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ORIGINAL ARTICLE

Diabetes Mellitus and Retinopathy: relationship, complications and management as comparative study among patients in KSA and Egypt

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ABSTRACT

Diabetes Miletus (DM) for long duration is associated with damage of various organ systems mainly affecting the eyes, nerves, kidneys, and the heart. It can cause diabetic retinopathy (DR) in patients with Type-2 DM has been found to be related to hyperglycemia and hypertension. Our aim to investigate the relationship between DM and Retinopathy, complications and their management either in KSA & Egypt. Data were collected through patients' interviews in different hospitals; Hail University medical clinic, King Khalid Hospital, Hail, KSA and El-Demerdash, Ain Shams University, Egypt. The results showed that Type-1 DM in KSA is more in males(22%) than Egypt (16.7%) while Type-2 in Egypt is more in males (77.8%) than KSA(69.2%). Obesity and hypertension are more in KSA than Egypt, while cholesterol and triglycerides are in the same range. High percentage of Egyptian patients have DM since 6-10years (42%), Vs(18%) in KSA, while 12% of Egyptian participants have DM for >10 years, Vs (40%) in KSA. High percentages of patients follow diet and visit sugar and ophthalmology clinics more in Egypt than KSA. The percentage of patients with Cataract more in KSA (about 26%) than Glaucoma (about 8%) in comparison to Egypt (about 10% both). Retinopathy was equal between patients either in KSA or Egypt (about 15%). About 7% Egypt Vs 28% KSA of patients with high glycated hemoglobin (HbA_{1c}) level (10-12%). We can conclude that increased age, disease duration, high HbA_{1c}, obesity, hypertension and no adherence to treatment were the main risk factors for microvascular disease.

Key Words: *Diabetes Mellitus, Retinopathy, complications, managements, Saudi Arabia, Egypt.*

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INTRODUCTION

Diabetes mellitus (DM) is about chronic metabolic disorder in the body characterized by increased level of blood glucose and it causes damage to different organs and tissues, for example the heart, kidneys, eyes, nervesand blood vessels[1].The mortality of DM was 1.37 million [2]. DM is leading to blindness and amputation, kidney disease, cardiomyopathy, cerebrovascular and peripheral artery diseases [3].[The pathological effects due to DM includes the vasculature leading to both microvascular and macrovascular complications [4].They found that aging, DM duration, and glycated hemoglobin (HbA_{1c}) were the main risk factors for microvascular disease and diabetic foot, while age was the only risk factor for macro-vascular complications. Gender differences should be considered when providing management for prevention and treatment of DM-related complications [5].Stem cell-based therapy is promising for the treatment of DM and its complications[6].Diabetes for long duration is associated with damage and failure of various organ systems mainly affecting the eyes, nerves, kidneys, and the heart [7].It can cause diabetic retinopathy (DR) in patients with (T2DM) has been found to be related to both severities of

hyperglycemia and presence of hypertension. In the United States, approximately 10,000 new cases of blindness attributed to DR [8]. It is reported that more than 77% of patients who survive for over 20 years with diabetes are affected by Retinopathy [9].Diabetic retinopathy can result in various degrees of visual impairment and is a leading cause of blindness worldwide [10].The study done in 2010 estimated that 10.2 million US adults 40 years and older known to have diabetes, and the prevalence rate for developing diabetic retinopathy was 40.3% [11]. KSA have a high prevalence of DM [12].The prevalence was about 23.7% during 2004 in Saudi Arabia[13].and increased to 30% by 2011 with a rate of 34.1% in men and 27.6% in women [14[.In 2015, KSA became in the second rank with the highest prevalence of DM among the Middle East and the 7th rank among the world according to a WHO report[15].The Ministry of Health in Saudi Arabia reported that, there were 0.9 million individuals who were diagnosed with diabetes in 1992, this number increased by 2.7 times to 2.5 million in 2010[16]. Study done in 2016 reported that diabetics are of risk factor for eye complication. They found the prevalence of DR among Saudi patients with type 2 DM to be 14.8% [17]. DR as one of the microvascular complications for DM, it can affect about 24% of diabetic patients with long duration (for 10–15 years)[18].Around 35% of all diabetic patients became with DR [19].Also, diabetic nephropathy is leading to end-stage renal disease (ESRD) requiring dialysis[20]. Diabetic neuropathy affects about half of the diabetic population [21].In Saudi Arabia, study reported that the prevalence is 19.9% [22].Proteinuria occurs in 15–40% of patients with type 1 diabetes while it ranges from 5 to 20% in patients with T2DM[23].The prevalence of diabetic retinopathy in different regions of Saudi Arabia: Riyadh (31%), Madinah (36.8%), Taif (36.1%), and Al-Hassa (30%). [9]. This study was aimed to assess the prevalence of retinopathy and its association with DM in diabetic patients also complications and management in KSA & Egypt.

