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Study on Prevalence and Management of Gestational Diabetes In Hospitals and Private Clinics In Oman

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ABSTRACT

Gestational diabetes mellitus is considered as one of the most common medical complications of pregnancy as it has implications on both the mother and the child. It is caused by reduced pancreatic β -cells function as they don't produce enough insulin to meet the requirements of pregnancy. Internationally, it is recommended to screen all pregnant women by measuring their glucose between 24 and 28 weeks of pregnancy. It can be managed either non-pharmacologically or pharmacologically depending on the severity of hyperglycemia. The present study was intended to measure the prevalence of gestational diabetes mellitus in Oman and to explore the available treatment options in both governmental and private hospitals. Out of 1792 patients who attended the Gynecological department between the study period, a total of 219 patients visited gestational diabetes clinic at Sohar Hospital, Saham Polyclinic and a private hospital. Of the total number of participants from all the clinics, 103 had a family history of diabetes mellitus whereas 17 had no family history. 120 patients agreed to participate in questionnaire interview and were informed about the purpose of the study. A good response from patients is a good indication for a future national study.

Keywords: Gestational diabetes, Sohar hospital, congenital anomalies

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INTRODUCTION

According to The world Health Organization (WHO), GDM is defined as any degree of glucose intolerance which starts and is first recognized during pregnancy.¹ It is one of the most common medical complications of pregnancy which has implications on both the mother and the child. In the first trimester, spontaneous abortion and congenital anomalies may be induced. On the other hand, neonatal hypoglycemia, jaundice excessive growth and still birth may occur during the second and third trimester of gestation. It is characterized by hyperglycemia with disturbances of protein, carbohydrate and fat metabolism due to defects in insulin secretion or action or both. Function of pancreatic β – cells is reduced and they do not produce enough insulin to meet the needs of pregnancy.² If ignored, it can lead to unnecessary morbidities. All women should be tested between 24 and 28 weeks of pregnancy. Women who have risk factors like marked obesity, history of DM in first degree relative, current glucosuria or history of glucose intolerance are marked as high risk and should have plasma glucose screening as early as possible and repeat at 24 – 28 weeks of gestation.

On the other hand, women with no diabetes in first degree relative, normal weight gain during pregnancy and no history of abnormal blood glucose concentrations are marked as low risk group. Screening programs and diabetic care are essential for this group of patients as around 10% of women with GDM proceed to have diabetes mellitus (DM) soon after delivery.³ Others (20-60%) may develop it within 5-10 years of pregnancy if appropriate care is not given. Generally, DM is considered as a major health concern for all healthcare professionals as well as governmental organizations because it consumes a large part of health budgets. This is not because of the disease itself but because of its complications which contribute to the occupancy of hospital beds and long stay as inpatients. In the United States of America (USA), a diabetic patient may cost the health budget up to \$13,200 per year compared to \$2,500 for a non-diabetic patient for the same period.⁴ It is expected to become an increasing burden on national healthcare systems globally. Therefore, it is very essential, especially in developing countries, to increase the prevention programs in order to reduce the burden.⁵

A study aimed to categorize women according to the risk level for screening was conducted on 3131 pregnant women.⁶ It showed that it helped in reducing the burden of testing and detecting more cases. A study between 1995 and 2009 found that the overall prevalence of GDM was 10%. The rates were highest in Asian (17%) followed by Hispanic (11%) women. In non-Hispanic lowest rates were recorded.⁷

A meta-analysis and other studies found that diagnosing and managing GDM by nutritional advice, glucose-self monitoring and exogenous insulin when required is beneficial and reduces the risk of complications like fetal overgrowth and maternal hypertension.⁸

Management of gestational diabetes

It can be managed either non-pharmacologically or pharmacologically depending on the severity of hyperglycemia. The non-pharmacological approach in the management mainly includes diet and exercise. Individualized medical nutrition therapy (MNT) is considered as the standard of care for all patients with GDM. Moreover, exercise is useful in the management as it may reduce the risk of developing type 2 DM.⁹ On the other hand, pharmacological therapy mainly type 1 or type 2 DM. Women who have risk factors like marked obesity, history of DM in first degree relative, current glucosuria or history of glucose intolerance are marked as high risk and should have plasma glucose screening as early as possible and repeat at 24 – 28 weeks of gestation.

