

## Original Article

# Knowledge, Attitude, and Practice of Diabetic Retinopathy among Physicians in Northwestern Nigeria

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## INTRODUCTION

Diabetic retinopathy (DR) is the leading cause of preventable blindness in the productive adult working population and a common microvascular complication of diabetes mellitus (DM).<sup>[1]</sup> It poses a considerable global public health burden, because of the growing number of people with DM in developing countries, despite its low prevalence at present.<sup>[2,3]</sup>

Meta-analysis of large-scale studies has reported a pooled prevalence of DR of any severity to be about 30% while the risk of visual impairment is approximately 10%.<sup>[4]</sup> The national blindness and visual impairment survey conducted in Nigeria between January 2005 and June 2007 reported a DR prevalence of 20.5%, of which 51.4% had macular edema and 10.8% had proliferative disease.<sup>[5]</sup> In addition, an overall prevalence of 36% was also reported in an earlier study conducted

**ABSTRACT** **Background:** Diabetic retinopathy (DR) is the leading cause of preventable blindness in the productive population that poses a considerable global public health burden. **Objective:** The objective of this study is to assess the knowledge, attitude, and practice of DR screening among physicians in Northwestern Nigeria. **Materials and Methods:** Survey responses were obtained from 105 physicians in 4 tertiary hospitals using a Likert scale questionnaire. The internal consistency of the questionnaire was calculated using Cronbach's alpha coefficient. Principal component analysis was used for data reduction and grouping with the varimax rotation method, and the factors were extracted based on an Eigenvalue >1. **Results:** Most of the respondents (78.8%) were aware of the most effective method of delaying the onset of DR and frequency of eye examination (94.1%). Lack of ophthalmoscopes (70.6%) and dilating eye drops (50.6%) form important barriers to performing a good eye examination. **Conclusion:** DR screening among physicians practicing in Northwestern Nigeria was suboptimal, which prompts the need for improved training of physicians managing persons with diabetes on eye examination in a bid to strengthen DR screening and reduce the burden of visual impairment in our environment.

**KEYWORDS:** Attitude, diabetic retinopathy, knowledge, ophthalmologist, practice

among persons with DM attending a tertiary hospital in our region.<sup>[6]</sup> Visual loss and blindness from DM that often occurs during the productive years of life is usually associated with loss of independence and lack of mobility,<sup>[7]</sup> which may limit their earning potentials or even preclude them from gainful employment.<sup>[8]</sup>


Strategies of regular screening, early detection, and prompt treatment of DR have been shown to reduce the risks and therefore the burden of visual impairment and blindness from DM.<sup>[9,10]</sup> Current guidelines recommend that persons with DM be screened annually.<sup>[11,12]</sup> However, as the burden of the disease is projected to outstrip the

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growth of the ophthalmology workforce that performs examinations, more pragmatic methods of screening must be evaluated. Systematic review of evidences suggests that single-field nonmydriatic photography is the gold standard, being the most effective screening strategy (high sensitivity 87%–97% and specificity of 83%–92%) for detection of sight-threatening DR, despite variability in terms of reference standard by most screening guidelines.<sup>[13]</sup> It is highly cost-effective in screening for greater number of people but technically more demanding and highly susceptible to media opacity-related failure when compared to direct ophthalmoscopy. To implement sustainable guidelines in low-resource settings (i.e., typically characterized by a lack of funds to cover for basic health care costs, on individual or societal basis), an approach that has been proposed was to “task-shift” to increase reliance on nonophthalmic workforce in the process of DR screening using ophthalmoscopy. In many countries, nonophthalmologist physicians usually conduct the first level of screening, by performing retinal examination using direct ophthalmoscopy.<sup>[14,15]</sup> The lack of a robust and coordinated structure for eye care service in our low resource setting was identified as a major barrier to routine diabetic retinopathy screening. Having to see another doctor (ophthalmologist) usually presents another burden to the patient when considering the out-of-pocket payments for health.<sup>[16]</sup> Studies have shown that early detection and prompt treatment in DR is effective in the prevention of blindness, which, however, is lacking in most parts of the world, more so in Sub-Saharan Africa where diabetic patients do not receive regular fundus examinations as recommended by the International Council of Ophthalmologist (ICO) and American Diabetes Association (ADA).<sup>[17]</sup>

Tight glycemic control only with insulin and oral hypoglycemic agents has been shown to significantly reduce the risk for retinopathy and its progression.<sup>[18,19]</sup> Insulin therapy predominantly used in the management of type I DM has been shown to have a local impact on ocular tissue by restoration of retinal insulin receptor signaling cascade and rod photoreceptor function. Indeed, while there are conflicting reports on the benefit of antihypertensive therapies alone with either angiotensin-converting-enzyme inhibitors or angiotensin receptor blockers in the prevention of DR, combined control of hyperglycemia, dyslipidemia, and blood pressure has been shown clearly to delay the onset and slow the progression of DR.<sup>[20,21]</sup>

Our study, therefore, assessed the level of knowledge, attitude, and practices (KAPs) of physicians to DR screening, practicing in Northwestern Nigeria managing persons with DM, to identify possible ways of improving eye care as part of the overall diabetes care.