SUBJECTS AND METHODS

The Study conducted through cross-sectional study design. It carried out among diabetic patients with or without eye diseases who follow up at clinic of Diabetes or ophthalmology, Hail University medical polyclinic, Hail and Riyadh, KSA and Egypt among 5 months (October 2019 to March 2020). The study excluded pregnant women, patients with a psychiatric illness or mental impairment, or patients unable to give informed consent. All participants were provided with clear and easy to understand information about the research paper in order to allow them to make an informed and voluntary decision about their participation. The data collection tool through a well-structured questionnaire (interview with patients) was used to address the study objective. The questionnaire consists of 25 questions, 4 about socio-demographic, 6 about diabetes and eye diseases knowledge, 7 about their adherence to treatment, to visiting physician, checking glucose level and finally 8 about their knowledge about symptoms of DM & eye complications. Statistical analyses were performed using SPSS version 23 (SPSS, Chicago, IL, USA). Frequencies and percentages were calculated for categorical variables.

RESULTS AND DISCUSSION

Many complications were found due to DM that leading to blindness and amputation and contributes substantially to kidney disease, cardiomyopathy, and cerebrovascular and peripheral artery diseases [3].It is recognized that more than 77% of patients who survive for over 20 years with diabetes are affected by Retinopathy [9].In this study the participants were 167 patients from Saudi Arabia (91 males and 76 females), 129 from Hail, 37 from Riyadh, 0ne from Dammam and other 60 patients from Egypt (36 males and 24 females). Table 1-3 showed the results of Saudi Arabia Diabetic patients. Table 1showed that 22% of males & 15.8% of females have diabetes type1, while 69.2% males & 72.4% females have diabetes type2 and the rest of patients did not know their type of diabetes. While Table 4 showed that in Egypt about 16.7% of males or females have diabetes type1, while 77.8% males & 83.3% females have diabetes type2[Figure 1]. Other study showedthat most of diabetic participants in Sudan at the age of 44.9 years, 70.3% of them were women[24].Other study was done in Saudi Arabia (2015), included 5396 patients, they found that 2959 are males (51.5% Type 1 and 55.5% Type 2), on other hand, 2437 are females (48.5% Type 1 and 44.7% Type 2) [25]. The global diabetes prevalence in 2019 is estimated to be 9.3% (463 million people), rising to 10.2% by 2030 and 10.9% by 2045 at the age between 20-79 years [26].

Most of patients in Saudi Arabia became diabetic more than 10 years (54.9% in males Vs 25% in females) followed by patient that became diabetic since 1-5 years (18.7% in males Vs 38.2% in females), and other patients since 6-10 years (20.9% in males Vs 15.8% in females).In Egypt, patients became diabetic in the last 6-10 years (50% in males Vs 34.6% in females) but about 16.7% became diabetic in the last 1-5 years or more than 10 years. Other study reported that>44% of individuals aged 55 with severe uncontrolled DM with long-term complications. They have hypertension (38%) and coronary heart disease (24%) in

Saudi Arabia[27].Another study in Jeddah, Saudi Arabia reported that an age from 5–70 years the patients had microvascular complications such as neuropathy, retinopathy, nephropathy and in 6% of Type1 DM patients[28].In KSA, 69.2% of males & 60.5% female patients said that diabetes Mellitus is hereditary, they said that their parents, 60.4% male Vs 63.2% female had diabetes. In Egypt, 55.6% of males & 75% female patients said that diabetes Mellitus is hereditary, they said that their parents, 78.3% male Vs 34.6% female had diabetes. In KSA37.4% males Vs 43.4% females are obese, but 49.5% males Vs 55.3% females with hypertension, while 34.1% males Vs 50% females with high level of Cholesterol & Triglycerides. Comparing results in Egypt, 15% males Vs 30.8% females are obese, but 40% males Vs 34.6% females with hypertension, while 33.3% males Vs 50% females with high level of Cholesterol & Triglycerides. Another research revealed that triglyceride is an independent predictor of type 2 DM among middle and old age [29].