On the other hand, women with no diabetes in first degree relative, normal weight gain during pregnancy and no history of abnormal blood glucose concentrations are marked as low risk group. Screening programs and diabetic care are essential for this group of patients as around 10% of women with GDM proceed to have diabetes mellitus (DM) soon after delivery.³ Others (20-60%) may develop it within 5-10 years of pregnancy if appropriate care is not given. Generally, DM is considered as a major health concern for all healthcare professionals as well as governmental organizations because it consumes a large part of health budgets. This is not because of the disease itself but because of its complications which contribute to the occupancy of hospital beds and long stay as inpatients. In the United States of America (USA), a diabetic patient may cost the health budget up to \$13,200 per year compared to \$2,500 for a non-diabetic patient for the same period.⁴ It is expected to become an increasing burden on national healthcare systems globally. Therefore, it is very essential, especially in developing countries, to increase the prevention programs in order to reduce the burden.⁵

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A study conducted by Turki Gasim (2012) on 220 patients in the Kingdom of Saudi Arabia.,¹⁴ to assess the maternal and fetal complications of pregnancy in mothers with GDM in comparison with non-diabetic women showed that patients with GDM had a statistically significant higher incidence of pre-eclampsia, induction of labor, preterm delivery and higher birth weight.

The United Kingdom (UK) is also facing a huge increase in the number of diabetic patients. It had increased dramatically to 2.6 million in 2009 and is expected to reach over 4 million by 2025 with an average prevalence of 4% as per the statistics of 2010.¹⁵ Gestational diabetes mellitus (GDM) affects up to 5% of all pregnancies in the UK and 30% of those are at risk of developing type 2 DM after GDM. Most of them are either overweight or obese (The Lancet Group 2008).¹⁶ Studies by Ferrara in 2007 recommended that health behaviour like diet and physical activity may prevent or delay the onset of diabetes better than pharmacological interventions.¹⁷ Roglic G. et. al and Dabella et al. in 2005 carried out studies which were aimed to estimate the global number of excess deaths due to diabetes in the year 2000. It was found that the excess global mortality attributable to diabetes was estimated to be 2.9 million, (2005).^{18,19} Bose T in (2005) identified risk factors such as family history, socioeconomic factors and weight.^{20,21} The present study was aimed to identify the prevalence of gestational diabetes in Oman and various treatment

options available in the government hospitals and private clinics. There is no sufficient literature available to describe prevalence of GDM especially in private clinics. Specific objectives included investigation of patients' perception and information about the disease and to explore pharmacists' role in gestational diabetes and how it affects the patients' compliance. In GDM, the pharmacists can play a major role especially in patient education as it can include dietary counseling, life style modification, self-blood glucose monitoring and demonstration for the appropriate technique for using insulin. Furthermore, patient education about the symptoms of hypoglycemia and how to treat it, is very important. There are many patients who have poor compliance to their prescribed medication and targeting them will improve their compliance and subsequently better disease control.

MATERIALS AND METHODS

Type of the study:

It was a prospective study carried over a period in hospitals in Oman. All pregnant females visiting the hospital and clinics were included for the study.

Subjects and settings:

This study was intended to measure the prevalence of gestational diabetes mellitus in Oman and to explore the treatment options available in both governmental and private hospitals. All pregnant females visiting the hospital and clinics were included for the study. All the patients attending the gestational diabetes clinic at Sohar Hospital, Saham Polyclinic and a private hospital in Sohar were asked to participate in the study. 120 patients who agreed to participate were informed about the purpose of the study and were interviewed. A questionnaire was developed (shown in appendix 1) and was used as a tool for data collection. It contained questions about age of participants, weight before pregnancy and at time of visit, number of pregnancies, family history of DM, awareness of GDM complications and role of pharmacists in medication adherence. The last two questions of the questionnaire were about the pharmacists' role in counselling this group of patients and whether counselling did improve their adherence to the treatment regimen or not. Prior to data collection, a research application form was completed and submitted to the Research and Ethical Review and Approve Committee at North Batinah Governorate and approval was granted.

Data collection and analysis

Statistical Analysis

The data obtained through the survey (questionnaires) was analysed descriptively using frequency tables, cross tabulations and graphically using charts. Chi-square test of independence

was also used to obtain inferential conclusions about any two variables of interest. These methods and tests were conducted using Statistical Package for the Social Sciences (SPSS). Data collection was done at two governmental healthcare institutions namely Sohar Hospital and Saham Polyclinic and one private healthcare institution.

