Introduction

Diabetes mellitus (DM) is a metabolic health problem related to defect in either insulin secretion or function, which results in elevated blood glucose levels, known as hyperglycemia.[1] DM can be categorized into three major types; type 1 (T1DM), type 2, (T2DM), and gestational diabetes.[1] In 2011, the prevalence of DM worldwide has reached 8% and is anticipated to rise to 10% by 2030.[2] Saudi Arabia and Middle East nations have high prevalence of DM. Of note, Saudi Arabia is ranked as the second-highest prevalence country with DM in the Middle East and the seventh worldwide. It is predestined that approximately seven million Saudi people have diabetes and about three million are pre-diabetic.[3]

DM can cause different complications including diabetic retinopathy (DR), peripheral neuropathy, and cardiovascular problems.[4] DR is an avoidable retinal disorder affecting the transmission of oxygen and nutrients to the retina and is deemed the most common microvascular complication among diabetic

Context: Diabetic retinopathy (DR) is an avoidable retinal disorder affecting the retina and is deemed the most common microvascular complication of diabetes mellitus (DM). Aims: This study aimed to estimate the awareness and attitude of type 2 diabetic patients toward DR. Methods and Materials: A study questionnaire was distributed among Saudi patients with type 2 DM who visited primary health care at Abha, Saudi Arabia, after obtaining an ethical approval. It was a modified questionnaire and included basic demographic characteristics of the patients, general knowledge and awareness of DM and DR, and their practices toward eye examination. Statistical Analysis Used: Data analysis was performed using SPSS software. Chi-square and z-proportionality tests were applied where appropriate. Results: A total of 381 patients with DM responded to our survey; 36% of them had DM for five years or less. Notably, 93.5% of participants knew that diabetes can cause eye disease but only 63.3% agreed that regular eye examination for diabetic patients is necessary, with a significant difference of DM duration (p = 0.01). A total of 217 (57%) patients thought that there is no need to visit an ophthalmologist if diabetes is under control. However, 74.5% believed that patients with type 2 DM should go for an eye examination once diagnosed, with a significant difference between disease duration subgroups (p = 0.006). Conclusion: The current study demonstrated high levels of awareness regarding the effect of DM on the eye and importance of early eye assessment. However, we need to improve the patients' awareness to the value of regular eye checking and standard practices.

Keywords: Awareness, diabetes, diabetic retinopathy, questionnaire, and Saudi Arabia

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patients. DR is a devastating complication that may induce visual impairment and complete blindness. It has been estimated that DR can affect 24% of individuals who have suffered DM for 10–15 years. Moreover, around 35% of worldwide DM patients develop a degree of DR. In Saudi Arabia, the prevalence for DR was found to be 28–36% among diabetic patients in studies from different areas of the country. Published reports in the literature showed that increased blood sugar, high blood pressure, and lengthy course of DM are main risk factors for incidence of DR. As the condition remains asymptomatic in the earlier stage, it may worsen with lack of constant screening. A previous study showed that early screening and intervention of DR can stop vision loss by about 57%.

The degree of knowledge and understanding of DR is essential for prompt diagnosis and intervention for any probable visual impairment. Diabetic patients usually follow up with family medicine physicians or primary health care centers. Patients may aim to report any changes with their vision or diabetes control to their primary healthcare doctors. Of note, delayed referral of DR patients may affect the patient's quality of life and the economic burden on the healthcare system.

Studies aiming to evaluate the knowledge, attitude, and awareness of DR among DM patients were conducted previously in Saudi Arabia. While these studies demonstrated a high level of awareness for DR, there is a limited attitude toward the periodic visual examination and screening. Abha is the capital of the Asir region in Saudi Arabia, it is to the best of our knowledge that no previous study assessing knowledge and awareness of DR among diabetic patients has been carried out in Abha. Therefore, this study aimed to estimate awareness, attitude, patients' practices, and compliance to regular checks of DR among subjects with type 2 DM.

Material and Methods

Study setting
This is a questionnaire-based cross-sectional study carried out in primary health care at Abha, which is the capital of the Asir region, Saudi Arabia. The study has followed all ethical principles and its protocol was notarized by the research ethics committee in General Health Affairs Aseer, Ministry of Health, Saudi Arabia.

