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## Awareness of diabetic retinopathy and association with attendance of systematic screening for diabetic retinopathy from a cross-sectional survey

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Complete List of Authors:	Lian, Jinxiao; The Hong Kong Polytechnic Univeristy, School of Optometry McGhee, Sarah; The University of Hong Kong, School of Public Health Gangwani , Rita A; The University of Hong Kong, Department of Ophthalmology Lam, Cindy; The University of Hong Kong, Department of Family Medicine and Primary Care Yap , Maurice KH; The Hong Kong Polytechnic University, School of Optometry Wong , David SH; Royal Liverpool University Hospital
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Manuscripts

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3 **Awareness of diabetic retinopathy and association with attendance of systematic screening**  
4 **for diabetic retinopathy from a cross-sectional survey**  
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8 Lian JX<sup>1,2</sup>, McGhee SM<sup>3</sup>, Gangwani RA<sup>2</sup>, Lam CLK<sup>4</sup>, Yap MKH<sup>1</sup>, Wong DSH<sup>5</sup>  
9

10  
11 <sup>1</sup> School of Optometry, The Hong Kong Polytechnic University, Hong Kong  
12

13  
14 <sup>2</sup> Department of Ophthalmology, The University of Hong Kong, Hong Kong  
15

16  
17 <sup>3</sup> School of Public Health, The University of Hong Kong, Hong Kong  
18

19  
20 <sup>4</sup> Department of Family Medicine and Primary Care, The University of Hong Kong, Hong Kong  
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22  
23 <sup>5</sup> Royal Liverpool University Hospital, UK  
24  
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28  
29

30  
31 **Corresponding author:** JinXiao Lian  
32

33  
34 Address: HJ519, School of Optometry, The Hong Kong Polytechnic University, Hung Hom,  
35  
36 Kowloon, Hong Kong  
37

38  
39 Telephone number: +852 2766 6341  
40

41  
42 E-mail: [jljian@polyu.edu.hk](mailto:jljian@polyu.edu.hk)  
43  
44

45 **Key words:** awareness, diabetic retinopathy screening, attendance  
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## Abstract

Objective: To assess the association between awareness of diabetic retinopathy (DR) with actual attendance at DR screening.

Design: Cross-sectional study

Setting: Two public general outpatient clinics

Participants: The subjects were people with diabetes mellitus (DM) who participated in a randomized controlled trial which was set up in 2008 to test the impact of a co-payment on attendance at screening.

Primary and secondary outcome measures: The subjects' awareness of DR was examined using a structured questionnaire before the screening. The attendance at screening was from the actual attendance data.

Results: A total of 2593 participants completed the questionnaire of which 42.9% (1113/2593) said they would worry if they have any vision loss. Nearly 80% (2063/2593) knew that DM can cause blindness but only 17.5% (453/2593) knew that treatment was available for DR and 11.5% (297/2593) knew that early DR could be asymptomatic. The importance of regular eye examination was acknowledged by 75.7% (1964/2593) and 58.9% (1528/2593) thought their eyes should be examined every 6 or 12 months, but 34% (881/2593) did not know how frequent to be examined. Only 15.8% (409/2593) reported having been recommended by a doctor to have a regular eye examination and 13.0% (337/2593) to have been screened by a general practitioner for DR. Worry about vision loss (OR=1.72, p-value<0.001), awareness of the importance of regular eye examination (OR= 1.83, p-value=0.002) and thinking that eye examinations should

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3 be every year (OR=2.64, p-value<0.001) or every 6 months (OR=3.27, p-value<0.001) were the  
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5 most significant factors associated with attendance.  
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8  
9 Conclusions: Deficits in knowledge of DR and screening were found among subjects with DM  
10  
11 and three awareness factors were associated with attendance at screening. These factors could be  
12  
13 targeted by future interventions.  
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### 16 17 18 19 **Strengths and limitations of this study**

- 20  
21  
22 • The actual attendance data were collected prospectively and used which overcome the  
23 errors in recall and reverse causality.
- 24  
25 • We had over 2000 subjects which enabled us to have enough statistical power to test a  
26 number of variables indicating awareness.
- 27  
28 • One limitation is in generalizability of the results to subjects with diabetes throughout  
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## Introduction

Screening is the testing of apparently well persons who probably have a disease from those who probably do not.<sup>1</sup> Individual awareness is postulated as one of the predisposing factors to influence individual's behaviour, e.g. attendance for screening.<sup>2,3</sup>

Screening for diabetic retinopathy (DR), which is a common complication of diabetes mellitus (DM), is an effective and cost-effective intervention to prevent vision loss.<sup>4-7</sup> Regular screening for DR is recommended in many clinical guidelines<sup>8-10</sup> but in practice only 58% to 81% of all eligible subjects were regularly screened, reported from studies in Ireland, US, Turkey and Netherlands.<sup>2,11-15</sup> Even in the systematic DR screening programmes in UK, the attendance rate has varied from 55% to 95%.<sup>16</sup> Non-attendance at screening was associated with increased risk of developing sight threatening diabetic retinopathy (STDR), particularly for those who already have DR and wasted of the screening resources.<sup>17,18</sup> Why some people do not attend is an active research question and is probably a multifactorial problem.

Awareness of DR and its implications for vision would appear to be an important prerequisite for attendance at screening and it has been examined in among subjects with diabetes with highly variable findings across different ethnic populations.<sup>2,14,19-23</sup> However, despite many studies on awareness, few have examined its association with attendance at screening. Those which did, found that lack of awareness was an obstacle to attendance at screening. The types of awareness measured were knowledge of detrimental effects of DR on visual acuity, knowledge of DM on DR, whether physicians or health-care provider had recommended regular eye examinations, awareness of the need for regular and frequency of screening, and whether concerned about vision loss.<sup>2,14,22,24,25</sup> Among those studies which examined the association between screening

