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RESEARCH ARTICLE

“EFFECT OF ASHGOURD JUICE ON ANTHROPOMETRIC AND BIOCHEMICAL VARIABLES AMONG HEALTHY VOLUNTEERS - A COHORT STUDY”

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Abstract

Background & Objective: Ash gourd has antioxidant, anti-inflammatory, analgesic, antiasthmatic, diuretic, nephroprotective, antidiabetic, hypolipidemic, and antimicrobial effects. Flavonoids, glycosides, saccharides, proteins, carotenes, β -sitosterol were the main components. Chemical analysis showed that the main sugars in the Benincasa hispida peels were galactose, glucose, xylose, and sorbose and the edible portion contains 96.3% moisture, 0.12% acidity, and 0.5% minerals. The mineral content in ash gourd follows the order: Na>Ca>Fe>Zn>K>Mn, which are important for maintaining homeostatic balance. Drinking ash gourd juice also aids in weight loss. Hence the present study is to evaluate the effect of ash gourd on anthropometric and biochemical variables of healthy individuals.

Methods: In this study, 60 subjects were advised to drink 200ml of ash gourd juice for 4 days in a week. Baseline data for Anthropometric measurement, Biochemical variables, and Depression Anxiety Stress Score, were taken before the study and after 3 months of the study. Data was analyzed using appropriate statistical tests.

Results: The result showed significant impact of ash gourd juice on anthropometric variables. There was reduction in weight, BMI, waist-hip ratio, Triceps-SKF, and Subscapular-SKF measures. On analysis, Total cholesterol, Triglyceride, LDL cholesterol, HDL cholesterol, Urine pH and NLR showed significant reduction $p < 0.05$. A significant change in DASS21 adds value to psychological well-being. There was no change in Lymphocytes, Neutrophils, and VLDL cholesterol parameters.

Conclusion: There was significant impact of ash gourd juice on parameters like Anthropometry height, weight, waist circumference, hip circumference, BMI, skinfold thickness and biochemical variables, Total cholesterol, Triglyceride, LDL cholesterol, HDL cholesterol, Urine pH and NLR. The result of the DASS21 questionnaire in the study shows evidence to enhance mental health and well-being. Hence,

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Ash gourd juice may be beneficial in metabolic disorders and inflammatory conditions.

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Introduction:-

Ash gourd is a locally available vegetable that belongs to the Cucurbitaceae family and was discovered in a wild form on the beaches of Java and Japan. India, China, the Philippines, and many other Asian countries rely heavily on ash gourd as a vegetable crop. Latin America and the Caribbean also grow it.¹ It is cultivated more or less throughout India and warm countries.² All parts of fruits of ash gourd can be used as a medicine.³ Several evidences revealed that the ash gourd has exerted many pharmacological activities like antioxidant, anti-inflammatory, analgesic, anti-asthmatic, diuretic, nephroprotective, antidiabetic, hypolipidemic, and antimicrobial effects.⁴ The major constituents were volatile oils, flavonoids, glycosides, saccharides, proteins, carotenes, vitamins, minerals, β -sitosterol, and uronic acid.⁵ A significant group of natural products are flavonoids; specifically, they are a group of secondary plant metabolites with a polyphenolic structure that are prevalent in fruits, vegetables, and some drinks. They have a variety of beneficial biochemical and antioxidant properties linked to several illnesses, including cancer, Alzheimer's disease AD, atherosclerosis, etc.⁶⁻⁹ Drinking ash gourd juice also helps in weight loss management. The plant contains high amounts of vitamins B1 0.04 mg 4.42%, B2 0.145 mg 11.15%, B3 0.528 3.30%, B5 0.176 mg 3.52%, B6 0.046 mg 3.54% and Vit. C, 17.2 mg 19.11% per 100g of edible portion.¹⁰ Because of its low calorific value ash gourd is highly useful for diabetic and obese people by preventing the conversion of sugars into fat.¹ It also contains many other bioactive compounds, such as isovitexin, 1-sinapoylglucose, benzylalcohol-O-1-arabinopyranosyl-1-6-d-glucopyranoside, somultiflorenyl acetate, 5-gluten-3-ylacetate, alnusenol, and multiflorenol.¹¹ Due to the high levels of dietary fiber and lipids in ash gourd, the polyphenols linked to dietary fiber and sugar interact, increasing their bioavailability. Ash gourd dietary fibers exhibit strong pre-biotic action.¹² The functionally important bioactive and therapeutic compounds phenolics, sterols, and glycosides of ash gourd can be used for the treatment of epilepsy, ulcers, and other nervous disorders. Inflammation is the root cause of almost all diseases and the acidic pH of the stomach is the main cause of chronic gastritis, ulcers, and acidity. Stomach pH is maintained at pH ~1 and it can be changed into acidic due to changes in lifestyle, food, stress, etc. This pH has a direct influence on the epithelial layer, chlorine ion acts as a counter ion for potassium flux across the membrane thereby reducing alkalinity. The antacid action of ash gourd helps maintain body pH and counteracts acidity caused by some foods.¹⁰ The presence of terpenes, flavonoid C, glycosides, and sterols makes it a potent antioxidant. The ulcer index decreases as a result of the reduction in damage to the gastric mucosa.¹³

