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Original Article

The Effect Of Green Tea(Epigallocatechin Gallate)A Polyphenol on High Obesesubjects In Bingham University Community

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A R T I C L E I N F O

Keywords:
Green tea,
Weight,
Slimm, Lipid,
Obese

A B S T R A C T

Background:Green Tea Epigallocatechin gallatea Polyphenol looked promising to be effective in improving metabolic health and as well reduces weight in individuals who are obese. This study aimed at investigating the effectiveness of slimming tea, specifically green tea, in improving both weight loss and metabolic health in individuals with obesity. Method:A randomized controlled trial was conducted with 132 participants, who were divided into intervention andplacebo groups. The Intervention group received green tea for a period of 12 weeks, after which body mass index (BMI), weight, and lipid profile were estimated in the subjects using enzymatic methods and Lieberman Buchman assay. Results:Statistical analyses revealed significant differences in BMI ($p < 0.001$) and weight ($p < 0.002$) between the two groups, although changes in lipid profiles, including total cholesterol and LDL cholesterol, did not reach statistical significance ($p > 0.001$); however, there was statistically significant difference in Triglycerides ($p < 0.001$). Post-hoc analyses confirmed substantial weight loss in the post intervention group compared to pre intervention groupwith statistically significant difference ($p < 0.001$). Conclusion: Overall, the findings indicated that slimming tea (polyphenol) effectively aided weight loss in participants on high-fat diets, while the short-term effects on lipid metabolism necessitated further investigation into the long-term health benefits associated with its consumption.

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Introduction

Green tea, particularly those containing green tea extracts rich in catechins like epigallocatechin gallate (EGCG), has gained popularity as a natural remedy for weight management. Obesity, characterized by excessive fat accumulation, creates major health risks, including type 2 diabetes, cardiovascular diseases, and certain cancers. Traditional weight loss methods often prove challenging for many individuals. Emerging evidence suggests that the consumption of slimming tea can enhance energy expenditure and fat oxidation, potentially aiding in weight loss[1]. Obesity is a significant global health concern, with over 1.9 billion adults classified as overweight, and 650 million categorized as obese as of 2016, according to the [2]. This condition is defined by an excessive accumulation of body fat, typically measured using Body Mass Index (BMI), where a BMI of 25-29.9 kg/m^2 is considered overweight, and a BMI of over 30 kg/m^2 is classified as obesity [2]. Obesity is a complex disorder influenced by a combination of genetic, metabolic, behavioral, and environmental factors[3].One of the major challenges with obesity is its association with various comorbidities, including type 2 diabetes, hypertension, cardiovascular diseases, and certain cancers [4].

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Additionally, obesity has been linked to numerous mental health issues, such as depression, anxiety, and sleep disturbances [5] The relationship between obesity and these health consequences highlights the critical need for effective weight management strategies.

Traditional weight loss methods, including dietary changes and increased physical activity, often face adherence challenges, prompting the exploration of alternative approaches such as the use of natural supplements. One of such supplement is green tea, particularly its extract known for its potential weight loss benefits. Green tea contains polyphenols like epigallocatechin gallate (EGCG), which have shown to enhance energy expenditure and fat oxidation, thereby promoting weight loss [6,7].

Several studies have demonstrated the positive effects of green tea catechins on weight management. For instance, research indicates that EGCG, combined with caffeine, significantly increases 24-hour energy expenditure and fat oxidation, [8,9]. These findings suggest that green tea could be an effective supplement for weight loss and maintenance. Moreover, the regular intake of green tea has been associated with reductions in body fat and improvements in cardiovascular health markers[10, 11].

The efficacy of green tea in promoting weight loss has been supported by numerous clinical trials. A study by[11] showed that obese women who consumed green tea extract experienced significant reductions in body weight and waist circumference compared to a placebo group. Similarly, another study found that a high-catechin green tea beverage reduced body fat, blood pressure, and improved metabolic health over a 90-day period [10]. These studies show the potential of green tea as a viable option for weight management, particularly for individuals struggling with high-fat levels.