## MATERIALS AND METHODS

### Study design

The study was a descriptive cross-sectional survey conducted between October 1, 2015, and December 14, 2015, in four tertiary health hospitals located in Northwestern Nigeria. They included Aminu Kano Teaching Hospital (AKTH), Mohammed Abdullahi Wase Specialist Hospital (MAWSH), Murtala Mohammed Specialist Hospital (MMSH) in Kano state, and Federal Medical Centre Birnin (FMCB) Kudu located in Jigawa State. Institutional approval was obtained from the hospital research and ethics committee before commencement of the study.

### Study population

The study respondents were general practitioners (GPs), residents, and consultants in family medicine, internal medicine, and other doctors managing adult diabetes patients in these hospitals as the representative sample of nonophthalmologist physicians provides primary care. Ophthalmologists, doctors in anesthesia, obstetricians, gynecologists, pediatricians, and surgeons were excluded from the study. Participants were recruited by random sampling and a verbal consent was obtained from them.

### Study protocol

The 20-item self-administered KAP questionnaire was developed using information from published literature on DR, including publications on guidelines by the International Council of Ophthalmology. The section on demographic data indicates the age, gender, medical cadre, number of years on cadre, specialty, and place of practice of the individual respondent. It also consists of three main KAP domains: the knowledge domain, which is concerned with general knowledge on DR; the attitude domain, which is concerned with the major changes seen in the eye due to diabetes and the logistics of funduscopy; and the practice domain concerned with the current individual practice of funduscopy, when to refer and training needed to build capacity of a nonophthalmologist.

The respondents completed the questionnaire without consulting any manuals, textbooks, or their colleagues during one of the continuous professional development/medical education (CPD/CME) programs for physicians in the presence of the investigators.

The knowledge questions have between 3 and 5 possible options for each question, while accepting only one right answer. Each correct response in the knowledge domain signifies good knowledge while a “wrong response and do not know” signifies poor knowledge.

The attitude questions were formatted according to a 5-point Likert scale. Positive attitude included those who “strongly agree and agree” to the questions while

negative attitude included those who were “neutral, disagree, or strongly disagree” to the questions on DR screening.

Similarly, the 5-point Likert scale was applied to the practice questions. Those who responded with “not at all, rarely, and sometimes” were categorized to have negative behavior while those who responded with “frequently and always” were categorized to have good behavior to DR screening.

### Statistical analysis

#### Sample size

The sample size for our study was 110, calculated using the Cochran's formula<sup>[22]</sup> and the finite population reduction factor formula.<sup>[23]</sup> The estimated number of physicians taking care of patients with diabetes was estimated as 150. Questionnaires were distributed by proportionate allocation based on the number of designated physicians per population (AKTH-55, MMSH-20, FMCB-20, and MAWSH-15).

#### Data analyses

The extracted data were entered into Microsoft Excel 2013 for cleaning and analyzed using the PASW® Statistics version 18.0 (SPSS Inc., Chicago, IL). Qualitative data were described as proportions or percentages and comparison was made using Chi-square test. Statistically significant differences were considered when  $P < 0.05$ . Principal component analysis was done for data reduction and grouping the related variables into conceptually similar and statistically related groups. The extraction method was done using varimax rotation method, with factors extracted based on an Eigenvalue  $>1$ . Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were used, and the cutoff point for loading on each factor was 0.3 and  $P < 0.001$ , respectively. Percentage cutoff score for each domain was calculated using weighted average quartile scores, where the 50<sup>th</sup> percentile was accepted with respect to the physicians having either a good or a poor KAP on DR.

## RESULTS

One hundred and ten questionnaires were distributed, out of which 105 were received, completely answered, representing a response rate of 95.4%. Consequently, these included 51 (48.6%), 15 (14.3%), 19 (18.1%), and 20 (19.0%) respondents from AKTH, MAWSH, MMSH, and FMCB, respectively.

#### Demographic variables

There were 42 (40.0%), 48 (45.7%), and 15 (14.3%) respondents in the 21–30 years, 31–40 years, and 41 years or older age categories, respectively. Twenty-six (24.8%) of the respondents were females. Of the respondents,

eighty (76.2%) have  $\leq 5$  years of experience while 20 (19.0%) have between 6 and 10 years of experience on their job title. The remaining 5 (4.8%) respondents have  $>10$  years' experience on their respective job title. Of these, 61 (58.1%) were medical officers/general practitioners, 37 (35.2%) were residents/senior medical officers, while 7 (6.7%) were in the consultant, principal, or chief medical officer cadre.

