

Original article

Comparative Study of Diet Effect (Fresh Coconut and Groundnut) on Healthy Adults Using Electrophotonic Imaging Parameters

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Abstract:

Context: Consumption of fresh coconut vis a vis groundnut is being explored on physiological and psychological health.

Objective: This study aimed at exploring the effect of diet (Fresh Coconut and Groundnut) among healthy subjects on the levels of hemoglobin through the technique of electrophotonic imaging (EPI) and personality scores.

Methods: To carry out this study, 58 subjects comprising 31 males and 27 females of age 18 to 40 years of age were recruited voluntarily with informed consent at SVYASA, Bengaluru, India. The design was a randomized comparative study and data collected by EPI device and GIN of personality on 1st day and 90th day of the study.

Results: The level of hemoglobin (Hb) has shown appreciation in both coconut and groundnut subjects at $p < 0.05$ level with more gain for coconut group subjects. The personality scores indicate better for coconut group than groundnut group. The results show that the changes in EPI parameter integral area without filter (psycho-physiological) were not statistically significant in both right and left side indicating marginal influence on the type of diet adopted. Integral entropy decreased on leftside without filter, which indicates less disorder after diet intervention, but these changes were not significant. The study showed a reversed change in integral entropy on the right side without filter.

Conclusion: The study suggests that diet (fresh coconut) administered showed better results on the levels of hemoglobin and personality scores as compared to diet (groundnut).

Key words: Electrophotonic imaging technique, Gas discharge visualization, Haemoglobin, Gunas

Introduction:

Balanced Diet provides the human body required nutrients and energy to function optimally. Investigating subtle energy levels among humans through instruments has been on rise as part of preliminary diagnosis in complimentary medicine system. Electrophotonic Imaging (EPI) is one such technique which is becoming of great help to medical practitioners to estimate the health status of subjects. The focus of the present study is to compare the effect of intake of food based on fresh coconut and groundnuts and groundnut oil. Thus the

current study is carried out to substantiate with scientific evidence that fresh coconut diet may aid in enhancing the scores of hemoglobin. The effect of diet on Electrophotonic imaging parameters, integral area (IA, general health index) and integral entropy (IE, disorderliness in human energy systems) is being studied among healthy subjects. Electrophotonic Imaging technique also known as Gas Discharge Visualization (GDV) has been used in a number of studies as a scientific device to evaluate stress, general health and disorderliness in energy based on the measurement of

stimulated optoelectronic emission of humans.[1-4] This emission takes place when finger tips are exposed to a short electric pulse of high voltage (10 kv), with high frequency (1024 Hz) and low current in micro amps for less than millisecond.[5] Emission is captured in the form of an image by a CCD-camera placed under a dielectric plate in the EPI system.[6] Further the acquired 10 EPI images (one for each fingertip) are divided into various sectors, which correlate with diverse organs and systems within the body.[7,8] This Correlation of EPI image sectors with different organs of the body is based on empirical findings and also supported by acupuncture and meridian system of Sujok.[9] Recently, the meridian system has been scientifically supported by a newly found circulatory system called Bonghan system. It is a thread like structure found on the superficially inside blood or lymph vessels, on the surface of internal organs and also in the brain ventricles.[10] It provides a possible connection between the EPI sectors from finger tips' images and with the organs and systems within the body. EPI assessment is done in two ways; namely, with filter and without filter.[3] A filter is a plastic film specially designed to be used between the finger tips and the dielectric plate to eliminate the sympathetic nervous system response which results in sweat and cooling sensations of fingers and to register the information which is of physiological in nature. Thus, measurements using filter provide physiological data and those without filter provide psycho-physiological information.[9]

Gita Inventory of Personality (GIN): The GIN inventory is based on the concept of *Gunas* (personality) from the Bhagavadgita, a traditional text of yoga, which was developed by Das in 1991. This measure of the three *Gunas* contains ten questions that have three response choices. This test has a test-retest of

0.60 with a confidence level of 99% and has been validated. This is a valid tool for identifying the type of personality.[11] The present study also explores Hemoglobin (Hb) and psychological factors like personality score, vis a vis the effect of fresh coconut and groundnut diet on the studied subjects. There are no previous studies which have focused on consumption of fresh coconut as diet and its effects on biochemical processes bringing about changes in the levels of hemoglobin, which are accounted in arriving at the indices of good health among healthy humans.