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3 and awareness, the attendance at screening was usually collected retrospectively from self-  
4 reported data or review of medical chart. This precludes elimination of reverse causality i.e.  
5 those who were screened have more knowledge because they went to screening rather than the  
6 knowledge making them go, and potential error in recall if it was self-reported data i.e.  
7 incorrectly perceiving other eye examinations, e.g. for glasses, as dilated retinal exams for DR.  
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10 To date, there is few studies on Chinese populations' awareness of DR and its association with  
11 attendance for screening.<sup>20 25</sup> Cultural, social and geographical factors could limit generalization  
12 of the results found elsewhere to Chinese populations. This is partly because DR screening is not  
13 widespread in China but Hong Kong (HK) offers a chance to examine the response in a majority  
14 Chinese population where DR screening is being offered through a systematic call and recall  
15 system at the public primary care level with only a small co-payment.<sup>26 27</sup>  
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18 Using data collected from a randomized controlled trial (RCT) study of DR screening carried out  
19 in HK, we aimed to assess the association between awareness of DR and actual attendance at  
20 screening from a cross-sectional survey.  
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## 23 **Methods**

24 In 2008, we set up an RCT to test the impact of a co-payment on attendance at screening.<sup>26 27</sup> In  
25 that study, as well as collecting information on financial barriers to attendance at screening at a  
26 public general outpatient clinic (GOPC), we asked questions on awareness of DR and screening.  
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## 29 **Participants**

30 The participants were people with an existing diagnosis of DM recorded in their computerized  
31 medical records and who attended one of two neighbouring public GOPCs. The whole group of  
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3 4644 were randomized into a free screening group without any co-payment or a pay group with a  
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5 co-payment of HK\$60 (about £5). Of these subjects, 2593 agreed to participate in the study and  
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7 completed a structured questionnaire by telephone. They were then invited for DR screening  
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9 with or without a co-payment according to their group allocation at the end of the telephone call.  
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11 Finally, 2217 subjects attended screening, an attendance rate of 85.5% (2217/2593). Ethics  
12  
13 approval was obtained from the Institutional Review Board of the University of Hong Kong and  
14  
15 HA West Cluster (Institutional Review Board Reference Number UW08-134), the research  
16  
17 adhered to the tenets of the Declaration of Helsinki and all participants gave informed consent  
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19 before taking part. Full details of the study design and subject recruitment have been published  
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21 previously.<sup>26 27</sup>  
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### 26 27 **Data collection**

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29 The subjects' awareness of DR and its implications was examined using a structured  
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31 questionnaire with previously validated questions from literature as far as possible.<sup>2 12 28</sup> These  
32  
33 questions were translated into Chinese and the questionnaire was piloted in face-to-face  
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35 interviews on 15 randomly selected subjects with DM in the community or in a hospital-based  
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37 clinic to test understanding and acceptability. No problems were found for this part.  
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### 41 **Data analysis**

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44 A descriptive analysis was used to summarize the characteristics of participating subjects.  
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46 Variables indicating awareness of DR are listed below and include nine questions most of which  
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48 have 3 response categories i.e. Yes, No, or Don't know, except for a few questions as specified.  
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3 AD1. "At the present time, how would you rate your eyesight using both eyes (with glasses or  
4 contact lenses, if you wear them)?" with a six category response scale from excellent to  
5 completely blind.  
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11 AD2. "Do you worry if you have any vision loss?"  
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14 AD3. "Do you know if diabetes could affect blindness (retinopathy)?"  
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17 AD4. "Do you think it is important to have regular eye examinations?"  
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20 AD5. "Have you ever been recommended by a doctor to have regular eye examinations?"  
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23 AD6. "How often do you think your eyes should be examined if you are diabetic?" with a five-  
24 scale choice from Never to Every 6 months and Don't know.  
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28 AD7. "Do you believe early diabetic retinopathy is symptomatic?"  
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32 AD8. "Do you aware that there is treatment available for diabetic retinopathy?"  
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35 AD9. "Have your eyes ever been screened by a general practitioner for Diabetic retinopathy?"  
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38 Most of these variables did not need recoding, except for self-rated eyesight (question AD1) for  
39 which the original 6 category scale was recoded to 3 categories of good (including excellent and  
40 good), fair and poor (including poor, very poor and completely blind).  
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46 These variables were compared between those who did and did not attend screening by Chi-  
47 squared test and those variables which differed significantly between the groups were included  
48 into a multivariate logistic regression model with attendance at screening as the dependent  
49 variable. The model was adjusted for age, sex, marital status, socioeconomic status (i.e.  
50 education level, occupation, whether receiving comprehensive social security assistance, family  
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income, housing type) and the fee group allocation. Missing age (98% complete) was replaced by the median value of the self-reported age group and used in the logistic regression model. We report odds ratios (ORs) and their 95% confidence intervals (CI) with a p-value of 0.05 being considered significant. All analyses were performed using STATA version 13.

## Results

The 2593 participants had a mean age of 64 years, a mean duration of diabetes of 7.6 years, mean HbA1c of 7.5% and mean blood pressure of 139/78 mmHg (Table 1).

**Table 1. Characteristics of participants**

Variables	N=2593 (%)	
Mean age (SD)	64(11)	n=2540
Female	1422(54.8)	
Marital status		
Married	1917(73.9)	
Single	676(26.1)	
Educational level		
No schooling	773(29.8)	
Primary	970(37.4)	
Secondary	733(28.3)	
Sixth form and up	117(4.5)	
Current occupation		
Employed	847(32.7)	
Retired	908(35.0)	
Home maker	832(32.1)	
Refuse to answer	6(0.2)	
Receiving welfare payments (Yes)	220(8.5)	
Family income/month		
HK\$ 0-9999	815(31.4)	
HK\$ 10,000-19,999	580(22.4)	
HK\$ 20,000 or above	310(12.0)	
Refuse to answer/don't know	888(34.3)	
Duration of diabetes in years (SD)	7.6(7.0)	n=2513
Mean systolic blood pressure (SD)	138.5(12.8)	n=2542
Mean diastolic blood pressure (SD)	78.0(8.5)	n=2542
HbA1c% (SD)	7.5(1.3)	n=1852

Most (2237/2593,86.3%) participants rated themselves to have good eyesight, 42.9% (1113/2593) would worry if they have any vision loss and 79.6% (2063/2593) knew diabetes can affect blindness (retinopathy) but only 17.5% (453/2593) knew treatment was available for DR and 11.5% (297/2593) knew early DR could be asymptomatic (Table 2). The importance of DR screening was acknowledged by 75.7% (1964/2593) and 58.9% (1528/2593) thought that their eyes should be examined every 6 to 12 months, but 34% (881/2593) did not know how frequent to be examined. Only 15.8% (409/2593) reported having been recommended by a doctor to have a regular eye examination and 13.0% (337/2593) to have been screened by a general practitioner (GP) for DR.