Study population and sample size
We invited Saudi patients with type 2 DM who visited primary health care at Abha to fill the study survey. The selection was limited to Saudi diabetic individuals aged 35–75 years. Subjects who; (i) had type 1 DM, (ii) were non-Saudi, (iii) aged less than 35 or older than 75 years, (iv) have had congenital eye diseases, and (v) have suffered from previous eye trauma, were excluded from our study. There were no limitations regarding any other specific characteristic. The patients have not received any incentives for joining and filling study questionnaire. The sample size was calculated based on Cochran's sample size formula with a margin of error at 5% and the confidence level at 95%, which yielded a total of 381 needed subjects.

Data collection and questionnaire
Our study used a modified questionnaire from a previously published study after obtaining the authors' consent. The questionnaire was translated into Arabic and reviewed by family medicine and ophthalmology consultants. The questionnaires included basic demographic characteristics including age, sex, marital status, economic level, and disease duration. It also covered questions of general knowledge and awareness of DM, DR, and subjects' practices toward eye examination.

Statistical methods
All data analysis was carried out using SPSS software Version 19. Percentages, mean, and standard deviation were calculated. Also, Chi-square and z-proportionality tests were applied where appropriate.

Results

General demographic characteristics of study participants
A total of 381 patients with DM responded to our structured survey. Male gender was predominated as 61.2% of the sample. Almost half of the sample were more than 55 years old (n = 198, 52%), and 33.6% were between 46 and 55 years. Regarding the socioeconomic status, the majority of participants were married (93.2%) and has monthly income between 5000 and 15000 R.S (69.3%). However, only 16.8% who were graduated or had higher studies, the primary education was counted the highest in the sample (26.5%) followed by secondary education (24.7%), illiterate (23.9%), and lastly intermediate education (8.1%). Duration of DM as reported by responders; 137 (36%) participants had DM for five years or less, and almost similar percentages in other groups, 86 (22.6%) patients had DM for 6 to 9 years, 80 (21%) patients for 9 to 14 years and 78 (20.5%) patients for more than 15 years. Detailed basic demographic characteristics are shown in Table 1.

Subjects' response on the general awareness of diabetic retinopathy questions
Notably, 93.5% of participants knew that diabetes can cause eye disease, with no significant difference with respect to DM duration (P = 0.119). However, only 241 (63.3%) participants agreed that regular eye examination for diabetic patients is necessary. A significant difference was noted with regard to subgroups of DM duration (p = 0.01). On the other hand, almost more than half of the sample (n = 217, 57%) thought that there is no need to visit an ophthalmologist if diabetes is under control, there was no significant difference observed concerning disease duration. A total of 97.6% of the responder agreed on the usefulness of early eye examination and timely treatments to prevent or delay diabetes damage to the eyes [Table 2].
Knowledge of choice of healthcare professional and available treatment for diabetic retinopathy

A total of 99.5% of the sample reported they would consult ophthalmologist in the event of eye problem, yet 18 cases reported that they may also consult optometrist (4.7%), seven for general practitioner (1.8%), and one participant may also consult any specialist (non-ophthalmologist). This difference was statistically significant ($p < 0.001$). A total of 99.2% of participants reported that control of diabetes and modification of lifestyle are available lines of treatments in DR management. Moreover, 97.6% of the participants knew about surgical procedures and alternative medical therapies in DR treatment. However, 81.4% replied that only medication is the available treatment for DR. This difference was considered statistically significant ($p < 0.001$ [Table 3]).