Table 1: Percentages and Numbers of Diabetic patients in Saudi Arabia that answer the following questions about diabetes Mellitus. (n= 167).

Questions		Answers											
Do you have Diabetes?	Answer	YES				NO				Don't Know			
	Male	89	97.8%			0		0		2		2.2%	
	Female	75	98.7%			0		0		1		1.3%	
What is the type of Diabetes?	Answer	Type 1				Type 2				Don't know			
	Male	20		22%		63		69.2%		8		8.8%	
	Female	12		15.8%		55		72.4%		9		11.8%	
What is the age of being Diabetic?	Answer	Since <1 Year		Since 1-5 Years		Since <6-10 Years		>10 Years					
	Male	5	5.5%	17	18.7%	19	20.9%	50		54.9%			
	Female	6	7.9%	29	38.2%	12	15.8%	19		25%			
If any person in your family have DM?	Answer	Parents		Brothers & Sisters		Grandfathers		Sons			None		
	Male	55	60.4%	12	13.2%	20	22%	6	6.6%	9	9.9%		
	Female	48	63.2%	9	11.4%	8	10.5%	1	1.3%	20	26.3%		
If DM hereditary in your family?	Answer	YES				NO				Don't Know			
	Male	63		69.2%		14		15.4%		14		15.4%	
	Female	46		60.5%		12		15.8%		18		23.7%	
Do you have any other diseases?	Answer	obesity				Hypertension				High Cholesterol & Triglycerides		None	
	Male	34		37.4%		45		49.5%		31	34.1%	17	18.7%
	Female	33		43.4%		42		55.3%		38	50%	10	13.2%

Table 2 showed the adherent of Saudi patients to treatment, we found that 69.2% male patients Vs 55.3% female patients who receive oral hypoglycemic drugs, while, 59.3% of male patients Vs 88.2% females who receive insulin. On the other hand, Table 4 showed the adherent of Egyptian patients to treatment it showed that 44.4% male patients Vs 40% female patients who receive oral hypoglycemic drugs, while, 11.2% of male patients Vs 20% females who receive insulin. Other studies showed that in japan that revealed 72.6% male and 59.7% for female Japanese patients who received only oral Hypoglycemic drug [30]. In our study, 59.3% male Vs 88.2% females who received insulin only compared to 11.0% of male Vs 29.9% females who receive only insulin, about 0.5% of patients who receive both insulin and Oral hypoglycemic Drug [30]. Only small percentage of Saudi patients who adjusted diets (17.6% males Vs 10.5% females), While the comparative study showed 50% of the subjects were using diet therapy with percentage 57.5%males and 52.2% females, and about 47.9% males and 29.9 females who do exercise[30].

About 62.6% of male patients Vs 55.3% females that visit the diabetes clinic regularly. Only 16.5% male Vs 25% female patients who visit the ophthalmology clinic one per month, 31.9% male Vs 27.6% female patients who visit the ophthalmologic clinic one per year and about 50% of patients did not visit. On the other hand, high percentage of Egyptian patients who adjusted diets (44.4% males Vs 40% females), and 88.9% of male patients Vs 91.7% females that visit the diabetes clinic regularly, about 27.8% male Vs

75% female patients who visit the ophthalmology clinic one per month, 55.6% male Vs 8.3% female patients who visit the ophthalmologic clinic one per year and 16.7% of patients did not visit. One third of male or female Saudi patients who adjusted their glucose level. Half of patients with middle and high level of fasting glucose, while about 7% with normal fasting glucose. High percentage of Egyptian patients (72.2% male Vs 58.3% female) who adjusted their glucose level, while 16.7% males Vs 41.7% females who did not adjusted [Figure 2].High 48.4% of male Saudi patients with HbA_{1c} (3.7-6.9%) VS female patients (19.7%), but for female patients 38.2% with high HA1c level (7-9.9% or 10-12%). Most of diabetic patient measure their glucose level once daily (54.9% males Vs 71.1% females). High percentages (61.1% males Vs 66.7% females) of Egyptian patients with glycated hemoglobin (HbA_{1c}) (3.7-6.9%), but (27.8% males Vs 25% females) of patients with HbA_{1c} level (7-9.9%) [Figure 3]. Some of diabetic patient measure their glucose level once weekly (22.2% males Vs 58.3% females), other measured one per month (33.3% males Vs 25% females). Other studies showed that blood HbA_{1c} level was 7.09% male and 7.47% female [30]. Another research found that that increased age, disease duration, HbA_{1c} were the main risk factors for microvascular disease and diabetic foot, while age was the only risk factor for macrovascular complications [31].

