

Original Research Article

An Observation into Random Blood Glucose, Autonomic, Respiratory and Hematological Parameters in Vegetarians and Non-Vegetarians of Karukutty Village, Kerala State

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ABSTRACT

Background and objectives: Researchers reported that vegetarian diets are beneficial in the prevention and treatment of certain diseases, such as cardiovascular disease, hypertension, diabetes, cancer, osteoporosis, renal disease and dementia, as well as diverticular disease, gallstones and rheumatoid arthritis. The present study was undertaken to observe random blood glucose, autonomic, respiratory, hematological parameters in vegetarians and non-vegetarians and to create awareness among the general population.

Methodology: The present study has been performed at Little Flower Medical Research Centre, Angamaly, Kerala, India. Four hundred and twenty males and females of Karukutty village, Kerala with mean age 37+/- 18 were enrolled comprising two hundred vegetarians and two hundred and twenty non vegetarians. Random blood glucose is measured by using one touch ultra mini glucometer; Measurement of blood pressure was performed by using sphygmomanometer. Saturation of hemoglobin and pulse rate was measured by using Pulse Oximeter. Bleeding time was estimated by Duke Method and clotting time was estimated by capillary tube method.

Results: In the present study we have observed higher random blood glucose levels in vegetarians than non-vegetarians. When compared with in males, vegetarians are having lower random blood glucose levels than non-vegetarians. In contrast when compared with in females, vegetarians are having higher blood glucose levels than non-vegetarians. We have observed higher bleeding time in vegetarians. The same result is observed when compared with in males and within females also. We have observed equal clotting time in males and females. When compared with in males, vegetarians are having shorter clotting time than non-vegetarians. In contrast female vegetarians are having longer clotting time than female non-vegetarians. Higher systolic and diastolic blood pressure is observed in vegetarians. When compared with in males, both vegetarians and non-vegetarians are having equal systolic and diastolic pressure. When

compared with in females, vegetarians are having higher systolic and diastolic pressure than non-vegetarians. Higher pulse rate is observed in vegetarians than non-vegetarians. When compared within males and females, higher pulse rate is observed in vegetarians. Equal Spo₂ is observed in vegetarians and non-vegetarians and the same is observed when compared with in males. But when compared with in females, vegetarians are having slightly lower Spo₂ than non-vegetarians.

Conclusion: We conclude that blood glucose, bleeding time, clotting time, blood pressure and pulse rate varies in vegetarians and non-vegetarians. These effects are different in males and females. . Hence this study certainly merits continuation of the work with more investigations in the field by increasing parameters and sample size to confirm the results.

Key words: Blood glucose, Vegetarians, Non-vegetarians.

INTRODUCTION

India might be the only nation in the world, which has more number of people following vegetarianism in it compared to rest of the globe.^[1] The benefits of vegetarian diet arises from lower intakes of saturated fat, cholesterol and animal protein as well as higher intakes of complex carbohydrates, dietary fiber, magnesium, folic acid, vitamin C and E, carotenoids and other phytochemicals. Well-balanced vegetarian diets are appropriate for all stages of the life cycle, including children, adolescents, pregnant and lactating women, the elderly and competitive athletes. In most cases, vegetarian diets are beneficial in the prevention and treatment of certain diseases, such as cardiovascular disease, hypertension, diabetes, cancer, osteoporosis, renal disease and dementia, as well as diverticular disease, gallstones and rheumatoid arthritis.^[2] The vegetarian diet is associated with lower levels of important cardiovascular disease risk factors.^[3] Vegetarians are at lesser risk for obesity, atonic constipation, lung cancer, and alcoholism. Evidence is good that risks for hypertension, coronary artery disease, type II diabetes, and gallstones are lower.^[4] The associations between meat consumptions and diabetes were stronger in males than females.^[5] The total number of white blood cells, lymphocytes, and other sub-populations did not differ between vegetarians and non-vegetarians however

enhanced natural cytotoxicity may be one of the factors contributing to the lower cancer risk shown by vegetarians.^[6] The BMIs were significantly lower for men and women on the high carbohydrate diet; the highest BMIs were noted for those on a low carbohydrate diet.^[7] Vegetarian diets will produce very significant metabolic advantages for the prevention and treatment of diabetes and its complications.^[8] Strict vegetarians have lower blood pressures.^[9]

Consumption of food of animal origin was highly significantly associated with systolic and diastolic BP after the age and weight effects were removed.^[10] Vitamin B12 and iron status were compromised by a vegetarian diet.^[11]

The present study was undertaken to observe random blood glucose, autonomic, respiratory, hematological parameters in vegetarians and non-vegetarians and to create awareness among the general population.