RESULTS AND DISCUSSION:

Data was collected after obtaining approval by Research and Ethical Review and Approve Committee (RERAC). In Sohar and other Hospitals a total of 1792 patients visited the Obstetrics and Gynaecology outpatient and 219 of this number visited the gestational diabetes clinic. Patients with GDM who visited the out-patient departments between 7th April 2013 and 6th May 2013 at the governmental institutions were approached and requested to participate in this study. This gave a prevalence rate of 12.2%. Due to the small sample size, it was inappropriate to extrapolate this rate and consider it as a national rate. Table 2 shows the number of participants (n=120) and their distribution in each healthcare institution. There were 80 participants (66.7%) from Sohar Hospital, 20 participants (16.7%) from Saham Polyclinic and 20 participants (16.7%) from a private hospital.

Table 1: Participants per healthcare institution

Hospitals/Clinics	Frequency	Percent of total	Valid Percent	Cumulative Percent
Sohar Hospital	80	66.7	66.7	66.7
Saham Poly Clinic	20	16.7	16.7	83.3
Private	20	16.7	16.7	100.0
Total	120	100.0	100.0	

Table 2: Age of participants

		Statistics
Age (Years)	Mean	31.3417
	Median	31.0000
	Minimum	18.00
	Maximum	44.00
	Range	26.00

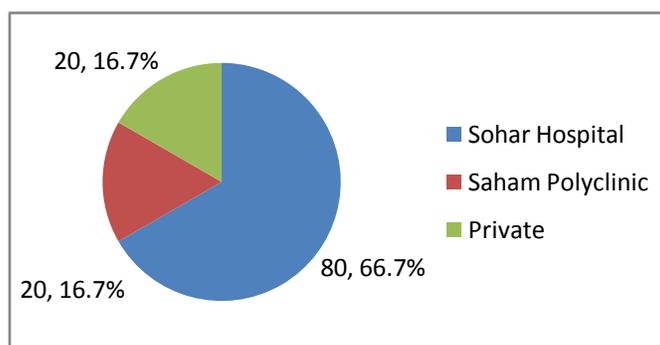


Figure 1: Participants per healthcare institution

Table 3 shows the age range for all participants. The youngest participant was 18 years old while the eldest was 44 years old. Table 4 shows the educational level of all participants. It reveals that the majority of them (n =56, 46.7%) were at the secondary education level or below. On the other hand, the total numbers of graduates in this study included 28 diploma holders (23.3%);, 27 participants (22.5%) and the postgraduates were only 9 (7.5%).

Table 3: Educational level of participants

Educational Level	Frequency	Percent of Total	Valid Percent	Cumulative Percent
Secondary and below	56	46.7	46.7	46.7
Diploma	27	22.5	22.5	69.2
Graduate	28	23.3	23.3	92.5
Postgraduate	9	7.5	7.5	100.0
Total	120	100.0	100.0	

Table 4: Family history of DM

Family History of DM	Frequency	Percent of Total	Valid Percent	Cumulative Percent
No	17	14.2	14.2	14.2
Yes	103	85.8	85.8	100.0
Total	120	100.0	100.0	

Referring to the experience of GD, figure 2 shows that 46.7% (n=56) of participants were having GD for the first time while the rest had it in earlier pregnancies.

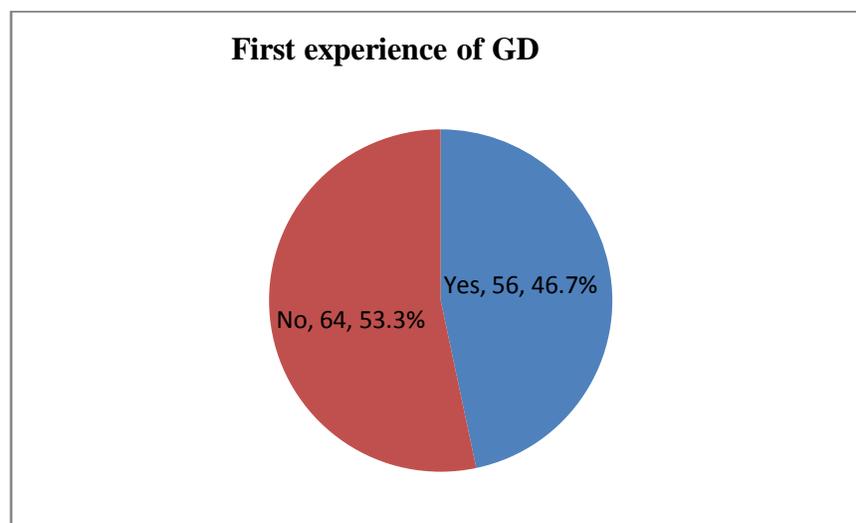


Figure 2: Is it your first experience of GD?