Table 2: Numbers and percentages of Diabetic patients in Saudi Arabia that being adherent to antidiabetic drugs treatment (n= 167).

Questions		Answers							
What is the antidiabetic drug used?	Answer	Diet		Oral hypoglycemic		Insulin			
	Male	16	17.6%	63	69.2%	54	59.3%		
	Female	8	10.5%	42	55.3%	67	88.2%		
Do you visit the sugar clinic?	Answer	YES		NO		Sometimes			
	Male	57	62.6%	10	10.9%	24	26.4%		
	Female	42	55.3%	10	13.2%	22	28.9%		
Do you visit the Ophthalmology clinic regularly?	Answer	One /month		One / year		I don't visit			
	Male	15	16.5%	29	31.9%	47	51.6%		
	Female	19	25%	21	27.6%	36	48.7%		
Do your glucose level is adjusted?	Answer	YES		NO		Don't know			
	Male	29	31.9%	56	61.5%	6	6.6%		
	Female	20	26.3%	44	57.9%	12	15.8%		
What is your fasting blood glucose?	Answer	Normal (70-100)		Middle (101-125)		High (>126)		Don't know	
	Male	7	7.7%	46	50.5%	45	49.5%	11	12.1%
	Female	6	7.9%	31	40.8%	35	46.1%	5	6.6%
What is your HbA_{1c} level?	Answer	3.7-6.9%		7-9.9%		10-12%		>12	
	Male	44	48.4%	26	28.6%	17	18.7%	4	4.4%
	Female	15	19.7%	29	38.2%	29	38.2%	15	19.7%
Do you measure your glucose level?	Answer	Once daily		Once weekly		Twice weekly		One / month		Don't measure	
	Male	50	54.9%	24	26.4%	8	8.8%	7	7.7%	2	2.2%
	Female	54	71.1%	4	5.3%	8	10.5%	4	5.3%	6	7.9%

Table 3 showed the complications due to DM. Most of patients with polyurea (71.4% males Vs 64.5% females), followed by Tingling & Numbness, Mouth or toes fungi (about 22% males Vs 36% females). In Egyptian patients some complications were found due to DM. Fifty of patients with polyurea followed by Tingling & Numbness (27.8% males Vs 75% females), Mouth or toes fungi (27.8% males Vs 16.7% females). (Table 6). Study done in 2016 about Type 1 DM Saudi Children revealed the main symptoms present are 96% (polyuria), 85% (polydipsia), 62% (weight loss), 47% (nocturia), and 22% are diabetic Kidney diseases [32]. Other symptoms were frequent with Saudi patients such as eye pain (26.4% in males Vs 32.9% in females), followed by clouds in vision (14.3% in males Vs 35.5% in females). Presence of cataract in (22% in males Vs 30.3% in females), Glaucoma (4.4% in males Vs 11.8% in females) and retinopathy (15.4% in males Vs 13.2% in females), while (60.4% in males Vs 57.9% in females) did not have eye problems. Other symptoms were frequent with Egyptian patients such as eye pain (16.7% in males Vs 41.7% in females), followed by clouds in vision (22.2% in males Vs 50% in females). Presence of cataract and in (2.8% in males Vs 16.7% in females), Glaucoma (2.8% in males Vs 16.7% in females) and retinopathy (16.6% in males Vs 12.5% in females), while (77.8% in males Vs 54.2% in females) did not have eye problems [Figure 4].Other study in Taif, KSA (2019) showed that the most prevalent complication was neuropathy (65.4%) followed by retinopathy (43.3%), hypoglycemia (27.7%), cardiovascular accident (5.2%), and renal failure (3.5%), cardiovascular (5.2%)[33].Another study in

Jeddah, KSA (2015) said that Long-term complications were found as retinopathy (4.4%), microalbuminuria (16.2%) and dyslipidemia (8.3%)[34].

