

Studying Blood Glucose Level From Fingertip Blood Sample by Using Portable Blood Glucose Monitor After Peeling and Handling Fruits

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Abstract: Background: Timely blood sugar monitoring and prompt intervention are necessary to prevent life threatening hypoglycemic episodes and prevent long-term complications. **Objective** to examine effect of peeling or handling fruit on measuring glucose level from fingertip blood sample. **Methods** Thirty healthy female students in Tanta Nursing Faculty had normal fasting blood glucose level, and 10 female patients with type two diabetes from Diabetic out Patient Clinic of Tanta University Hospital were enrolled in this study. Capillary blood glucose samples were collected in the fasting state from the fingertip of females before handling fruits or peeling and after peeling fruits tests were done three times. Three samples of blood were taken from fingers followed by washing hand with tap water, no washing but swab and dry hand by tissue paper after peeling and handling fruits, or rubbing the fingertip by alcohol swab and analyzed with glucose monitoring. Results Blood glucose (BG) level using fingertip blood samples obtained after peeling and handling cutting fruits from the healthy person without diabetes or with diabetes that was not followed by hand washing but wiped by tissue paper only or the fingertip was rubbed several time with alcohol swabs were extremely high. While (BG) level measured after peeling and handling fruits, followed by washing hand with tap water were nearly the same to the level of the first reading before peeling and handling fruits. **conclusion** False blood glucose level reading occurred when neglected hand washing or substituted with the use of alcohol swab after fruits peeling when (BG) monitoring test was done by using capillary blood from the fingertip. The study recommended that hand washing with tap water and soap is extremely important for accurate blood glucose monitoring using fingertips capillary blood.

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Key words: Diabetes, self monitoring blood glucose, peeling fruits

1. Introduction

Self-monitoring blood glucose (SMBG) is an important and integral component of modern therapy for diabetes mellitus. SMBG has been recommended for people with diabetes in order to achieve a target level of glycemic control and thus achieve their HbA1c target. The goal of SMBG is to achieve target HbA1c by regularly monitoring blood glucose levels at different time intervals so as to check short term glycemic changes and enable maintenance of a more constant glucose level. This can help the healthcare professionals in the adjustment of a therapeutic regimen in response to blood glucose values and to help individuals adjust their dietary intake, physical activity, and understanding insulin doses to improve glycemic control on a day-to-day basis. (1,2,3)

Frequent monitoring or checking of blood glucose levels is critical to diabetes management. Timely blood sugar monitoring and prompt intervention are necessary to prevent life threatening hypoglycemic episodes. Equally important, close monitoring to maintain blood glucose levels within a

specified range is essential to prevent long-term complications such as heart disease, kidney failure, blindness, and serious impairment of circulation that may require amputations. For people who are treated with insulin, the results will help guide patients to choose the appropriate doses from meal to meal. ^(4,5).

2. Objective:

To examine effect of peeling and handling fruit on measuring glucose level from fingertip blood sample.

Hypothesis: False blood glucose reading can occur when measuring blood glucose from fingertip blood sample after fruit peeling and handling by hand

Research designs and methods

Design: this research is experimental study

Setting : Tanta Nursing Faculty and Diabetic Out Patient clinic in Tanta University Hospital

Sample: convenient sample of forty person and patients were included in the study. Thirty of them were healthy female students non diabetic had normal fasting blood glucose level and glucohemoglobin level. Their age ranged from 18 to 22 years old. The

other 10 patients were females with type two diabetes their age ranged from 35 to 45 years old.