Method:-

It is a cohort study, the subjects were recruited from SDM College of Naturopathy and Yogic Sciences, Ujire. Out of the 200 subjects screened, 60 subjects were recruited based on inclusion and exclusion criteria. Individuals who fulfilled the inclusion and exclusion criteria were shown information sheet having details regarding the nature of study and intervention to be used. They were given the opportunity to ask any questions. An informed consent was obtained. Volunteers without a medical history were accepted, but those who were gravely ill, unwilling to participate in the study, or who disliked the intervention were not included. Following the intervention, the participants were observed for three months, and assessments were completed both before and after the intervention. (Figure 1) Approval was obtained from SDM institutional ethical committee (EC-439). Trial was registered under Clinical Registry of India with registration number CTRI/2022/01/039367.

Anthropometric Measurements

The most popular anthropometric measure is body mass index BMI, which is a marker for generalized adiposity and is calculated as body weight in kg divided by height in meter² squared.¹⁴ Height was measured using the Stadiometer, which comprises a ruler and a sliding horizontal headpiece that may be placed above the head to measure height.¹⁵ And weight is measured using digital weighing flat scales SECA code 874

Waist Hip Ratio:

Waist circumference WC and hip circumference were also measured by the same observer and the waist to hip ratio WHR is calculated.

Skinfold thickness:

It will be measured by using a Harpenden caliper.

Urine Ph Analysis

Midstream urine is collected for pH analysis using Digital pH meter.

Lipid Profile And NLR:

After an overnight fast of 10 to 12 hours, blood samples were taken using a suction venous puncture. Before collection, the subjects were told not to engage in strenuous activity for 24 hours and/or to abstain from alcohol for 72 hours. Laboratory analyses of complete blood count and lipid profile were performed within 4 hours after blood collection using the Dry- Chemistry method.

Depression, Anxiety, & Stress Analysis:

DASS21 questionnaire is a set of three self-report scales designed to measure the emotional states of depression, anxiety, & stress, sum scores are computed by adding up the scores on the items per sub scale & multiplying them by a factor of 2, thus range between 0-120 & each subscale may range between 0 & 42. Subjects were given to answer the DASS21 questionnaire which is designed to measure the emotional states of depression, anxiety, & stress.

Intervention

Subjects were distributed with 200ml water bottle with milliliter markings. Subjects were asked to drink 200ml Ash gourd juice 4 times in a week for up to 3 months. This intervention was carried out for 3 months. They were advised to restrict intake of Meat, Alcohol. They were informed to update regarding diet, alcohol ingested during this period and also to maintain a diary to update weight, food intake, water intake, and exercise if done for three months. No dietary modifications were done.

Statistical Analysis

The normality of the data was assessed using Kolmogorov–Smirnov tests. We expressed data in mean \pm standard deviation. Effect of intervention was analyzed using paired Student's t-test for dependent samples test or Wilcoxon signed-rank test based on data distribution. The jamovi project 2022. jamovi. Version 2.3 software for statistical analysis was used. $P < 0.05$ was set as statistically significant.