Other study revealed that diabetes complications were varied such as microvascular complication present in 9%, macrovascular (6%), cardiovascular (4%), cerebrovascular and peripheral vascular disease (1%) andabout 30% of the patients had both micro- and macrovascular complications [28].In other research done by Algeffari showed that 35% of DM patients in Saudi Arabia suffer diabetic neuropathy [35]. Other study in King Fahd Hospital at Al-Madinah showed that about 36% of DM type 2 patients had microalbuminuria [36],while other cross-sectional study in Saudi Arabia showed that about 20% of DM patients had diabetic retinopathy and 10.8% of DM patients had diabetic nephropathy [37]. Recent research found an association between both Diabetic Kidney disease, diabetic retinopathy and peripheral neuropathy, also statistically significant association between both Diabetic Kidney disease, diabetic retinopathy and peripheral arterial disease [38,39]. It was recognized that more than 77% of patients who survive for over 20 years with diabetes are affected by Retinopathy[9].

In Saudi patients, 58.4% of male Vs 81.6% had vision problems after became 40.7% males Vs 48.7% had problems in vision at night, while 13.2% males Vs 11.8% had problems in side vision. Only 15.4% males Vs 27.6%% had lipids on their eye lids. On the other hand, with Egyptian patients we found that 55.6% of male Vs 77.7% had vision problems after became diabetic, 5.6% males Vs 25% had problems in vision at night, while 11.1% males had problems in side vision, but no in females. About 22.2% males Vs 50% had lipids on their eye lids.Other studies showed that Postoperative monitoring and good management of surgical complications will protect the risk of vision loss in patients with cataract either with or without diabetes [40].

Table 3: Numbers and percentages of Diabetic patients in Saudi Arabia that answer the following questions about symptoms of DM & eye diseases. (n= 167).

Questions		Answers									
Are these symptoms frequent with you due to diabetes?	**Answer**	**Polyurea**		**Tingling & Numbness**		**Dry skin**		**Diabetic coma**		**Ankle Edema**	
	Male	**65**	**71.4%**	**22**	**24.2%**	**8**	**8.8%**	**3**	**3.3%**	**1**	**1.1%**
	Female	49	64.5%	29	38.2%	19	25%	6	7.9%	4	5.3%
Are these symptoms frequent with you due to diabetes?	**Answer**	**Foot ulcer**		**Mouth or toes fungi**		**Diarrhea**		**Anxiety**		**None**	
	Male	**16**	**17.6%**	**19**	**20.9%**	**5**	**5.5%**	**12**	**13.2%**	**8**	**8.8%**
	Female	23	30.3%	26	34.2%	2	2.6%	15	19.7%	2	2.6%
Do you have problem in vision before Diabetes?	**Answer**	**YES**		**NO**		**Don't know**					
	Male	**31**	**34.1%**	**39**	**42.9%**	**21**	**23.1%**				
	Female	**28**	**36.8%**	**29**	**38.2%**	**19**	**25%**				
Do you have problem in vision after Diabetes?	**Answer**	**YES**		**NO**		**Don't know**					
	Male	**53**	**58.4%**	**22**	**24.2%**	**16**	**17.6%**				
	Female	**62**	**81.6%**	**7**	**9.2%**	**7**	**9.2%**				
Do you have vision problem at night?	**Answer**	**YES**		**NO**		**Sometimes**					
	Male	**37**	**40.7%**	**24**	**26.4%**	**30**	**32.9%**				
	Female	**37**	**48.7%**	**11**	**14.5%**	**20**	**26.3%**				
Do you have these diseases?	**Answer**	**Cataract**		**Glaucoma**		**Retinopathy**		**None**			
	Male	**20**	**22%**	**4**	**4.4%**	**14**	**15.4%**	**55**	**60.4%**		
	Female	**23**	**30.3%**	**9**	**11.8%**	**10**	**13.2%**	**44**	**57.9%**		
Are these symptoms frequent with you?	**Answer**	**Eye pain**		**Clouds in vision**		**Double vision**		**More lightness to objects**		**None**	
	Male	**24**	**26.4%**	**13**	**14.3%**	**10**	**11%**	**20**	**22%**	**37**	**40.7%**
	Female	**25**	**32.9%**	**27**	**35.5%**	**13**	**17.1%**	**16**	**21%**	**12**	**15.8%**
Do you lose your side vision?	**Answer**	**YES**		**NO**		**Sometimes**					
	Male	**12**	**13.2%**	**40**	**43.9%**	**39**	**42.9%**				
	Female	**9**	**11.8%**	**44**	**57.9%**	**23**	**30.3%**				
Do you have lipids on your eye lid?	**Answer**	**YES**		**NO**							
	Male	**14**	**15.4%**	**77**	**84.6%**						
	Female	**21**	**27.6%**	**55**	**72.4%**						

Table 4: Percentages and Numbers of Diabetic patients in Egypt that answer the following questions about diabetes Mellitus. (n= 60).