Materials and Methods:

A comparative study was carried out from October 2015 to January 2016 amongst 58 healthy adults from Prasanthi Kutiram, SVYASA University, Bangalore were assessed on day 1 and day 90, as part of the study with 31 male and 27 female subjects. Healthy volunteers, age ranging from 18 to 40 years, both male and female willing to participate were included in the study. *Guna* (personality) was assessed on day 1 and day 90 using the self-administered "The 'Gita' Inventory of Personality" (GIN) to assess *Sattva* (*gentle and controlled*), *Rajas* (*violent and uncontrolled*), and *Tamas* (*dull and uncontrolled*). Subjects with chronic disorders like heart disorder, diabetes mellitus, hypertension, dyslipidaemia, seizures, fall & injury, pregnant women, smoking and drinking alcohol were excluded. Further subjects intolerant to nuts are checked for coconut intolerance and excluded from the study. The institutional ethics committee provided approval for the study protocol. Written informed consent was obtained from all participants at the beginning of the study and the confidentiality of the data and information provided by the subjects was maintained.

Intervention:

The subjects were randomly allotted to two groups, administered coconut (C) (mean age \pm SD, 23 ± 4.1) and groundnut (G) (mean age \pm SD, 24.65 ± 5.5) diets for 90 days at breakfast, lunch, snack and dinner. A balanced diet based on Yogic principles of food (Sattvik, Rajasika and Tamasik) blended with modern medical nutrition was provided to the two groups. The quantity (%) of energy, amount of fat, carbohydrates and proteins and the fatty acid composition was equal for both coconut and groundnut groups. Subjects consumed this standard meal with either coconut or groundnut intervention for a period of 90 days. Coconut group consumed 100 g of fresh coconut per day and ground nut group consumed 45g of ground nuts and 22g of ground nut oil per day. Subjects were specifically instructed to abstain from consuming anything other than the food and snacks provided by the coconut project kitchen set up exclusively for the study.

Assessment tools:

In the present study, EPI Pro (gas discharge visualization) produced by Kirlionics Technologies International, Saint-Petersburg, Russia.[1] Blood samples of subjects for hemoglobin assessment. The Gita inventory (GIN), as a standardized, psychological tool, and is based on the concept that there are three different levels of human existence in which the mind is always in a dynamic equilibrium between three types of response patterns called *Gunas* for personality scores.

EPI Parameters:

Integral Area (IA) and Integral Entropy (IE) are two important components of EPI system. First component is Integral Area (IA), a measure of general health index of the person being investigated.[9] IA values range from [-0.6 to +1] and is an indicative of good health condition in human subjects being studied. Second

component is Integral Entropy (IE), is determinant of disorderliness in the human energy system. A range of [1 to 2] indicates a healthy pattern of entropy in an organism.[9,12,13] EPI provides a non-invasive, objective and painless method, which is used for quick evaluation of health abnormalities in the human energy system.[8,14] Therefore, it is gaining high significance in the field of medicine and energy dimensions. From the reliability point of view, EPI parameters have a variation of 4.1% on a daily average, whereas, on 10 minute average it varies only 6.6% showing high reliability of the technique.[8]

Procedure:

The subjects were asked to remove all metallic items which they do not wear for 24 hours in a day. Further, they were also provided an electrically isolated surface to stand on during the measurements and were instructed to place one finger at a time on the dielectric glass plate at 45° angle. A distance of 3 feet was maintained between the EPI camera and the computer system. The calibration of the instrument was performed routinely, and an alcoholic solution was used to clean the glass plate after the assessment of each individual. The EPI Parameters were recorded on day 1 and day 90 for the participated subjects of the study.