Results:-

The present study was conducted to evaluate the effect of Ash gourd juice on Anthropometry and Biochemical variables in healthy individuals. Data was obtained after screening 200 individuals out of which 60 were eligible based on the inclusion criteria. Obtained data were analyzed for normal distribution using Kolmogorov smirnov test.

Normally distributed data were analyzed further using paired t test. within the group paired t-test, and wilcoxon signed rank test was done for statistical evidence.

Within the group the effect of ash gourd juice on the lipid profile is represented in the table 2 on analysis pre- and post-data of Triglyceride, LDL, HDL, and Cholesterol show a significant change and impact an individual lipid score, whereas VLDL level were not statistically satisfied. Complete blood count data shows statistical significance with NLR but neutrophils, lymphocytes were unsatisfied. Impact on anxiety, stress, depression depicted via DASS score showed a positive result. On comparison post values of urine pH was significant change was found statistically.

Discussion:-

In this study the impact of ash gourd juice on anthropometric variables was significant. There was a decrease in the values of weight, BMI, waist-hip ratio, Triceps-SKF, and Subscapular-SKF. Based on the analysis changes were noticed in the values of Total cholesterol, Triglyceride, LDL cholesterol, HDL cholesterol, and NLR and showed statistical significance $p < 0.05$. Change in urine pH levels were statistically significant. However biochemical variables like Lymphocyte, Neutrophils, and VLDL cholesterol show no change.

Triterpene TTA is one of the compounds found in ash gourd. SOD protects tissues from oxygen free radicals by catalyzing the removal of superoxide radicals, which damage membranes and biological structures. When diabetic rats were given TTA, their SOD activity increased, resulting in the removal of superoxide radicals and hydrogen peroxide.¹⁶ As a result, TTA aids in decreased lipid peroxidation, which is linked to improved SOD activity. Diabetes-related dyslipidemia may potentially be reversed, as well as cardiovascular problems, which are common in diabetic individuals. The observed effects could have been caused by any of these active principles. As a result, ash gourd juice can be utilized to aid in the decrease of TC and TG in patients at risk of metabolic disorders and dyslipidemia.

The NLR is a simple biomarker that provides information regarding inflammatory diseases. Furthermore, epidemiological studies have shown that chronic inflammation as evaluated by the NLR is linked to traditional risk factors such as diabetes, hypertension, metabolic syndrome, obesity, smoking, and high cholesterol levels. The severity of disorders with an inflammatory component may be reflected in NLR levels.¹⁷ Because there was a significant change in NLR in this study, we can use ash gourd juice to treat obesity, dyslipidemia, and inflammatory disorders.

Stress has been studied as a potential risk factor for cardiovascular disease. The Autonomous Nervous System ANS equilibrium is influenced by stress.¹⁸ Many human diseases are caused by oxidative stress induced by free radicals. Plant-derived antioxidant supplements can protect cells from oxidative damage. Cellular enzymes such as catalases, peroxidases, and superoxide dismutase can counteract the adverse impacts of ROS or RNS. Molecular antioxidants, such as ROS scavengers, vitamins C and E, and other antioxidative compounds, can also prevent ROS and RNS formation.¹⁹ Ash gourd contains a significant quantity of phenolic and flavonoid content, which is directly associated with antioxidant activity and demonstrated as the scavenging ability of various free radicals such as DPPH, hydroxyl, superoxide nitrite, and others. The current study's major purpose was to analyze DASS21, which showed significant changes in each domain and can thus be recommended in patients suffering from stress, anxiety, and depression.

Low levels of white blood cell count are associated with a high vegetable intake.²⁰ Previous research has linked the microbiome to blood cell dynamics, such as neutrophil-to-lymphocyte ratios, which have been linked to the prognosis of a variety of disorders, including inflammatory and cardiovascular disease.^{21,22,23} Because ash gourd contains dietary fibers, the ulcer index falls due to less injury to the gastrointestinal mucosa.¹³ It may aid in the reduction of gut dysbiosis and is recommended for ulcer and gastritis problems.