Attitude regarding diabetic retinopathy

Most of the participants showed an average accepted attitude regarding DR; 259 (68%) participants reported that they go for eye examination yearly while 111 (19.2%) participants denied going to eye examination. No significant difference was noted between diabetes years subgroups. More than two-thirds (74.5%) of the sample believed that patients with type 2 DM should go for an eye examination once diagnosed, with a significant difference between disease duration subgroups ($p = 0.006$). A total of 97.6% thought that the process needed to refer patients from primary health care to ophthalmology clinics is simple. Moreover, 35% of participants reported that they were able to get an ophthalmology appointment after a referral from a family medicine clinic after two months, while 88 (23%) participants were able to have an appointment after three months. Only 4% reported that they could get the appointment within less than one month. No significant difference was noted between diabetes duration subgroups. Patients’ evaluation regarding the DR awareness in primary health care was estimated as excellent and very good by 54.1% and 40.4% of the participants, respectively. [Table 4]

Discussion

Diabetes is a global disease and a growing burden, hence its complications, including DR, are expected to rise. However, this risk may be decreased by sufficient screening and tight control of blood sugar.$^{[10]}$ It is worth noting that lack of public awareness of DM and its complications may considerably impact the delivery and costs of health care.$^{[12-15]}$ Thus, our study aimed to check the level of awareness and attitude toward DR among Saudi patients with DM.

Table 1: Characteristic of our participants

| Item               | n   | %     | Z   |
|--------------------|-----|-------|-----|
| Gender             |     |       |     |
| Male               | 233 | 61.2  | <0.001 |
| Female             | 148 | 38.8  |     |
| Age                |     |       |     |
| 35-45 years        | 55  | 14.4  | <0.001 |
| 46-55 years        | 128 | 33.6  |     |
| >55 years          | 198 | 52.0  |     |
| Social status      |     |       |     |
| Married            | 355 | 93.2  | <0.001 |
| Widowed            | 21  | 5.5   |     |
| Divorced           | 3   | 0.8   |     |
| Single             | 2   | 0.5   |     |
| Economic status    |     |       |     |
| <5000 RS           | 107 | 28.1  | <0.001 |
| 5000-15000 RS      | 264 | 69.3  |     |
| >15000 RS          | 10  | 2.6   |     |
| Educational status |     |       |     |
| Illiterate         | 91  | 23.9  | <0.001 |
| Primary            | 101 | 26.5  |     |
| Intermediate       | 31  | 8.1   |     |
| Secondary          | 94  | 24.7  |     |
| Graduate or higher | 64  | 16.8  |     |
| Duration of DM     |     |       |     |
| 5 years or less    | 137 | 36.0  | <0.001 |
| 6-9 years          | 86  | 22.6  |     |
| 9-14 years         | 80  | 21.0  |     |
| >15 years          | 78  | 20.5  |     |
| Work               |     |       |     |
| Retired            | 145 | 38.1  | <0.001 |
| Employed           | 121 | 31.8  |     |
| Housewife          | 113 | 29.7  |     |
| Not reported        | 2   | 0.5   |     |
| Type of living     |     |       |     |
| Rent               | 218 | 57.2  | <0.001 |
| Own house          | 161 | 42.3  |     |
| Not reported        | 2   | 0.5   |     |

Table 2: General awareness of diabetic retinopathy among diabetic patients

| Item                                      | Answer             | Duration of diabetes | $P$ between duration of DM | Total n (%) | $P$   |
|-------------------------------------------|--------------------|----------------------|---------------------------|-------------|-------|
| Do you know that diabetes can cause eye disease? | No                 | 7 4 10 4           | 0.119                     | 25 (6.6)    | <0.001|
|                                           | Yes                | 130 82 70 74       | 356 (93.4)                |             |       |
| Should persons with diabetes go for regular eye examinations? | No                 | 65 26 27 22        | 0.011                     | 140 (36.7)  | <0.001|
|                                           | Yes                | 72 60 53 56        | 241 (63.3)                |             |       |
| There is no need to visit ophthalmologist if a person is having diabetes under control? | No                 | 51 34 39 40        | 0.136                     | 164 (43)    | <0.001|
|                                           | Yes                | 86 52 41 38        | 217 (57)                  |             |       |
| Timely treatment can prevent/delay damage due to diabetes in eyes? | No                 | 2 1 5 1           | 0.84                      | 9 (2.4)     | <0.001|
|                                           | Yes                | 135 85 75 77       | 372 (97.6)                |             |       |
Our study showed that 93.5% of participants knew that diabetes can cause eye disease, but only 63.3% agreed that regular eye examination for diabetic patients is necessary. In a previous study in Saudi Arabia, the level of awareness of DR was high among DM patients; more than two-thirds of subjects knew that DR may cause vision loss, and majority of sample knew that DM can...