#### Reliability analysis

The internal consistency of questionnaire was 0.64 measured using the Cronbach's alpha score. The sample size for factor analysis was 20 items with 105 subjects. KMO measure of sampling adequacy was 0.470. Bartlett's test of sphericity demonstrated a satisfactory suitability of the data to factor analysis ( $P < 0.001$ ) which showed that our variables were related and therefore suitable for structure detection. A loading cutoff  $>0.30$  was adopted and eight factors were extracted. Each factor explained between 6.3% and 10.4% of the total variance. The eight factors extracted explained 67.6% of the total variance, revealing a strong factor structure. Extraction communality estimates of the variance in each variable accounted for by the components were all above 0.38–0.85.

#### Knowledge assessment of physicians to diabetic retinopathy screening

Most of the respondents, i.e., 67 (63.8%) were aware of the most effective methods of delaying the onset and progression of DR and how often persons with diabetes should have their eyes examined 80 (76.2%). However, there was a general paucity of knowledge on the gold standard for evaluating DR (4.8%) and on the ocular complications of DM (7.6%) in low-resource settings. Furthermore, less than a third (23.8%) of the respondents knew who are better placed to screen for DR in the outpatient clinic [Table 1].

**Table 1: Knowledge of physicians to diabetic retinopathy**

Item	Response	
	Right, n (%)	Wrong, n (%)
What is/are the most effective method of delaying the onset and progression of diabetic retinopathy?	67 (63.8)	38 (36.2)
What is the gold standard for evaluating diabetic retinopathy in a low-resource setting?	5 (4.8)	100 (95.2)
Which of the following is not a known ocular complication of diabetes mellitus?	8 (7.6)	97 (92.4)
How often should a person with diabetes have an eye examination?	80 (76.2)	25 (23.8)
Who is better placed to screen for diabetic retinopathy in the outpatient clinic?	25 (23.8)	80 (76.2)

**Table 2: Attitude of physicians to diabetic retinopathy**

Item	Response	
	Positive, <i>n</i> (%)	Negative, <i>n</i> (%)
What barriers do you think prevent you performing routine eye examination on persons with diabetes?		
a. It is time-consuming	35 (33.3)	70 (66.7)
b. Lack of an ophthalmoscope	75 (71.5)	30 (28.5)
c. Lack of dilating eye drops	51 (48.6)	44 (51.4)
d. Not feasible in an outpatient clinic	29 (27.6)	76 (72.4)
e. Not part of my job, I would rather refer	19 (18.1)	86 (81.9)
Which category of persons with diabetes do you think needs referral to the ophthalmologist?		
a. All patients	39 (37.1)	66 (62.9)
b. Patients with visual symptoms only	39 (37.1)	66 (62.9)
c. Patients with retinal changes on ophthalmoscopy only	27 (25.7)	78 (72.3)
How long do you think a refresher course on funduscopy would be sufficient to improve your skills in screening for diabetic retinopathy?		
a. <1 week	26 (24.7)	79 (75.3)
b. 8-14 days	36 (34.3)	69 (65.7)
c. 15-30 days	28 (26.7)	77 (73.3)
d. >30 days	30 (28.5)	75 (71.5)

**Table 3: Practice of physicians to diabetic retinopathy**

Item	Response	
	Positive, <i>n</i> (%)	Negative, <i>n</i> (%)
How often do you perform routine eye examination on your persons with diabetes?	38 (36.2)	67 (63.8)
How well are you able to detect diabetic changes on ophthalmoscopy?	6 (3.7)	99 (94.3)
Do you dilate the pupils for noting diabetic retinopathy changes?	10 (9.5)	95 (90.5)

**Table 4: Correlation between the knowledge, attitude, and practice of physicians to Diabetic Retinopathy screening**

Knowledge	Attitude	Practice
Correlation coefficient	0.136	0.086
Significant (two-tailed)	0.166	0.385
<i>n</i>	105	105
Attitude	Knowledge	Practice
Correlation coefficient	0.136	-0.143
Significant (two-tailed)	0.166	0.144
<i>n</i>	105	105
Practice	Knowledge	Attitude
Correlation coefficient	0.086	-0.143
Significant (two-tailed)	0.385	0.144
<i>n</i>	105	105

**Attitude assessment of physicians to diabetic retinopathy screening**

Majority of respondents agree that the greatest barriers to performing eye examination in persons with diabetes were lack of functional ophthalmoscopes, 75 (71.5%). However, most of them, i.e., 86 (81.9%) disagree that eye examination

is not part of their job and would rather refer. It also showed variable duration of refresher training, which was essential to improve their DR screening skills by respondents outside what was suggested in the questionnaire [Table 2].