Strengths of the study:

1. It was a pre- post study with clinical application.
2. Feasible and easily affordable.

Limitations:

1. Smaller sample size.
2. It's an experimental design without control group.
3. No follow up assessments done to understand the long-term benefits.

Directions for future research:

1. Study can include larger sample size.
2. Longer intervention period and follow up for better outcome.
3. Uniform diet module for better results.

Conclusion:-

The study shows a significant impact of ash gourd juice on healthy individuals. positive evidence of ash gourd juice on parameters like Anthropometry height, weight, waist circumference, hip circumference, BMI, skinfold thickness Biochemical variables like total cholesterol, Triglyceride, LDL, HDL is suggestive to deal with metabolic disorders and even help in prevention of cardiovascular disorders. There is also a significant change in NLR which being a simple biomarker is suggestive to deal with inflammatory conditions, dyslipidemia. Result of DASS21 questionnaire in the study shows evidence to enhance mental health and wellbeing. There is also a significant change in urine pH suggestive of improved alkalinity of urine.

Figures and Table

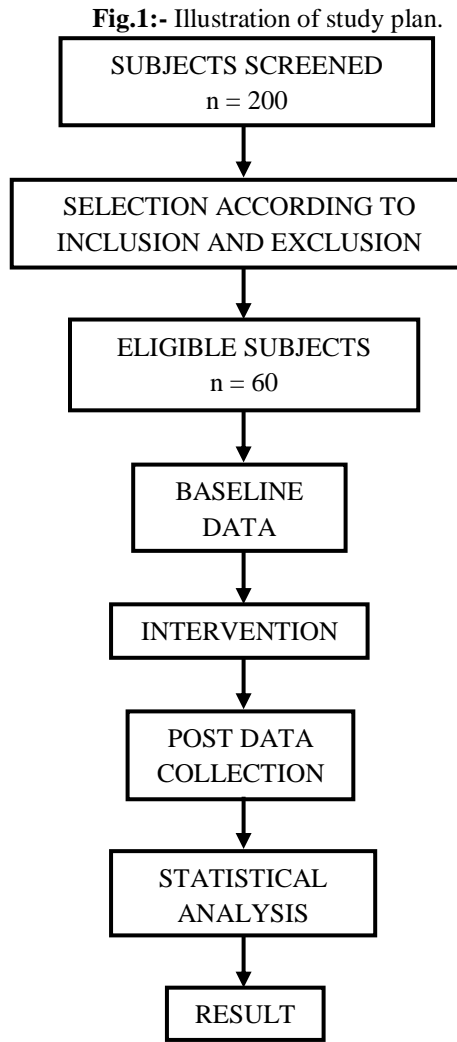


Fig. 2:- Demographic characteristics of Age and Gender.