Methods of data collection: capillary blood glucose samples were collected in the fasting state from the fingertip of volunteers before handling or peeling different types of fruits like oranges, grapes sweet melon, cantaloupe .., wash hand and rubbing by alcohol swab followed by drying (this is first reading). Then peeling fruits three time and test 3 samples of blood from fingers followed by washing hand with tap water, then peeling one type of fruits followed by no washing but wipe and dry hand by tissue paper after peeling fruits and wait 5 minutes, the last sample taken after peeling or handling fruits followed by rubbing finger with an alcohol swab several times and drying hand. The samples were analyzed immediately with a portable blood glucose monitor. Blood samples were obtained from the hand that held the fruit and its skin. Consent was obtained from all cases enrolled in this study before the tests after explanation the purpose of the study. A pilot study was conducted on two participants and necessary corrections mad on data collections methods.

Statistical analysis:

The data entered and processed on computer using SPSS. P value was considered significant at $p < 0.05$.

Data were expressed as mean \pm SD and range. Comparisons were made by Student’s t-test (two-tailed for independent samples).

3. Results

Blood glucose (BG) level using fingertip blood samples obtained after peeling and handling cutting fruits from the healthy person that not followed by hand washing but swabbed by tissue paper only were extremely high, also samples obtained after peeling and handling from the fingertip was rubbed several time with alcohol swab the mean was 135.13 ± 50.30 and 130.16 ± 50.30 for healthy non diabetic persons. While (BG) level measured after peeling and handling fruits, followed by washing hand with tap water were nearly the same to the level of the first reading before peeling and handling fruits (table 1). Also the mean of (BG) level were 184.80 ± 66.17 and 175.50 ± 52.61 respectively for diabetic patients after peeling and handling fruits followed by wiping hand with tissue paper only without washing by tab water and rubbing the finger several time with alcohol swab, were extremely high. While (BG) level measured after peeling and handling fruits, followed by washing hand with tap water were nearly the same to the level of the first reading before peeling and handling fruits 127.30 ± 19.72 and 130.60 ± 17.08 (table 2).

Table (1) Correlation of first reading before peeling fruits and after peeling in healthy non diabetic patient

| No =30 | First reading before peeling | Reading after peeling and cleaning by alcohol | Reading after peeling fruits without cleaning (swab by tissue paper) | Reading after peeling and cleaning by water |
|---|------------------------------|---|--|---|
| Blood glucose level (mg/dl) Mean SD \pm | 95.70 \pm 7.26 | 130.16 \pm 50.30 | 135.13 \pm 37.84 | 94.13 \pm 6.015 |
| Minimum reading of blood glucose | 81 | 91 | 87 | 87 |
| Maximum reading of blood glucose | 100 | 280 | 294 | 100 |
| P significance | | 0.000841* | 0.000003* | 0.059 |

* P< 0.05 is consider Significant

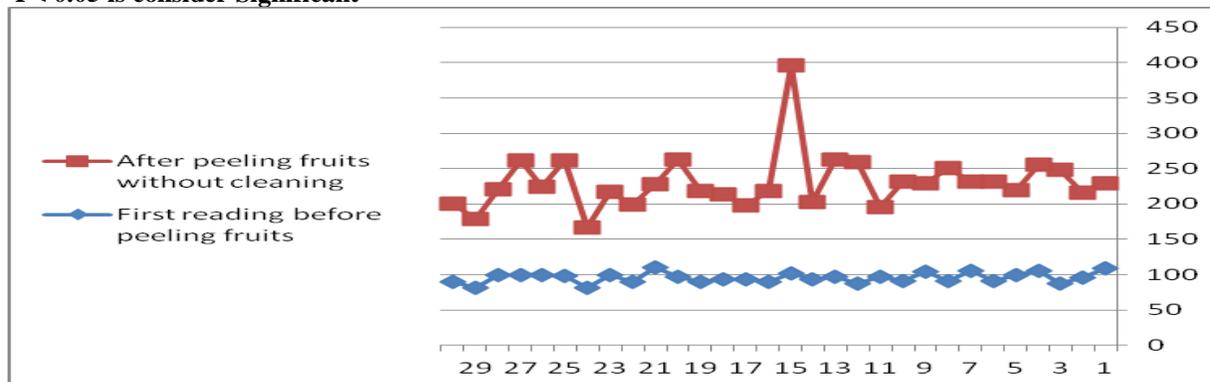


Figure (1) comparison between first reading before peeling fruits and after peeling without cleaning hand in non diabetic participant

