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Prevalence Of Controlled Diabetes In Diabetic Patients By Glycated Hemoglobin "A1c" & FBS And Diabetes Complications (in outpatient clinic at AL- Balsam health center in AL -Balsam Charitable Foundation. Seiyun , Hadramout . Yemen)

انتشار السكري الخاضع للسيطرة في مرضى السكري بواسطة الفحص التراكمي وفحص الدم أثناء الصوم ومضاعفات السكري (في العيادة الخارجية في مركز البلسم الصحي بجمعية البلسم الخيرية سيئون- حضرموت- اليمن)

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Abstract:

Background: Diabetes mellitus (DM) is global public health, there is published study in 2014 estimated the prevalence of DM among men in Yemen is 9.8%.Most of the cost of the diabetes in suffering, comes from its complications. Efficient glucose control and monitoring using HBA1c thus, can reduce diabetes complications efficiently. Our study focused upon glycemic control objective achieved and role of certain factors in DM control and the association of HbA1c level with diabetic related complications. Patients & Methods : Descriptive retrospective study was carried out on 100 diabetic patient who visit outpatient clinic on 2 days (5-6 October 2022) of registered patient at AL- Balsam health center in AL -Balsam Charitable Foundation(Seiyun- Hadramout-Yemen) , and information of history & examination (age, sex ,duration, drugs (types & combinations) compliance, diet history and complication and lab. investigation (CBC.creatinine.A1c ..) are gathering in questionnaire. Data analysis: The obtained data were analyzed using statistical program , Statistical Package for Social Sciences (SPSS) & presented in figures, table were necessary. Result: out of 100 patients, only 11% of the cases have controlled DM by AIC (89%) uncontrolled. By FBS(25%) of the Patients have controlled DM with a significant statistical association between AIC and FBS ($\chi 2=9.840$, $p<0.05$). More than half (53.0%) of the DM patients reported (>10years duration), 24% (>5&<10 years), 6% (>3&<5 years) and 17% (>3 year) ,there is statistical significant association between controlled DM by A1c & duration, where more duration is less controlling(p-value 0.012) , while no significant association with sex and age group. Regarding the drugs, (56%) have compound oral hypoglycemic drug OHD , (32%)One OHD only (6%) reported to take Insulin, , and (19%) other non-hypoglycemic drugs ,the majority of them (85) 85.0% showed compliance to take drugs , one third (34%) showed avoidance of sugar and carb, and about one fifth (23.0%) reported regular F/U in social history no

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complication screening . Regarding complication ,79% have neuropathy, 50% (Eye), 49% HTN,15% renal, 11% (IHD), 9% (stroke), and only 9.1% of them have DM foot . CONCLUSION: Our study shows , small percentage of patients are within controlled range of A1c , with small percentage use insulin and small percentage avoid carb. And small percentage with regular follow up, with high percentage of neuropathy and eye complications. The trend of glycemic level reflected by HbA1c showed that the inadequate control of diabetes may propagate the micro-vascular and macro-vascular complications. Recommendation: Despite poor adequate medical service availability to cover diabetic patients in our country, we recommend ,the services should be adequately improved for achieving benefit and other efforts should be taken to make aware the importance of disease, complication screening. role of medication adherence, role of regular counseling of dietitians and other life style changes need to be arranged to increase good outcome of patients. **Key words** : A1c, Prevalence Of Controlled Diabetes , Seiyun-Hadramout

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انتشار السكري الخاضع للسيطرة في مرضى السكري بواسطة الفحص التراكمي وفحص الدم أثناء الصوم ومضاعفات السكري

(في العيادة الخارجية في مركز البلسم الصحي بجمعية البلسم الخيرية سيئون- حضرموت- اليمن)

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الخلاصة:

مرض السكري مشكلة صحية عالمية وقد أجريت دراسة في اليمن بين الرجال تقول بان انتشار السكري 9.8 % .معظم الخسائر الاقتصادية ناشئة عن المضاعفات للسكري ولذلك السيطرة عليه بمتابعة الفحص التراكمي وجعله في هدف معين سيقلل من تلك المضاعفات وهذه الدراسة ستلقي الضوء على ذلك. تم إجراء هذا البحث على 100 مريض سكري مسجلين في مركز البلسم الصحي سيئون – حضرموت وقد ارتادوا العيادة خلال يومين متتابعين (5-6 اكتوبر 2022) وجمعت المعلومات من خلال القصة المرضية والفحص السريري والمختبري في استبيان ثم تم جمع تلك المعلومات وتحليلها وفق أسس البحث العلمي وكانت النتيجة:

11% من المرضى كان السكري لديهم خاضع للسيطرة حسب الفحص التراكمي (أقل من 7)، و25 % بواسطة فحص الصوم بعلاقة إحصائية معتبرة، 53% من هؤلاء المرضى فترة السكري عندهم تزيد على 10 سنوات مع علاقة إحصائية معتبرة بين طول فترة السكري والسيطرة عليه من خلال الفحص التراكمي. (كلما زادت المدة قلت السيطرة). بينما لا توجد علاقة إحصائية معتبرة بين السيطرة على السكري والجنس أو الفئة العمرية. وبخصوص العلاج فإن 56% من المرضى كانوا يستخدمون علاج سكري فموي مركب 32% علاج سكري فموي واحد و6% فقط على الانسولين و 19 % يستخدمون علاجات أخرى و85% منهم قالوا أنهم ملتزمون بالعلاج تماما و 34% قالوا أنهم ملتزمون بالحمية واجتناب الكربوهيدرات و23 % منهم لهم مراجعة منتظمة ولا يوجد بينهم من يعمل مسح دوري لاكتشاف المضاعفات مبكرا. وبالنسبة للمضاعفات فإن

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79%,50%,49%,15% 11%,% 9%,9% لديهم مضاعفات عصبية طرفية حسية، في العين، ارتفاع ضغط، الكلى، القلب وشرايينه، الجلطة الدماغية، والقدم السكري، وخلاصة القول فالدراسة بينت أن نسبة قليلة جدا من مرضى البحث السكري لديهم خاضع للسيطرة من خلال فحص التراكمي، وكذلك نسبة كبيرة منهم فترة السكري لديهم طويلة، وأن نسبة قليلة جدا يستخدمون الانسولين وغير ملتزمين بالحمية والمتابعة المنتظمة، وهناك نسبة أيضا غير ملتزمة بالعلاج مما أدى إلى المضاعفات وخاصة في الجهاز العصبي الطرفي والعين بدرجة أكبر . لذلك فإننا نرشد إلى رفع الوعي لدى مريض السكري من أجل الالتزام بعلاج السكري وإدخال الانسولين مبكرا واستخدام الحمية، والمتابعة المنتظمة والفحوصات الدورية، ومسح المضاعفات وتغيير نمط وأسلوب الحياة لدى مريض السكري من شأنه أن يزيد من انتشار السكري الخاضع للسيطرة وتقليل المضاعفات.

الكلمات المفتاحية: فحص السكري التراكمي، انتشار السكري الخاضع للسيطرة، سيئون، حضرموت.

1- INTRODUCTION & LITERATURE REVIEW

Diabetes mellitus(DM) is a global public health problem that affecting humans and threaten their life's. The global diabetes prevalence in adults (aged above 18) has increased from "4.7% in 1980 to 8.5% in 2014".The predominance has been elevated swiftly in low and middle-income countries. In the middle-east there are three countries' has been classified among the top ten countries with higher prevalence of diabetes are Saudi Arabia (23.9%), Kuwait (23.1%) and Qatar (22.9%).

Although there are common persecution among doctors in Yemen that DM is a common problem in Yemen; but studies about DM were scarce in the country. There is published study in 2019 estimated the prevalence of DM among men in Yemen is 9.8%. While one old study (published in 2004) reported that the overall prevalence of type II DM in Yemen was 4.6% (7.4% in males and 2% in females), {1,2,3}.