MATERIALS AND METHODS

Study design and Participants

The present study has been performed at Little Flower Medical Research Centre, Angamaly, Kerala, India. Four hundred and twenty males and females of Karukutty village, Kerala with mean age 37+/- 18 were enrolled comprising two hundred vegetarians and two hundred and twenty non vegetarians. Confirmed strict vegetarians who consume predominantly

foods of plant origin, with milk and other dairy products were included in vegetarian group and those consuming foods of plant and animal origin were included in non-vegetarian group.

Random blood glucose

Random blood glucose is measured by using one touch ultra mini glucometer. [12]

Autonomic and respiratory parameters

Measurement of systolic and diastolic blood pressure (SBP,DBP) was performed by using sphygmomanometry. [11] Saturation of hemoglobin and pulse rate is measured by using Pulse Oximeter.

Pulse Oximetry is a non-invasive method allowing the monitoring of the saturation of hemoglobin and pulse rate (PR).The Oximeter uses oximetry to measure functional oxygen saturation in blood. Pulse Oximeter works by applying the sensor to a pulsating arteriolar vascular bed, such as a finger or toe. The sensor contains dual light source and a photonic detector. Bone, tissue, pigmentation, and venous vessels normally absorb a constant amount of light over time. The arteriolar bed normally pulsates and absorbs variable amounts of light during the pulsations. The ratio of light absorbed is translated into a measurement of functional oxygen saturation (SpO₂).Because a measurement of SpO₂ is depend upon light from the sensor, excessive ambient light can interfere with this measurement.

Pulse Oximetry is based on two principles

- Oxyhaemoglobin and deoxyhaemoglobin differ in their absorption of red and infrared light.
- The volume of arterial blood in tissue (hence light absorption by the blood) changes during the pulse.

The Oximeter determines SpO₂ by passing red and infrared light into an arteriolar bed and measuring changes in light absorption during pulsatile cycle.Red

and infrared low – voltage light emitting diodes (LED) serves as light sources; a photonic diode serves as the photodetector. Because oxyhaemoglobin and deoxyhaemoglobin differ in light absorption, the amount of red and infrared light absorbed by blood is related to hemoglobin oxygen saturation. To identify the oxygen saturation of arterial hemoglobin, the Oximeter uses the pulsatile nature of arterial flow.

During systole, a new pulse of arterial blood enters the vascular bed, and blood volume and light absorption increase. During diastole, blood volume and light absorption reach their lowest point.The Oximeter bases its SpO₂ measurements on the difference between maximum and minimum absorption (measurements at systole and diastole).by doing so, it focuses on light absorption by pulsatile arterial blood, eliminating the effects of non – pulsatile absorption by tissue, bone and venous blood.

Hematological parameters

Bleeding time (BT) was estimated by Duke Method and clotting time (CT) was estimated by Capillary tube method. [13]

Procedure

All the subjects visited the Department of physiology in Little Flower Medical Research Centre at 9 am in the morning for the convenience. After signing the voluntary informed consent form random blood glucose, autonomic, respiratory and hematological parameters were observed and recorded.

Ethical committee approval

Study protocol was approved by Institutional Ethics Committee of Little Flower Medical Research Centre, Angamaly.

Data analysis

The analysis of data is done by SPSS 20.0.Independent-Samples t Test is used for data analysis and level of significance is set at 5%.

RESULTS

Table no: 1 Mean values of the parameters in vegetarians and non-vegetarians.

