🌐 Abstract Highlights

The following highlights spotlight abstracts presented at the 59ᵗʰ European Association for the Study of Diabetes (EASD) Annual Meeting. Selected abstracts cover pertinent and timely topics, including cardiopulmonary performance in patients with Type 2 diabetes and obesity, and gestational diabetes screening in early pregnancy.

Chronic Kidney Disease and Continuous Positive Airway Pressure

NOVEL research presented at the EASD Annual Meeting 2023 highlighted the potential use for continuous positive airway pressure (CPAP) in reducing the chronic kidney disease (CKD) burden in patients with Type 2 diabetes (T2D) and obstructive sleep apnoea (OSA).

OSA is a risk factor for CKD in patients with T2D; therefore, researchers sought to investigate whether CPAP (a treatment used in OSA) could help to reduce this risk. Led by E.A. Makhdom, University of Birmingham, UK, and Imam Abdulrahman Bin Faisal University, Damman, Saudi Arabia, researchers performed an open-label, multicentre, feasibility randomised controlled trial, which took place over a 2-year period. The impact of CPAP on CKD burden was evaluated through measurement of estimated glomerular filtration rate (eGFR) and urinary albumin-creatinine ratio (ACR).

A total of 83 patients with T2D and OSA from across 13 centres were enrolled, and were randomised to either receive CPAP (n=43) or no CPAP (n=40) over the study course. OSA was defined as an Apnoea–Hypopnoea Index (AHI) of ≥10 events/hour. Exclusion criteria included Epworth Sleepiness Score (ESS) of ≥11, central apnoea index >15/hour, or resting O_2 saturation <90%.

Of those enrolled, mean participant age was 62.5±10.9 years; average diabetes duration was 12.2±7.9 years; median follow-up duration was 645 days; 71.1% were male; 89.1% were of White European ethnicity; 48.2% were prescribed insulin; and 77.7% had obesity. Due to the impact of the COVID-19 pandemic, study-end renal data was only available for 49 patients. Out of the 43 patients enrolled to receive CPAP, only 23 used it. The median CPAP usage was 3 hours and 40 minutes per night.

The analysis found that randomisation to the CPAP group was associated with a higher eGFR, lower urinary ACR, and lower risk for developing albuminuria and an eGFR <60 mL/min/1.73m^2, compared to the no CPAP group. Moreover, the authors reported that those in the CPAP group experienced an improvement in eGFR and ACR, whereas these parameters remained stable in the no CPAP group.

> **"Those in the CPAP group experienced an improvement in eGFR and ACR."**

Whilst this study was limited by small size, from the findings, the team concluded that use of CPAP could have a beneficial effect on eGFR and ACR in patients with OSA and T2D, but for the future, this would need to be validated in a full and adequately powered randomised controlled trial. ●

Type 2 Diabetes and Obesity: Effects on Cardiopulmonary Performance

EFFORT intolerance is highly prevalent in patients with Type 2 diabetes (T2D). Measured through O_2 uptake in peak exercise (VO_{2peak}), effort intolerance predicts incident heart failure. However, the quantification and pathophysiological causes of effort intolerance remain to be debated. A research team from University of Pisa, Italy, aimed to investigate the effects of T2D and obesity on cardiopulmonary performance.

Patients at high cardiovascular risk, both with and without T2D, underwent pulmonary spirometry and a thorough cardiovascular characterisation, which included maximal combined echocardiography-cardiopulmonary exercise test to exclude pulmonary and/or cardiovascular disease, along with overt microvascular complications. Multivariable models accounted for the major pathophysiological determinants of VO_{2peak} normalised for lean body weight (LBW). This ensured the effects of T2D were isolated, permitting the identification of the underpinning mechanisms.

A total of 109 patients with T2D and 97 controls without diabetes were included in the analysis. Both test groups had similar baseline characteristics, with the exception of BMI, which was higher in the T2D group. Patients with T2D achieved lower VO_{2peak} than the participants who did not have diabetes (26.1 ± 5.4 versus 29.5 ± 9.6 mL/min/kg_{LBW}). Subclinical cardiopulmonary impairments were observed in the T2D group, namely chronotropic incompetence, subclinical systolic dysfunction, and more marked cardiac remodelling. Furthermore, the presence of T2D was an independent negative determinant of VO_{2peak} in all models, maintaining statistical significance and a strong coefficient of determination. Finally, BMI reduced exercise capacity by 0.2 mL/min/kg_{LBW}, which could be largely explained by reduced peripheral O_2 extraction, impaired systolic reserve, chronotropic incompetence, and ventilator inefficiency. Meanwhile, T2D independently reduces VO_{2peak} by 1 mL/min/kg_{LBW} and this is only marginally explained by any or all of the previously listed determinants of cardiopulmonary fitness.

> "Both test groups had similar baseline characteristics, with the exception of BMI."