Subjects who attended DR screening reported higher proportions of worrying about vision loss (45.7% vs 26.3%, p-value<0.001), knowing that diabetes could lead to blindness (80.6% vs 73.4%, p-value=0.004), being aware of the importance of regular eye examination (79.0% vs 56.4%, p-value<0.001) and the need for yearly or more frequent screening (every year:39.6% vs 28.7%; every 6 months 22.5% vs 11.7%, p-value<0.001), being recommended by a doctor to have an eye examination (16.2% vs 13.3%, p-value=0.019) and previously screened by a GP for DR (13.7% vs 8.8%, p-value=0.011), than those who did not attend (Table 2).

**Table 2. Awareness of diabetic retinopathy by attendance and non-attendance of screening**

	Total N=2593 (%)	Attendance of screening n=2217(%)	No attendance of screening n=376 (%)	P-value*
At present time, how would you rate your eyesight using both eyes (with glasses or contact lenses, if you wear them)?				
Good	2237(86.3)	1903(85.8)	334(88.8)	
Fair	325(12.5)	288(13.0)	37(9.8)	
Poor	31(1.2)	26(1.2)	5(1.3)	0.229
Do you worry if you have any vision loss?				

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3	No	1348(52.0)	1094(49.4)	254(67.6)	
4	Yes	1113(42.9)	1014(45.7)	99(26.3)	
5	Don't know	132(5.1)	109(4.9)	23(6.1)	<0.001
6					
7	Do you know if diabetes would affect blindness				
8	(Retinopathy)?				
9	No	25(1.0)	22(1.0)	3(0.8)	
10	Yes	2063(79.6)	1787(80.6)	276(73.4)	
11	Don't know	505(19.5)	408(18.4)	97(25.8)	0.004
12					
13	Do you believe early diabetic retinopathy is				
14	symptomatic?				
15	No	297(11.5)	245(11.1)	52(13.8)	
16	Yes	504(19.4)	443(20.0)	61(16.2)	
17	Don't know	1792(69.1)	1529(69.0)	263(70.0)	0.103
18					
19	Do you aware that there is treatment available for				
20	diabetic retinopathy?				
21	No	2140(82.5)	1824(82.3)	316(84.0)	
22	Yes	453(17.5)	393(17.7)	60(16.0)	0.403
23					
24	Do you think it is important to have regular eye				
25	examinations?				
26	No	259(10.0)	176(7.9)	83(22.1)	
27	Yes	1964(75.7)	1752(79.0)	212(56.4)	
28	Don't know	370(14.3)	289(13.0)	81(21.5)	<0.001
29					
30	How often do you think your eyes should be				
31	examined if you are diabetic?				
32	Never	33(1.3)	22(1.0)	11(2.9)	
33	Less often	151(5.8)	94(4.2)	57(15.2)	
34	Every year	986(38.0)	878(39.6)	108(28.7)	
35	Every 6 months	542(20.9)	498(22.5)	44(11.7)	
36	Don't know	881(34.0)	725(32.7)	156(41.5)	<0.001
37					
38	Have you ever recommended by a doctor to have				
39	regular eye examination?				
40	No	2159(83.3)	1841(83.0)	318(84.6)	
41	Yes	409(15.8)	359(16.2)	50(13.3)	
42	Don't know	25(1.0)	17(0.8)	8(2.1)	0.019
43					
44	Have your eyes ever been screened by a general				
45	practitioner for diabetic retinopathy?				
46	No	2242(86.5)	1903(85.8)	339(90.2)	
47	Yes	337(13.0)	304(13.7)	33(8.8)	
48	Don't know	14(0.5)	10(0.5)	4(1.1)	0.011

\* P-value by chi-square test for the comparison between attendance and non-attendance of screening

In the adjusted logistic regression model, worry about vision loss (OR=1.72, p-value<0.001), awareness of the importance of regular eye examination (OR= 1.83, p-value=0.002) and thinking that eye examinations should be every year (OR=2.64, p-value<0.001) or every 6 months

(OR=3.27, p-value<0.001) compared to less often were significantly associated with attendance at screening (Table 3).

**Table 3. Adjusted associations between awareness of diabetic retinopathy and attendance of screening (N=2593)**

Variable	Odds ratio*	95% confidence interval	P-value
Do you worry if you have any vision loss?			
No	1.00		
Yes	1.72	1.31-2.26	<0.001
Don't know	1.04	0.63-1.70	0.881
Do you know if diabetes would affect blindness (Retinopathy)?			
No	1.00		
Yes	0.48	0.13-1.69	0.251
Don't know	0.49	0.13-1.75	0.271
Do you think it is important to have regular eye examinations?			
No	1.00		
Yes	1.83	1.24-2.70	0.002
Don't know	1.17	0.77-1.77	0.464
How often do you think your eyes should be examined if you are diabetic?			
Less often	1.00		
Never	0.93	0.40-2.15	0.858
Every year	2.64	1.65-4.22	<0.001
Every 6 months	3.27	1.92-5.56	<0.001
Don't know	2.11	1.38-3.25	0.001
Have you ever been recommended by a doctor to have regular eye examination?			
No	1.00		
Yes	1.03	0.73-1.46	0.847
Don't know	0.39	0.16-0.98	0.044
Have your eyes ever been screened by a general practitioner for diabetic retinopathy?			
No	1.00		
Yes	1.16	0.78-1.73	0.457
Don't know	0.80	0.23-2.74	0.718

\* The logistic regression model is adjusted for demographic variables (age, sex, marital status), socioeconomic status (education level, occupation, whether receiving comprehensive social security assistance, family income, housing type) and whether charge a co-payment for screening.

