P1-P091

Screening for T2D in high risk Egyptian children and adolescents using HbA1c and OGTT

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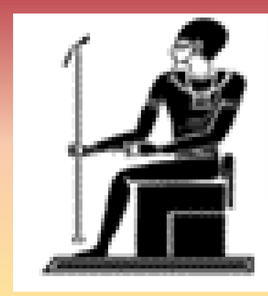


Background and Objective

The prevalence of type 2 diabetes (T2D) is significantly increased in pediatric population, which is affected by obesity worldwide[1]. The progression of insulin resistance to T2D in obese children has been shown to be faster than in adults. Therefore, screening for T2D seems meaningful especially in high risk groups such as children and adolescents with obesity, family history of T2D, and those with clinical features of insulin resistance[2] (hypertension, dyslipidemia, polycystic ovarian syndrome, or acanthosis nigricans). The current study aimed to estimate the prevalence of prediabetes and T2D and their associated risk factors among obese and overweight high risk[3] Egyptian children and adolescents using strip HbA1c as a screening test.

Methodology

The current cross-sectional study was conducted on 339 children and adolescents (between 5 and 18 years) at high risk for T2D recruited from Cairo University Children's Hospital outpatient clinics over a period of 10 months. Patients with hemoglobinopathies, known T1D and children on steroid therapy were excluded. Study design was approved by Research Ethics Committee of Cairo University. Informed consents were obtained from study participants (their legal guardians). Study population was subjected to full history taking (birth weight, family history of T2D, GDM, HTN or CHD), clinical evaluation (including BP assessment, signs of insulin resistance), anthropometric measurements (BMI, waist circumference), and screened for prediabetes and T2D using strip HbA1c and OGTT. Subjects with abnormal HbA1c (defined as HbA1c >5.7%) were subjected to serum HbA1c for confirmation.

Results

The study included 156 males (46%) and 183 females (54%) with mean age of 9.5±2.84 yrs, 77% had family history of T2D (n=263) and 49% had obesity in the family. Most of the studied patients (87%) were obese, while the rest were overweight according to BMI Egyptian growth curves, 5.9% and 13.3% had HTN according to systolic and diastolic BP percentiles respectively. More than half of the patients had acanthosis, while 12.6% of females had hirsutism [Table 1].

Table (1): Demographic and clinical data of study group.

		No.	(%)
Age	< 10 yrs	172	50.7
	≥10 yrs	167	49.3
Sex	Females	183	54
	Males	156	46
Consanguinity	Positive	116	33.9
	Negative	223	66.1
Diet	Healthy	1	0.3
	Unhealthy	338	97
Exercise	No	269	79.4
	Irregular	62	18.2
	Regular	8	2.4
Risk factors for T2D	NASH	4	1.2
	Obesity/Overweight	339	100
	T2D in family	263	77.6
	GDM in family	19	5.5
SBP	Normal	301	88.8
	Pre-hypertensive	81	5.3
	Hypertensive	120	5.9
DBP	Normal	273	80.5
	Pre-hypertensive	21	6.2
	Hypertensive	45	13.3
Pubertal stage	Prepubertal	141	42
	Pubertal	198	58
Acanthosis nigricans		198	58.4
Hirsutism (in females only)		23	12.6

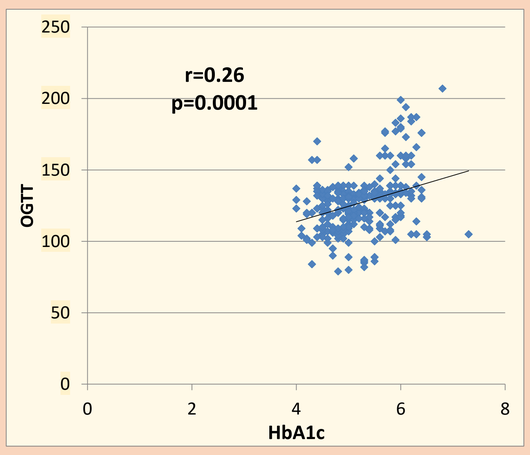


Figure (2): Correlation between Hb1Ac and OGTT

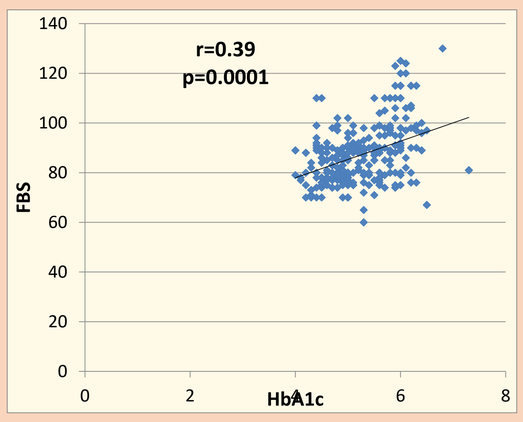


Figure (3): Correlation between HbA1c and FBG.

