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Article *in* Endocrine Practice · June 2021

DOI: 10.1016/j.eprac.2021.04.612

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Digital Twin Enabled Precision Nutrition Induces Remission of Diabetes Independent of Improvement Obesity Markers

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OBJECTIVE

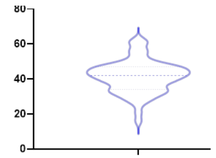
- Technology-enabled precision nutrition, a combination of macro, micro and biota nutrients, along with Continuous Glucose Monitoring (CGM) have been demonstrated to be a key for reversal of diabetes.
- We explored the association between change in the glycated hemoglobin (HbA1c) and parameters of obesity that included body weight, waist circumference and visceral obesity

METHOD

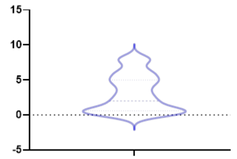
- We conducted an initial analysis (n=63) of the ongoing randomized controlled trial of Twin Precision Nutrition Treatment (TPN): a novel whole-body digital twin enabled precision treatment for reversing diabetes
- The TPN program entailed detailed patient food intake information with CGM readings as inputs to a machine learning.
- The machine learning algorithm integrated these multi-dimensional data to predict personalized postprandial glucose response.
- This led to a predictive model, which enabled daily precision nutrition guidance to the patient.
- Physicians utilized the TWIN app recommendations as a decision-enabling tool to customize the therapeutic approaches.
- Clinical Trial Registration Number - CTRI/2020/08/027072

RESULTS

Mean age (years) was 41 (±9.2, minimum 16, maximum 62, 95% CI 39 to 44)

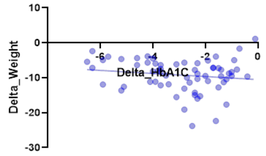


Duration of diabetes (years) was 3.1 (±2.7, maximum 8, 95% CI 2.4 to 3.8)

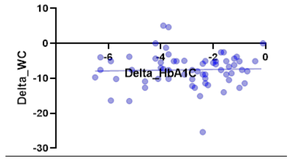


- There was a statistically significant improvement in HbA1c % (8.5 ± 1.6, 95% CI 8.17 to 8.99 reduced to 5.6 ± 0.52, 95% CI 5.52 to 5.79; p< 0.0001),
- HOMA2-IR (1.81 ± 0.71, 95% CI 1.63 to 1.99 decreased to 1.11 ± 0.51, 95% CI 0.98 to 1.24; p< 0.0001),
- HOMA2 Beta (51.78 ± 28, 95% CI 44.6 to 58.97 increased to 94.42 ± 38.9, 95% CI 84.62 to 104.2; p< 0.0001),
- Body weight (kg) (79.8 ± 14.67, 95% CI 76.14 to 83.53 decreased to 70.58 ± 12.31, 95% CI 67.48 to 73.68; p=0.0002) and
- Waist circumference (cms) (97.13 ± 10.82, 95% CI 94.41 to 99.86 decreased to 89.58 ± 8.9, 95% CI 87.31 to 91.84.684; p=0.0002).
- There was a decrease in the visceral fat (12.44 ± 7.7, 95% CI 10.5 to 14.39 reduced to 10.31 ± 8.2, 95% CI 8.23 to 12.39, p=0.136 ns).
- There was a negative correlation for the change in the HbA1c and body weight (Pearson r - 0.15, 95% CI -0.38 to 0.10, p= 0.022 ns), and visceral fat (Pearson r – 0.14, 95% CI -0.38 to 0.10, p= 0.24 ns).
- There was a positive correlation between HbA1c and waist circumference (Pearson r 0.034, 95% CI -0.21 to 0.27, p= 0.78 ns)

Correlation body weight Hba1c



Delta_HbA1C vs. Delta_WC



CONCLUSIONS

- There was an independent significant decrease in HbA1c (34%), HOMA2IR (39%), body weight (4.63%), waist circumference (7.7%) with a significant increase of 82% in HOMA2Beta, from baseline.
- However, there was no significant correlation between the glycemic parameters and the markers of obesity.
- Technology enabled precision nutrition, a combination of macro, micro and biota nutrients, with physician-led adoption and technology-driven intervention had positive implications for diabetes remission which is independent of the weight loss and the reduction in the waist circumference