Effect of change in life style on control of blood glucose in diabetes type 1 patients

Abdul Roudsari[a,b], Omid Shabestari[b]

[a]*School of Health Information Science University of Victoria,Canada*
[b]*Centre for health informatics, City University, London*

Abstract and objective

Diabetes Mellitus is a chronic disease which requires continuous monitoring. This control involves the recording of blood glucose measurements. Various changes in life style can affect blood glucose level but the overall balance is the result of these effects and changes in the dose of insulin. For better evaluation of changes in blood glucose, its deviation from the average value for each person in each period of the day was considered. In this research, the effect of some of these changes in life style including food intake, physical activity, napping, alcohol consumption, illness/ infection, menstrual period, stress and holiday/trip on blood glucose was evaluated. This study shows that in most of these changes in life style, the injected insulin dose is higher than required and should be better adjusted.

Keywords:

Diabetes mellitus, Telemedicine, Life style change, Blood glucose, Disease management.

Introduction

Diabetes Mellitus is an endocrine disease characterized by a high level of blood glucose. The primary treatment for type 1 of this disease is supplementary injections of insulin to replace its defected production in the body. The required dose varies based on the intake of carbohydrates in food, level of exercise and any instances of change in life style such as stress or illness. In this study telemedicine technology was applied for remote control of people with diabetes. The self report procedure in such models will help clinicians gain more information about change in life style of patients and its effect on blood glucose level. Although the physiological effect of many changes in life style are well known, the behavior of patients as a reaction to them can be a subject for further investigation.

Methods

Home blood glucose metering was used in this research which automatically stamped the measurements with date and time and also provided a facility for the participants to tag measurements based on 8 main changes in life style accompanying them. The tags used in this system were food intake, alcohol consumption, physical activity, napping, stress, menstrual period and holidays. To reflect daily seasonality of blood glucose level, the measurements in each day were discretized into 5 time buckets. Then for each participant the mean of blood glucose measurements were calculated for each of the mentioned time intervals. The difference between each instance of blood glucose measurement and the calculated mean value for the same person at the same period of day was calculated as deviation from the average. The declarations of the life style changes were subjective and the participants did not report them completely. For being able to analyze this data, we had to put all instances in one pool of data and consider the incomplete cases as missing. Instead of sequence analysis of cases, we had to cluster all the data based on the existing life style evidences and compare these groups.

Results

The mean blood glucose level is lowest in instance of illness followed by physical activities, napping stress, holidays, food intake and Alcohol Consumption in ascending order. Another important outcome of this study is the role of physical activities in management of blood glucose. Whether it is because of the activity itself or the active control by the participants, it shows that these changes in life style cause the best performance near the target level.

These results show a slight relationship in classified blood glucose levels with stress ($Z = -0.116$, $P = 0.907$) and menstrual period ($Z = -0.112$, $P = 0.954$). Also a moderate relationship with napping ($Z = -0.89$, $P = 0.374$) and strong relationship with food intake (Chi^2 (3) = 49.38 and $P = 0.000$), holidays ($Z = -3.777$, $P = 0.000$), illness (Chi^2 (2) = 13.85, $P = 0.001$) and alcohol consumption ($Z = -2.29$, $P = 0.022$) were observed. The strong relationships show the improper moderation of insulin dose in such instances.

This article demonstrates the requirement for further investigation into the adjustment of insulin dose in case of change in life style. This issue is particularly important in decision support systems for advising this dosage to diabetics.