Table 5 and figure 3 illustrate that 103 participants (85.8%) had a family history of diabetes mellitus which is a major risk factor for gestational diabetes. On the other hand, 17 participants (14.2%) did not have a family history of diabetes mellitus and their gestational diabetes could be attributed to other factors.

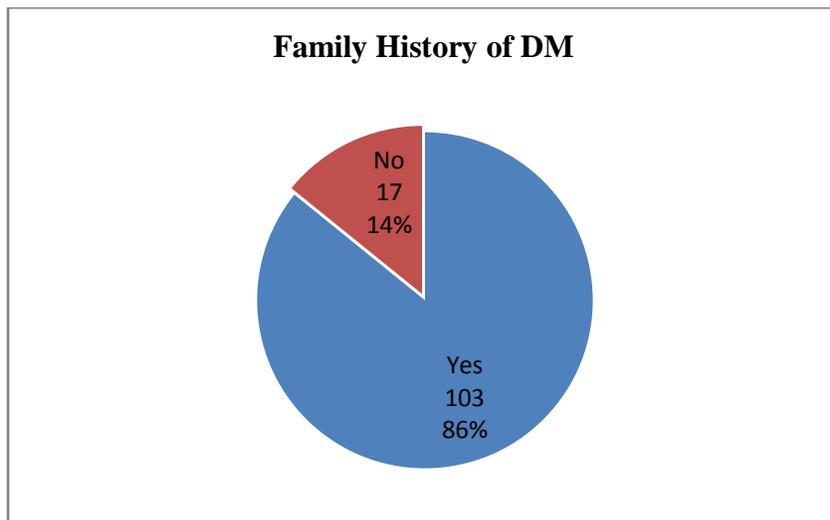


Figure 3: Family history of DM

The majority of participants (n=107, 89.2%) did not suffer from any other illnesses, while the rest (n=13, 11.8%) had co-morbidities like hypertension, sickle cell disease, asthma, eczema and osteoporosis.

It is evident from Table 6 that the majority of participants were willing to control their weight by different means like diet, exercise or both together. Forty one participants (34.2%) were not interested to look after their weight and control it. Table 7 shows that the majority of participants (n=102, 85%) were aware of GD complications while the rest were not aware. The participants' intention to measure glucose level at home was measured as shown in figure 4. It shows that 70 of the total participants were willing to measure it at home while the others (n=50, 41.7%) were not.

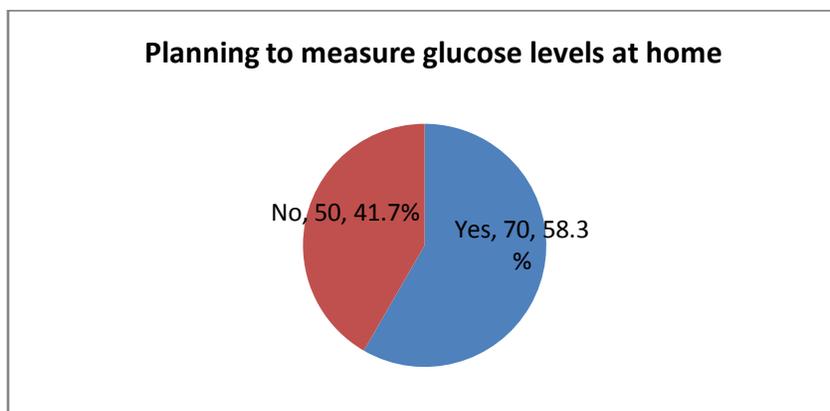


Figure 4: Planning to measure glucose levels at home

Table 8 shows that 45 participants (37.5%) were being treated for their GD by insulin while others were not on any treatment for GD. Table 9 shows that the majority of participants (n=64, 53.3%) were not counseled by a pharmacist while the rest (n=56, 46.7%) were. Furthermore,

Table 10 indicates that the majority of participants (n=86, 71.7%) felt that the pharmacist counseling would improve the medication adherence.