**Practice assessment of physicians to diabetic retinopathy**

Our study also showed that only about a third (36.2%) of the respondents perform routine eye examination on persons with diabetes visiting their facility. Furthermore, few (5.7%) of the respondents who perform routine eye examination detect retinal changes associated with diabetes with confidence. Response to the question on the routine use dilating eye drops was predominantly (90.5%) negative [Table 3].

**Relationship between knowledge, attitude, and practice of physicians to diabetic retinopathy**

Table 4 shows the correlation analysis between the knowledge and attitude ( $r = 0.136$ ,  $P = 0.166$ ), attitude and practice ( $r = -0.143$ ,  $P = 0.144$ ), and practice and knowledge ( $r = 0.086$ ,  $P = 0.385$ ) to DR screening in our study. Attitude showed negative correlation to practice but was not significant ( $P > 0.01$ ).

**DISCUSSION**

The study showed good knowledge among hospital physicians regarding the recommended frequency of eye examination in persons with DM and awareness about tight glycemic control as the most effective method for delaying the onset of DR. This, however, did not seem to translate to appropriate referral of patients for specialized ophthalmologist examinations, which is in contrast to a previous report by Preti *et al.*<sup>[24]</sup> In addition, it showed that knowledge about

ocular complications of diabetes among our respondents was also suboptimal, which was comparable to a study in the US where 26% of the physicians interviewed were able to answer the questions regarding ocular complications of DM correctly.<sup>[25]</sup> This may be explained by the unaccustomed use of the ophthalmoscope by the respondents to routinely check for ocular complications of chronic diseases in their patients. It could also corroborate the less than optimal provision of refresher courses and updates to physicians on routine clinical skills in most of our health facilities outside the teaching hospitals.

Despite the unavailability of ophthalmoscopes and dilating eye drops in the clinics which were identified as the greatest barriers to performing routine funduscopy for persons with DM, the study showed that less than half of the respondents perform routine eye examination although our figures were higher than those reported from Brazil and southern India.<sup>[25,26]</sup> Additional barriers faced by the Indian physicians included time constraints and lack of adequate training on screening for DR. Furthermore, it corroborates reports from Australia, with the addition of lack of confidence to funduscopy on the part of the physicians.<sup>[27]</sup> Although not captured in the questionnaire, most of those that perform routine funduscopy confessed that they do not use dilating drops because of the possible side effects of glaucoma, which is not easily excluded in routine DM clinic visits.

Given the fact that there were not enough ophthalmologists to screen for the increasing population of persons in resource-limited settings, one of the proposed solutions is the training of nonophthalmologist physicians to screen DR early and refer patients appropriately in refresher courses or incorporated into updates and CME/CPD programs. This has several advantages, being more cost-effective, and does not require additional staff or use of very expensive equipment. It would also reduce the burden of double clinic visits by the patient, thereby ensuring good compliance and continuity of care. For this to be effective, there is a need for better coordination of care through improved communication between the physicians and ophthalmologists, which has been shown to improve patients adherence to recommended care, thereby preventing DM-related eye complications.<sup>[28]</sup> There was no correlation between knowledge, attitude, and practice of the physicians in our study, which is in contrast to figures reported from a similar setting in the Middle East which showed positive correlation between the attitude and practice of physicians to DR screening, and may not be unrelated to a better system of health-care delivery, despite their lower level of knowledge.<sup>[15]</sup>

The strength of our study was it being multicentered in design and involving only physicians, which is quite

difficult to undertake in our environment, because of their disproportionate distribution influenced by varied remunerations and social services in places where they practice. In addition, our study pioneered a preliminary survey on this important subject of knowledge, attitude, and practice of DM screening among physicians, which is currently not available in our environment.

Our findings, however, should be interpreted within the context of it being conducted in tertiary health-care facilities and therefore may not be generalizable to lower levels of health care, which have few or sometimes no physician at all to take care of persons with DM. Furthermore, the larger number of respondents from other geopolitical parts of the country may be required to support the establishment of a national guideline toward the provision of effective DR services.

## CONCLUSION

In summary, the level of knowledge of physicians to DR screening in our environment was suboptimal. Although most were aware of the effective method of delaying onset of DR and the frequency of eye examination, unavailability of ophthalmoscopes and dilating eye drops still form an important barrier to routine eye examination. Furthermore, only few of them were able to detect retinal changes on funduscopy with confidence, which prompts the need for improved training of physicians managing persons with DM on eye examination in a bid to strengthen DR screening and reduce the burden of visual impairment in our environment.

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## Conflicts of interest

There are no conflicts of interest.

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