General Health Characteristics vary in the Novel Subgroups of Adult-Onset Diabetes

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Introduction

Diabetes mellitus is a chronic metabolic disease primarily arising from insulin deficiency and insulin resistance (1).

Lifestyle and socio-demographic factors vary between people with diabetes and normoglycaemia along with health outcomes.

These are all important in the development of complications (2), leading to vastly differing needs between individuals.

Recently, new subgroups for diabetes have been devised with the goal of reducing this heterogeneity and improving precision medicine for people with diabetes (3).

These groups include mild age-related diabetes (MARD), mild obesity-related diabetes (MOD), severe insulin resistant diabetes (SIRD), severe insulin deficient diabetes (SIDD), and severe auto-immune diabetes (SAID).

To date differences in lifestyle factors and socio-demographics between the subgroups have not been explored.

This study aims to determine the prevalence of these groups in an Australian population-based study to explore how they differ in various lifestyle factors, socio-demographics, and health outcomes.

Methods

Data was from the Geelong Osteoporosis study (GOS).

Sampled from the electoral roll using and age stratified sampling method.

1170 men were assessed for glycaemia status at baseline (2001-06) and the 5-year follow-up (2007-10).

Diabetes was classified as a fasting plasma glucose (FPG) test ≥7.0mmol/L, self-report of diabetes, or the use of antihyperglycaemic medications.

Normoglycaemia was classified as FPG<5.6mmol/L.

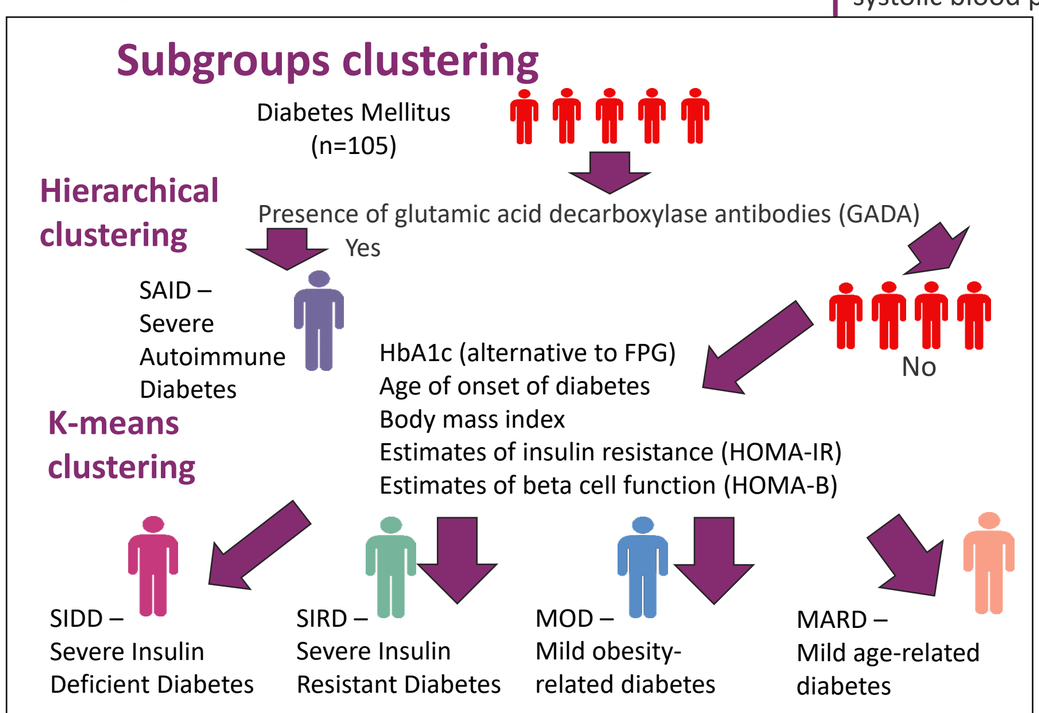

Figure 1: Outline of subgroups clustering. Method outlined by Ahlqvist et al. (3).