## Discussion

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3 We found that our Chinese subjects had good awareness of DM as a potential cause of blindness  
4 (79.6%) and of the importance of regular eye examination (75.7%). However, there were specific  
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6 deficits in knowledge including the fact that early DR can be asymptomatic (11.5% knew) and  
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8 that treatment is available for DR (17.5% knew). There were 58.9% subjects who thought  
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10 screening should be performed at least once a year (i.e. every year or every 6 months), but there  
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12 was still 34% did not know how often they should be screened. This was at the time when the  
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14 DR screening was firstly set up as a pilot in the year 2008 and provided annually. These  
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16 knowledge deficits have also been identified in other populations, for example in Ireland, Turkey,  
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18 and US.<sup>2 13 21</sup> Awareness of DR in our study population was generally higher than those found in  
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20 surveys conducted in mainland China.<sup>20 25</sup> One study by Liu et al. showed that only 36.6%  
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22 (174/475) subjects with DM were aware of DR as a diabetic complication that could result in  
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24 blindness.<sup>20</sup> Another study by Wang et al. showed that 76.7% (632/824) subjects were aware of  
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26 DM affecting eyes but only 49.4% (407/824) thought regular eye examination necessary.<sup>25</sup>

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28 We identified that worry about vision loss, awareness of the importance of regular eye  
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30 examination and awareness of the frequency of screening were the most important factors to be  
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32 associated with attendance at screening. This is consistent with studies which found subjects'  
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34 awareness of eye examinations being needed every 6 months was a significant predictor for  
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36 receiving DR screening in Ireland<sup>2</sup> and subjects' awareness of needing an eye examination every  
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38 12 months was significantly associated with having a dilated eye examination in US.<sup>24</sup> However,  
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40 we did not find an association between a medical doctor's recommendation to have a regular eye  
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42 examination and attendance at screening as had been found in previous studies.<sup>2 14 24</sup> This may be  
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44 because we also examined other awareness factors together in the same model. However, the  
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46 proportion who reported a previous screening by a GP or that they had been recommended to  
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3 have regular eye examinations by a doctor were both less than 20% in the attenders and even  
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5 lower in the non-attenders at the time of setting up this study when there was no systematic DR  
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7 screening. A subject's awareness of DR could be obtained from different sources, but medical  
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9 doctor's or health care provider's recommendation might be one of the most important sources  
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11 and this may need to be strengthened.  
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15 The strengths of this study are that the actual attendance data were collected prospectively and  
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17 used which overcome the errors in recall and reverse causality in some previous studies. We had  
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19 over 2000 subjects which enabled us to have enough statistical power to test a number of  
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21 variables indicating awareness. One limitation is in generalizability of the results to subjects with  
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23 DM throughout HK because our study took place in only one of the seven clusters which are  
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25 somewhat variable in socio-demographic characteristics. However, in general, GOPC attenders  
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27 across clusters have some clear similarities in that they are more likely to be of low  
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29 socioeconomic status, older and with more chronic illness. Many people with DM have already  
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31 experienced complications and are being cared for at the secondary level by specialists. They  
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33 may have different levels of awareness of DR. These subjects are now being examined in another  
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35 study.  
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42 Subjects' awareness of potential complications and their prevention is a potentially modifiable  
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44 risk factor which might be improved through education. It would be useful to incorporate the  
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46 facts of the need for screening and that it should be regularly scheduled, as the two most  
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48 important awareness predictors of attendance in our study, into education and/or self-  
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50 management programmes for DM. A systematic review found that increasing patient awareness  
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52 of DR was an effective intervention to increase screening attendance.<sup>29</sup> Once the subjects with  
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54 DM are aware of DR and the need for regular screening, barriers to attendance might be reduced.  
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3 This will be important not only in HK where systematic screening has been set up but also in  
4 other places such as mainland China where scarce resources used to set up screening may be  
5 wasted by non-attendance. Screening in China might have to rely more on subjects' self-seeking  
6 behaviour in which awareness could play an important role. Future education interventions  
7 could usefully raise awareness e.g. of the importance of screening and of the frequency of  
8 screening and may result in improved screening attendance rates.  
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10  
11 In conclusion, deficits in knowledge of DR and screening were found among subjects with DM  
12 and three awareness factors were significantly associated with attendance at screening. Future  
13 interventions could usefully raise awareness e.g. of the importance of screening and of the  
14 frequency of screening and may result in improved screening attendance rates.  
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20 this study.  
21  
22

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25 for important intellectual content. GRA contributed to the acquisition of the data and revised the  
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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	P.1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	P.2-3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	P.4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	P.5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	P.5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	P.5-6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	P.5
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	P.6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	P.6-7
Bias	9	Describe any efforts to address potential sources of bias	P.5
Study size	10	Explain how the study size was arrived at	P.6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P.6-7
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	P.6-8
		(b) Describe any methods used to examine subgroups and interactions	NA
		(c) Explain how missing data were addressed	P.7
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P.8
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	P.8
		(b) Indicate number of participants with missing data for each variable of interest	P.8
Outcome data	15*	Report numbers of outcome events or summary measures	P.9-10
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which	P.9-11

		confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	NA
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	P.11-12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	P.13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	P.13
Generalisability	21	Discuss the generalisability (external validity) of the study results	P.13
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P.14

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

NA=not applicable.

# BMJ Open

## Awareness of diabetic retinopathy and its association with attendance for systematic screening at the public primary care setting: a cross-sectional study in Hong Kong

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Complete List of Authors:	Lian, Jinxiao; The Hong Kong Polytechnic Univeristy, School of Optometry McGhee, Sarah; The University of Hong Kong, School of Public Health Gangwani , Rita A; The University of Hong Kong, Department of Ophthalmology Lam, Cindy; The University of Hong Kong, Department of Family Medicine and Primary Care Yap , Maurice KH; The Hong Kong Polytechnic University, School of Optometry Wong , David SH; Royal Liverpool University Hospital
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Keywords:	Diabetic retinopathy < DIABETES & ENDOCRINOLOGY, screening, awareness, attendance

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Manuscripts

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3 **Awareness of diabetic retinopathy and its association with attendance for systematic**  
4 **screening at the public primary care setting: a cross-sectional study in Hong Kong**  
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8 Lian JX<sup>1,2</sup>, McGhee SM<sup>3</sup>, Gangwani RA<sup>2</sup>, Lam CLK<sup>4</sup>, Yap MKH<sup>1</sup>, Wong DSH<sup>5</sup>  
9

