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Effectiveness Of Digital Twin Technology For The Improvement In Depression Among Patients Undergoing Remission Of Diabetes

Joshi Shashank, Jahangir Mohammed, Maluk Mohamed, Terrence Poon, Mala Dharmalingam, Banshi Saboo, Suresh Damodaran, Arun Vadavi, Mohamed Thajudeen, Ashok Keshavamurthy, Suchitra Bhonsley, Sarah Mohammed, and Paramesh Shamanna

Introduction: Twin Precision Treatment (TPT): a novel whole-body digital twin enabled precision nutrition that utilises 174 health markers and 3000 daily data points from blood tests and connected devices that measure weight, physical activity, sleep and sensor glucose values, for achieving remission. The prevalence of depression is higher among those with diabetes than in the general population. The Patient Health Questionnaire (PHQ-9) is commonly used to assess depression in people with diabetes, but the impact of the diabetes reversal program on the depression has not yet been investigated. **Methods:** We compared the change in the PHQ-9 scores at the baseline and at three months for the patients enrolled in the real-world study in TPT program. Contemporary consensus statement defines remission as a return of hemoglobin A1c (HbA1c) to <6.5% and persists for at least three months in the absence of diabetes medication. **Results:** We evaluated 96 patients of which 54.1% (n=52) had any grade of depression. 28% (n=27), 18% (n=17), 5% (n=5), 3% (n=3) had mild, moderate, moderate to severe and severe depression. Within these categories 67% (n=18) improved from mild to normal, 94% (n=16) improved in the moderate category with 10 improved to normal category, none remained as moderately severe and severe depression, respectively. There was a significant association with the improvement in the PHQ-9 scores and the number of daily oral medication count change. Out of 15 on 1 medication/day changed to 7 (46.7%) off medication. Out of 27 with 2 medications/day, 10 (37%) were off medications. Out of 22 with 3 medications/day, 5 (22.7%) were off medications. Out of 12 with 4 medications/day, 2 (16.7%) were off medications; p<0.005. The mean HbA1c % at baseline (8.9±2.4) changed to (6.8±9.2), p<0.001. The mean body weight (kg) at baseline (76.2±13.5) changed to (71.9±12.9), p<0.001. **Discussion:** This is perhaps the first evaluation for the improvement of the PHQ-9 in patients undergoing remission by digital twin technology. Depression was highly prevalent. Higher the PHQ-9 score, greater was the degree of improvement in depression. TPT appears to be a useful tool to simultaneously address reversal of diabetes and improvement in the grade of depression.

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