Variables	Vegetarians	Non-Vegetarians	P value
Blood glucose(mg%)	100.27±29.31	98.69±26.52	0.690
Bleeding time(seconds)	74.70±36.80	67.50±35.77	0.162
Clotting time(seconds)	271.50±85.96	271.80±77.32	0.979
SBP(mmHg)	116.44±9.84	114.11±13.80	0.171
DBP(mmHg)	81.40 ± 10.25	77.89±11.81	0.026
PR(per minute)	92.68 ± 2.60	88.93 ± 9.45	<0.001
SPo ₂ (%)	0.99 ± 0.02	0.99±0.01	0.517

The analysis of data is presented in table no: 1. Mean random blood glucose levels are slightly higher in vegetarians (100.27±29.31mg%) than non-vegetarians (98.69±26.52mg%), however this variation is not statistically significant (p value 0.690). Mean bleeding time is slightly higher in vegetarians (74.70±36.80 sec) than non-vegetarians (67.50±35.77 sec), however this variation is not statistically significant (p value 0.162). Mean clotting time is equal in both vegetarians and non-vegetarians. Mean systolic blood pressure is slightly higher in vegetarians (116.44±9.84 mmHg) than non-

vegetarians (114.11±13.80 mmHg), however this variation is not statistically significant (p value 0.171). Mean diastolic blood pressure is higher in vegetarians (81.40 ± 10.25 mmHg) than non-vegetarians (77.89±11.81 mmHg) and this variation is statistically significant (p value 0.026). Mean pulse rate is higher in vegetarians (92.68 ± 2.60/min) than non-vegetarians (88.93 ± 9.45/min) and this variation is statistically significant (p value <0.001). SpO₂ is equal in both vegetarians and non-vegetarians.

Comparison of the parameters in male vegetarians and non-vegetarians

Table no: 2 Mean values of the parameters in male vegetarians and non-vegetarians.

Variables	Vegetarians	Non-Vegetarians	P value
Blood glucose(mg%)	94.42±15.00	97.96±22.43	0.356
BT(seconds)	83.40±40.43	71.40±35.28	0.117
CT(seconds)	264.60±76.35	274.20±77.86	0.535
SBP(mmHg)	115.80±7.85	115.64±13.02	0.941
DBP(mmHg)	80.20±7.42	80.02±8.57	0.911
PR(per minute)	92.58±2.60	89.30±11.35	0.049
SPo ₂ (%)	0.99±0.01	0.99±0.01	0.574

Mean blood glucose levels are slightly lower in male vegetarians (94.42±15.00mg%) than male non-vegetarians (97.96±22.43 mg%). However this variation is not statistically significant (p value 0.356). Mean bleeding time is higher in vegetarians (83.40±40.43 sec) than non-vegetarians (71.40±35.28). However this variation is not statistically significant (p value 0.117). Mean clotting time is lower in vegetarians (264.60±76.35 sec) than non-

vegetarians (274.20±77.86 sec). However this variation is not statistically significant (p value 0.535). Mean systolic and diastolic pressures are equal in vegetarians and non-vegetarians. Mean pulse rate is higher in vegetarians (92.58±2.60/min) than non-vegetarians (89.30±11.35/min) and this variation is statistically significant (p value 0.049). Mean SpO₂ is equal in both drinkers and non-drinkers.

Comparison of the parameters in female vegetarians and non-vegetarians

Table no: 3 Mean values of the parameters in male vegetarians and non-vegetarians.

Variables	Vegetarians	Non-Vegetarians	P value
Blood glucose (mg%)	106.12±37.96	99.42±30.29	0.332
BT (seconds)	66.00±30.90	63.60±36.18	0.722
CT (seconds)	278.40±94.88	269.40±77.50	0.605
SBP	117.08±11.54	112.58±14.50	0.089
DBP	82.60±12.42	75.76±14.11	0.012
PR	92.78±2.63	88.56±7.16	<0.001
SPo2	0.98±0.02	0.99±0.01	0.694