Questions		Answers									
Do you have Diabetes?	Answer	YES				NO				Don't Know	
	Male	34	94.4%			0		0		2	5.6%
	Female	24	100			0		0		0	0
What is the type of Diabetes?	Answer	Type 1				Type 2				Don't know	
	Male	6		16.7		28		77.8%		2	5.5%
	Female	4		16.7%		20		83.3%		0	0
What is the age of being Diabetic?	Answer	Since <1 Year		Since 1-5 Years		Since <6-10 Years		>10 Years			
	Male	6	16.7%	6	16.7%	18	50%	6		16.8%	
	Female	0	0	4	16.7%	18	34.6%	2		8.3%	
If any person in your family have DM?	Answer	Parents		Brothers & Sisters		Grandfathers		Sons		None	
	Male	36	78.3%	5	10.9%	5	10.9%	0	0	0	0
	Female	18	34.6%	4	16.7%	2	8.3%	0	0	0	0
1 If DM hereditary in your family?	Answer	YES				NO				Don't Know	
	Male	20		55.6%		9		25%		7	19.4%
	Female	18		75%		6		25%		0	0
Do you have any other diseases?	Answer	Obesity				Hypertension				High Cholesterol & Triglycerides	None
	Male	6		15%		16		40%		12 33.3%	6 16.7%
	Female	16		30.8%		18		34.6%		12 506%	6 25%

Table 5: Numbers and percentages of Diabetic patients in Egypt that being adherent to antidiabetic drugs treatment (n= 60).

Questions		Answers									
What is the antidiabetic drug used?	Answer	Diet				Oral hypoglycemic				Insulin	
	Male	24	44.4%			24	44.4%			6	11.2%
	Female	16	40%			16	40%			8	20%
Do you visit the sugar clinic?	Answer	YES				NO				Sometimes	
	Male	32	88.9%			4	11.1%			0	0
	Female	22	91.7%			2	8.3%			0	0
Do you visit the ophthalmologic clinic regularly?	Answer	One /month				One / year				I don't visit	
	Male	10	27.8%			20	55.6%			6	16.6%
	Female	18	75%			2	8.3%			4	16.7%
Do your glucose level is adjusted?	Answer	YES				NO				Don't know	
	Male	26	72.2%			6	16.7%			4	11.1%
	Female	14	58.3%			10	41.7%			0	0
2 What is your fasting blood glucose?	Answer	Normal (70-100)				Middle (101-125)				High (>126)				Don't know	
	Male	2	5.6%			24	66.7%			4	11.1%			4	11.1%
	Female	8	33.3%			12	50%			4	16.7%			0	0
3 What is your HbA_{1c} level?	Answer	3.7-6.9%				7-9.9%				10-12%				>12%	
	Male	22	61.1%			10	27.8%			2	5.6%			2	5.6%
	Female	16	66.7%			6	25%			2	8.3%			0	0
Do you measure your glucose level?	Answer	Once daily				Once weekly				Twice weekly				One / month				Don't measure	
	Male	6	16.7%			8	22.2%			3	8.3%			12	33.3%			8	22.2%
	Female	2	8.3%			14	58.3%			0	0			6	25%			2	8.3%

Table 6: Numbers and percentages of Diabetic patients in Egypt that answer the following questions about some medical analysis. (n= 60).