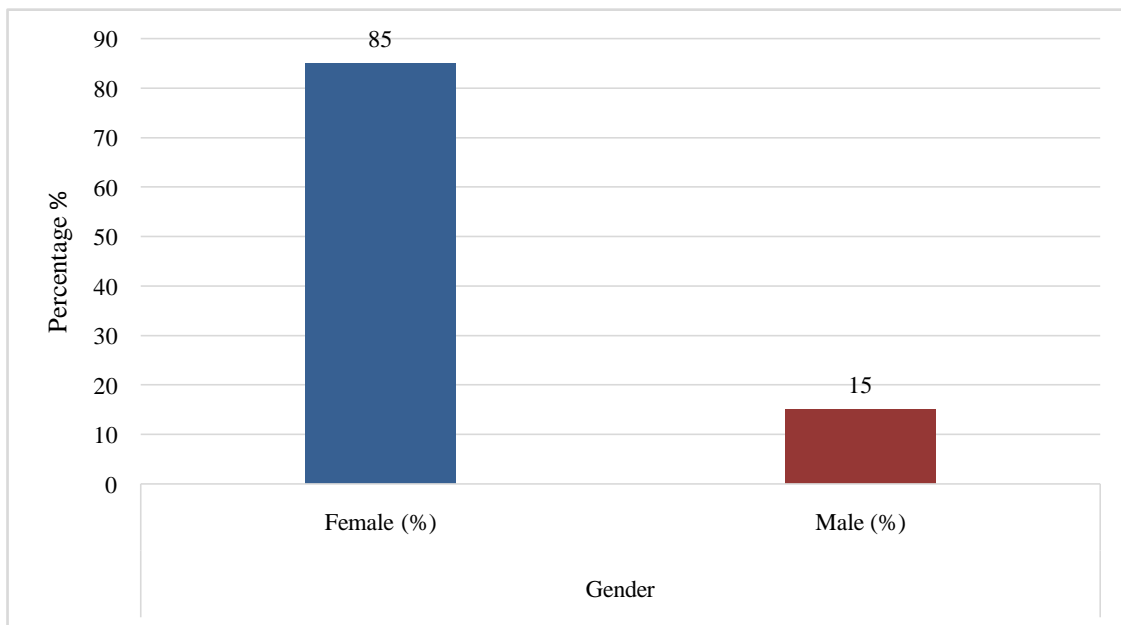
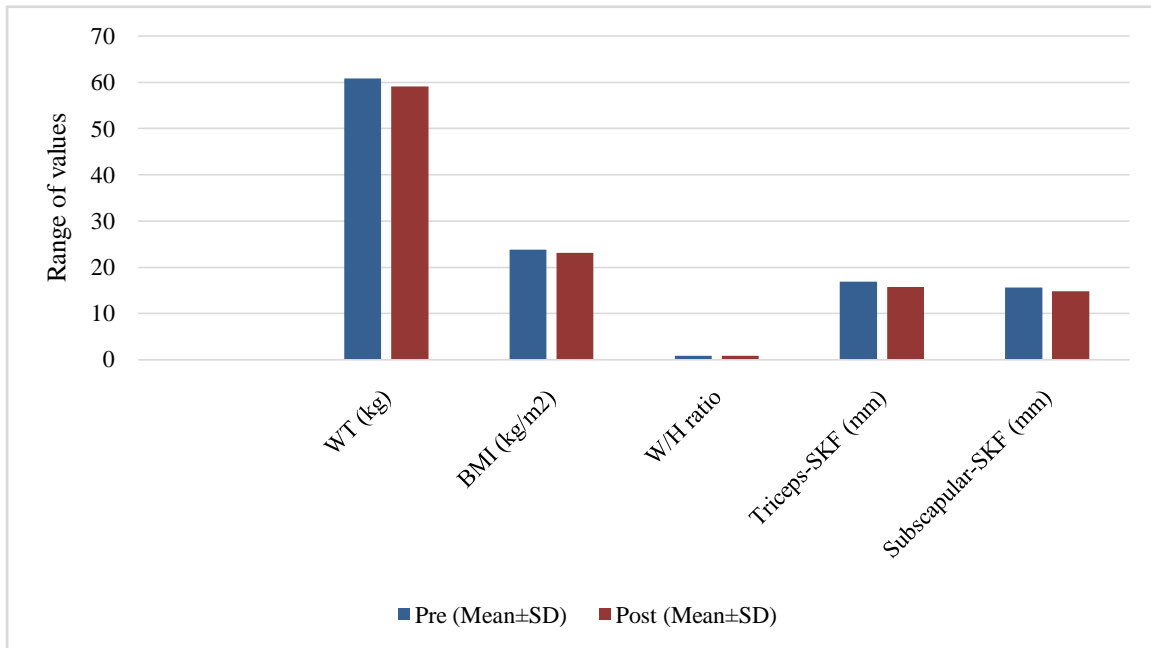


Table 1:- Demographic characteristics.

SL NO	Variables	
1	Age (Years)	22.9±1.87
2	Gender	Female (%)
		Male (%)
		85
		15

Fig. 3:- Pre and Post comparison of anthropometric variables.



Comparison of variables within the group:

Table 2:- Within group comparison of anthropometric variables among the study participants.