Comorbidity and Mortality

Comorbidities were obtained through a combination of self-reported, testing, and data linkage, and then categorised into themes.

Cardiovascular, pulmonary, musculoskeletal and cancer.

Participants were followed from the baseline visit to date of death or the end of the study period (14/07/2017).

Median follow-up of 11.8 years (Interquartile range 9.7-11.3).

Table 1: Descriptive characteristics comparing the diabetes subgroups and normoglycaemia. Data shown as n(%), mean±sd, or med(IQR).

	Normoglycaemia (N=790)	MOD (N=25)	MARD (N=30)	SIRD (N=31)	SIDD (N=16)	SAID (N=3)	p value
Age (years)	57.0 ± 19.4	73.3 ± 5.6	82.6 ± 4.7	65.0 ± 7.3	58.6 ± 12.5	39.1 ± 10.6	<0.001
Age of onset (years)	N/A	68.4 ± 3.8	80.2 ± 4.5	58.2 ± 3.1	45.8 ± 6.0	27.0 ± 11.5	<0.001
Weight (kg)	81.2 ± 13.9	88.7 ± 15.3	79.0 ± 12.0	86.9 ± 14.5	86.8 ± 11.6	83.4 ± 8.1	0.011
Height (m)	174.7 ± 7.4	171.5 ± 7.6	170.8 ± 7.8	172.0 ± 6.1	174.3 ± 4.4	179.3 ± 2.6	0.004
BMI (kg/m^2)	26.6 ± 4.0	30.2 ± 5.2	27.1 ± 3.8	29.4 ± 4.7	28.6 ± 3.7	25.9 ± 1.9	<0.001
Systolic BP (mmHg)	135.4 ± 17.0	149.5 ± 20.4	147.7 ± 16.8	145.7 ± 18.8	129.6 ± 11.4	132.8 ± 21.1	<0.001
Diastolic BP (mmHg)	84.9 ± 11.2	92.3 ± 17.0	82.8 ± 15.0	87.3 ± 13.3	81.8 ± 11.4	85.8 ± 7.6	0.022
Physical inactivity	180 (22.8%)	10 (40.0%)	15 (50.0%)	9 (29.0%)	2 (12.5%)	0	0.003
HbA1c (ug/ml)	56.7 (46.1- 117.2)	51.9 (39.6-73.6)	63.9 (485-113.6)	116.6 (50.4-129.8)	120.9 (62.4-635.4)	40.0 (21.0-47.0)	<0.001
HOMA-IR	0.13 ± 0.06	0.27 ± 0.16	0.29 ± 0.24	0.29 ± 0.15	0.25 ± 0.15	0.05	<0.001
HOMA-B	9.6 ± 1.1	4.9 ± 3.5	5.9 ± 6.5	5.6 ± 7.4	3.9 ± 2.9	2.1	0.001
eGFR<60	65 (8.3%)	6 (24.0%)	10 (33.3%)	4 (12.9%)	3 (18.8%)	0	<0.001
eGFR (ml/min)	>90.0 (78.6->90.0)	78.8 (67.2->90.0)	67.6 (53.3-81.8)	82.3 (66.2->90.0)	81.8 (64.4->90.0)	>90.0 (78.3->90.0)	<0.001
Insulin preparations	0	0	0	1 (3.2%)	3 (18.8%)	2 (66.7%)	<0.001
Antihyperglycaemic agents	0	10 (40.0%)	14 (46.7%)	19 (61.3%)	13 (81.3%)	0	<0.001
Cardiovascular comorbidities	497 (62.9%)	24 (96.0%)	28 (93.3%)	28 (90.3%)	16 (100%)	2 (66.7%)	<0.001
Pulmonary comorbidities	134 (17.0%)	4 (16.0%)	5 (16.7%)	7 (22.6%)	3 (18.8%)	0	0.930
Musculoskeletal comorbidities	115 (14.6%)	5 (20.0%)	8 (26.7%)	6 (19.4%)	1 (6.3%)	1 (33.3%)	0.312
Cancer	73 (9.2%)	3 (12.0%)	3 (10.0%)	2 (6.5%)	1 (6.3%)	0	0.962
Mortality	195 (24.7%)	10 (40.0%)	24 (80.0%)	10 (32.3%)	6 (37.5%)	0	<0.001