However, the effectiveness of green tea may vary based on factors such as ethnicity and regular caffeine intake. For example, studies involving Asian populations have consistently reported positive outcomes, whereas results from Caucasian populations have been mixed[12,13]. Additionally,

high habitual caffeine consumption may diminish the weight loss effects of green tea catechins [9]. This variability suggests that individual differences must be considered when recommending green tea for weight management.

In general, obesity remains a critical public health issue due to its widespread prevalence and associated health risks. While traditional weight loss methods are important, the incorporation of natural supplements like green tea offers a promising adjunct strategy.

The polyphenols in green tea, particularly EGCG, have demonstrated potential in enhancing energy expenditure and fat oxidation, thus aiding in weight loss and maintenance. However, further research is needed to fully understand the variability in response among different populations and the long-term effects of green tea consumption.

This research is aimed at exploring the impact of slimming tea on individuals with high-fat levels, examining its efficacy in promoting weight reduction and improving metabolic health through both short-term and long-term studies. Understanding the potential benefits and mechanisms of action of slimming tea is crucial for developing effective, natural weight management strategies.

Materials And Methods

A total 132 participants were involved in the study and the target population includes adults aged 18-65 years, those who have been diagnosed with obesity, having body mass index (BMI ≥ 30 kg/m^2) were randomly selected and recruited into the study. The study focuses on individuals who are either staff, students, or residents within the Bingham University community and its surrounding areas.

Inclusion Criteria

- Adults aged 18-65 years.
- Body Mass Index (BMI) of 30 kg/m^2 or higher.
- Diagnosed with obesity.
- Willingness to adhere to the study protocol and attend follow-up visits.

Exclusion Criteria

- Pregnant or breastfeeding women.
- Subjects with known habits of smoking and alcoholconsumption.
- Individuals with known allergies to any components of the slimming tea.
- Patients currently participating in another weight loss program or clinical trial.
- Individuals with a history of eating disorders or severe psychiatric conditions.
- Patients on medications that may affect weight or metabolism, such as steroids or thyroid hormones.

Ethical Clearance

Ethical approval was sought and obtained from the Bingham University Ethical Clearance Committee, number BHU/FOAHS/24.06.2024.

Data Collection

Prior to specimen collection, demographic information of the participants was obtained through administration of structured questionnaires. Interpreter was provided for translation where it was necessary. Each questionnaire had a unique participant identification number (PIDN).

For reason of privacy, all data were kept confidential in accordance with World Medical Association declaration of Helsinki (WMA, 2024). For each participant, only the PIDN was recorded on the laboratory forms (no names). All the filled questionnaires were destroyed after data entry had been completed.

Statistical analysis

The demographic characteristics of the participants were expressed as mean values and standard deviation (SD). The BMI, Total Cholesterol, Triglycerides, HDL-C, and LDL-C levels between the post administration group and the pre administration group were tested by student t-test; P value < 0.001 were considered statistically significant.

The statistical package of social science (SPSS) window version 20.0 was used for all calculation and data analysis.

Results

The study included 132 participants, divided equally between the slimming tea group (pre-administration 66) and (post administration 66). Table 4.1., figure 4.1, 4.2, 4.3 summarizes the demographic characteristics, including gender and age distribution, and summarizes the gender distribution and age groups of the participants, showing that 53.0% were male and 47.0% were female, with the majority (60.6%) being in the 18-65 age group.

Table 4.1: Demographic Characteristics of Participants (n=132)

Table 4.1 and Figures 4.1 and 4.2summarizes the gender distribution and age groups of the participants, showing that 53.0% were male and 47.0% were female, with the majority (60.6%) being in the 18-35 age group.

Variable	Frequency (n)	Percentage (%)
Gender		
Male	70	53.0
Female	62	47.0
Age Group		
18-35	80	60.6
36-65	52	39.4

Fig 4.1 presents sex and percentage distribution of the participants.