WHO has recommended Glycated haemoglobin HbA1c as a diagnostic test for diabetes with certain conditions of standardization. The test was introduced into clinical use in the 1980s and subsequently has become a cornerstone of clinical practice. The potential utility of HbA1c in diabetes care is first mentioned in the 1985 WHO report. This test gives an indication of chronic glycaemia, an integrated index of glycaemia over the entire 120-day lifespan of the red blood cell. {4,5,6,7}

HbA1c is directly related to the average glucose level over the past 6 to 8 weeks . The American Diabetes Association (ADA) recommended an A1c goal of less than 7%, while the American Association of Clinical Endocrinology recommended less than 6.5%. Most of the cost of the diabetes in suffering, the lost years of working capacity and in health care, comes from its complications. Efficient

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glucose control and monitoring using HBA1c thus can reduce diabetes complications efficiently. {8,9,10,11}.

The UKPDS demonstrated that each percentage point reduction in HbA1c was associated with a 35% reduction in micro vascular complications. As in the DCCT, there was a continuous relationship between glycemic control and development of complications. Improved glycemic control also reduced the cardiovascular event rate in the follow-up period of >10 years .{12}

Access to health services, cost of DM diagnosis and treatment as well as weak research capacity are

challenges to understand the size of the DM problem in the country and specifically at sub-national and remote governorates. Mukalla city is the capital of Hadramout governorate at eastern Yemen, the city population is about 291,873 inhabitants. {13} .

Up to our knowledge ,there is one published research related to DM in Hadramout , while in Seiyun is nothing , Seiyun (Total Population (2006) = 75,700) is a city in the region and Governorate of Hadramout. It is located in the middle of the Hadramout Valley, about 360 km (220 mi) from Mukalla , the health services provided by one public hospital, Seiyun General Hospital Authority (SGHA.) & many other health centers. Al-Balsam Health Center In Al Balsam Charitable Foundation one of these , this center provides free health services of chronic illness as DM ,hypertension and ischemic heart diseases , this study is done in this center .Where the DM control is important to delay complication , Our study focused upon glycemic control objective achieved and role of certain factors in DM control and the association of HbA1c level with diabetic related complications.

2-AIM OF STUDY:

GENERAL OBJECTIVE:

This study will conducted to contribute in basic data about prevalence of controlled diabetes in registered diabetic patients (Glycated hemoglobin "A1c") and FBS and diabetes complications

SPECIFIC OBJECTIVES:

1. to study the prevalence of controlled diabetes in registered diabetic patients by HbA1C&FBS.
2. To determine the association between HbA1C&FBS as measures for DM control.
3. To determine the association between diabetic control & certain factors as age, sex, duration, drugs , compliance etc.
4. To study Diabetes Complications .

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3-METHODE AND MATERIAL:

- **Study design:**

Cross sectional, Descriptive retrospective

- **Study population and sample size:**

patient in outpatient clinic at Seiyun

- **Site of study:**

outpatient clinic at AL- Balsam health center in AL balsam Charitable Foundation. Seiyun Hadramout . Yemen

- **Method of data collection and analysis technique:**

Predesigned questionnaire was prepared for collection data from the patient at clinic visit which include:

1. Personal data: name , age ,sex ,
2. DM duration:
3. history Of main complain & complications symptoms of DM.
4. Drug history:
5. Lab. Investigations: CBC,A1c ,FBS .RBS , creatinine
6. Others: history of DM follow up ,diet regimen, drug compliance

- **Study variable:**

The variable are those included in questionnaire .

- **Data analysis:**

The obtained data will be analyzed using statistical program , Statistical Package for Social Sciences. (SPSS).

4-THE RESULT:

Table (1) shows the socio-demographic characteristics of DM . Both Male and Female have the same rate (50%). The Majority(61.0%) of the MD patients age are between 41-60 years. Only `10% of them are smokers.

Table (1) : the socio-demographic characteristics of DM

		Count	Column N %
Sex	Male	50	50.0%
	Female	50	50.0%
Age group	20-40 years	17	17.0%
	41-60 years	61	61.0%
	61-80 years	22	22.0%
Smoker	No	90	90.0%
	Yes	10	10.0%

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As shown in table (2), more than half (53.0%) of the DM patients reported (>10years duration), 24% (>5&<10 years), 6% (>3&<5 years) and 17% (>3 year).

Figure (2) : the DM duration.