Data extraction and analysis:

The GDV program was used to extract the raw data into Excel sheet from the system. This provides all the considered parameters in our analysis, namely Integral Area and Integral Entropy. Statistical Analysis was performed using SPSS version 10. Quantitative data parameters were measured using paired t test, Independent t test, and qualitative data was calculated using chi-square test. All data were expressed as mean \pm standard deviation. P-value <0.05 was considered as statistically significant.

Results:

Table 1: Within group and between group results for IA, IE and Hb values

Variables	Coconut Group (Experimental Group)			Groundnut Group (Control Group)			Between Groups
		Mean ± SD	p-value		Mean ± SD	p-value	p-value
IANL	Pre	0.248 ± 0.165	0.723	Pre	0.227 ± 0.140	0.91	0.884
	Post	0.230 ± 0.195		Post	0.223 ± 0.193		
IANR	Pre	0.242 ± 0.140	0.18	Pre	0.189 ± 0.175	0.723	0.839
	Post	0.164 ± 0.255		Post	0.176 ± 0.191		
IENL	Pre	1.865 ± 0.253	0.793	Pre	1.836 ± 0.192	0.167	0.738
	Post	1.881 ± 0.184		Post	1.897 ± 0.176		
IENR	Pre	1.915 ± 0.143	0.41	Pre	1.847 ± 0.191	0.655	0.193
	Post	1.881 ± 0.153		Post	1.826 ± 0.164		
Hb	Pre	13.37 ± 1.648	0.00*	Pre	14.174 ± 2.047	0.00*	0.00*
	Post	16.022 ± 1.522		Post	15.954 ± 1.448		

IANL: Integral area, no filter left, IANR: Integral area, no filter right, IENL: Integral entropy, no filter left, IENR: Integral entropy, no filter right, Hb: Hemoeglobin, Significant level-* p<0.05,

As Table 1 indicates that in both coconut and groundnut groups, the decreasing trends were seen in Integral Area (IA) without filter (psycho-physiological) but not significant statistically. This indicates very less marginal influence on the type of diet adopted on the subjects in the present study. Entropy on the left side improved within both coconut group and groundnut group. Entropy on the right side deteriorated within

both coconut and groundnut group. Disorderliness index decreased in both coconut and groundnut groups but more in coconut group. Subjects in coconut group showed better result than in groundnut group in terms of changes in entropy. The level of hemoglobin (Hb) in blood has shown appreciation in both coconut and ground group subjects at p<0.05 level with coconut group subjects recording better than groundnut group.

Table 2: Within group and between group results for psychological variables

Variables	Coconut Group(Experimental Group)			Groundnut Group (Comparative Group)			Between Groups
		Mean ± SD	p-value		Mean ± SD	p-value	p-value
Personality Score	Pre	24.96 ± 2.653	0.034*	Pre	24.13 ± 2.604	0.035*	0.158
	Post	26.04 ± 2.377		Post	25.10 ± 2.599		

As Table 2 deals with the results of psychological variables. The personality scores are recorded from the G inventory personality (GIN) questionnaire administered on 1st day and the 90th day of the study.

The scores indicate that progress was made by subjects from pre score to post scores both in coconut and groundnut at p<0.05 from gross Rajasic state towards better Rajasic state. The Gita inventory of

personality GIN gives a single overall score that describes the disposition of an individual towards *Sattva*, *Rajas*, or *Tamas*. The ranges are 29-30 for *Sattva*, 24-28 for *Rajas*, and *Tamas* for scores <24.