| Table 3: Knowledge of proper healthcare professional and available treatment choices |
|----------------------------------------|---------|-------|------------|
| Item                                   | Answer  | Duration of diabetes | P between | Total n (%) | P       |
|----------------------------------------|---------|----------------------|-----------|-------------|---------|
|                                       |         | ≥5       | 6-9       | 9-14       | >15     |
| Knowledge of choice of healthcare professional in the event of eye problem. Whom do you consult in the event of eye problem? | Ophthalmologist | No | 1 | 0 | 0 | 1 | 0.6 | 2 (0.5) | 0.001 |
|                                       |         | Yes | 136 | 86 | 80 | 77 | 379 | (99.5) | <0.001 |
|                                       | Optometrist | No | 134 | 81 | 75 | 73 | 363 | (95.3) | <0.001 |
|                                       |         | Yes | 3 | 5 | 5 | 5 | 18 | (4.7) |         |
|                                       | General practitioner | No | 136 | 85 | 78 | 75 | 374 | (98.2) | <0.001 |
|                                       |         | Yes | 1 | 1 | 2 | 3 | 7 | (1.8) |         |
|                                       | Any specialist (Non-ophthalmologist) | No | 137 | 84 | 80 | 77 | 380 | (99.7) | <0.001 |
|                                       |         | Yes | 1 | 0 | 0 | 1 | 1 | (0.3) |         |
| Knowledge of available treatment for diabetic retinopathy? | No treatment available | No | 136 | 84 | 80 | 75 | 375 | (98.4) | <0.001 |
|                                       |         | Yes | 1 | 2 | 0 | 3 | 6 | (1.6) |         |
|                                       | Control of diabetes | No | 2 | 1 | 0 | 0 | 3 | (0.8) | <0.001 |
|                                       |         | Yes | 135 | 85 | 80 | 78 | 378 | (99.2) |         |
|                                       | Modification of life style | No | 1 | 1 | 1 | 0 | 3 | (0.8%) | <0.001 |
|                                       |         | Yes | 136 | 85 | 79 | 78 | 378 | (99.2) |         |
|                                       | Only medication | No | 19 | 18 | 19 | 15 | 71 | (18.6) | <0.001 |
|                                       |         | Yes | 118 | 68 | 61 | 63 | 310 | (81.4) |         |
|                                       | Alternative medical therapies | No | 4 | 4 | 1 | 0 | 9 | (2.4) | <0.001 |
|                                       |         | Yes | 133 | 82 | 79 | 78 | 372 | (97.6) |         |
|                                       | Surgical procedures | No | 5 | 3 | 1 | 0 | 9 | (2.4) | <0.001 |
|                                       |         | Yes | 132 | 83 | 79 | 78 | 372 | (97.6) |         |