SL NO	Variables	Pre (Mean±SD)	Post (Mean±SD)	Mean difference	Statistic	SE difference	Effect size	P value
1	WT (kg)	60.89±14.17	59.13±13.83	1.761	10.419	0.169	0.904	<0.001 ^a
2	BMI (kg/m ²)	23.76±5.12	23.1±4.94	0.662	9.557	0.069	1.233	<0.001 ^a
3	W/H ratio	0.83±0.06	0.86±0.26	-0.02	-0.827	0.034	-0.106	<0.411 ^b
4	Triceps-SKF (mm)	16.917±6.14	15.73±5.59	1.183	5.176	0.228	0.85	<0.001 ^b
5	Subscapular-SKF (mm)	15.65±5.9	14.81±5.59	1	4.8	0.215	0.792	<0.001 ^b

*p < 0.05, a- paired t-test, b- Wilcoxon signed-rank test, WT-weight, BMI-Body mass index, W/H-waist by hip ratio, SKF-Skin fold thickness

Table 3:- Within group comparison of lipid profile among the study participants.

SL NO	Variables	Pre (Mean±SD)	Post (Mean±SD)	Mean difference	Statistic	SE difference	Effect size	P value
1	Total cholesterol (mg/dl)	172.87±34.94	157.57±30.95	15.301	4.856	3.151	0.626	<0.001 ^a
2	Triglyceride (mg/dl)	113.71±51.36	96.78±34.12	16.925	2.273	7.443	0.293	0.027 ^a
3	LDL cholesterol (mg/dl)	107.82±28.92	98.57±26.92	9.257	3.498	2.646	0.451	<0.001 ^a
4	HDL cholesterol (mg/dl)	50.36±10.46	45.15±11.55	5.21	4.81	1.083	0.621	<0.001 ^a
5	VLDL cholesterol	20.11±10.7	20.17±8.55	-0.055	-0.03	1.837	-0.003	0.976 ^a

(mg/dl)							
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*p < 0.05, a- paired t-test, LDL-Low density lipoprotein, HDL-High density lipoprotein, VLDL-Very low-density lipoprotein.

Fig. 4:- Pre and Post comparison of Lipid profile.

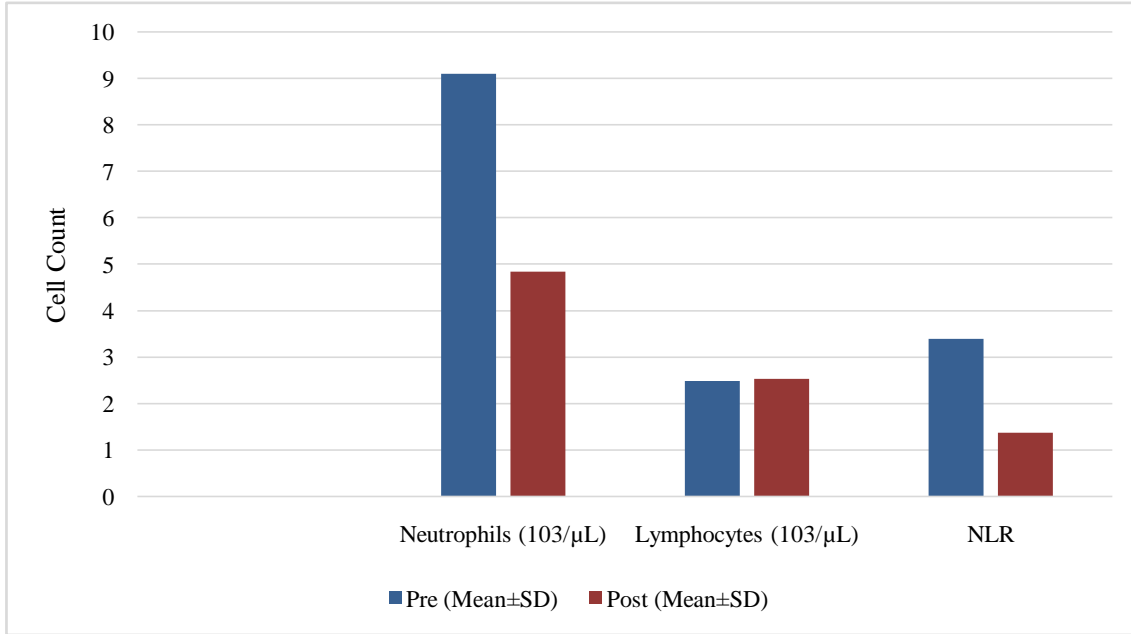


Table 4:- Within group comparison of complete blood count among the study participants.

