC	Yes	775	250	29.03% (28.2-33.2)
Total			7310	1270	17.37% (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 n**	**Screened for DR % (95% CI)**	**Significance**
Screening location					
CHC	A+B	4010	490	12.22% (10.6-12.3)	*Z* test=14.13, *P*<0.0001
PHC	C+D	3300	780	23.64% (23.0-25.9)	
Health education					
NO	A+C	4261	700	16.43% (13.4-15.4)	*Z* test=5.73, *P*<0.0001
YES	B+D	3049	570	18.69% (17.6-19.9)	
Total		7310	1270	17.37% (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	170	320	530	250	780	490	1270
Male	97(57.06)	175(54.69)	285(53.77)	140(56)	425(54.49)	272 (55.51)	697(54.88)
Female	73(42.94)	145(45.31)	245(46.23)	110(44)	355(45.51)	218(44.45)	573(45.12)
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	57.9±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 byhealth education

Vision category	Overall (*n*)	Health education not imparted	Health educationimparted
Blind	8.03% (102)	9% (63)	6.84% (39)
Severe visualimpairment	6.30% (80)	7.14% (50)	5.26% (30)
Moderate visual impairment	20.08% (255)	20.71% (145)	19.30% (110)
Mild or no visualimpairment	65.59% (833)	63.14% (442)	68.60% (391)
Total	100% (1270)	100% (700)	100% (570)

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-mydriatic 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-mydriatic 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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