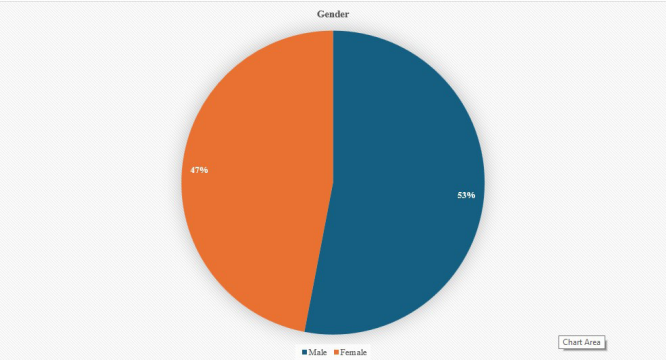
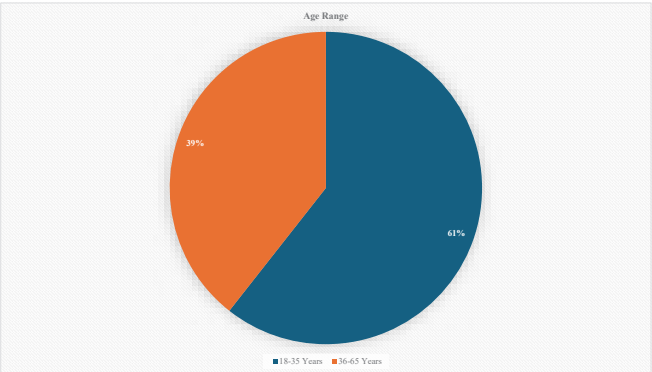


Fig. 4.2 presents age percentage and age distribution of the participants.



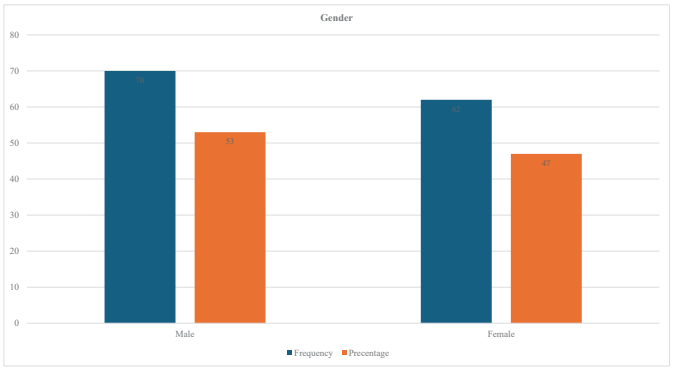


Fig. 4.3 Presents percentage and frequency sex distribution of participants.

Lipid Profile Changes Over Time

The lipid profile analysis aimed to evaluate the impact of the slimming tea onBMI, Weight, Waist, triglycerides, total cholesterol, LD-cholesterol, and HD-cholesterol, Systolic and Diastolic pressure post administration, after the 12-week period.

Initial baseline measurements indicated that the post administration group had an average total cholesterol of (4.55± 0.02), while the pre-administration group had (5.57± 0.32). After 12 weeks, the post administration group demonstrated a statistically significant reduction ($p<0.001$) as represented in tables 4.2 and 4.3 below.

The triglyceride levels in the pre-administration group decreased from a baseline of (1.74± 0.01) to post administration(1.27± 0.01) after 12 weeks. This reduction in triglycerides in the post administration group was statistically significant ($p <0.001$), as represented in tables 4.2 and 4.3 below.

The analysis of HDL cholesterol revealed that the pre administration group experienced a slight increase from (1.21± 0.01) to post administration(1.41± 0.01), However, this increase in HDL- cholesterol was not statistically significant ($p >0.001$), as represented in tables 4.2 and 4.3 below.

The analysis ofLDL cholesterol, baseline levels were (2.62± 0.01) in the post administration group and (3.21± 0.02) in the pre-administration group. The observed change in LDL cholesterol was not significant ($p >0.001$), as represented in tables 4.2 and 4.3 below.

Table 4.2,represents the mean SD of the BMI, Weight, Waist circumference, Total Cholesterol, HDL-C , LDL-C, Triglycerides, Systolic pressure and Diastolic pressure of the participant pre and post administration of the slimming tea. The association of BMI, Weight, Waist circumference, and the lipids are represented in figures 4.4 to 4.20 as shown below.

Table 4.2.