| Table 4: Patients’ attitude regarding diabetic retinopathy |
|----------------------------------------------------------|---------|-------|----------|
| Item                                                     | Duration of diabetes | P       | Total n (%)| P       |
|----------------------------------------------------------|----------------------|---------|------------|
| How often you go for eye examination?                    | ≥5       | 6-9    | 9-14     | >15     |
| Monthly                                                  | 0        | 1      | 1        | 0       | 0.08    | 2 (0.5) | <0.001 |
| Every six months                                         | 0        | 3      | 2        | 4       | 9 (2.4) |         |         |
| Yearly                                                   | 86       | 60     | 55       | 58      | 259     | (68)    |         |
| I have not                                               | 51       | 22     | 22       | 16      | 111     | (29.1) | <0.001 |
| When should type 2 diabetic patient go for eye examination? | After five years | 14      | 14      | 11      | 8       | 47 (12.3) | <0.001 |
|                                                         | After one year | 29      | 9       | 10      | 2       | 50 (13.1) |         |
|                                                         | On diagnosis   | 94      | 63      | 59      | 68      | 284 (74.5) |         |
| Referral from primary health care to ophthalmology clinic in general hospital, was it a simple process? | No | 4 | 1 | 3 | 1 | 0.618 | 9 (2.4) | <0.001 |
|                                                         | Yes | 132 | 85 | 77 | 77 | 372 (97.6) |         |
| How often you get ophthalmology appointment after referral from family medicine clinic? | <1 month | 5 | 5 | 4 | 1 | 0.735 | 15 (4) | <0.001 |
|                                                         | 1 month | 27 | 14 | 12 | 15 | 68 (17.8) |         |
|                                                         | 2 months | 47 | 31 | 29 | 26 | 133 (35) |         |
|                                                         | 3 months | 27 | 25 | 17 | 19 | 88 (23) |         |
|                                                         | >3 months | 31 | 11 | 18 | 17 | 77 (20.2) |         |
| Your evaluation regarding awareness to diabetic retinopathy in primary health care? | Excellent | 66 | 49 | 43 | 48 | 0.593 | 206 (54.1) | <0.001 |
|                                                         | Very good | 63 | 33 | 33 | 25 | 154 (40.4) |         |
|                                                         | Good     | 8 | 4 | 4 | 5 | 21 (5.5) |         |
|                                                         | Bad      | 0 | 0 | 0 | 0 | 0 |         |
affect retina. Moreover, most of the study responders knew that controlled blood sugar may decrease the risk of DR.\[^{[20]}\] These results come in consistent with studies from regional countries such as Oman (93\%), Jordan (88\%), and Turkey (88\%) where they also showed high levels of awareness toward DM effect on the eyes.\[^{[20‑22]}\]

Our results showed statistical significance and association with DM duration regarding two questions “if regular eye examination is necessary for diabetic patients”, and “when should diabetic patient attend for eye examination”. In a study from Turkey, patients with type 2 DM more than 10 years had higher awareness about DR.\[^{[20]}\] These findings were consistent with a report from Saudi Arabia.\[^{[23]}\] In the study by Alsaidan et al.,\[^{[15]}\] the level awareness toward DR was affected by DM duration.

It is recommended to annually check the eye of diabetic patients for earlier diagnosis of DR and prevention of its complications as it has a silent course at first stages. In our study, 68\% of patients reported that they go for eye examination yearly and 74.5\% believed that patients with DM type 2 should go for an eye examination once diagnosed. In a previous study by al Zarea, approximately 95\% of subjects attended regular eye examinations with 48.97\% of them attending a yearly assessment.\[^{[12]}\] A nearly similar percentage was reported by AlHargan et al.\[^{[19]}\] where 48\% of study participants went for annual ocular examination. Of note, these two aforementioned studies were carried out in different regions in Saudi Arabia.\[^{[12,13]}\] These percentages are lower than what previously shown in published reports from different countries such as Switzerland (71\%) and Jordan (76\%).\[^{[22,24]}\]

Our study reported that 57\% of patients thought that there is no need to visit an ophthalmologist if diabetes is under control. This is in contrast to what is reported by Al-Yahya et al.\[^{[14]}\] where most of participants agreed on the importance of regular ocular evaluation regardless of blood sugar level but more than 60\% of them did not believe it is essential to do check-up if their vision is good. This may reflect the deficit in diabetic patients’ knowledge of DR. While they demonstrated high awareness and good knowledge of DR, this does not necessarily indicate their good practice.\[^{[14]}\] In a study by Funatsu et al.,\[^{[19]}\] more than 98\% of patients were aware of eye-associated problems in DM; however, only 69.5\% of the patients attended the regular ophthalmology examinations. Similarly, in a study by Alzahrani et al.,\[^{[20]}\] although more than 82\% of study subjects were aware of DM complications on eyes, only 65\% went to periodic eye examination.

