ESTIMATION OF GLUCOSE LEVELS IN BLOOD AND SALIVA-A COMPARATIVE STUDY

Gayathri Karthikeyan*1, GifrinaJayaraj2 and K.R.Don3

1 BDS, Saveetha Dental College & Hospitals, Poonamalle High Road, Chennai,
2 Department of Oral and maxofacial pathology Saveetha Dental College & Hospitals,
Poonamalle High Road, Chennai,
3Department of Oral and maxofacial pathology, Saveetha Dental College & Hospitals,
Poonamalle High Road, Chennai,

ARTICLE INFO

Article History:
Received 18th December, 2016
Received in revised form 16th January, 2017
Accepted 26th February, 2017
Published online 28th March, 2017

Key words:
Glucose Levels, Blood Collection

ABSTRACT

BACKGROUND: Blood is the most common biological fluid used in investigatory projects but it is an invasive procedure, saliva is another biological fluid that can be used as an alternative to blood since it is less invasive and most of the biological parameters found using blood can also be identified in saliva.

AIM: to estimate the glucose levels in blood and saliva and verify if there is a correlation between them.

OBJECTIVE: to compare the glucose levels in blood and saliva and estimate the level and justify that the levels in both are equal.

METHOD: The study group comprised of 25 randomly selected patients. Blood collection: The samples were collected using the venipuncture method. Values were calculated using a semi auto analyzer to estimate the random blood glucose levels. Saliva collection: Mostly only stimulated saliva was collected from the subjects. The saliva was collected by asking the participants to spit into the eppendorf, after rinsing their mouth.

Statistical analysis: Pearson’s correlation test was done on the data collected and it showed a negative correlation.

RESULT: When the statistical analysis was done it showed a negative correlation in the study, which means that if salivary glucose levels decreases the blood glucose levels increase.

CONCLUSION: The present study sheds some light on the importance of early diagnosis and preferment and utilization of non-invasive saliva analysis over the invasive blood analysis. Even though the present study shows a negative correlation more research should be conducted in this area.

INTRODUCTION

Diabetes mellitus is a clinically and genetically heterogeneous metabolic disease characterized by hyperglycemia and deregulation of carbohydrate, protein, and lipid metabolism. The primary feature of diabetes mellitus is chronic hyperglycemia, resulting from either a defect in insulin secretion from pancreas or resistance of body’s cells to insulin action or both (1).

The global prevalence of diabetes is 6.4% in adult population. Worldwide, the number of people with diabetes is expected to grow to 438 million by 2030, corresponding to 7.8% of the adult population.

*Corresponding author: Gayathri Karthikeyan
1 BDS, Saveetha Dental College & Hospitals, Poonamalle High Road, Chennai,

The crude prevalence rate of diabetes in urban areas is about 9% and in rural areas, has increased to around 3% of the total population (2). Type 2 diabetes mellitus is the fifth most common condition and the sixth leading cause of mortality amongst the elderly (3).

FalaceMarchetti in 1989 and Amer in 2001 reported similar results. But, Leach in 1970 and Ficara in 1975 did not find any significant relationship between blood glucose and salivary glucose level in diabetic patients (5). Owing to lack of sufficient diagnosis and treatment, diabetes is a major cause of death worldwide, more than half of the diabetics remain undiagnosed especially the patients with Type 2 diabetes.

Monitoring people with diabetes by repeatedly estimating blood glucose and glycosylated hemoglobin levels is invasive which becomes appalling and expensive over time (3).

The need to monitor periodic blood glucose is present because it reveals the pattern of blood glucose change in individuals,
and helps in planning of meals, and also at what time of the day a patient has to take medication. The choice of blood as a diagnostic fluid for clinical testing is clear-cut considering its close relationship to the homeostasis of the body (4). While the early diagnosis of diabetes is essential to prevent its devastating complications, the current method of investigation needs the painful needle prick to withdraw blood, which may discourage the individuals from the investigation (2).

Saliva fulfills several of the chief diagnostic concerns for a diagnostic bio fluid as it is obtained noninvasively, and its collection requires no special skill (4). Saliva acts as a mirror of the body and, hence, is a perfect medium to be explored for disease and health surveillance (6). This study was conducted to check if saliva can be used as an alternative bio-fluid for glucose estimation.

**MATERIALS AND METHODS**

- **Sample size:** The study group comprised of 25 randomly selected patients. Almost all the subjects were non-diagnosed patients. The study comprised of 9 male participants and 16 female participants.
- **Age group:** aged between 18 to 80 years.
- **Sample collection:**
  - **Blood collection:** The samples were collected using the venipuncture methods. Values were calculated using a semi-auto analyzer to estimate the random blood glucose levels. The method that was used to estimate the serum glucose level was hexokinase method.
  - **Saliva collection:** Mostly only stimulated saliva was collected from the subjects. The saliva was collected by asking the participants to spit into the eppendorf, after rinsing their mouth well. The random saliva glucose values were calculated using the glucose oxidase method and the values were calculated using a calorimeter.
- **Statistical analysis:** Pearson’s correlation test was done on the data collected and it showed a negative correlation.

