ELECTRO PHOTONIC IMAGING (EPI) PARAMETERS OF DIABETES TYPE 2 AND THEIR CORRELATION WITH GLYCATED HAEMOGLOBIN (HbA1c)

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ABSTRACT:

Diabetes is increasing and more people are coming under its grip. Medicines along with some lifestyle modifications are currently the most recommended regimen for management of this disorder. Glycated haemoglobin (HbA1c) test is a confirmed screening tool for detection of type 2 diabetes. Electro Photonic Imaging (EPI) is a screening tool from the alternative medicine. This equipment can be used to monitor various diseases in the human body much like diabetes itself. ***Aim:*** The aim of this study is to find correlation between HbA1c test values with EPI parameters. The objective is to work out a relationship between them to be used for diagnosis of diabetes. ***Materials and methods:*** A total of 86 subjects were selected from various yoga camps and Arogyadham (a residential health care centre) of Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA) Yoga University. The selected participants were categorized into three groups; a) normal b) pre diabetics c) diabetics: based on HbA1c measurements. The various scales for interpretation of the stage of diabetes are a) < 5.6 mmol/L normal b) 5.7-7.0 mmol/L pre diabetes c) > 7.1 mmol/L diabetes. All the three groups were subjected to EPI and their parameters individually and collectively were checked for correlation with HbA1c using linear regression. The EPI parameters were related to general health and organ specific viz., integral area of Pancreas, Liver, Immune organs, Coronary vessels, Cerebral vessels, Left Kidney and the Right Kidney. ***Results:*** No significant correlation was observed between EPI parameters and HbA1c in any of the three groups and as observed from β (regression coefficient) values in linear regression. ***Conclusion:*** HbA1c cannot be a preferred biochemical parameter for correlation with EPI parameters in case of Diabetes Mellitus type 2. The tests which give averaged values over a period of time are not compatible with EPI parameters.

KEYWORDS:

Electro Photonic Imaging (EPI), Glycated Haemoglobin (HbA1c), Parameters, Correlation.

INTRODUCTION

Diabetes is increasing and more people are coming under its grip[1]. To combat diabetes is a

worldwide problem[2]. India by its genetic disposition is facing a serious problem on this account as the progression of the disease is very fast, though the diet in this country is less sugar loaded compared to western world, particularly the U.S [3]. The cost for management of diabetes is increasing world over. It is a huge economic burden on underdeveloped and developing economies. In the modern medical system there are drugs for keeping blood sugar levels under control but there is no cure. The medicines along with some lifestyle modifications are currently the most recommended regimen for management of this disorder. Unchecked, the progression of disease leads to serious dysfunction of vital organs and then the costs go exponential [4, 5]. There is continuous research in the modern medical system on the subject in the area of diagnosis and medicines. Glycated haemoglobin (HbA1c) test is an established screening tool for type 2 diabetes and likewise Fasting blood sugar (FBS). Improved versions of medicines hit the market from time to time [6]. There is lot of encouragement from the State of India for the alternative medicine to research and innovate, especially for diseases like diabetes [7]. Clues from alternative medicine are also integrated in the holistic approach. [8]. Stress is supposed to be one of the major reasons for development of diabetes mellitus type 2 [9]. Yoga is a proved therapy against stress. Meditation, Pranayama, Asanas are great stress busters [10]. Electro Photonic Imaging (EPI) is another contribution from alternative medicine in the sphere of diagnosis. It measures the subtle bio energy levels of the body which are interpreted to indicate the state of health. Russia has already integrated EPI into their medical system. The images of tips of 10 fingers are taken and with the help of software, the image is analyzed and the outcome is in the form of energy diagrams and numerical values. From these diagrams and data we can assess the health status of an individual [11]. The fingers are representative of various organs and systems as per the Chinese system of traditional medicine [12]. This equipment can be used to monitor various diseases in the human body both organ specific and systemic disorder like the diabetes. This is a non invasive device, simple to use and can be effectively utilized for assessing the effectiveness of any treatment regimen; be it modern, alternative or holistic [13]. EPI is a great tool to evaluate body through subtle bio energy [14, 15]. EPI parameters indicate status of health in the pre and post condition of intervention therapy [16]. For integrating into modern medical system, we need to correlate the EPI parameters with established biochemical markers. While correlation with FBS has been established [17], this study is about exploring correlation with HbA1c.

AIM

The aim of this study was to study the correlation of HbA1c with various EPI parameters related with diabetes type 2.