SL NO	Variables	Pre (Mean±SD)	Post (Mean±SD)	Mean difference	Statistic	SE difference	Effect size	P value
1	Neutrophils (10 ³ /µL)	9.11±32.84	4.85±1.59	4.259	0.996	4.273	0.074	0.619 ^b
2	Lymphocytes (10 ³ /µL)	2.49±0.54	2.54±0.67	-0.043	-0.473	0.091	-0.06	0.638 ^a
3	NLR	3.4±11.57	1.38±0.64	0.667	1.379	1.522	0.533	<0.001 ^b

*p < 0.05, a- paired t-test, b- Wilcoxon signed-rank test, NLR-Neutrophils Lymphocytes ratio.

Table 5:- Within group comparison of urine pH among the study participants.

SL NO	Variables	Pre (Mean±SD)	Post (Mean±SD)	Mean difference	Statistic	SE difference	Effect size	P value
1	Urine pH	5.054±0.74	5.246±0.53	-0.19	2.08	0.092	-0.26	0.04

*p < 0.05, a- paired t-test.

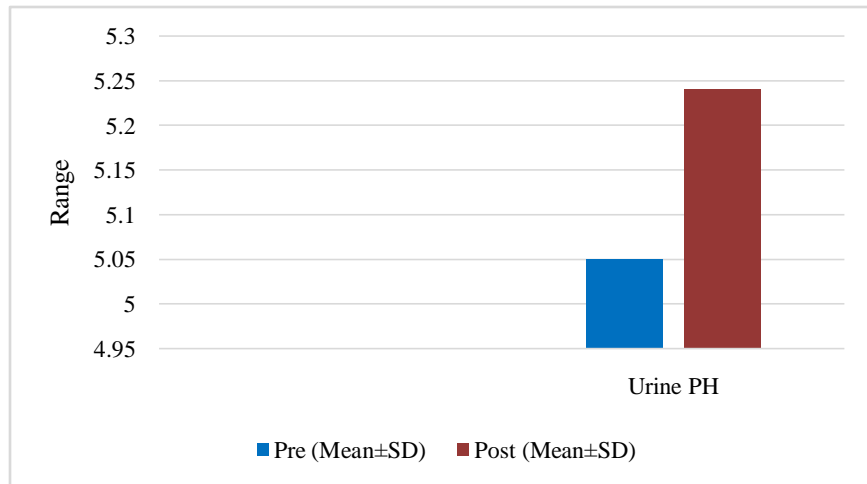


Fig.5:- Pre and Post comparison of complete blood count.