10  
11 <sup>1</sup> School of Optometry, The Hong Kong Polytechnic University, Hong Kong  
12

13  
14 <sup>2</sup> Department of Ophthalmology, The University of Hong Kong, Hong Kong  
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16  
17 <sup>3</sup> School of Public Health, The University of Hong Kong, Hong Kong  
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19  
20 <sup>4</sup> Department of Family Medicine and Primary Care, The University of Hong Kong, Hong Kong  
21

22  
23 <sup>5</sup> Royal Liverpool University Hospital, UK  
24  
25  
26  
27  
28  
29

30  
31 **Corresponding author:** JinXiao Lian  
32

33  
34 Address: HJ519, School of Optometry, The Hong Kong Polytechnic University, Hung Hom,  
35  
36 Kowloon, Hong Kong  
37

38  
39 Telephone number: +852 2766 6341  
40

41  
42 E-mail: [jljian@polyu.edu.hk](mailto:jljian@polyu.edu.hk)  
43  
44

45 **Key words:** awareness, diabetic retinopathy screening, attendance  
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## Abstract

Objective: To assess the association between awareness of diabetic retinopathy (DR) with actual attendance for DR screening.

Design: Cross-sectional study

Setting: Two public general outpatient clinics

Participants: The subjects were people with diabetes mellitus (DM) who participated in a randomized controlled trial, set up in 2008, to test the impact of a co-payment on attendance for DR screening.

Primary and secondary outcome measures: The subjects' awareness of DR was evaluated using a structured questionnaire conducted via a telephone interview. The attendance for screening was from the actual attendance data. Association between awareness and attendance for screening was determined using multivariate logistic regression model and reported as odds ratios (OR).

Results: A total of 2593 participants completed the questionnaire. A total of 42.9% (1113/2593) said they would worry if they had any vision loss and 79.6% (2063/2593) knew that DM could cause blindness. Only 17.5% (453/2593) knew that treatment was available for DR and 11.5% (297/2593) knew that early DR could be asymptomatic. The importance of having a regular eye examination was acknowledged by 75.7% (1964/2593) but 34% (881/2593) did not know how frequently their eyes should be examined. Worry about vision loss (OR=1.72, p-value<0.001), awareness of the importance of regular eye examination (OR= 1.83, p-value=0.002) and awareness of the frequency of eye examinations ( "every year" (OR=2.64, p-value<0.001) or



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3 “every 6 months” (OR=3.27, p-value<0.001)) were the most significant factors associated  
4 with attendance.  
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9 Conclusions: Deficits in knowledge of DR and screening were found among subjects with DM  
10 and three awareness factors were associated with attendance for screening. These factors could  
11 be targeted for future interventions.  
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### 15 16 17 18 19 20 **Strengths and limitations of this study**

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23 • The actual attendance data were collected prospectively which overcome the errors in  
24 recall and reverse causality.  
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28 • The sample size was over 2000 subjects which gave sufficient statistical power to test a  
29 number of variables indicating awareness.  
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33 • One limitation is the generalizability of the results to subjects with diabetes who are  
34 looked after in secondary care.  
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## Introduction

According to the World Health Organization, screening is “the presumptive identification of unrecognized disease in an apparently healthy, asymptomatic population by means of tests, examinations or other procedures which can be applied rapidly”.<sup>1</sup> An individual’s awareness is postulated as one of the predisposing factors which influences the individual’s behaviour, e.g. attendance for screening.<sup>2,3</sup>

Diabetic retinopathy (DR), a common complication of diabetes mellitus (DM), has become the leading cause of new cases of blindness among people of working age in developed countries.<sup>4</sup> However, DR can be asymptomatic until there is significant vision loss. Therefore, early detection plays an important role in preventing blindness resulting from DR. Iceland and the UK are two countries which adopted systematic DR screening early.<sup>5,6</sup> Iceland has successfully reduced the prevalence of blindness in the diabetic population from 2.4% to 0.5% between 1980 and 1994.<sup>5</sup> The incidence of sight impairment and severe sight impairment in the diabetic population was found to be almost halved in Wales over an 8-year period up to 2015.<sup>7</sup> Screening for DR has also been shown to be a cost-effective intervention to prevent vision loss.<sup>8-10</sup>

Regular screening for DR is recommended in many clinical guidelines<sup>11-13</sup> but in practice, only 58% to 81% of all patients with DM were regularly screened, as reported from studies in Ireland, US, Turkey and Netherlands.<sup>2,14-18</sup> Even in the systematic DR screening programmes in the UK, attendance rates have varied between 55% and 95%.<sup>19</sup> Non-attendance for screening, apart from wasting resources, was also associated with increased risk of developing sight threatening diabetic retinopathy (STDR).<sup>20-22</sup> Why some people do not attend is an important issue to

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2  
3 understand and address in order to better manage the risk of DM complications and efficient  
4 resources allocation.  
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8 Awareness of DR and its implications for vision is an important prerequisite for attendance for  
9 screening and it has been examined in subjects with diabetes with highly variable findings across  
10 different ethnic populations.<sup>2 17 23-27</sup> However, few studies have examined the association of  
11 awareness with attendance for screening. In general, lack of awareness was found to be an  
12 obstacle to attendance for screening. The types of awareness measured were knowledge of  
13 detrimental effects of DR on visual acuity, knowledge of DM on DR, whether physicians or  
14 health-care providers had recommended regular eye examinations, awareness of the need for  
15 regular and frequency of screening, and concern for vision loss.<sup>2 17 26 28 29</sup> Among those studies  
16 which examined the association between screening and awareness, attendance for screening was  
17 usually collected retrospectively from self-reported data or review of medical chart. This cannot  
18 eliminate reverse causality (i.e. those who were screened have more knowledge because they  
19 went to screening rather than the knowledge itself that made them go) and potential error in  
20 recall if it was self-reported data ( e.g. mistaking tests for spectacle prescription for retinal  
21 examination for DR).  
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41 To date, there are few studies on awareness of DR and its association with attendance for  
42 screening in Chinese populations.<sup>24 29</sup> Cultural, social and geographical factors could limit  
43 generalization of the results found elsewhere to Chinese populations. Hong Kong (HK) offers a  
44 good venue to study the response in a majority Chinese population where DR screening is  
45 offered through a systematic call and recall system at the public primary care level with only a  
46 small co-payment.<sup>30 31</sup>  
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3 Using data collected from a randomized controlled trial (RCT) study of DR screening carried out  
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5 in HK, we aimed to assess the association between awareness of DR and actual attendance for  
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7 screening from a cross-sectional study.  
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## 10 11 **Methods**