Table (2) Correlation of first reading before peeling fruits and after peeling in diabetic patient

| No =30 | First reading before peeling | Reading after peeling and cleaning by alcohol | Reading after peeling fruits without cleaning | Reading after peeling and cleaning by water |
|--|------------------------------|---|---|---|
| Blood glucose level (mg/dl) Mean SD ± | 130.60± 17.08 | 130.60±66.17 | 175.50 ±52.61 | 127.30± 19.72 |
| Minimum reading of blood glucose | 110 | 129 | 134 | 109 |
| Maximum reading of blood glucose | 160 | 299 | 360 | 165 |
| P significance | | 0.026* | 0.005* | 0.070 |

* P< 0.05 is consider Significant

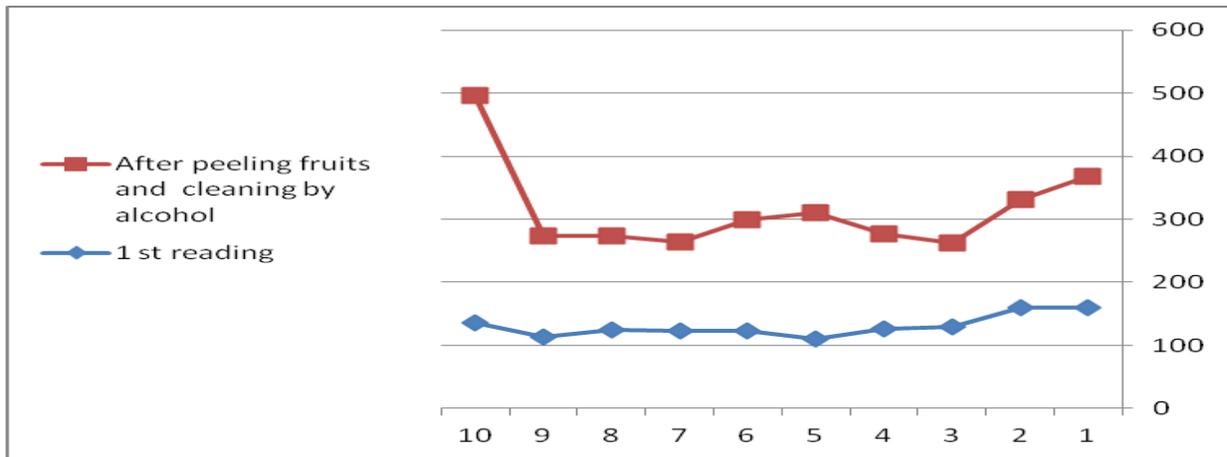


Figure (2) Compare reading after cleaning by alcohol after peeling and handling fruits against first reading before handling fruits in diabetic patients

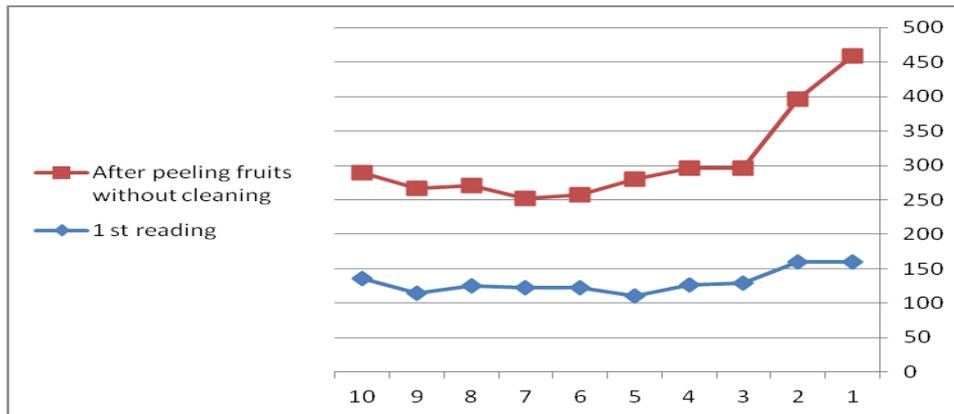


Figure (3) Compare blood glucose reading without cleaning after handling fruits with first reading before handling fruits in diabetic patients