Statistical analysis

ANOVA and Kruskal-Wallis tests were used to examine differences between groups.

Cox proportional hazards models were used to assess mortality risk in the subgroups, adjusting for age, physical activity, and systolic blood pressure.

Results

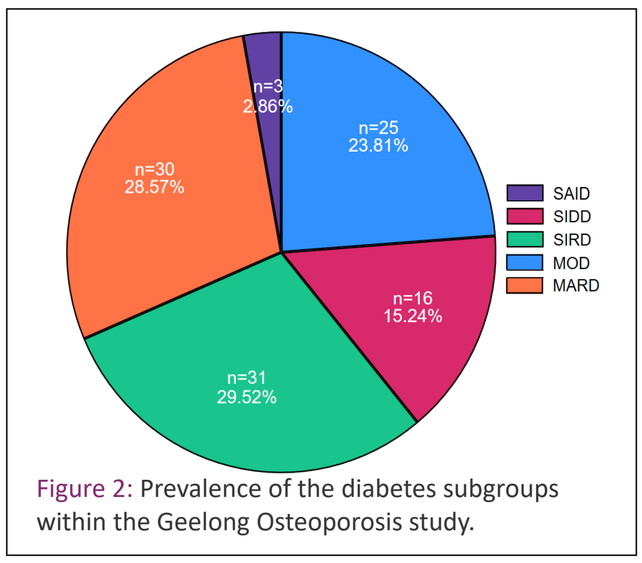

Figure 2: Prevalence of the diabetes subgroups within the Geelong Osteoporosis study.

Clustering characteristics

The subgroups had greater weight, were shorter,.

and had a higher BMI compared to normoglycaemia. These differences were greatest in the MOD group, along with the SIRD and SIDD groups (Table 1).

SIRD had the highest HOMA-IR, and SIDD had the lowest HOMA-B along with the SAID group

Systolic blood pressure was highest in the MOD group, the MARD and SIRD groups.

The subgroups had a lower eGFR compared to normoglycaemia, and greater prevalence of poor eGFR (eGFR<60) (Table 1).

The subgroups were also less physically active.

Diabetes related medication use was more prevalent within the SIDD and SIRD groups.

Comorbidities and mortality

Cardiovascular related comorbidities were more common in all but the SAID subgroup (Table 1).

The subgroups had higher prevalence of mortality compared to normoglycaemia.

Mortality risk was 5.5 times greater (Hazard Ratio 5.5, 95% Confidence Interval 3.6-8.4, p<0.001) in the MARD group in an unadjusted model but was not significant after adjustment.

However, in this model the SIRD groups has a two times greater risk (Hazard Ratio 2.0, 95% Confidence Interval 1.0-3.9) of mortality (p=0.038).

Discussion

Using methods outlined by Ahlqvist et al. (3), this study was able to identify five distinct groups with characteristics comparable to the subgroups previously described.

Occurrence of mortality was higher in those within the MARD group; however, this relationship may be driven primarily by age, given it was attenuated with adjustment.

The SIRD and SIDD subgroups may be more extreme, with greater numbers of pathophysiological risk factors.

This could lead to greater risk of complications.

The prevalence of each subgroup suggests there is a similar likelihood of each occurring, the current “one size fits all” approach may not be insufficient for clinical management.

Further research is required to better define these groups and the various characteristics of the subgroups.

References

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