METHODS AND MATERIALS

This study involved yoga participants from Arogyadham and yoga camps connected with the Stop Diabetes Movement (SDM) campaign under the guidance of S-VYASA Yoga University. The data was collected during the months of Jun 2015 to Sep 2015. For EPI data, images were taken from the tips of ten fingers using high voltage short duration pulses of amplitude 10 kV with a frequency of 1024 Hz. Because of this electrons are extracted and due to presence of high electrical field get converted into photons and illuminate the area around fingers. This image is captured by CCD camera in EPI. In this study we have considered two types of EPI parameters. 1. General health 2.Organ/system specific. Among the general parameters are Area, Intensity, Entropy, Form Coefficient, Fractility. Those related to specific systems/ organs are Liver, Pancreas, Immune organs, Coronary vessels, Cerebral vessels, Left kidney and Right kidney. The values of HbA1c for the three conditions of diabetes were considered as a) <5.6mmol/L normal b) 5.7-7.0 mmol/L pre diabetic and c) > 7.1 mmol/L diabetic as per the American Diabetes Association scores [18].

STUDY SUBJECTS

Participants in the age range of 18-75 years, male or female, willing for the study and trials were included. Eighty six subjects were selected after scrutiny of 150 participants from various Stop Diabetes Movement camps and Arogyadam. HbA1c reports of all the 86 volunteers were available. The rejections were due to improper finger prints or/and non availability of biochemical test HbA1c. The selected subjects were categorized into three groups a) normal b) pre diabetic c) diabetic (Table 1). Normal comprised of 50 subjects (mean age 38.6 ± 10.2). Out of these 25 were males (mean age 37.2 ± 9.74) and 25 were females (mean age 40 ± 10.7). Pre diabetic comprised of 17 subjects (mean age 48 ± 14.49). Out of these 14 were females (mean age 48 ± 14.49) and rest were males (mean age 61 ± 18.52). The diabetic group of 19 subjects (mean age 51.05 ± 10.29) comprised of 13 females (mean age 49.31 ± 10.96) and 06 males (mean age 54.83 ± 8.23).

Exclusion Criteria The following subjects were excluded from the study: Participants with co-morbidity (e.g., hypertension, dyslipidemia, fatty liver disease) and taking any medicine in the case of normal and pre diabetic participants; diabetic participants taking medicines apart from diabetes medications; participants suffering from any infectious or contagious diseases; physically handicapped persons with missing fingers and females having menstruation or pregnancy on the day of measurement.

SAMPLING TIME

Data was taken in the morning hours with a gap of at least 3 hours from the last meal. Blood samples for HbA1c and EPI imaging were taken on the inaugural day of camp. Data at Arogyadham was taken in the morning as well in the evening but ensuring a gap of 3 hours after the last meal. EPI was calibrated whenever the place of taking measurement changed or as required. Informed consent was taken from all the participants before conducting study. The study was approved by the Institutional Ethics Committee of the University vide RES/IEC-S-VYASA/66/2015.

INSTRUMENT

HbA1c was done by diagnostic laboratories. Kirlionics Technologies International (KTI) company Saint-Petersburg, Russia (GDV camera Pro with analog video camera, model number: FTDI.13.6001.110310) was used for the assessment of EPI parameters. EPI software provided various features such as EPI screening, EPI scientific laboratory, EPI diagram. These are different software programs for analysis and data extraction. EPI screening allows to see particular sectors of different fingers related to body systems as well as to different organs. EPI scientific laboratory gives the data for each finger and the average related to general health parameters and EPI diagram brings forth detailed insight into the left and right brain hemisphere communication and distribution of energy through every organ.

PARAMETERS ANALYZED

From EPI scientific laboratory, the following parameters were analyzed: Total area is an absolute value and is measured as the number of pixels in the image having brightness above a preset threshold. Area of glow is in proportion to quantity of electrons; average intensity is evaluation of light intensity averaged over the area of image; form Coefficient and fractility are measure of irregularity in the image external contour; entropy reflects the level of non uniformity of image, in other words, the level of stability of the energy field. It is a measure of disturbance in the body. From EPI screening / EPI diagram , integral area of liver, pancreas, immune organs, coronary vessels, cerebral vessels, left kidney and right kidney were analyzed. Integral area is relative value and shows the extent to which the EPI gram deviates from an ideal model. For evaluation of the functional state of particular systems and organs, these parameters may be calculated for the whole EPI gram or for the sectors of particular zones. It is indicative of general health.