There are several strength points in the present study; (i) it has investigated awareness of diabetic individuals in detail and assessed the overall knowledge, (ii) it has included a relatively larger sample population compared with published reports in the literature, (iii) patients were invited from primary health care, which makes them representative for the level of awareness and real practices, and minimizes the selection bias. Nonetheless, this study is not limitation-free. It has been limited by being conducted in one city in Saudi Arabia which may affect the generalization of our findings. A second limitation is the fact that the participants’ answers regarding DM duration and attitude toward DR were self-reported and were not compared with their medical records, which makes the results subject to overreporting by some patients. Future studies may consider addressing these issues. Although the level of awareness of eye affection by DM may be high in the present study and previous studies, policymakers should establish education programs to enhance diabetic patients’ awareness of DR and highlight the value of regular eye check-ups. Moreover, future studies are needed to investigate more variables that may influence the degree of knowledge and awareness of DR. Primary healthcare doctors should offer novel ways and contribute to patients’ education about the impact of DM and DR on their health. Appropriate guidance and immediate referral by family medicine physicians for patients presenting with early features of DR could lessen the long-term impact.\[^{[19,27]}\] This approach will allow specialists to establish a comprehensive treatment plan together with following up any progression by family medicine doctors.

### Key points

- Diabetic retinopathy is a serious complication of diabetes millets and a major cause of vision loss worldwide.
- The current study showed high levels of awareness regarding the effect of diabetes on the eye and risk factors of diabetic retinopathy.
- The current study also showed that diabetic patients have a high awareness level regarding the usefulness of early eye examination and timely treatments of diabetes-related eye damage.

### Conclusion

DR is a serious avoidable complication of DM and a leading cause of vision loss worldwide. The current study demonstrated high levels of awareness regarding the effect of DM on the eye, risk factors of DR, and the usefulness of early eye examination and timely treatments in prevention of eye damage. However, we need to improve the patients’ awareness to the value of regular eye checking and available treatment options for DR. Our results shed the light on the importance of DM education since awareness is substantial in limiting diabetes-associated complications and improving their outcomes. Our inferences need further confirmation by data from large multi-center randomized studies.