Questions		Answers									
Are these symptoms frequent with you due to diabetes?	Answer	Polyurea		Tingling & Numbness		Dry skin		Diabetic coma		Ankle Edema	
	Male	18	50%	10	27.8%	4	11.1 %	4	11.1%	0	0
	Female	12	50%	18	75%	6	25%	8	33.3%	10	41.7%
Are these symptoms frequent with you?	Answer	Foot ulcer		Candidiasis in mouth or toes		Diarrhea		Anxiety		None	
	Male	8	22.2%	10	27.8%	0	0	22	61.1%	0	0
	Female	0	0	4	16.7%	4	16.7 %	0	0	0	0
Do you have problem in vision before Diabetes?	Answer	YES		NO		Don't know					
	Male	28	77.8%	6	16.7%	2	5.6%				
	Female	14	58.3%	10	41.7%	0	0				
4 Do you have problem in vision after Diabetes?	Answer	YES		NO		Don't know					
	Male	20	55.6%	8	22.2%	8	22.2%				
	Female	16	77.7%	6	25%	2	8.3%				
Do you have vision problem at night?	Answer	YES		NO		Sometimes					
	Male	2	5.6%	32	88.9	2	5.6%				
	Female	6	25%	18	75%	0	0				
5 Do you have these diseases?	Answer	Cataract		Glaucoma		Retinopathy		None			
	Male	1	2.8%	1	2.8%	6	16.6%	28	77.8%		
	Female	4	16.7%	4	16.7%	3	12.5%	13	54.2%		
7 Are these symptoms frequent with you?	Answer	Eye pain		Clouds in vision		Double vision		More lightness to objects		None	
	Male	6	16.7%	8	22.2%	0	0	6	16.7%	16	44.4%
	Female	10	41.7%	12	50%	0	0	2	8.3%	0	0
Do you lose your side vision?	Answer	YES		NO		Sometimes					
	Male	4	11.1%	32	88.9%	0	0				
	Female	2	8.3%	22	91.7%	0	0				
Do you have lipids on your eye lid?	Answer	YES		NO							
	Male	8	22.2%	28	77.8%						
	Female	12	50%	12	50%						

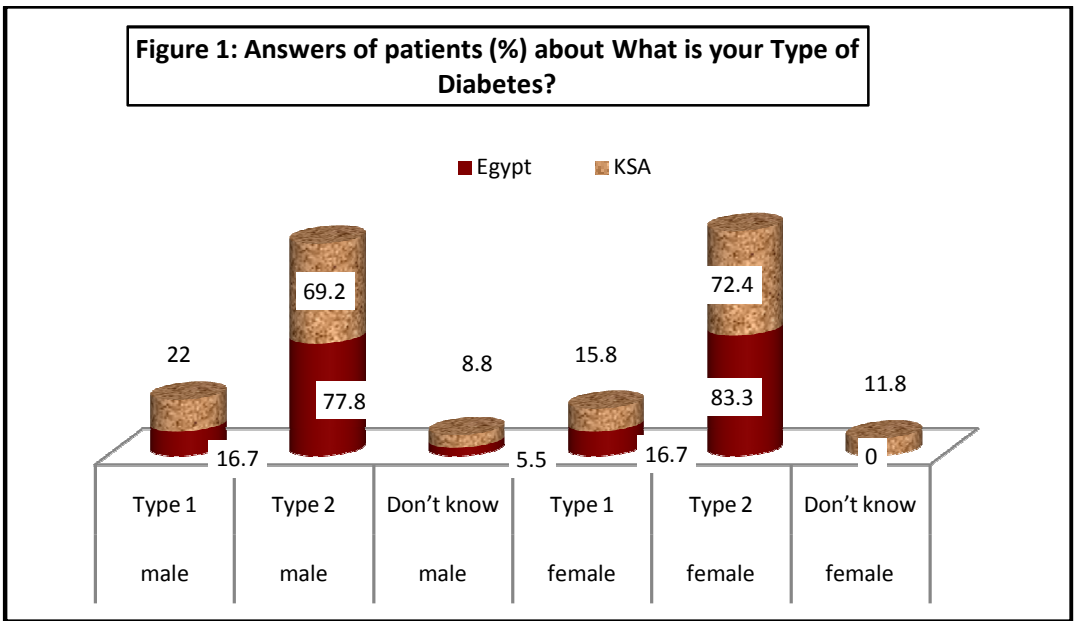


Figure 2: Answers of patients in KSA & Egypt (%) about Do your glucose level is adjusted?