DATA ANALYSIS

Data analysis was done with the help of Microsoft Office Excel 2007 and 'R Studio' version 3.2.0 along with 'R Cmdr' version 2.1-7. Tests related to correlation and linear regression were conducted.

RESULTS

Bio chemical parameter HbA1c was compared with EPI parameters namely 1. General parameters area, entropy, intensity, form coefficient, fractality. 2. Organ specific: integral area of liver, pancreas, immune organs, coronary vessels, cerebral vessels, left kidney, right kidney. The organ specific parameters were selected from a large number of parameters as they are closely related to diabetes. The subjects were divided into three groups; a. normal b. pre diabetic and c. diabetic. First the correlation of HbA1c was done with the selected EPI parameters. From the correlation analysis parameters were identified to be considered in the regression analysis. In all the three cases no significant correlation was established between HbA1c and the EPI parameters. However, a correlation was seen between HbA1c and right kidney (p=0.17 r= 0.19) in case of normal subjects (Table 2); between HbA1c and liver (p=0.15 r=0.36), pancreas (p=0.16 r= 0.35), intensity (p=0.16 r= 0.35), form coefficient (p=0.11 r= -0.39) in the case of pre diabetics (Table 3); and between HbA1c and right kidney (p=0.16 r= .38), entropy (p=0.18 r=-0.3178) in the case of diabetics (Table 4). These were the parameters chosen for regression analysis in each of the 3 groups. No significant results were observed (Table 5, 6, 7).

DISCUSSIONS

In the case of HbA1c, the reading is an average of sugar levels in blood over a period of three months. EPI parameters are based on the molecular state within the body at the particular moment the measurements are taken [19]. It depends on the level of oxidized state and the quantum of free radicals in the body at the instant [20]. This can vary from time to time depending on many factors viz., biochemical changes which itself depend on some gross as well as subtle aspects of energy flow [21]. Therefore, may not be possible that a correlation between HbA1c and EPI parameters be established, be it in the case of normal, pre diabetics or diabetics. Since EPI measures the overall energy levels of the body which are associated at the organ /system level, these are dependent on many factors such as stress at that point of time. In the case of alternative medicine be it through yoga, naturopathy or homeopathy, EPI can be a very valuable tool for the healer to monitor the effects on the participant. The readings of EPI reflect current changes unlike HbA1c which is a measure over a period of three months. In fact there is no correlation between the two which has been demonstrated scientifically through this study. Though Fasting Blood Sugar (FBS) is another established bio marker for diagnosis of diabetes but there is a study which shows the difference between Fasting Blood Sugar (FBS) and HbA1c. Afternoon and evening plasma glucose (post lunch, pre dinner, post dinner and bed time) show higher correlation with HbA1c than morning time points (pre-breakfast, post-breakfast and pre-lunch) [22]. In one of the study, it has been argued that HbA1c should not be recommended as a routine test for screening of diabetes. There are problems in standardization [23] and the factors like abnormal hemoglobin, anemia and some drugs affect the results [24]. Also there are demographic factors like race and gender [25, 26]. In one study there was no correlation established between FBS and HbA1c. These strengthen our argument that even though both FBS and HbA1c are bio markers for diagnosis of diabetes yet they may not have a correlation. It is a strong revelation that if ever we have to correlate EPI parameters with biochemical parameters, the later must not be the average values based over a period of time. Therefore, between the HbA1c and FBS, it is the FBS that should be considered for scientific study on EPI [16]

CONCLUSION

Through this study is demonstrated that the reference marker for correlation between EPI parameters and biochemical parameters is not HbA1c. This will be very helpful for the future research on usability of EPI in the holistic scenario and as a supplementary tool for diagnostics. It is a very important revelation for further research on making EPI a perfect diagnostic tool for integration into modern medicine.

DECLARATION OF CONFLICTING INTERESTS

The authors declared no potential conflict of interest with respect to research, authorship and/or publication of this article. There was no funding for the project.

ETHICAL APPROVAL

This study was cleared by Institutional Ethics Committee (IEC) at S-VYASA Yoga University Bangalore India vide RES/1EC-SVYASA/66/2015. Informed consent was obtained from the participants.

REFERENCES

1. Shaw J.E., Sicree R.A., Zimmet P.Z. Global estimate of prevalence of diabetes for 2010 and 2030. Diabetes Res Clin Pract. 2010; 87(1): pp4-14.