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### Conflicts of interest

There are no conflicts of interest.
References

1. American Diabetes Association. Diagnosis and classification of diabetes. Diabetes Care 2004;27:S5-10.
2. Guariguata L, Whiting DR, Hambleton I, Beagley J, Linnenkamp U, Shaw JE. Global estimates of diabetes prevalence for 2013 and projections for 2035. Diabetes Res Clin Pract 2014;103:137-49.
3. Al Dawish MA, Robert AA, Braham R, Al Hayek AA, Al Saeed A, Ahmed RA, et al. Diabetes mellitus in Saudi Arabia: A review of the recent literature. Curr Diabetes Rev 2016;12:339-68.
4. Alberti KG, Zimmet PZ. Definition, diagnosis and classification of diabetes mellitus and its complications. Part 1: Diagnosis and classification of diabetes mellitus. Provisional report of a WHO consultation. Diabetic Med 1998;15:539-53.
5. Voigt M, Schmidt S, Lehmann T, Köhler B, Kloos C, Voigt UA, et al. Prevalence and progression rate of diabetic retinopathy in type 2 diabetes patients in correlation with the duration of diabetes. Exp Clin Endocrinol Diabetes 2018;126:570-6.
6. Yau JW, Rogers SL, Kawasaki R, Kowalski JW, Bek T, et al. Global prevalence and major risk factors of diabetic retinopathy. Diabetes Care 2012;35:556-64.
7. El‑Asrar AM, Al‑Rubeaan KA, Al‑Amro SA, Kangave D, Moharram OA. Risk factors for diabetic retinopathy among Saudi diabetics. Int Ophthalmol 1998-1999;22:155‑61.
8. Hajjar S, Al Hazmi A, Wasi M, Moussa A, Rabiu M. Prevalence and causes of blindness and diabetic retinopathy in Southern Saudi Arabia. Saudi Med J 2015;36:449‑55.
9. Ahmed RA, Khalil SN, Al‑Qahtani MA. Diabetic retinopathy and the associated risk factors in diabetes type 2 patients in Abha, Saudi Arabia. J Family Community Med 2016;23:18-24.
10. Ting DS, Cheung GC, Wong TY. Diabetic retinopathy: Global prevalence, major risk factors, screening practices and public health challenges: A review. Clin Exp Ophthalmol 2016;44:260‑77.
11. Huang OS, Zheng Y, Tay WT, Chiang PP‑C, Lamoureux EL, Wong TY. Lack of awareness of common eye conditions in the community. Ophthalmic Epidemiol 2013;20:52‑60.
12. Al Zarea BK. Knowledge, attitude and practice of diabetic retinopathy amongst the diabetic patients of aljouf and hail province of Saudi Arabia. J Clin Diagn Res 2016;10:Nc05‑8. doi: 10.7860/JCDR/2016/19568.7862.
13. AlHargan MH, AlBaker KM, ALFadhel AA, AlGhamdi MA, AlMuammar SM, AlDawood HA. Awareness, knowledge, and practices related to diabetic retinopathy among diabetic patients in primary healthcare centers at Riyadh, Saudi Arabia. J Family Med Prim Care 2019;8:373‑7.
14. Al‑Yahya A, Alsulaibian A, Almizel A, Barri A, Al Adel F. Knowledge, attitude, and practices (KAP) of diabetics towards diabetes and diabetic retinopathy in Riyadh, Saudi Arabia: Cross-sectional study. Clin Ophthalmol 2020;14:3187‑94.
15. Alsaidan AA, Ghoraba M. Awareness of diabetic retinopathy among patients with type 2 diabetes mellitus in primary health care in security forces hospital Riyadh, Saudi Arabia. J Family Med Prim Care 2019;8:2433‑8.
16. Alamri A, Al‑Jahash NA, Alsultan MS, AlQahtani SS, Saeed YA, Alhamlan RA. Awareness, knowledge, and practice regarding to diabetic retinopathy among KKU students besides medical students in Abha, Saudi Arabia. J Family Med Prim Care 2021;10:3233‑9.
17. Alswaina NF Awareness of diabetic retinopathy among patients with type 2 diabetes mellitus in Qassim, Saudi Arabia. J Family Med Prim Care 2021;10:1183‑7.
18. Alluhaymid YM, Alotaibi FY, Alotaibi AB, Albasha AM, Alnaim AS, Sabi EM, et al. Awareness of diabetic retinopathy among Saudis with diabetes type 2 in Riyadh city. J Family Med Prim Care 2020;9:4229‑33.
19. Robin A, Giovingo M. Screening recommendations for diabetics. Dis Mon 2021;67:101116.
20. Çetin EN, Zencir M, Fenkcİ S, Akn F, Yildrum C. Assessment of awareness of diabetic retinopathy and utilization of eye care services among Turkish diabetic patients. Prim Care Diabetes 2013;7:297‑302.
21. Khondekar R, Al Harby S, Al Harthy H, Al Lawatti J. Knowledge, attitude and practice regarding eye complications and care among Omani persons with diabetes-A cross sectional study. Oman J Ophthalmol 2010;3:60‑5.
22. Bakkar MM, Haddad MF, Gammoh YS. Awareness of diabetic retinopathy among patients with type 2 diabetes mellitus in Jordan. Diabetes Metab Syndr Obes 2017;10:435‑41.
23. Almalki NR, Almalki TM, Alswat K. Diabetics retinopathy knowledge and awareness assessment among the type 2 diabetics. Open Access Maced J Med Sci 2018;6:574‑7.
24. Konstantinidis L, Carron T, de Ancos E, Chinet L, Hagon‑Traub I, Zuercher E, et al. Awareness and practices regarding eye diseases among patients with diabetes: A cross sectional analysis of the CoDiab‑VD cohort. BMC Endocr Disord 2017;17:56.
25. Funatsu H, Hori S, Shimizu E, Nakamura S. Questionnaire survey on periodic ocular examination in Japanese diabetic patients. American J Ophthalmol 2003;136:955‑7.
26. Alzahrani SH, Bakarman MA, Alqahtani SM, Alqahtani MS, Butt NS, Salawati EM, et al. Awareness of diabetic retinopathy among people with diabetes in Jeddah, Saudi Arabia. Ther Adv Endocrinol Metab 2018;9:103‑12.
27. Schoenfeld ER, Greene JM, Wu SY, Leske MC. Patterns of adherence to diabetes vision care guidelines: Baseline findings from the Diabetic Retinopathy Awareness Program. Ophthalmology 2001;108:563‑71.