4. Discussion

Monitoring blood sugar levels is extremely important. Checking blood sugar helps diabetics manage their disease by helping them learn how food, activity, stress, medicine, and insulin affect their health. This knowledge can help patients to avoid complications of diabetes such as kidney failure or blindness. Although inaccurate blood glucose readings are usually due to human error, this new study shows that various factors can contribute to faulty readings. Fruit residue on the hands of diabetics can cause finger-prick blood tests to show inaccurate blood sugar readings.^(6,7,8)

In our study Blood glucose (BG) level using fingertip blood samples obtained after peeling and handling cutting fruits from the healthy person without diabetes or in patient with diabetes that was not followed by hand washing but swabbed by tissue paper only or rubbing the fingertip w several times with alcohol swab were extremely high 135.13 ± 50.30 and 130.16 ± 50.30 for healthy person and 184.80 ± 66.17 and 175.50 ± 52.61 for diabetic patients respectively. This result is consistent with the result of **Takahisa et. al.**⁽⁹⁾ who made his study in Japan on healthy persons without diabetes using three type of fruits grape, kiwi, and orange the average of (BG) were high when volunteers peeled fruit and took a blood sugar reading right away, the levels shown by the blood sugar meter shot up to about 170 mg/dL on average after peeing an orange, 180 mg/dL after peeling a kiwi, and 360 mg/dL after peeling a grape. This may be due to traces of glucose from fruits on the finger. Also **Genevra**⁽⁸⁾ stated that invisible bits of fruit on patients' hands when they do finger-prick tests can make their glucose levels look artificially higher. The Sugars present in fruits like Fructose interfere with the normal enzymatic reactions in the Glucose strips. Also **Joseph. and Barry**^(10,11) discuss some factors affecting accuracy of blood glucose meters quality include test strips , anemia and sickle cell anemia that affect hematocrit values, other substances may interfere with testing process include uric acids (a natural substance in the body that can be more concentrated in some people with diabetes, glutathione (antioxidant) and ascorbic acid (vitamin C) , also temperature, humidity, altitude, room temperature. So you should check the package insert each blood glucose monitoring meter.

Also our results were in coordinate with results of **Takahisa et al.**⁽⁹⁾ that indicate hand washing with tap water after peeling fruits or handling it is very important for accurate monitoring of (BG) level using blood samples obtained by pricking the fingertip. Also **Johanna , et al.**⁽¹²⁾ recommend washing the hands with soap and water, drying them, and using the first drop of blood for

self-monitoring of blood glucose. If washing hands is not possible, and they are not visibly soiled or exposed to a sugar-containing product, it is acceptable to use the second drop of blood after wiping away the first drop. External pressure may lead to unreliable readings. **Hourglass**⁽¹³⁾ stated that this is an important finding since many patients on Insulin frequently measure their Blood Sugar levels just before meals, based on which they decide or correct the insulin dosage, pseudo hyperglycemia or falsely high Blood Sugar levels may force patients to increase the insulin dosage leading to hypoglycemia or Low Sugar levels.

5. Conclusion

False blood glucose level reading occurred when neglected hand washing or substituted with the use of alcohol swab after fruits peeling when (BG) monitoring using capillary blood from the fingertip.

Recommendation

Hand washing with tap water before glucose monitoring using blood from the fingertip is important and can use alone or with alcohol swab to avoid over estimation of blood glucose using portable monitor. The nurse should ask patient clean hand and avoid measuring blood glucose from fingertip after peeling or handling fruits until clean hand by tap water.

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