2. Misra P., Upadhya R.P., Misra A., Anand K. A review of the epidemiology of diabetes in rural India. Diabetes Res Clin Pract. 2011; 92(3): pp303-11,

3. Radha V., Mohan V. Genetic pre disposition to type 2diabetes among Asian Indians. Indian J Med Res. 2007: pp 259-74

4. Timothy M.D., Zhang Y., Chen Y.J., et al. The economic burden of diabetes. Health affairs. 2010; 29(2): pp297-303

5. Rubin R.J., Altman W.M., et al. Health Care Expenditures for people with diabetes mellitus. J Clin. Endocrinol Metab.1994; pp78:809

6. Ripsin C.M., Kang H., Urban R.J. Management of blood glucose in type 2 diabetes mellitus. Am Fam Physician. 2009; p79

7. Vincent M.B.Silenzio. What is the role of complementary and alternative medicine in public health. Am J Public Health. 2002; 92(10):pp1562-64

8. Ofori S.N., Unachukwu C.N. Hollistic approach to prevention and management of type 2 diabetes mellitus in a family setting. Diab Metab Syndr Obes. 2014; Vol. 7: pp159-68

9. Pouwer F., Kupper N., Adriananse M.C. Does emotional stress cause type 2 diabetes mellitus? A review from the european depression in diabetes (EDID) Research Consortium. Discov med. 2010; 9(45): pp112-18.

10. Sharma R., Gupta N., Bijlani R.L. Effect of yoga based lifestyle intervention on subjective well being. Indian J Physiol Pharmacol. 2008; 52(2): pp123-31

11. Korotkov K.G., Matravers P., Orlov D.V., Williams B.O. Application of electro photon capture (EPC) analysis based on gas discharge visualization (GDV) technique in medicine.A systematic review. J Altern Complement Med. 2010;16(1) :pp13-25

12. Alexandrova R.A., Fedoseev B.G., Korotkov K.G., et al. Measuring the human energy field: state of the science: National Institute of health 2003: pp70-81

13. Hill F.J. Complementary and alternative medicine: the next generation of health promotion. Health Promotion International Vol.(18)

14. Srinivasan T.M. Prana and electrons in health and beyond. Int J Yoga 2014; 7(1): pp1-3

15. Srinivasan T.M. Bridging the mind- body divide. Int J Yoga 2013; 6(2): pp85-86

16. Kortyuk N., Cole P., Meghanathan N., et al. Gas discharge visualize. An imaging and modeling tool for medical biometrics. International Journal of Biomedical imaging, 2011; 7 pages.

17. Bhat R.K., Deo G., Mavathur R., Srinivasan T.M. Correlation of Electro Photonic Imaging Parameters with Fasting Blood Sugar in Normal, Pre diabetics and Diabetics.Journal of Evidence-Based Complementary & Alternative Medicine.2016. pp1-8

18. American Diabetes Association. Diagnosis and classification of diabetes mellitus. Diabetes Care 2011; 34(1): pp 62-69

19. Rubik B. The biofield hypothesis: Its bio physical basis and role in medicine. J Altern Complement Med 2202; 8(6):p703

20. Balaban R.S., Nemoto S., Finkell T. Mitochrondia oxidants and aging . Cell 2005; Vol.120: pp483-95

21. Cifra M. Measurement of spontaneous photon emission from the human body. Technical aspects, Parameters, Time and temperature dependant fluctuations of photon emission. 2012; Vol.56:pp388-92

22. Gill G.V., Hardy K.J., Patrick A.W., Masterson A. Random blood glucose estimation in type 2 diabetes: Does it reflect overall glycemic control? Diabet Med 1994; Vol.11:pp705-8

23. Tanaka Y., Atsumi Y., Matsuoka K., et al. Usefulness of stable HbA1c for supportive marker to diagnose diabetes mellitus in Japanese subjects. Diabetes Res Clin Pract 2001; 53(1); pp4 5-50.

24. Kilpatrick E.S. Haemoglobin A1c in the diagnosis and monitoring of diabetes mellitus. J Clin Pathol 2008; 61(9):pp977-82

25. Ginde A.A., Cagliero E., Nathan D.M., Camargo C.A. Value of risk stratification to increase the predictive validity of HbA1c in screening for undiagnosed diabetes in the US population. J Gen Intern Med.2008; 23(9); pp1346-53.