Prevalence of prediabetes and T2D using OGTT were 15% and 0.3% respectively, while HbA1c showed higher prevalence for prediabetes and T2D (31%) [Fig. 1]. HbA1c showed 81.63% sensitivity & 76.84% specificity at cut off point ≥5.6 for prediabetes and diabetes [Fig. 4].

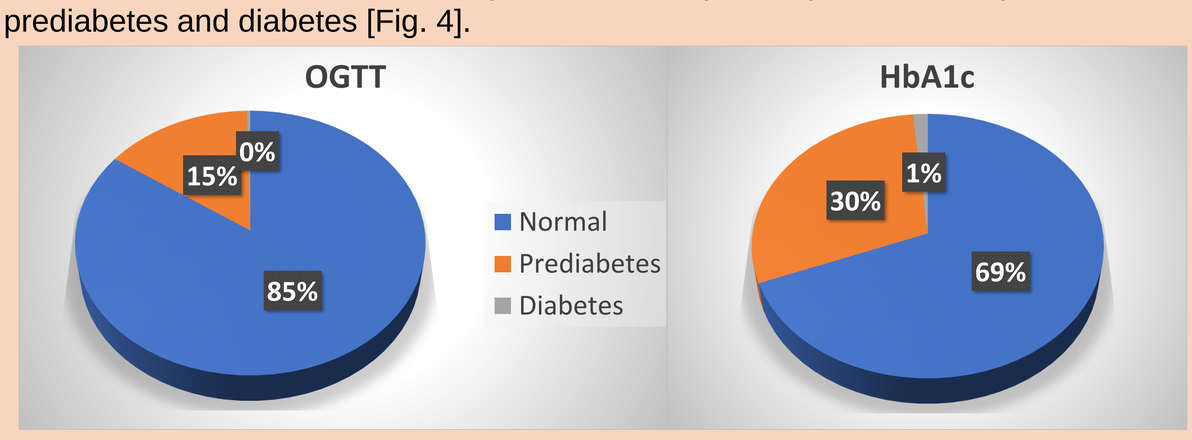
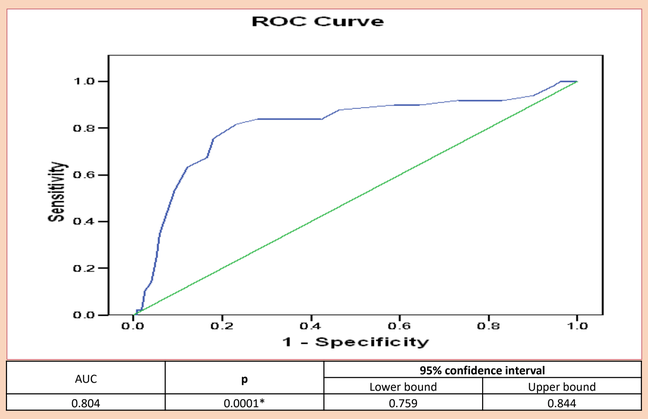


Figure (1): Prevalence of prediabetes/diabetes in the study group using HbA1c and OGTT.

Table (2): Different study parameters in both normal and abnormal glycemic groups as by HbA1c and OGTT.