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14 In 2008, we set up an RCT to test the impact of a co-payment on attendance for screening.<sup>30 31</sup> In  
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16 that study, as well as collecting information on financial barriers to attendance for screening at a  
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18 public general outpatient clinic (GOPC), we asked questions on awareness of DR and screening.  
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## 21 22 **Participants**

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25 The participants were people with an existing diagnosis of DM recorded in their computerized  
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27 medical records and who attended one of two neighbouring public GOPCs. The whole group of  
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29 4644 subjects were randomized into a free screening group without any co-payment or a pay  
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31 group with a co-payment of HK\$60 (about £5). Of these subjects, 2593 agreed to participate in  
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33 the study with 1316 in the free group and 1277 in the pay group. All the participants completed a  
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35 structured questionnaire by telephone. They were then invited for DR screening with or without  
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37 a co-payment according to their group allocation at the end of the telephone call. Finally, 2217  
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39 subjects attended screening, an attendance rate of 85.5% (2217/2593). Ethics approval was  
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41 obtained from the Institutional Review Board of the University of Hong Kong and HA West  
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43 Cluster (Institutional Review Board Reference Number UW08-134), the research adhered to the  
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45 tenets of the Declaration of Helsinki and all participants gave informed consent before taking  
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47 part. Full details of the study design and subject recruitment are published elsewhere.<sup>30 31</sup>  
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## 52 53 **Data collection**

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3 The subjects' awareness of DR and its implications were evaluated using a structured  
4 questionnaire with previously validated questions from the literature as far as possible.<sup>2 15 32</sup>  
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8 These questions were translated into Chinese and the questionnaire was piloted in face-to-face  
9 interviews on 15 randomly selected subjects with DM in the community or in a hospital-based  
10 clinic to test understanding and acceptability. No problems were found for this part.  
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### 14 15 **Data analysis**

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17 A descriptive analysis was used to summarize the characteristics of participating subjects.  
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19 Variables indicating awareness of DR are listed below and include nine questions most of which  
20 have 3 response categories i.e. Yes, No, or Don't know, except for a few questions as specified.  
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26 AD1. "At the present time, how would you rate your eyesight using both eyes (with glasses or  
27 contact lenses, if you wear them)?" with a six category response scale from excellent to  
28 completely blind.  
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34 AD2. "Do you worry if you have any vision loss?"  
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37 AD3. "Do you know if diabetes could affect blindness (retinopathy)?"  
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40 AD4. "Do you think it is important to have regular eye examinations?"  
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43 AD5. "Have you ever been recommended by a doctor to have regular eye examinations?"  
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46 AD6. "How often do you think your eyes should be examined if you are diabetic?" with a five-  
47 scale choice from Never to Every 6 months and Don't know.  
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51 AD7. "Do you believe early diabetic retinopathy is symptomatic?"  
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54 AD8. "Do you aware that there is treatment available for diabetic retinopathy?"  
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AD9. “Have your eyes ever been screened by a general practitioner for diabetic retinopathy?”

Most of these variables did not need recoding, except for self-rated eyesight (question AD1) for which the original 6 category scale was recoded to 3 categories of good (including excellent and good), fair and poor (including poor, very poor and completely blind).

These variables were compared between those who did and did not attend screening by Chi-squared test and those variables which differed significantly between the groups were included into a multivariate logistic regression model with attendance for screening as the dependent variable. The model was adjusted for age, sex, marital status, socioeconomic status (i.e. education level, occupation, whether receiving comprehensive social security assistance, family income, housing type) and the fee group allocation. Missing age (98% complete) was replaced by the median value of the self-reported age group and used in the logistic regression model. We report odds ratios (ORs) and their 95% confidence intervals (CI) with a p-value of 0.05 being considered significant. All analyses were performed using STATA version 13.

## Results

The 2593 participants had a mean age of 64 years, a mean duration of diabetes of 7.6 years, mean HbA1c of 7.5% and mean blood pressure of 139/78 mmHg (Table 1).

**Table 1. Characteristics of participants**

Variables	N=2593 (%)	
Mean age (SD)	64(11)	n=2540
Female	1422(54.8)	
Marital status		
Married	1917(73.9)	
Single	676(26.1)	
Educational level		
No schooling	773(29.8)	
Primary	970(37.4)	

Secondary	733(28.3)	
Sixth form and up	117(4.5)	
Current occupation		
Employed	847(32.7)	
Retired	908(35.0)	
Home maker	832(32.1)	
Refuse to answer	6(0.2)	
Receiving welfare payments (Yes)	220(8.5)	
Family income/month		
HK\$ 0-9999	815(31.4)	
HK\$ 10,000-19,999	580(22.4)	
HK\$ 20,000 or above	310(12.0)	
Refuse to answer/don't know	888(34.3)	
Duration of diabetes in years (SD)	7.6(7.0)	n=2513
Mean systolic blood pressure (SD)	138.5(12.8)	n=2542
Mean diastolic blood pressure (SD)	78.0(8.5)	n=2542
HbA1c% (SD)	7.5(1.3)	n=1852

Most (2237/2593,86.3%) participants rated themselves to have good eyesight, 42.9% (1113/2593) would worry if they had any vision loss and 79.6% (2063/2593) knew diabetes could affect blindness (retinopathy) but only 17.5% (453/2593) knew treatment was available for DR and 11.5% (297/2593) knew early DR could be asymptomatic (Table 2). The importance of DR screening was acknowledged by 75.7% (1964/2593) and 58.9% (1528/2593) thought that their eyes should be examined every 6 to 12 months, but 34% (881/2593) did not know how frequently their eyes should be examined. Only 15.8% (409/2593) reported having been recommended by a doctor to have a regular eye examination and 13.0% (337/2593) to have been screened by a general practitioner (GP) for DR.