Discussion:

At psychological level, the personality scores within both the coconut group and groundnut group are at significant level $p < 0.05$ and not statistically significant between the groups indicating the progress of the subjects from gross to subtler level in rajasic trait. The subjects in both the Coconut and Groundnut groups have recorded better scores on personality traits like passion, action and motion. On the psychophysiological level (without filter), the Integral Area (IA) reduced on both sides (left and right) within both coconut and groundnut groups and also between the groups. The observed changes in values of IANL & IANR are not statistically significant. This could indicate a reduction of free radicals in the body.[1,2,4] This may be probably attributed to the adoption of the subjects (healthy adults) to the diets administered with marginal altered state of health parameters. Also the adequacy of reserves, vital resources and character of metabolism is more positively recorded and discussed below in hemoglobin values among the subjects. The Integral Entropy (Right Side) values decreased in both coconut and groundnut groups indicating less disorder in the regulation of physiological functions of the human system. Contrary to this the Integral Entropy (Left Side) enhanced in the two groups though statistically not significant. Hemoglobin (Hb) values obtained through analysis of blood samples improved in both the groups significantly ($p < 0.05$) within and between the groups. In blood, Hb carries oxygen from respiratory organs to rest of the body. There it releases oxygen to permit aerobic respiration to provide energy, to power the functions of the organisms in process called

metabolism. Though the Integral Area outcomes from our study are not statistically significant, the hemoglobin values suggest the vital role in maintaining the blood oxygen homeostasis.

The blood oxygen content homeostat:

The kidneys measure the oxygen content (rather than the partial pressure of oxygen - PO_2) of the arterial blood. When the oxygen content of the blood is chronically low, these oxygen-sensitive cells secrete erythropoietin (EPO) into the blood. The effector tissue in this case is the red bone marrow which produces red blood cells (or erythrocytes). This tissue is stimulated by high levels of erythropoietin to increase the rate of red cell production, which leads to an increase in the hematocrit of the blood, and a consequent increase in its oxygen carrying capacity (due to the now high hemoglobin content of the blood). This is the mechanism whereby high altitude dwellers have higher hematocrits than sea-level residents, and also why persons with pulmonary insufficiency or right-to-left shunts in the heart (through which venous blood bypasses the lungs and goes directly into the systemic circulation) have similarly high hematocrits.[15,16]

The distinction between the partial pressure of oxygen (PO_2) of the arterial blood and its oxygen content (or oxygen concentration) is important. The PO_2 is the pressure with which the oxygen has been forced into the blood in the alveoli of the lungs. The amount of oxygen that is consequently carried in the blood (at a given PO_2) depends on the hemoglobin concentration in the blood. The greater the hemoglobin concentration greater the amount of oxygen that can be carried per liter of blood at that PO_2 . Thus, in anemia the PO_2 of the arterial blood is normal but the oxygen content is below normal. The oxygen content sensors in the kidneys detect this lower than normal oxygen concentration in the arterial blood, and increase their secretion of

erythropoietin into the blood. This stimulates a greater rate of red blood cell production in the red bone marrow. This will correct anemia, and therefore the oxygen concentration in the blood, if there are enough raw materials and co-factors (e.g. iron, vitamin B₁₂ and folic acid) to manufacture the extra red cells.[15,17] The Hb values observed in both the groups after the diet intervention indicate achievement of better health indices among the subjects.

Limitations:

The EPI parameters assessed in this study are limited to Integral Area and Integral Entropy. Further research may include Activation Coefficient (a measure of stress) in their study of EPI parameters which could help in understanding the health status of the subjects by diet intervention. The sample size for the present study is limited to 58 in number. A larger sample may be probably taken up for future studies for better representation of the scientific results and validity.

Conclusion:

Based on the current study, the result shows that coconut group was more beneficial at the health level both at physical and psychological levels. At physical level the disorder in the energy levels of coconut group is less than groundnut group though marginally. Also at

the psychological level, the personality scores are better in coconut group than groundnut group. Within the scope of the present study the coconut diet group was beneficial at health, energy flow level, improvement in personality scores than the groundnut diet group. Thus the present study will add to the strength that GDV technique and GIN may be used as an assessment tool on the health of the subjects both at physical and mental levels with specific coconut diet administered for a period of 90 days.

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