Overall, T2D negatively affects VO_{2peak} independently, even in the absence of cardiac or pulmonary disease. This effect is in combination to all other pathophysiological determinants of O_2 uptake. ●

Using Participant Characteristics to Prevent Gestational Diabetes

AN INDIVIDUAL's unique biological, social, and environmental context can be used to determine their responses to interventions for preventing diseases. However, the effects of intervention for the prevention of gestational diabetes (GD), according to individual characteristics, have yet to be systematically investigated. New data presented at the EASD Annual Meeting 2023 evaluated the participant characteristics associated with GD prevention.

Research involved a systemic review and meta-analysis of 116 studies (n=40,903 females), published up to 24th May 2022, in order to identify lifestyle (diet, physical activity, or both), metformin, myoinositol/inositol, and probiotics interventions. Studies commencing in preconception or antenatal periods with GD as an outcome were included. Participant characteristics were extracted according to the conceptual framework described in the Precision Medicine in Diabetes Consensus Report.

The results showed that physical activity was more effective in GD reduction in participants with a normal BMI compared with an obese BMI (risk ratio [95% confidence interval]: 0.06 [0.03–0.14] versus 0.68 [0.26–1.60]; p<0.001; 17 studies). Diet and physical activity were found to be more effective in reducing risk for patients with GD who did not have polycystic ovary syndrome (PCOS) than those who did (0.62 [0.47–0.82] versus 1.12 [0.78–1.61]; p=0.030; 59 studies), as well as in patients without a history of GD than those with unspecified history (0.62 [0.47–0.81] versus 0.85 [0.76–0.95]; p=0.030; 59 studies). Additionally, metformin interventions were more effective in participants with PCOS than they were in patients with unspecified status (0.38 [0.19–0.74] versus 0.59 [0.25–1.43]; p<0.001; 13 studies), and in older patients (β coefficient: -0.52 [-1.02–-0.02]; p=0.040; eight studies). The researchers also found that parity, history of having a large for gestational age infant, or family history of diabetes did not impact the effectiveness of any interventions.

> **"Physical activity was more effective in GD reduction in participants with a normal BMI."**

The team concluded that females with PCOS or higher age may benefit more from metformin than those without these traits, and that females with a normal BMI could benefit more from physical activity than those with a higher BMI when it comes to preventing GD. This study highlights the importance of further research into precision prevention. ●

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Dietary Interventions and Insulin Requirements in Type 1 Diabetes

IMPROVED insulin resistance, glycaemic control, and reduced medication requirements have been associated with a plant-based diet in people with Type 2 diabetes. The current study, presented at the EASD Annual Meeting 2023, compared the effects of this diet with a portion-controlled diet in patients with Type 1 diabetes (T1D).

A total of 58 participants with T1D were randomly assigned to follow either a low-fat vegan diet (n=29), or a portion-controlled diet (n=29) for 12 weeks. Meal content was recorded using the Cronometer mobile application (Revelstoke, Canada), and insulin sensitivity assessed using the carbohydrate to insulin ratio, which was calculated as the number of grams of total carbohydrate versus units of insulin administered. Total insulin dose was calculated as a sum of basal and bolus insulin units injected per day.

Consumption of carbohydrates increased in the vegan group by an average of 118 g/day (p=0.002), compared with no significant change in the portion-controlled group (-18 g/day; p=0.110; treatment effect: +137 [95% confidence interval (CI): +65–+208]; p<0.001). Insulin sensitivity increased in the vegan group by 6.2 on average (p=0.002), compared with no significant change in the portion-controlled group (-0.8; p=0.320; treatment effect: +7.0 [95% CI: +3.1–+10.9]; p=0.001). Total daily dose of insulin decreased by 28%, specifically by 12.1 units/day in the vegan group (p=0.007), compared with no significant change in the portion-controlled group (-1.4 units/day; p=0.660; treatment effect: -10.7 [95% CI: -21.3–-0.2]; p=0.046). HbA1c showed decrease by 0.8% in the vegan group (p<0.001), and by 0.6% in the portion-controlled group (p=0.002; treatment effect: -0.2 [-0.7–+0.2]; p=0.340). Total cholesterol decreased by 32.3 mg/dL in the vegan group (p<0.001) and by 10.9 mg/dL in the portion-controlled group (p=0.030; treatment effect: -21.4 mg/dL [-35.6–-7.2]; p=0.004). Low-density lipoprotein cholesterol decreased by 18.6 mg/dL in the vegan group (p<0.001), and did not change significantly in the portion-controlled group (treatment effect: -9.1 mg/dL [-22.6–+4.5]; p=0.180). Triglycerides did not change significantly in either group, but blood urea nitrogen decreased by 6.0 in the vegan group (p<0.001), and did not change significantly in the portion-controlled group (treatment effect: -5.2 mg/dL [-7.9–-2.5]; p<0.001). Blood urea nitrogen to creatinine ratio decreased by 5.1 mg/dL in the vegan group (p<0.001), and did not change significantly in the portion-controlled group (treatment effect: -6.7 [-10.7–-2.6]; p=0.002).