Subjects who attended DR screening reported higher proportions of worrying about vision loss (45.7% vs 26.3%, p-value<0.001), knowing that diabetes could lead to blindness (80.6% vs

73.4%, p-value=0.004), being aware of the importance of regular eye examination (79.0% vs 56.4%, p-value<0.001) and the need for yearly or more frequent screening (every year:39.6% vs 28.7%; every 6 months 22.5% vs 11.7%, p-value<0.001), being recommended by a doctor to have an eye examination (16.2% vs 13.3%, p-value=0.019) and previously screened by a GP for DR (13.7% vs 8.8%, p-value=0.011), than those who did not attend (Table 2).

**Table 2. Awareness of diabetic retinopathy by attendance and non-attendance for screening**

	Total N=2593 (%)	Attendance for screening n=2217(%)	No attendance for screening n=376 (%)	P-value*
At present time, how would you rate your eyesight using both eyes (with glasses or contact lenses, if you wear them)?				
Good	2237(86.3)	1903(85.8)	334(88.8)	
Fair	325(12.5)	288(13.0)	37(9.8)	
Poor	31(1.2)	26(1.2)	5(1.3)	0.229
Do you worry if you have any vision loss?				
No	1348(52.0)	1094(49.4)	254(67.6)	
Yes	1113(42.9)	1014(45.7)	99(26.3)	
Don't know	132(5.1)	109(4.9)	23(6.1)	<0.001
Do you know if diabetes would affect blindness (retinopathy)?				
No	25(1.0)	22(1.0)	3(0.8)	
Yes	2063(79.6)	1787(80.6)	276(73.4)	
Don't know	505(19.5)	408(18.4)	97(25.8)	0.004
Do you believe early diabetic retinopathy is symptomatic?				
No	297(11.5)	245(11.1)	52(13.8)	
Yes	504(19.4)	443(20.0)	61(16.2)	
Don't know	1792(69.1)	1529(69.0)	263(70.0)	0.103
Do you aware that there is treatment available for diabetic retinopathy?				
No	2140(82.5)	1824(82.3)	316(84.0)	
Yes	453(17.5)	393(17.7)	60(16.0)	0.403
Do you think it is important to have regular eye examinations?				
No	259(10.0)	176(7.9)	83(22.1)	
Yes	1964(75.7)	1752(79.0)	212(56.4)	
Don't know	370(14.3)	289(13.0)	81(21.5)	<0.001
How often do you think your eyes should be examined if you are diabetic?				
Never	33(1.3)	22(1.0)	11(2.9)	
Less often	151(5.8)	94(4.2)	57(15.2)	



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3	Every year	986(38.0)	878(39.6)	108(28.7)	
4	Every 6 months	542(20.9)	498(22.5)	44(11.7)	
5	Don't know	881(34.0)	725(32.7)	156(41.5)	<0.001
6					
7	Have you ever recommended by a doctor to have				
8	regular eye examination?				
9	No	2159(83.3)	1841(83.0)	318(84.6)	
10	Yes	409(15.8)	359(16.2)	50(13.3)	
11	Don't know	25(1.0)	17(0.8)	8(2.1)	0.019
12					
13	Have your eyes ever been screened by a general				
14	practitioner for diabetic retinopathy?				
15	No	2242(86.5)	1903(85.8)	339(90.2)	
16	Yes	337(13.0)	304(13.7)	33(8.8)	
17	Don't know	14(0.5)	10(0.5)	4(1.1)	0.011

18 \* P-value by chi-square test for the comparison between attendance and non-attendance for screening

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21  
22 In the adjusted logistic regression model, worry about vision loss (OR=1.72, p-value<0.001),  
23 awareness of the importance of regular eye examination (OR= 1.83, p-value=0.002) and thinking  
24 that eye examinations should be every year (OR=2.64, p-value<0.001) or every 6 months  
25 (OR=3.27, p-value<0.001) compared to less often were significantly associated with attendance  
26 for screening (Table 3).  
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34 **Table3.Adjusted associations between awareness of diabetic retinopathy and attendance for**  
35 **screening (N=2593)**

36 Variable	Odds ratio*	95% confidence interval	P-value
37 Do you worry if you have any vision loss?			
38 No	1.00		
39 Yes	1.72	1.31-2.26	<0.001
40 Don't know	1.04	0.63-1.70	0.881
41 Do you know if diabetes would affect blindness			
42 (Retinopathy)?			
43 No	1.00		
44 Yes	0.48	0.13-1.69	0.251
45 Don't know	0.49	0.13-1.75	0.271
46 Do you think it is important to have regular eye			
47 examinations?			
48 No	1.00		
49 Yes	1.83	1.24-2.70	0.002
50 Don't know	1.17	0.77-1.77	0.464
51 How often do you think your eyes should be			
52 examined if you are diabetic?			
53 Less often	1.00		

3	Never	0.93	0.40-2.15	0.858
4	Every year	2.64	1.65-4.22	<0.001
5	Every 6 months	3.27	1.92-5.56	<0.001
6	Don't know	2.11	1.38-3.25	0.001
8	Have you ever been recommended by a doctor to have regular eye examination?			
9	No	1.00		
11	Yes	1.03	0.73-1.46	0.847
12	Don't know	0.39	0.16-0.98	0.044
14	Have your eyes ever been screened by a general practitioner for diabetic retinopathy?			
15	No	1.00		
17	Yes	1.16	0.78-1.73	0.457
18	Don't know	0.80	0.23-2.74	0.718

\* The logistic regression model is adjusted for demographic variables (age, sex, marital status), socioeconomic status (education level, occupation, whether receiving comprehensive social security assistance, family income, housing type) and whether charge a co-payment for screening.