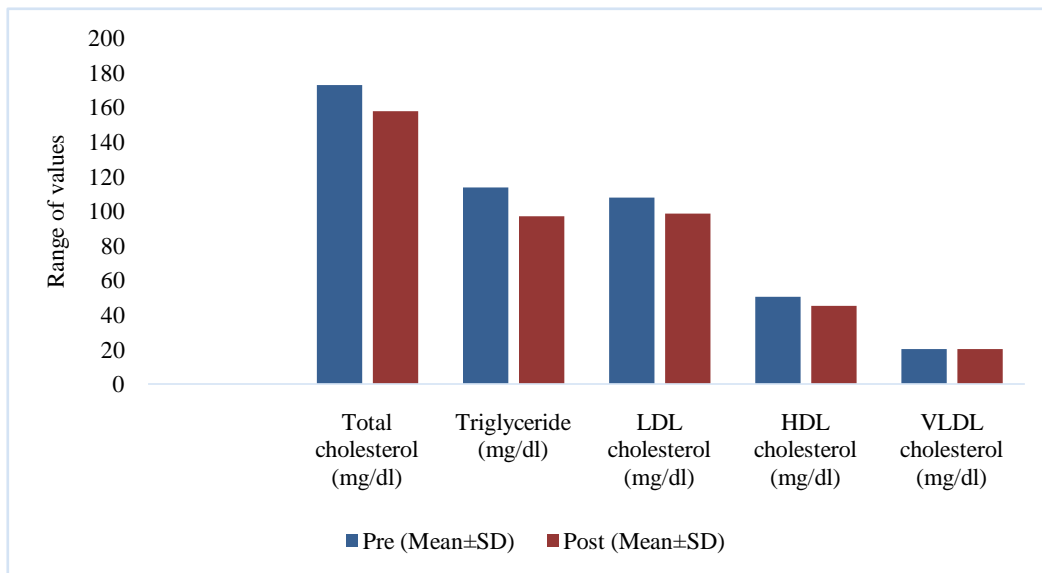
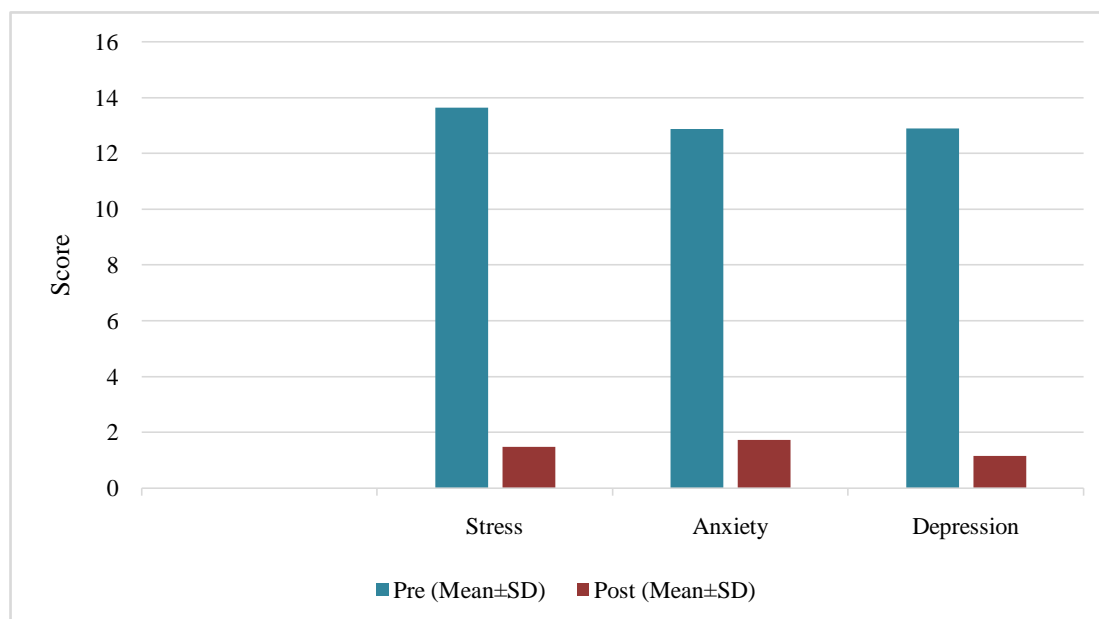


Fig. 6:- Pre and Post comparison of Urine pH.

SL NO	Variables	Pre (Mean±SD)	Post (Mean±SD)	Mean difference	Statistic	SE difference	Effect size	P value
1	Stress	13.65±7.58	1.5±1.32	12.2	12.1	1.002	1.57	<0.001 ^a
2	Anxiety	12.88±7.35	1.73±1.41	11.2	12	0.932	1.54	<0.001 ^a
3	Depression	12.9±7.66	1.17±1.39	11.7	12.3	0.956	1.58	<0.001 ^a

Table 6:- Within group comparison of DASS21 among the study participants.

*p < 0.05, a- paired t-test.

Fig.7:- Pre and Post comparison of DASS21.**Credit To Authors****Thanmaye Krishna:**

Data curation, writing-original draft preparation, **Prashanth Shetty:** Supervision. **Geetha. B. Shetty:** methodology, conceptualization.

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Conflict of interest:

None declared

Ethical approval:

The study was approved by the Institutional Ethics Committee

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