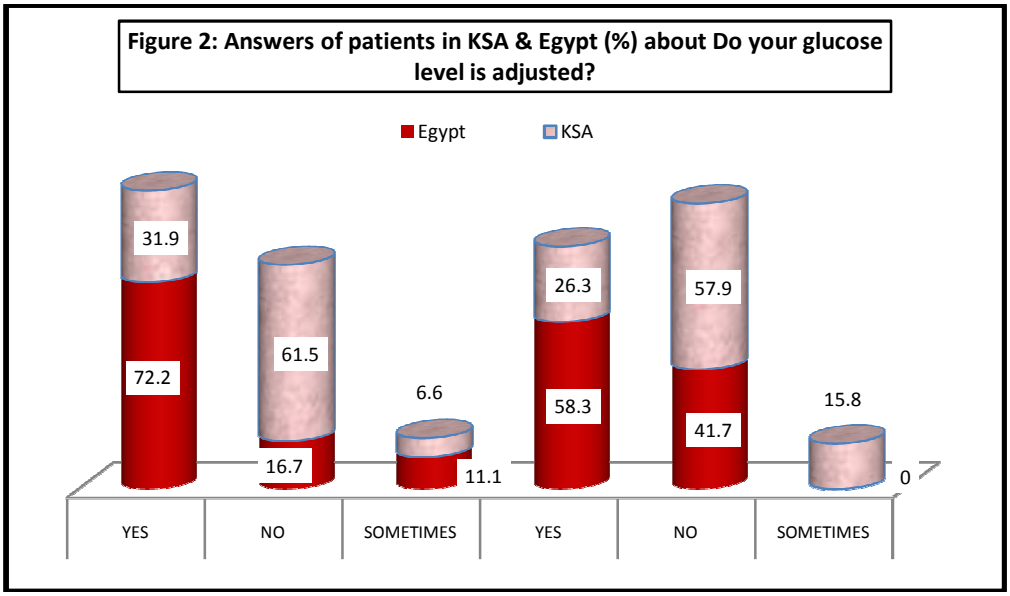


Figure 3: Answers of patients in KSA & Egypt (%) about What is your HbA1c level?

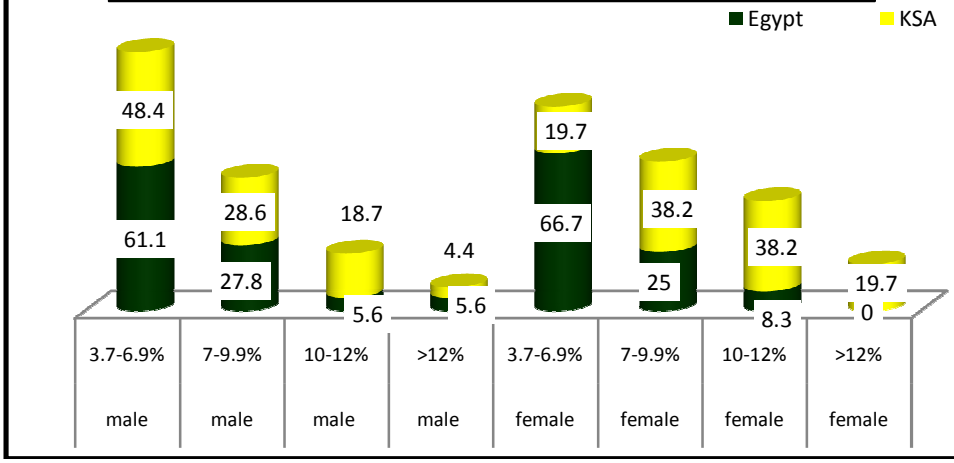
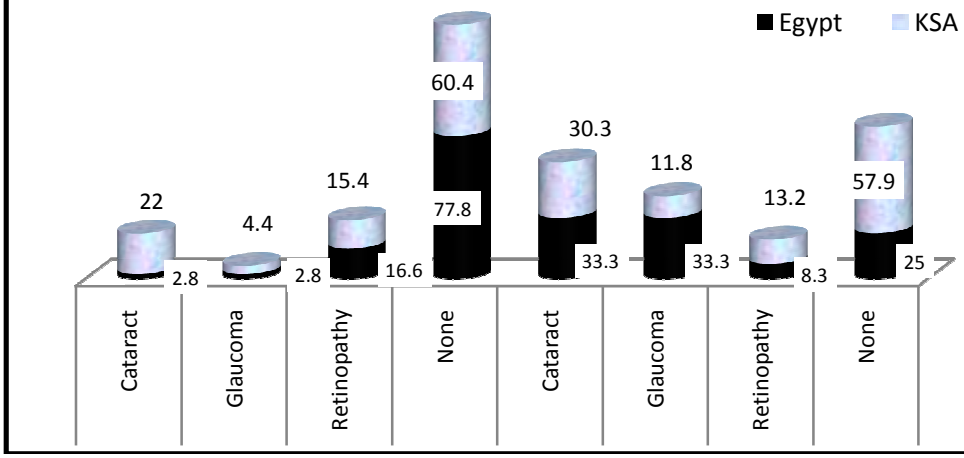


Figure 4: Answers of patients in KSA & Egypt (%) about Do you have these diseases?



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