Duration(YEARS)	N	%
3 or =<	17	17.0%
>3&<5 or =	6	6.0%
>5&<10 or =	24	24.0%
>10	53	53.0%

Out of 100 patients, 79% of them have neuropathy, only 9.1% of them have DM foot, 11% (IHD), 50% (Eye), 9% (stroke),15% renal, and 49% HTN as showed in table (3).

Table (3) : the descriptive statistics of DM complications

	N	%
neuropathy	79	79.0%
DM foot	9	9.1%
IHD	11	11.0%
eye	50	50.0%
stroke	9	9.0%
renal	15	15.2%
HTN	49	49.0%

Out of 100 patients, only 6% reported to take Insulin, 32%(One oral hypoglycemic drug), 56% (Compound) and 19% (other non-hypoglycemic drugs) as showed in table (4).

Table (4) : the descriptive statistics of Drugs used by DM patient.

	N	%
insulin	6	6.0%
one drug	32	32.0%
compound	56	56.0%
other drugs	19	19.0%

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As shown in the table(5), the majority of them (85) 85.0% showed compliance to take drugs , about one third of them (34%) showed avoidance of sugar and carb., and about one fifth (23.0%) reported regular F/U in social history**.**

Table (5) shows the descriptive statistics of social history.

	N	%
compliance	85	85.0%
avoidance	34	34.0%
regular	23	23.0%

As shown in table (6), only 11% of the cases have controlled DM by AIC while 89% of them were found uncontrolled. By FBS,25% of the Patients have controlled DM, while 75% of them were uncontrolled.

Table (6): the prevalence of controlled diabetes by HbA1C&FBS

		N	%
AIC	Controlled	11	11.0%
	Uncontrolled	89	89.0%
FBS	Controlled	25	25.0%
	Uncontrolled	75	75.0%

The findings showed a statistical association between AIC and FBS ($\chi 2=9.840$, $p<0.05$). Controlled DM by AIC mostly associated with Controlled DM by FBS (63.6%).& uncontrolled DM by AIC is mostly associated with uncontrolled DM by FBS as p value (>0.005).as showed in table (7)

			FBS		χ^2	*P*
			Controlled	Uncontrolled		
AIC	Controlled	N	7	4	9.840	.005
		%	63.6%	36.4%		
	Uncontrolled	N	18	71		
		%	20.2%	79.8%		

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As shown in table(8), there is no statistically significant association between AIC outcome and Sex of the patient ($\chi2=2.554$, $p>0.05$). However, it is noticed that the rate of Controlled AIC among male patients is significantly higher than Female AIC outcome (16.0% vs 6.0%). Adding to that, there is no statistically significant association between AIC outcome and Age group ($\chi2=3.061$, $p>0.05$). it is noticed that the higher the age of the patients, the more likely AIC outcome to be controlled. there is statistical significant association between controlled DM by A1c & duration. where more duration is less controlling,(p-value 0.012) .

Table (8) presents the association between AIC outcome and sociodemographic data.

		AIC				χ^2	*p*
		Controlled		Uncontrolled			
		N	%	N	%		
Sex	Male	8	16.0%	42	84.0%	2.554	.110
	Female	3	6.0%	47	94.0%		
Age group	20-40 years	0	0.0%	17	100.0%	3.061	.216
	41-60 years	9	14.8%	52	85.2%		
	61-80 years	2	9.1%	20	90.9%		
Duration	1	2	11.8%	15	88.2%	10.931	.012
	2	3	50.0%	3	50.0%		
	3	3	12.5%	21	87.5%		
	4	3	5.7%	50	94.3%		

As showed in table (9),There is no statistical significant association between controlled DM by A1c &DM complications(p-value >0.05)

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Table(9): Association between complications and DM controlled byAIC