Parameters	Pre-Administration	Post-Administration	P-value
BMI (kg/m^2)	33.00 ± 0.11	30.13± 0.07	< 0.001
Weight (kg)	88.01 ± 0.39	80.36 ± 0.23	< 0.001
Waist (cm)	95.62 ± 0.25	88.07 ± 0.18	0.005
TC (mmol/L)	5.57 ± 0.32	4.55 ± 0.02	< 0.001
LDL (mmol/L)	3.21 ± 0.02	2.62 ± 0.01	0.002
HDL (mmol/L)	1.21 ± 0.01	1.41 ± 0.01	0.630
TG (mmol/L)	1.74 ± 0.01	1.27 ± 0.01	< 0.001
Systolic (mmHg)	136.17 ±0.39	123.41 ± 0.31	0.121
Diastolic (mmHg)	86.35 ± 0.21	80.50 ± 0.16	0.033

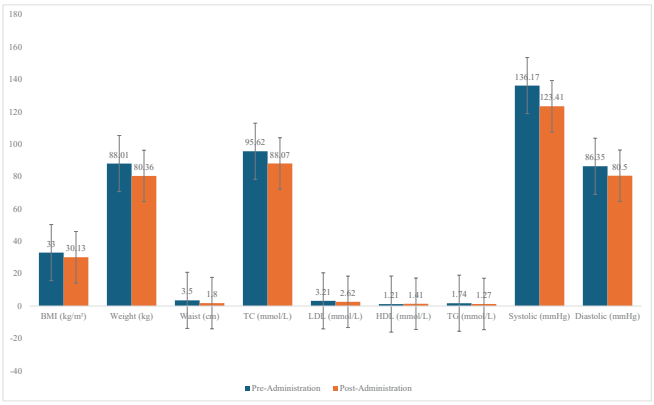


Fig.4.4. Diagrammatic representation of BMI, Weight, Waist and Lipids Pre and Post Administration