26. Anand S.S., Razak F., Vuksan V., et al. Diagnostic strategies to detect glucose intolerance in a multiethnic population. Diabetes Care 2003; 26(2):pp290-96

Table 1 Demographic details

Groups(N)	Mean age±SD	Male no. Mean Age±SD	Female no. Mean Age±SD
Normal (50)	38.6 ± 10.2	n=25 37.2±9.74	n=25 40±10.7
Pre diabetic (17)	48±14.49	n=03 61±18.52	n=14 48±14.49
Diabetic (19)	51.05 ± 10.29	n=06 54.83 ± 8.23	n=13 49.31 ± 10.96

SD –Standard deviation

Table 2 Correlation Analysis Normal

HbA1c/with	t	df	p	r
Area	0.7669	48	0.4469	0.1100
Cerebral	-0.1947	48	0.8464	-0.0281
Coronary	0.7934	48	0.4314	0.1137
Immunity	0.3811	48	0.7047	0.0549
Liver	- 0.7606	48	0.4506	- 0.1091
Lt Kidney	-0.3254	48	0.7462	-0.0469
Pancreas	0.8797	48	0.3834	0.1259
Rt Kidney	1.3614	48	0.1797	0.1928
Intensity	0.1026	48	0.9187	0.0148
Entropy	-0.1124	48	0.9110	-0.0162
Form Coeff	0.0391	48	0.9689	0.0056
Fractility	-0.6083	48	0.5458	-0.0874

t-'t' test; df- degree of freedom; p-level of significance,p<0.05 considered significant;
r-level of correlation varies between +1and -1. Both values considered high correlation

Table 3 Correlation Analysis Pre-diabetic

HbA1c/with	t	df	p	r
Area	1.1499	15	0.2682	0.2846
Cerebral	-0.0817	15	0.9360	-0.0210
Coronary	0.1959	15	0.8473	0.0505
Immunity	0.9717	15	0.3466	0.2433
Liver	1.5190	15	0.1496	0.3651
Lt Kidney	0.1109	15	0.9131	0.0286
Pancreas	1.4842	15	0.1585	0.3578
Rt Kidney	0.1921	15	0.8502	0.0495
Intensity	1.4752	15	0.1608	0.3559
Entropy	0.4355	15	0.6694	0.1117
Form Coeff	-1.6764	15	0.1144	-0.3972
Fractility	-0.3434	15	0.7360	-0.0833

t-'t' test; df- degree of freedom; p-level of significance,p<0.05 considered significant;
r-level of correlation varies between +1and -1. Both values considered high correlation

Table 4 Correlation Analysis Diabetic

HbA1c/with	t	df	p	r
Area	1.242	17	0.2311	0.2884
Cerebral	1.2457	17	0.2298	0.2892
Coronary	0.2885	17	0.7764	0.0698
Immunity	1.2537	17	0.2269	0.2909
Liver	0.9002	17	0.3806	0.2133
Lt Kidney	0.9234	17	0.3687	0.2185
Pancreas	0.6674	17	0.5135	0.1597
Rt Kidney	1.4761	17	0.1582	0.3370
Intensity	0.0972	17	0.9237	0.0235
Entropy	-1.3824	17	0.1848	- 0.3178
Form Coeff	-0.2800	17	0.7828	-0.0677
Fractility	0.1786	17	0.8604	0.0432

t-'t' test; df- degree of freedom; p-level of significance,p<0.05 considered significant;
r-level of correlation varies between +1and -1. Both values considered high correlation

Table 5 Regresion analysis Normal

	Estimate	Standard Error	t value	Pr(>|t|)
Intercept	5.20	0.03	135.357	<2e-16***
Right Kidney	0.10	0.07	1.361	0.18 Not significant

t- 't'test; p- level of significance, p<0.05 considered significant

Table 6 Regresion analysis Pre diabetic

	Estimate	Standard Error	t value	Pr(>|t|)
Intercept	6.22	2.04	3.051	0.0101*
Liver	0.10	0.25	0.434	0.6721 Not significant
Pancreas	0.05	0.22	0.229	0.8226 Not significant
Intensity	0.00	0.02	0.005	0.9962 Not significant
Form Coefficient	-0.01	0.02	-0.481	0.6394 Not significant

t- 't'test; p- level of significance, p<0.05 considered significant

Table 7 Regression analysis Diabetic

	Estimate	Standard Error	t value	Pr(>|t|)
Intercept	23.73	14.25	1.665	0.115 Not significant
Entropy	-7.29	7.21	-1.011	0.327 Not significant
Right Kidney	1.03	0.91	1.124	0.277 Not significant

t- 't'test; p- level of significance, p<0.05 considered significant