The results allowed the investigators to conclude that a low-fat vegan diet has beneficial effects upon insulin sensitivity, insulin requirements, glycaemic control, and both markers of cardiovascular and renal health in patients with T1D compared with a portion-controlled diet. This randomised control trial promotes the use of the low-fat vegan diet in management of T1D, but larger trials are warranted to confirm findings. ●

"This randomised control trial promotes the use of the low-fat vegan diet in management of T1D."

Impact of Exercise on Body Composition in Type 2 Diabetes

RELATIVELY large volumes of concomitant exercise can improve the negative effects of caloric restriction on fat-free mass (FFM), according to an abstract presented at the EASD Annual Meeting 2023. The study aimed to assess the effects of various exercise volumes, combined with diet-induced weight loss, on fat-mass percentage and FFM in patients with Type 2 diabetes (T2D).

Researchers conducted a secondary analysis of a 16-week four-armed randomised trial, which included 82 patients with T2D who were signed randomly to either standard care (CON), caloric restriction (DCON), DCON with exercise three times per week (MED), or DCON with exercise six times per week (HED). Change in fat-mass percentage points (FM%p) was the primary outcome, and secondary outcomes included changes in FFM and visceral adipose tissue (VAT) volume. They used a constrained baseline mixed effects linear model to analyse data, and mean differences were presented as percentages if data were log-transformed.

Mean age at baseline was 58.2±9.8 years, with T2D duration of 4.0 years (interquartile range: 1.9–5.5), and body weight of 101.4±14.6 kg. In the DCON group, FM%p was changed by -3.5%p following intervention, compared with -6.3%p

in the MED group, and -8%p in the HED group; however, there was a further reduction in the MED group (-2.8%p) and HED group (-4.5%p). The team noted a reduction in absolute FFM following intervention in the DCON (-2.7%) and MED (-1.9%) group, compared with CON, but no reduction in absolute FFM was noted in the HED group (-0.2%). Finally, all groups showed a reduction in VAT volume compared to CON (DCON: -666.0 cm^3; MED: -1,264.0 cm^3; HED: -1,786.4 cm^3), and the MED and HED groups showed greater VAT reductions compared to DCON.

The team concluded that all interventions were superior in reducing FM%p and VAT, compared with CON. Caloric restriction alone and combined with exercise three times per week led to reduced FFM, but this was unchanged in those exercising six times per week. These results suggest that relatively large volumes of concomitant exercise can improve the negative effects of caloric restriction on FFM. ●

> "Caloric restriction alone and combined with exercise three times per week led to reduced FFM."

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Gestational Diabetes Screening in Early Pregnancy

THE RESULTS of a multicentre cohort study, which used oral glucose tolerance tests (OGTT) and biomarkers to screen for gestational diabetes (GD) in the early stages of pregnancy, have been presented at the EASD Annual Meeting 2023.

GD is usually diagnosed after 24 gestational weeks, according to the majority of clinical recommendations. Providing females with an earlier diagnosis has the potential to greatly improve outcomes during pregnancy; however, at present, a clear consensus regarding accurate risk stratification during early stages of pregnancy does not exist.

The team, made up of researchers from a number of centres across Switzerland, Germany, Austria, and Italy, aimed to examine the predictive performance of using a 75 g OGTT, along with several biomarkers, during the first trimester. The researchers also assessed the association of OGTT and biomarkers with β-cell function and insulin action.

The study included 703 females who were pregnant, and receiving care at six centres in central Europe. At a median gestational age of 13.4 gestational weeks (interquartile range: 12.7–14.1), researchers considered patient history, biochemical markers, and a blinded 75 g OGTT.

A second 75 g OGTT was carried out between 24–28 gestational weeks, in order to identify those with GD. In a subgroup consisting of 204 females, researchers also performed a detailed investigation of glucose homeostasis during both visits.

It was discovered that glucose concentrations during the early OGTT (OGTT 0 minutes: 70.3%; 95% confidence interval [CI]: 63.8–76.8; OGTT 60 minutes: 75.0%; 95% CI: 69.6–80.5; OGTT 120 minutes: 72.9%; 95% CI: 66.5–79.2) could fairly predict the later development of GD, which occurred in 87 females in the study group (12.4%). Some biomarkers, which were examined using the area under the receiver operating characteristic curve, also identified significant, although modest, predictive accuracy (adiponectin: 61.2%; triglycerides: 60.1%; glycosylated fibronectin: 58.6%; and fructosamine: 56.9%).

The team concluded that a strong association exists between fair predictive accuracy for the development of GD and parameters of glucose homeostasis. In future, this test can be used to pinpoint those at low- and high-risk of developing GD during pregnancy. ●

"Providing females with an earlier diagnosis has the potential to greatly improve outcomes during pregnancy."