Table 5: Weight control measures

Measures to Control Weight	Frequency	Percent of Total	Valid Percent	Cumulative Percent
Not Interested	41	34.2	34.2	34.2
Diet	55	45.8	45.8	80.0
Exercise	8	6.7	6.7	86.7
Diet & Exercise	16	13.3	13.3	100.0
Total	120	100.0	100.0	

Table 6: Awareness of GD complications

Awareness of GD Complications	Frequency	Percent of Total	Valid Percent	Cumulative Percent
No	18	15.0	15.0	15.0
Yes	102	85.0	85.0	100.0
Total	120	100.0	100.0	

Table 7: Medicines taken by participants

Medicines prescribed	Frequency	Percent of Total	Valid Percent	Cumulative Percent
Nil	72	60.0	60.0	60.0
FeSO4	3	2.5	2.5	62.5
Insulin	45	37.5	37.5	100.0
Total	120	100.0	100.0	

Table 8: Participants counselled by a pharmacist

Frequency	Percent of Total	Valid Percent	Cumulative Percent
64	53.3	53.3	53.3
56	46.7	46.7	100.0
120	100.0	100.0	

Table 9: Does counselling improve adherence to medicines prescribed?

Response to Adherence due to Counseling	Frequency	Percent of Total	Valid Percent	Cumulative Percent
No	34	28.3	28.3	28.3
Yes	86	71.7	71.7	100.0
Total	120	100.0	100.0	

Table 10: GD experience versus awareness of complications

			Awareness of GD Complications		Total
			No	Yes	
First GD Experience	No	Count	5	59	64
		% within First GD Experience	7.8%	92.2%	100.0%
	Yes	Count	13	43	56
		% within First GD Experience	23.2%	76.8%	100.0%
Total		Count	18	102	120
		% within First GD Experience	15.0%	85.0%	100.0%

Cross-tabulations:

Comparing GD experience and awareness of its complications, Table 11 shows that 43 participants (76.8%) with their first GD experience were aware of the complications while 13 participants (23.2%) were not. On the other hand, 59 participants (92.2%) who had it before were aware of the complications and only 5 (7.8%) were not aware.

To test whether the awareness of complications is dependent on educational level, Chi-square Independence Test was used. The computed p-value was 0.029 which was statistically significant, hence knowing the education level does help in predicting whether the patient is aware or not. Numerically speaking, as illustrated in Table 12, 83.9% of secondary (or below) education holders, 70.4% of diploma holders, 96.4% of graduate and 100% postgraduate holders were aware of the complications.

To test whether willingness to measure glucose at home is dependent on awareness about complications, Chi-square Independence Test was used. The computed p-value was 0.02, which is statistically significant, and therefore, knowing the level of awareness helps in predicting whether the patient will plan to measure glucose. The results are shown in Table 13.

Table 11: Participants' education level versus awareness of complications

		Awareness of GD Complications		Total	
		No	Yes		
Educational Level	Secondary and below	Count	9	47	56
		% within Educational Level	16.1%	83.9%	100.0%
	Diploma	Count	8	19	27
		% within Educational Level	29.6%	70.4%	100.0%
	Graduate	Count	1	27	28
		% within Educational Level	3.6%	96.4%	100.0%
	Postgraduate	Count	0	9	9
		% within Educational Level	.0%	100.0%	100.0%
	Total	Count	18	102	120
		% within Educational Level	15.0%	85.0%	100.0%

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	9.039 ^a	3	.029
Likelihood Ratio	10.631	3	.014
Linear-by-Linear Association	2.758	1	.097

N of Valid Cases 120

Table 12: Awareness of GD complications versus planning to measure glucose at home

			Measure Glucose at Home		Total
			No	Yes	
Awareness of GD Complications	No	Count	12	6	18
		% within Awareness of GD Complications	66.7%	33.3%	100.0%
	Yes	Count	38	64	102
		% within Awareness of GD Complications	37.3%	62.7%	100.0%
Total	Count		50	70	120
	% within Awareness of GD Complications		41.7%	58.3%	100.0%

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.445 ^a	1	.020
Continuity Correction ^b	4.303	1	.038
Likelihood Ratio	5.391	1	.020
Fisher's Exact Test			
Linear-by-Linear Association	5.400	1	.020
N of Valid Cases	120		

Table 13: Types of healthcare institutions versus awareness of GD complications

			Awareness of GD Complications		Total
			No	Yes	
Healthcare Institution	Sohar Hospital	Count	10	70	80
		% within Healthcare Institution	12.5%	87.5%	100.0%
	Saham Poly Clinic	Count	5	15	20
		% within Healthcare Institution	25.0%	75.0%	100.0%
	Private	Count	3	17	20
		% within Healthcare Institution	15.0%	85.0%	100.0%
Total	Count		18	102	120
	% within Healthcare Institution		15.0%	85.0%	100.0%