		HbA1c			OGTT		
		Normal (n=234)	Pre/Diabetes (n=105)	*p* value	Normal (n=272)	Pre/Diabetes (n=49)	*p* value
Patients characteristics							
Age	< 10 yrs	142	56	0.21	147	24	**0.03**
	≥ 10 yrs	92	49		125	25	
Sex	Male	103	53	0.19	127	24	0.08
	Female	131	52		145	25	
Consanguinity	Positive	83	33	0.4	91	18	0.6
	Negative	151	72		181	31	
Mean birth weight (kg)		3.11±0.15	3.16±0.64	0.4	3.14±0.6	3.02±0.45	0.08
Breast feeding	Yes	196	94	0.3	229	46	0.1
	No	38	11		43	3	
Exercise habit	Present	55	15	0.1	64	2	**0.008**
	Absent	179	90		208	47	
Family history							
T2D	Yes	181	82	0.8	207	9	0.3
	No	53	23		65	40	
HTN	Yes	56	46	**<0.001**	82	18	0.3
	No	178	59		190	31	
CHD	Yes	7	10	**0.01**	13	4	0.3
	No	227	95		259	45	
Dyslipidemia	Yes	15	14	**0.03**	25	4	0.8
	No	219	91		247	45	
PCOs	Yes	6	7	0.06	11	2	0.9
	No	228	98		261	47	
Obesity	Yes	102	64	**0.003**	136	29	0.2
	No	132	41		136	20	
GDM	Yes	13	6	0.9	14	5	0.1
	No	221	99		258	44	
Anthropometric data							
Weight SDS		4.5 (3.71)	4.5 (3.1)	0.2	4.3 (3.6)	5.27 (2.7)	0.3
Height SDS		0.7 (1.6)	0.5 (1.5)	0.2	0.7 (1.7)	0.65 (1.3)	0.5
BMI (kg/m²)		29.7±5.3	31.6±6.8	**0.006**	29.7±5.3	33.7±7.8	**<0.001**
BMI SDS		3.4±0.82	3.37±0.73	0.74	3.39±0.82	3.47±0.61	**0.5**
Waist circumference (cm)		79.5±12.5	88.98±15.6	**<0.001**	80.2±12.5	95.6±16.7	**<0.001**
Clinical characteristics							
Pubertal stage	Prepubertal	111	30	**0.001**	125	9	**<0.001**
	Pubertal	123	75		147	40	
Acanthosis nigricans	Yes	117	81	**<0.001**	153	38	**0.005**
	No	117	24		119	11	
Hirsutism (females)	Yes	10	13	**0.001**	15	8	**<0.001**
	No	116	38		125	17	
Systolic BP (mm/Hg)		110.8±10.64	113.95±13.8	**0.02**	111.2±12.16	115.95±9.64	**0.01**
Systolic BP	Normal	221	89	0.2	241	43	0.9
	Prehypertensive	11	9		17	3	
	Hypertensive	11	7		14	3	
Diastolic BP (mm/Hg)		75.21±8.87	77.12±9.51	0.07	75.37±9.13	78.83±8.8	**0.01**
Diastolic BP	Normal	187	86	0.4	219	38	0.8
	Prehypertensive	30	15		36	8	
	Hypertensive	17	4		17	3	



AUC	p	95% confidence interval	
		Lower bound	Upper bound
0.804	0.0001*	0.759	0.844

Figure (4): ROC curve of HbA1c as a predictor of prediabetes/diabetes.

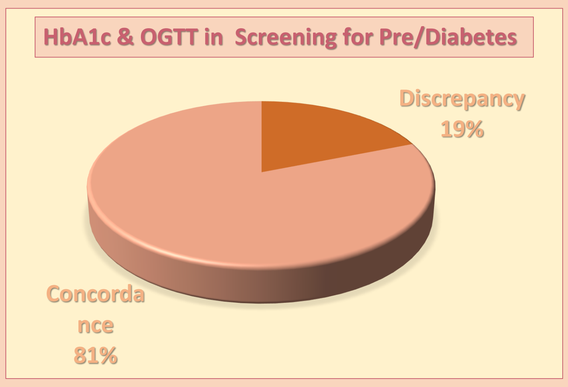


Figure (5): Concordance and discrepancy between OGTT and HbA1c in diagnosing T2D.

Moderate direct significant correlation was detected between HbA1c and each of FBS (r=0.39, p=0.001) and OGTT (r=0.26, p=0.0001) [Fig. 2,3]

Significant association between age and prediabetes/T2D was found using both OGTT and HbA1c (p value of 0.03 & 0.001 respectively). [Table 3]

Table(3): Correlation between HbA1c / OGTT and age as well as anthropometry in the study group.

	HbA1c		OGTT	
	r	p value	r	p value
Age (yrs)	0.17	0.001	0.057	0.31
Weight (kg)	0.2	<0.001	0.18	0.001
Weight SDS	-0.007	0.9	0.073	0.1
Height (cm)	0.13	0.01	0.12	0.03
Height SDS	-0.07	0.1	0.02	0.6
BMI (kg/m2)	0.19	<0.001	0.207	<0.001
BMI SDS	0.03	0.5	0.08	0.1
Waist circumference	0.33	<0.001	0.31	<0.001
Waist circumference percentile	0.21	<0.001	0.204	0.001

Conclusion

T2D and prediabetes are common conditions in obese and overweight Egyptian children and adolescents based on OGTT. Higher prevalence was detected based on HbA1c. Strip HbA1c had high sensitivity and specificity compared to OGTT and can be used for screening for prediabetes and T2D in high risk group.

References

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I declare I have no conflict of interest