Associations between adiposity and 7-day continuous glucose monitoring

Susana Quissua[1], Sophie V Eastwood[1], Michele Orini[1,2], Andrew Wong[1], Scott T Chiesa[1], Joshua King-Robson[2], Jonathan Schott[3], Nish Chaturvedi[1].

[1] MRC Unit for Lifelong Health & Ageing at UCL, [2] Dept of Biomedical Engineering, Kings College London, [3] UCL Dementia Research Centre.

Background

Continuous glucose monitoring (CGM) provides real-time data on glucose levels in the interstitial fluid via a sensor under the skin. This technology is particularly beneficial for managing diabetes. While there is extensive data supporting its use in people with diabetes, there is less information available on its application in non-diabetic individuals, especially the elderly. Such data could help establish standard glucose levels for this group.

Figure 1. A continuous glucose monitor (CGM)

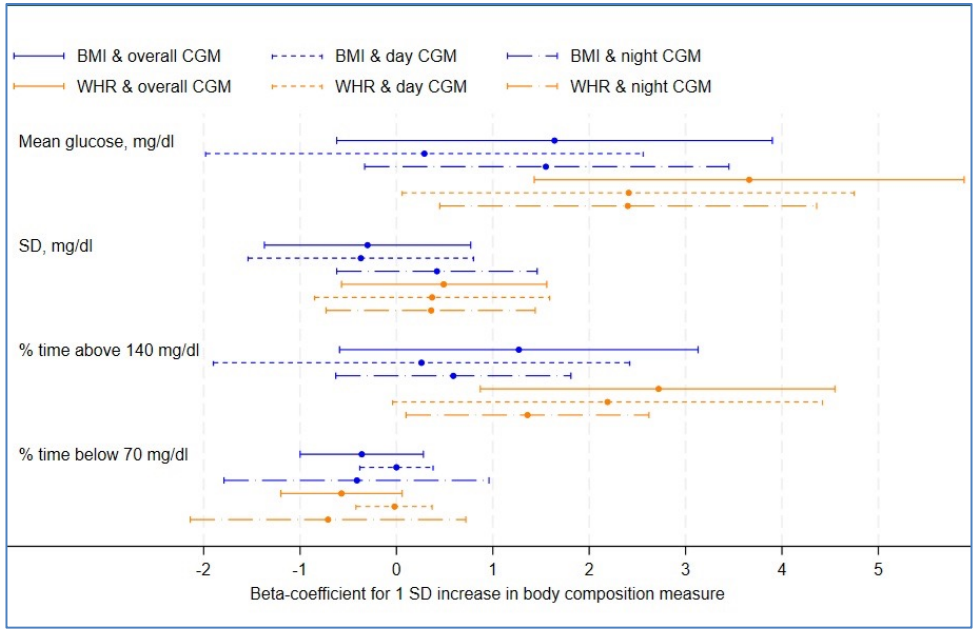
Aims

- To compare the association between overall (body mass index, BMI) and central (waist-hip ratio, WHR) adiposity measures and mean glucose, glucose variability and 'time in range' from 7-day continuous glucose monitoring (CGM) in older individuals.
- To explore how associations vary by nocturnal and diurnal periods.

Table 1. Baseline characteristics of the sample. Data are N(%) or mean(SD).

	People without diabetes	People with diabetes
n/N	273/309 (88.4)	36/309 (11.7)
Female sex	122 (44.7)	10 (27.8)
BMI, kg/m^2	27.4 (4.0)	30.0 (4.8)
Waist/ hip ratio	94.2 (11.7)	103.5 (12.3)
HbA1c, %	5.7 (0.34)	6.9 (0.92)
On hypoglycaemic medication	1 (0.40)	26 (76.5)

Figure 2. Associations between adiposity and 7-day continually measured glucose by day/ night period.



Methods

Design Cross-sectional sub-study of the National Survey of Health and Development (NSHD) 1946 birth cohort study.

Measurements BMI and WHR were measured in clinic. Participants wore the CGM monitor (Freestyle libre, Abbott) for 7 days, readings were taken every 15 minutes. All participants concurrently wore an "Actiwatch", to measure physical activity.

Analysis Actiwatch data was used to derive an algorithm to adjudicate whether the CGM reading was during the day or night. The "IGLU" package in R was applied to the data to produce the following measures: mean, SD and % time above 140mg/dl (diabetes threshold) and % time below 70 mg/dl (hypoglycaemia threshold). Associations between a 1 SD increase in WHR or BMI and CGM measures were quantified using standardised β-coefficients from linear regression models.

Results

309 participants were aged 76-77 years at CGM (Table 1). WHR appeared to be more strongly associated with mean glucose than BMI (respective β-coefficients (95%CI): 3.66 (1.43, 5.89) and 1.64 (-0.62, 3.90, Figure 1). This differences was evident to a lesser extent for SD and % time above 140 mg/dl, but associations were similar for time in hypoglycaemia. Associations with BMI generally appeared stronger for night than day periods.

Conclusions

- A stronger link was observed between high glucose levels and central than overall adiposity.
- Overall body fat may be more strongly linked to night time hyperglycaemia, but this requires further investigation.
- CGM could improve future predictive models for diabetes and the study demonstrates the potential of wearable technology for enhancing understanding of health conditions.