		AIC				χ^2	*p*
		Controlled		Uncontrolled			
		N	%	N	%		
neuropathy	No	0	0.0%	21	100.0%	3.285	.070
	Yes	11	13.9%	68	86.1%		
Dm foot	No	11	12.2%	79	87.8%	1.238	.266
	Yes	0	0.0%	9	100.0%		
IHD	No	9	10.1%	80	89.9%	.651	.420
	Yes	2	18.2%	9	81.8%		
eye	No	6	12.0%	44	88.0%	.102	.749
	Yes	5	10.0%	45	90.0%		
stroke	No	10	11.0%	81	89.0%	.000	.991
	Yes	1	11.1%	8	88.9%		
renal	No	9	10.7%	75	89.3%	.088	.766
	Yes	2	13.3%	13	86.7%		
HTN	No	4	7.8%	47	92.2%	1.060	.303
	Yes	7	14.3%	42	85.7%		

There is no statistical association between drugs and controlled DM by AIC . (χ2=.789, p>0.05). However, the findings showed that all those taking Insulin have uncontrolled AIC. as showed in table(10)

Table (10): association between A1c & drugs .

		AIC				χ^2	*p*
		Controlled		Uncontrolled			
		N	%	N	%		
insulin	No	11	11.7%	83	88.3%	.789	.374
	Yes	0	0.0%	6	100.0%		
one drug	No	7	10.3%	61	89.7%	.108	.742
	Yes	4	12.5%	28	87.5%		
compound	No	6	13.6%	38	86.4%	.558	.455
	Yes	5	8.9%	51	91.1%		
other drugs	No	8	9.9%	73	90.1%	.550	.458
	Yes	3	15.8%	16	84.2%		

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As shown in table(11), there is statistically significant association between FBS outcome and Sex of the patient ($\chi 2=4.320$, $p<0.05$). It is noticed that the rate of Controlled FBS among male patients is significantly higher than Female FBS outcome (34.0% vs 16.0%). Adding to that, there is also statistically significant association between FBS outcome and Age group ($\chi 2=6.940$, $p<0.05$). it is noticed that the higher the age of the patients, the more likely FBS outcome to be controlled. In other words, younger ages FBS outcome is more uncontrolled than older ages. . In other words, younger ages FBS outcome is more uncontrolled than older ages. Duration is not associated with FBS outcome ($\chi 2=1.562$, $p>0.05$).

Table (11) : the association between FBS outcome and sociodemographic data

		FBS				χ^2	*p*
		Controlled		Uncontrolled			
		N	%	N	%		
Sex	Male	17	34.0%	33	66.0%	4.320	.038*
	Female	8	16.0%	42	84.0%		
Age group	20-40 years	2	11.8%	15	88.2%	6.940	.031*
	41-60 years	13	21.3%	48	78.7%		
	61-80 years	10	45.5%	12	54.5%		
Duration	1	6	35.3%	11	64.7%	1.562	.668
	2	2	33.3%	4	66.7%		
	3	5	20.8%	19	79.2%		
	4	12	22.6%	41	77.4%		

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As showed in table(12),there is no statisticall significant association between complication & controlled DM by FBS.(p-value >0.05).

Table(12):Association between complications and FBS

		FBS				χ^2	*p*
		Controlled		Uncontrolled			
		N	%	N	%		
Neuropathy	No	5	23.8%	16	76.2%	.020	.887
	Yes	20	25.3%	59	74.7%		
Dm Foot	No	25	27.8%	65	72.2%	3.345	.067
	Yes	0	0.0%	9	100.0%		
IHD	No	22	24.7%	67	75.3%	.034	.854
	Yes	3	27.3%	8	72.7%		
Eye	No	11	22.0%	39	78.0%	.480	.488
	Yes	14	28.0%	36	72.0%		
Stroke	No	22	24.2%	69	75.8%	.366	.545
	Yes	3	33.3%	6	66.7%		
Renal	No	20	23.8%	64	76.2%	.057	.812
	Yes	4	26.7%	11	73.3%		
HTN	No	11	21.6%	40	78.4%	.654	.419
	Yes	14	28.6%	35	71.4%		

There is no statistical association between taking Insulin and FBS (χ2=2.128. p>0.05). Chi Square test showed that no statistical association between taking One drug and FBS (χ2=.245. p>0.05). Chi Square test showed that there is no statistical association between taking Compound and FBS (χ2=1.948. p>0.05). Fisher test showed that no statistical association between taking other drugs and FBS (χ2=.195, p>0.05).as showed in table (13).

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Table (13): association between controlled DM by FBS & drugs.