**RESULT**

- The correlation coefficient of the following data is -0.1163187.
- 3 people had elevated levels of blood glucose but their salivary glucose levels were relatively very low.
- The mean of blood glucose levels was 108.92 and that of salivary was 9.128, this showed a very high variance.
- When the statistical analysis was done it showed a negative correlation in the study, which means that if salivary glucose levels decreases the blood glucose levels increase.
- The salivary glucose levels are inversely proportional to each other and since it is giving a negative value the results were insignificant for random BGL and SGL.

<table>
<thead>
<tr>
<th>PATIENT</th>
<th>BLOOD(G) (mg/dl)</th>
<th>SALIVA(G) (mg/dl)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>94</td>
<td>51.51</td>
</tr>
<tr>
<td>P2</td>
<td>87</td>
<td>27.27</td>
</tr>
<tr>
<td>P3</td>
<td>85</td>
<td>3.03</td>
</tr>
<tr>
<td>P4</td>
<td>117</td>
<td>45.45</td>
</tr>
<tr>
<td>P5</td>
<td>96</td>
<td>3.03</td>
</tr>
<tr>
<td>P6</td>
<td>97</td>
<td>3.03</td>
</tr>
<tr>
<td>P7</td>
<td>116</td>
<td>3.03</td>
</tr>
<tr>
<td>P8</td>
<td>98</td>
<td>27.27</td>
</tr>
<tr>
<td>P9</td>
<td>90</td>
<td>0</td>
</tr>
<tr>
<td>P10</td>
<td>97</td>
<td>6.06</td>
</tr>
<tr>
<td>P11</td>
<td>96</td>
<td>3.03</td>
</tr>
<tr>
<td>P12</td>
<td>93</td>
<td>12.12</td>
</tr>
<tr>
<td>P13</td>
<td>256</td>
<td>0</td>
</tr>
<tr>
<td>P14</td>
<td>82</td>
<td>0</td>
</tr>
<tr>
<td>P15</td>
<td>83</td>
<td>3.03</td>
</tr>
<tr>
<td>P16</td>
<td>105</td>
<td>9.09</td>
</tr>
<tr>
<td>P17</td>
<td>134</td>
<td>0</td>
</tr>
<tr>
<td>P18</td>
<td>190</td>
<td>12.12</td>
</tr>
<tr>
<td>P19</td>
<td>113</td>
<td>9.09</td>
</tr>
<tr>
<td>P20</td>
<td>87</td>
<td>3.03</td>
</tr>
<tr>
<td>P21</td>
<td>67</td>
<td>2</td>
</tr>
<tr>
<td>P22</td>
<td>106</td>
<td>0</td>
</tr>
<tr>
<td>P23</td>
<td>145</td>
<td>4</td>
</tr>
<tr>
<td>P24</td>
<td>80</td>
<td>1</td>
</tr>
<tr>
<td>P25</td>
<td>109</td>
<td>0</td>
</tr>
</tbody>
</table>

**DISCUSSION**

- From the data collected it was observed that 3 individuals had elevated blood glucose levels but their salivary glucose level was relatively low, this was because of the negative correlation and so the salivary and blood glucose levels were inversely proportion to each other. Patient number 13 had a blood glucose value of 256 mg/dl where as he had a salivary glucose value of 0 mg/dl showing the
Estimation of glucose levels in blood and saliva-a comparative study

There have been varying reports on the salivary glucose levels based on gender. Darwazeh et al found higher levels of salivary glucose in males as compared to females, and Soares et al did not find any significant relationship with gender (4). FalaceMarcheti in 1989 and Amer in 2001 reported similar results. But, Leach in 1970 and Ficara in 1975 did not find any significant relationship between blood glucose and salivary glucose level in diabetic patients. (5) Statistically non-significant correlations between blood and salivary glucose in the study and control groups were obtained by Tenovuo et al., Aryeh et al., and Vaziri et al. This variation in result might have been because of the small sample size. (6) Englander et al expressed doubt regarding replacement of plasma with parotid secretion in the diagnosis of diabetes mellitus, because of its lower levels of glucose concentration. (7) A study carried out in last few years revealed that the salivary samples of the non-diabetic control subjects did not show the presence of glucose even in the slightest concentrations. (8)

There is still hope and lot of research has been going on to find an alternative to blood for diagnostic investigations. If saliva is soon proven to be an excellent bio-fluid for diagnostics tests then it would be less expensive noninvasive and simple to collect as well this would be easier for juveniles with diabetes. Moreover, it will be possible for the people with diabetes to self-monitor themselves with method that is easier and not painful (2). The present study sheds some light on the importance of early diagnosis and preferment and utilization of non-invasive saliva analysis over the invasive blood analysis.

REFERENCES

1. M Dhanya, S Hegde. Salivary glucose as a diagnostic tool in Type II diabetes mellitus: A case-control study, Department of Oral Medicine, The Oxford Dental College and Hospital, Bengaluru, Karnataka, India, 02-Nov-2015
3. Arati S. Panchbhai, Correlation of Salivary Glucose Level with Blood Glucose Level in Diabetes Mellitus, Department of Oral Medicine and Radiology, SharadPawar Dental College and Hospital, DMIMS University, Sawangi-Meghe, Wardha, India, 4 July 2012.
5. A. Azizi , A. Modaberi , The Correlation of Blood Glucose with Salivary glucose Level in Diabetic Patients , 24 Jul 2012 , Accepted: 30 Sept 2013

Please cite this article in press as:
http://dx.doi.org/10.24327/ijcar.2017.2995.0162

*******