Mean value of random blood glucose is higher in female vegetarians (106.12±37.96 mg%) than non-vegetarians (99.42±30.29 mg%). However this variation is not statistically significant (pvalue0.332). Mean bleeding time and clotting time are higher in female vegetarians (66.00±30.90 sec) (278.40±94.88 sec) than female non-vegetarians (63.60±36.18 sec) (269.40±77.50). However this variation is not statistically significant (p value 0.722) (p value 0.605). Mean systolic blood pressure is higher in female vegetarians (117.08±11.54 mmHg) than non-vegetarians (112.58±14.50mmHg). However, this variation is not statistically significant (p value 0.089). Mean diastolic pressure is higher in female vegetarians (82.60±12.42 mmHg) than female non-vegetarians (75.76±14.11 mmHg) and this variation is statistically significant (p value 0.012). Mean pulse rate is higher in female vegetarians (92.78±2.63/ min) than female non-vegetarians (88.56±7.16/min) and this variation is statistically significant (p value <0.001).

Mean spo₂ is slightly lower in female vegetarians (0.98±0.02%) than female non-vegetarians (.0.99±0.01%). However, this variation is not statistically significant (p value 0.694).

DISCUSSION

It was reported that vegetarian diet was associated with improved nutrient intake and associated reductions in blood

glucose and lipid levels.^[14] Vegetarian diet is more effective than a conventional diet for managing diabetes.^[15] In contrast it was reported that there was no differences in blood glucose in vegetarians and non vegetarians.^[16] In the present study we have observed higher random blood glucose levels in vegetarians than non vegetarians. When compared with in males, vegetarians are having lower random blood glucose levels than non-vegetarians. In contrast when compared with in females, vegetarians are having higher blood glucose levels than non-vegetarians.

Highly significant rise in platelet linoleic acid concentration and a decline in platelet arachidonic acid concentration in both vegetarian subgroups as compared with omnivorous controls. Serum thromboxane and prostacyclin levels as well as results of platelet aggregation studies did not differ among the groups tested.^[17] It was reported that vegetarians are having low platelet count.^[18] We agree with these studies as we have observed higher bleeding time in vegetarians. The same result is observed when compared with in males and within females also.

Vegetarian diet/fasting may have a beneficial influence on the concentration of serum peroxides and plasma fibrinogen concentration.^[19] The effect of dietary components on plasma fibrinogen levels is modest. Dietary components that were expected to have an effect on fibrinogen, but

for which no association was observed are black and green tea.^[20]

In the present study we have observed equal clotting time in males and females. When compared with in males, vegetarians are having shorter clotting time than non-vegetarians. In contrast female vegetarians are having longer clotting time than female non-vegetarians.

Vegetarians are having significantly lower blood pressure than non-vegetarians. Both groups excreted the same amounts of sodium, while potassium excretion was significantly higher in the vegetarians.^[21] It was presumed that the low blood pressure was due to a low sodium intake by the vegetarians. The few existing studies on vegetarians in developed countries also report lower blood pressures than in non-vegetarians.^[22-26] Vegans, have a lower prevalence of hypertension and lower systolic and diastolic blood pressures than meat eaters, largely because of differences in body mass index.^[27] In contrast we have observed higher systolic and diastolic blood pressure in vegetarians. When compared with in males, both vegetarians and non-vegetarians are having equal systolic and diastolic pressure. When compared with in females, vegetarians are having higher systolic and diastolic pressure than non-vegetarians.

Ambulatory systolic blood pressure and heart rates were lower in the vegetarian group during the working day. The preprandial rise in diastolic pressure was attenuated on the vegetarian diet. In contrast higher pulse rate is observed in vegetarians than non-vegetarians. When compared within males and females, higher pulse rate is observed in vegetarians.

In the present study we have observed equal SpO_2 in vegetarians and non-vegetarians and the same is observed when compared with in males. But when compared with in females, vegetarians are

having slightly lower SpO_2 than non-vegetarians

CONCLUSION

We conclude that blood glucose, bleeding time, clotting time, blood pressure and pulse rate varies in vegetarians and non-vegetarians. These effects are different in males and females. . Hence this study certainly merits continuation of the work with more investigations in the field by increasing parameters and sample size to confirm the results.

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