		FBS				χ^2	*p*
		Controlled		Uncontrolled			
		N	%	N	%		
Insulin	No	22	23.4%	72	76.6%	2.128	.145
	Yes	3	50.0%	3	50.0%		
One Drug	No	16	23.5%	52	76.5%	.245	.621
	Yes	9	28.1%	23	71.9%		
Compound	No	14	31.8%	30	68.2%	1.948	.163
	Yes	11	19.6%	45	80.4%		
Other Drugs	No	21	25.9%	60	74.1%	.195	.659
	Yes	4	21.1%	15	78.9%		

5- DISCUSSIN:

The mean (standard deviation) for the age in our study is (52.5 ±27.5) while in Oman was (52±11.6) years,. In our study ,uncontrolled DM by A1c(i.e. ≥7) is 89%, with average A1c (9.1±4.9),this result is higher than Oman study where the prevalence of uncontrolled DM by HbA1c (≥7.0%) was 76% & The average of HbA1c was(8.9±2)

In our study the optimal control (HbA1c < 7%) of DM is (11%)while inn Amman, Jordan Study the percentage is better than our study (25.4%) at the first visit.(increased to 27.5% at 12-month follow-up), the mean age was 58.1 (SD 9.3) years in Amman ,

In our study the average A1c is (9.1±4.9) while in Makah seddeque research, The mean HbA1c levels of patients was (8.95% SD± 2.44) i.e. better DM control . Overall the age range was 21 – 79 (58) years and a mean of (+/- SD of 56.67 +/- 11.17) while(52.5 ±27.5) in our study.

In Aseer , Sudea Arabia, The HbA1c target range of less than 7% was achieved by n=18(7.1%) patients only which is less than our study(11%). Except for duration of diabetes mellitus ,in Aseer , Sudea Arabia ,all other factors (age, sex, family history, type of treatment and BMI)does not seems to influence HbA1c values, this is the same for our study, duration influence controlled DM by a1c while other factors(sex, age ,drug types ..) are not, Maximum number of patients, n=197(78.5%)

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were with duration of DM above 10 years. While in our study is the same(Maximum number of patients, were with duration of DM above 10 years) but with less percentage(53%).

Achieving or maintaining levels of < 7% is more difficult in patients with a longer duration of DM. It has been recommended that rather than targeting an HbA1c level of < 7% for all diabetic patients, individualization of the target levels preferred {14}. Despite evidence of benefit of good glycemic control in controlling diabetic complications, good glycemic control was not achieved in many subjects 9.

Poor control could be due to poor eating habits, poor compliance with medication and the use of inappropriate herbal medicines {15},poor health seeking behavior, low level of literacy, and low adherence with follow up visits. Duration of DM appear to influence the HbA1c values (P=0.01). There was clear increase in HbA1c value with the increase in duration of DM, as the study by Goudswaard et al {16}.

6- CONCLUSION:

Our study shows , small percentage of patients are within controlled range, with small percentage use insulin and small percentage avoid carb. And small percentage with regular follow up, with high percentage of neuropathy and eye complications. The trend of glycemic level reflected by HbA1c showed that the inadequate control of diabetes may be disastrous as this may propagate the micro-vascular and macro-vascular complications. Despite poor adequate medical service availability to cover diabetic patients in our country, we recommend ,the service should be adequately improved for achieving benefit and other efforts should be taken to make aware the importance of disease, role of medication adherence, role of regular counseling of dietitians and other life style changes need to be arranged to increase good outcome of patients.

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7-LIMITATION OF STUDY:

Firstly ,The sample is taken from old age group and poor people at center in Al Balsam Charitable Foundation . Secondly, The values of HbA1c were considered not at the time of diagnosis of complications **.** thirdly, the complications is gathering by history & physical exam , no screening.

8-RECOMMENDATIONS:

The management of DM and good control is important to decrease and delay complication, so intensification of therapy to avoid long term complications of diabetes and early management with insulin and compound drug management, with more compliance to treatment and regular follow up, which effect Hba1c control ,with avoidance of carb. and follow good diet with regular counseling of dietitians , are needed for better control ,& decrease and delay the complication .

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