

Ethnic variation in the correlation of waist circumference to daily insulin requirement in children with type 1 diabetes

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Introduction

Total daily insulin required to achieve glycaemic control in type 1 diabetes (T1D) depends on numerous factors. Correlation of insulin requirement to body mass index and waist circumference has been variably reported in the literature and that of waist-to-height ratio has not been studied.

Objectives

To study the correlation of waist to height ratio (WHtR) and Body Mass Index (BMI) to daily insulin requirements (TDD) and examine the ethnic variation in this correlation. Associations of estimated glucose disposal rate (eGDR) a surrogate marker of insulin resistance were also studied.

Methods

Cross-sectional study of children with T1D attending a diabetes clinic in a multi-ethnic population was conducted. Ethical approval was obtained from Regional Ethics Committee. Data was collected from case notes and patients following written consent. Physical measurements were undertaken in the clinic setting.

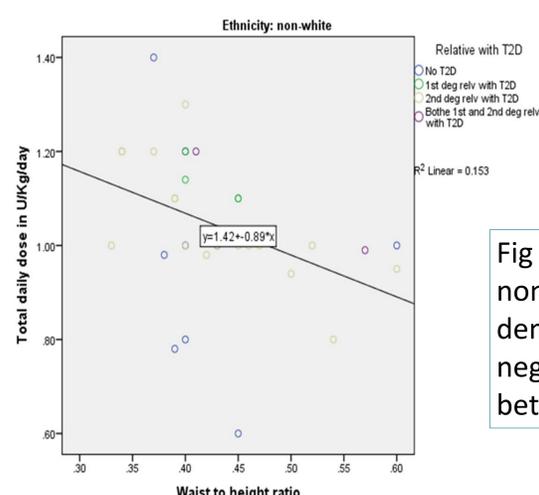


Fig 1. Scatter plot in non-whites demonstrating a negative correlation between WHtR and TDD

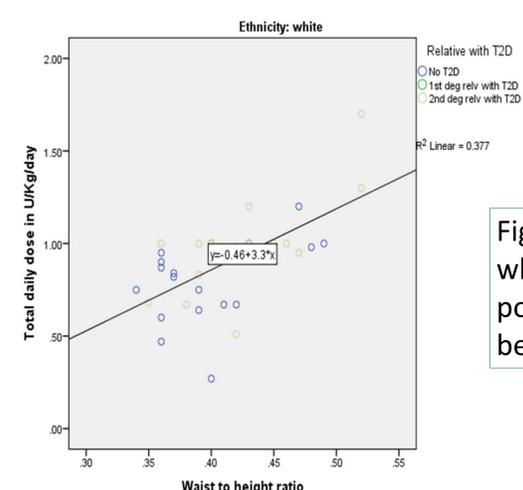


Fig 2. Scatter plot in whites demonstrating a positive correlation between WHtR and TDD

Results

	All N=69	White N=37	Non-white N=32
Age Mean (±SD) years	12.7 (3.1)	13.2 (3.3)	12.2 (2.8)
Gender (M:F)	35:34	21:16	14:18
Duration of diabetes Mean(±SD) years	5.4 (3.5)	5.4 (3.4)	5.6 (3.4)
Total daily insulin Mean (±SD) units/kg/day	0.96 (0.22)	0.89 (0.25)	1.03 (0.16)
Basal insulin Mean (±SD) units/kg/day	0.43 (0.16)	0.38 (0.13)	0.48 (0.16)
HbA1c Mean (±SD) mmol/mol	80 (18)	81 (19)	78 (16)
Weight Mean (±SD) Kg	51 (16)	52.4 (15.8)	49.3 (16.2)
Body Mass Index SDS Mean (±SD)	0.72 (1.0)	0.59 (0.89)	0.87 (1.1)
Overweight >+1SD and <+2SD N (%)	24 (34.8)	13 (35.1)	11 (34.4)
Obese ≥+2 SD and <+3.5SD N (%)	7 (10.1)	2 (5.4)	5 (15.6)
Waist circumference Mean (±SD) cm	65.2 (10.8)	64.8 (9.5)	65.6 (12)
Waist to height ratio Mean (±SD)	0.42 (0.06)	0.41 (0.05)	0.43 (0.07)
Cholesterol	4.2 (0.73)	4.1 (0.64)	4.3 (0.83)
Hypertensive N (%)	17 (25)	8 (15)	9 (19)
Microalbuminuria N (%)	11 (16)	4 (11)	7 (22)
Family history of type 2 diabetes in 1 st and 2 nd degree relatives N (%)	41 (60)	18 (33.5)	23 (49.5)
eGDR Mean (±SD) mg/kg/min	9.2 (2.3)	9.3 (2)	9.1 (2.5)
Index of Multiple Deprivation Scores Mean (±SD)	37.15(17.9)	30.33 (16.1)	45.29 (16.6)

Table 1: Description of study subjects with T1D

	All (n=69)	White (n=37)	Non-white (n=32)
Weight (kg)	-0.09	0.14	-0.29
Body Mass Index (kg/m²)	0.08	0.65**	-0.31*
Body Mass Index SDS	0.09	0.38*	-0.42*
Body Surface Area (m²)	-0.13	0.08	-0.30
Waist Circumference (cm)	0.03	0.48**	-0.46**
Waist to height ratio	0.18	0.58**	-0.47**

Table 2. Spearman's correlation coefficient for total daily insulin dose (units/kg/day) and various anthropometric measurements, according to ethnic group. Significance values are indicated as **p<0.01 and *p<0.05.

Conclusions

The Asian Pakistani population with type 1 diabetes are unique due to the high prevalence of obesity, family history of type 2 diabetes, microalbuminuria and deprivation. A variation in the correlation between TDD and WHtR in the two ethnic groups suggests that the two groups behave differently and should therefore be studied separately in the future with regards to factors influencing insulin requirements. A family history of type 2 diabetes plays a crucial role along with ethnicity in determining insulin resistance.