## Discussion

The data for this study were collected at the time when systematic DR screening was set up as a pilot in the year 2008 and conducted annually. We found that our subjects had good awareness of DM as a potential cause of blindness (79.6%) and of the importance of regular eye examination (75.7%). However, there were specific deficits in knowledge including the fact that early DR can be asymptomatic (11.5% knew) and that treatment is available for DR (17.5% knew). There were 58.9% subjects who thought screening should be performed at least once a year (i.e. every year or every 6 months), but there was still 34% who did not know how often they should be screened. These knowledge deficits have also been identified in other populations, for example in Ireland, Turkey, and US.<sup>2,16,25</sup> Awareness of DR in our study population was generally higher than those found in surveys conducted in mainland China.<sup>24,29</sup> One study by Liu et al. showed that only 36.6% (174/475) of subjects with DM were aware of DR as a diabetic complication that could result in blindness.<sup>24</sup> Another study by Wang et al. showed that 76.7% (632/824) subjects

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3 were aware of DM affecting eyes but only 49.4% (407/824) thought regular eye examinations  
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5 were necessary.<sup>29</sup>  
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8 We identified that worry about vision loss, awareness of the importance of regular eye  
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10 examinations and awareness of the frequency of screening were the most important factors  
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12 associated with attendance for screening. This is consistent with studies which found subjects'  
13  
14 awareness of eye examinations being needed every 6 months was a significant predictor for  
15  
16 receiving DR screening in Ireland<sup>2</sup> and subjects' awareness of needing an eye examination every  
17  
18 12 months was significantly associated with having a dilated eye examination in the US.<sup>28</sup>  
19  
20 However, we did not find an association between a doctor's recommendation to have a regular  
21  
22 eye examination and attendance for screening as reported in other studies.<sup>2 17 28</sup> This may be  
23  
24 because we also examined other awareness factors together in the same model. However, the  
25  
26 proportion who reported a previous screening by a GP or that they had been recommended to  
27  
28 have regular eye examinations by a doctor were both less than 20% in the attenders and even  
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30 lower in the non-attenders when there was no systematic DR screening. A subject's awareness of  
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32 DR could be obtained from different sources, but a doctor's or health care provider's  
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34 recommendation might be one of the most important sources and this may need to be  
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36 strengthened.  
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44 The strengths of this study are that the actual attendance data were collected prospectively which  
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46 overcome the errors in recall and reverse causality inherent in some previous studies. We had  
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48 over 2000 subjects which provided sufficient statistical power to test a number of variables  
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50 indicating awareness. One limitation is the generalizability of the results to subjects with DM  
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52 throughout HK. Our study took place in the Hong Kong West Cluster, only one of the seven  
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54 clusters of the public hospital system. However, in general, GOPC attendees across clusters  
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3 have some similarities in that they are more likely to be of low socioeconomic status, more  
4 elderly and more likely to have chronic illness. Many people with DM have already experienced  
5 complications and are being cared for at the secondary level. They may have different levels of  
6 awareness of DR. This is the subject of another study.  
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13 Subjects' awareness of potential complications and their prevention is a potentially modifiable  
14 risk factor which might be improved through education. It would be useful to incorporate the  
15 need for screening and that it should be regularly scheduled, as the two most important  
16 awareness predictors for attendance found in our study, into education and/or self-management  
17 programmes for DM. A systematic review found that increasing patient awareness of DR was an  
18 effective intervention to increase screening attendance.<sup>33</sup> Once the subjects with DM are aware  
19 of DR and the need for regular screening, barriers to attendance maybe reduced. This will be  
20 important not only in HK where systematic screening has been set up but also in other places  
21 such as mainland China. China has the largest number of people with diabetes in the world,  
22 numbering 114.4 million people in the year 2017.<sup>34</sup> DR, one of the potential complications of  
23 diabetes, substantially contributes to the risk of blindness in the Chinese diabetic population.  
24  
25 Early detection by screening and timely treatment for STDR is effective in preventing blindness,  
26 as the successful experience from Iceland and the UK have shown. However, one of the key  
27 steps is for people with DM to attend for DR screening. Given the relative underdevelopment of  
28 primary care in China, DR screening needs to rely more on self-seeking behaviour and  
29 awareness plays a key role. Reliable knowledge as to why people attend screening and what  
30 influences attendance are important questions and has implications on diabetes management.  
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32 Future education interventions should include raising awareness e.g. of the importance of  
33 screening and of the frequency of screening.  
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3 In conclusion, deficits in knowledge of DR and screening were found in subjects with DM and  
4 three awareness factors were significantly associated with attendance for screening. Future  
5  
6 interventions should include raising awareness.  
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9

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18  
19

20  
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24  
25 for important intellectual content. GRA contributed to the acquisition of the data and revised the  
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30  
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41  
42

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44

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STROBE Statement—Checklist of items that should be included in reports of *cross-sectional studies*

	Item No	Recommendation	Page
<b>Title and abstract</b>	1	(a) Indicate the study's design with a commonly used term in the title or the abstract	P.1
		(b) Provide in the abstract an informative and balanced summary of what was done and what was found	P.2-3
<b>Introduction</b>			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	P.4-5
Objectives	3	State specific objectives, including any prespecified hypotheses	P.5
<b>Methods</b>			
Study design	4	Present key elements of study design early in the paper	P.5
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	P.6
Participants	6	(a) Give the eligibility criteria, and the sources and methods of selection of participants	P.6
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	P.6-7
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	P.6-7
Bias	9	Describe any efforts to address potential sources of bias	P.5
Study size	10	Explain how the study size was arrived at	P.6
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	P.7-8
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding	P.7-8
		(b) Describe any methods used to examine subgroups and interactions	NA
		(c) Explain how missing data were addressed	P.8
		(d) If applicable, describe analytical methods taking account of sampling strategy	NA
		(e) Describe any sensitivity analyses	NA
<b>Results</b>			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	P.8
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	P.8-9
		(b) Indicate number of participants with missing data for each variable of interest	P.8-9
Outcome data	15*	Report numbers of outcome events or summary measures	P.9-11
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which	P.10-12



		confounders were adjusted for and why they were included	
		(b) Report category boundaries when continuous variables were categorized	NA
		(c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	NA
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	NA
<b>Discussion</b>			
Key results	18	Summarise key results with reference to study objectives	P.12-13
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	P.13
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	P.13
Generalisability	21	Discuss the generalisability (external validity) of the study results	P.13-14
<b>Other information</b>			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	P.15

\*Give information separately for exposed and unexposed groups.

**Note:** An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at <http://www.plosmedicine.org/>, Annals of Internal Medicine at <http://www.annals.org/>, and Epidemiology at <http://www.epidem.com/>). Information on the STROBE Initiative is available at [www.strobe-statement.org](http://www.strobe-statement.org).

NA=not applicable.