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.961 ^a	2	.375
Likelihood Ratio	1.765	2	.414
Linear-by-Linear Association	.444	1	.505
N of Valid Cases	120		

Table 14: Healthcare institution versus pharmacist counselling

			Counseled by a Pharmacist		Total
			No	Yes	
Healthcare Institution	Sohar Hospital	Count	43	37	80
		% within Healthcare Institution	53.8%	46.3%	100.0%
	Saham Poly Clinic	Count	15	5	20
		% within Healthcare Institution	75.0%	25.0%	100.0%
	Private	Count	6	14	20
		% within Healthcare Institution	30.0%	70.0%	100.0%
Total	Count	64	56	120	
	% within Healthcare Institution	53.3%	46.7%	100.0%	

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.153 ^a	2	.017
Likelihood Ratio	8.440	2	.015
Linear-by-Linear Association	1.423	1	.233
N of Valid Cases	120		

To test whether awareness is dependent on institution type, Chi-square Independence Test was used. The computed p-value was 0.375, and therefore, knowing the type of institution does not help in predicting whether the patient is aware or not. This suggests that the standards of private hospitals are similar to government hospitals in reference to educating patients regarding their medical conditions. The results are shown in Table 14.

Table 15: Healthcare institution versus improving adherence due to counselling

			Counseling Improves Adherence		Total
			No	Yes	
Healthcare Institution	Sohar Hospital	Count	23	57	80
		% within Healthcare Institution	28.8%	71.3%	100.0%
	Saham Poly Clinic	Count	8	12	20
		% within Healthcare Institution	40.0%	60.0%	100.0%
	Private	Count	3	17	20
		% within Healthcare Institution	15.0%	85.0%	100.0%
Total	Count	34	86	120	
	% within Healthcare Institution	28.3%	71.7%	100.0%	

To test whether counseling by pharmacists is dependent on institution type, Chi-square Independence Test was used. The computed p-value value of 0.017, shows that type of

institution does help in predicting whether the patient is counseled by a pharmacist or not. As illustrated in Table 15, patients of private hospitals had better chance in being counseled by a pharmacist than those of governmental hospitals. This can be justified by various factors including less work load and maintenance of customer satisfaction at private hospitals.

To test whether adherence is dependent on institution type, Chi-square Independence Test was used. The computed p-value of 0.212, showed that the type of institution did not help in predicting the adherence level of patients. Numerically speaking, participants from the governmental healthcare institutions (n=69, 69%) thought that counseling would improve whereas in the private it was much better (n=17, 85%). The results are shown in Table 16.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.098 ^a	2	.212
Likelihood Ratio	3.245	2	.197
Linear-by-Linear Association	.628	1	.428
N of Valid Cases	120		

CONCLUSION

In the present study, 1792 pregnant patients who visited Obstetrics and Gynaecology department during the study period, 219 visited the Gestational Diabetes Clinic. 103 had a family history of diabetes mellitus. 34% of the patients were not interested in controlling their weight. 85% of the patients were aware of GD complications. 58% of the patients were ready to measure glucose level at home. 37.5% patients were on insulin treatment. 53% patients did not receive any counselling from their pharmacist. The findings cannot be extrapolated due to small sample size and localization of the project in one region of the country.

ACKNOWLEDGEMENTS

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Appendix A.1: Research Questionnaire

Prevalence of gestational diabetes in Oman and the treatment given in hospitals and private clinics

Note: All data in this questionnaire will be kept confidential and used only for the intended purpose of the study

1. Healthcare institution:

Governmental

Private

2. Patient particulars

a. Initials_____ b. Age_____

c. Hospital ID_____

Weight

1. before pregnancy_____ 2. At the time of visit_____

3. Educational level

Secondary School Graduate

Diploma Postgraduate

4. How many pregnancies did you experience? _____

5. How many children do you have? _____

6. Is this your first GD experience?

Yes No

7. Do you have a family history of DM?

Yes No

8. Do you suffer from other comorbidities?

Yes if yes, _____

No

9. Are you using any weight control measures?

Yes Diet Exercise No

10. Are you aware of GD complications?

Yes No

11. Do you plan to measure your blood glucose level at home?

Yes No

12. What medications are you currently on?

13. Have you been counseled by a pharmacist about your medication?

Yes No

14. Do you feel pharmacist counseling will improve your adherence to your medication?

Yes No

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