Pre-Administration

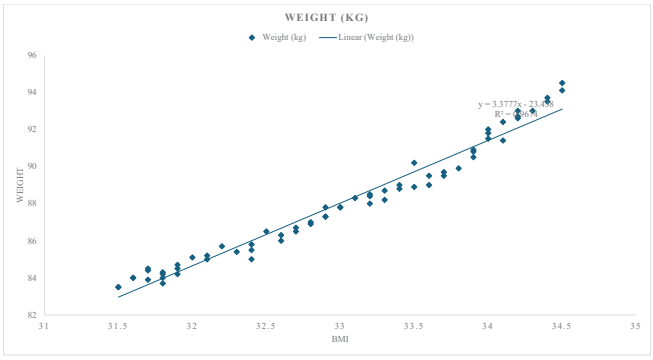


Fig 4.5. Association between BMI and Weight

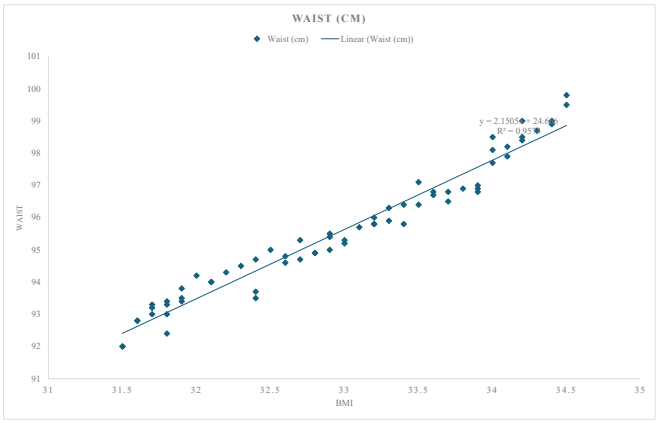


Fig 4.6 Association between BMI and Waist circumference

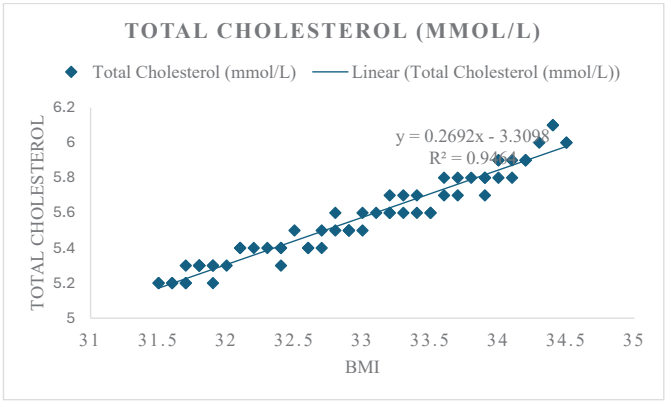


Fig 4.7 Association between BMI and Total Cholesterol

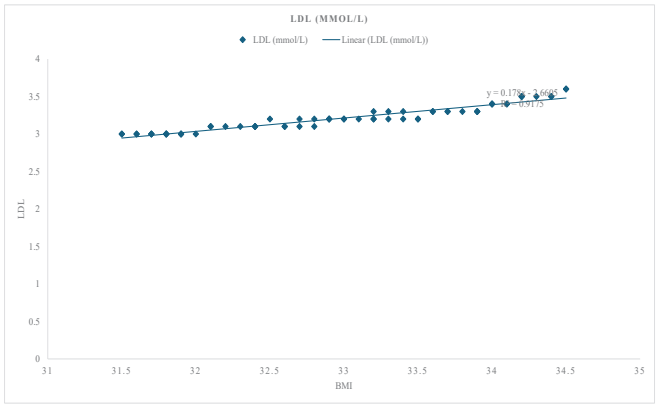


Fig 4.8. Association between BMI and LDL-C

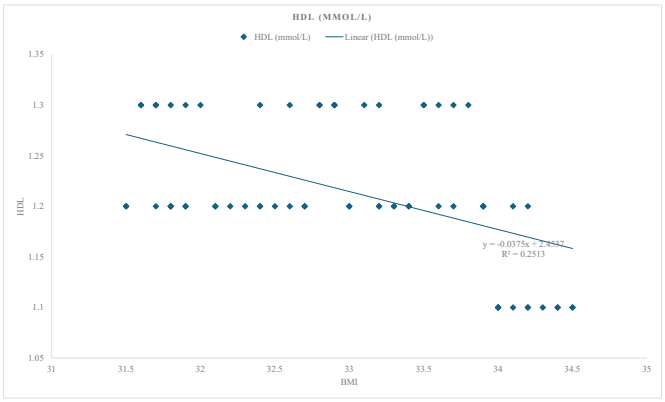


Fig 4.9. Association between BMI and HDL-C

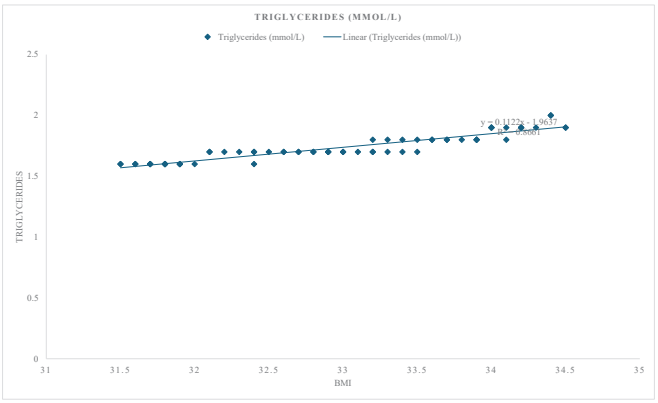


Fig 4.10. Association between BMI and Triglycerides

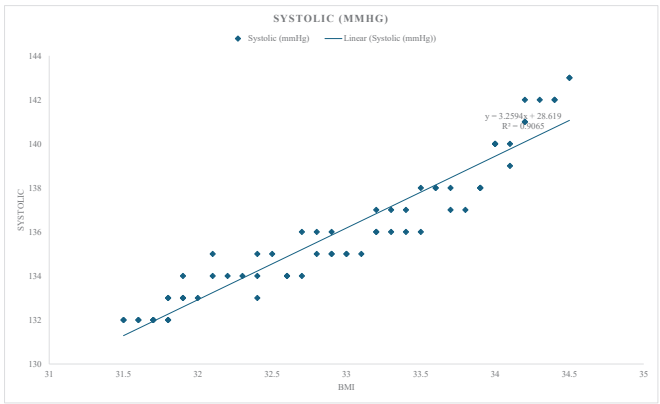


Fig 4.11. Association between BMI and Systolic Pressure

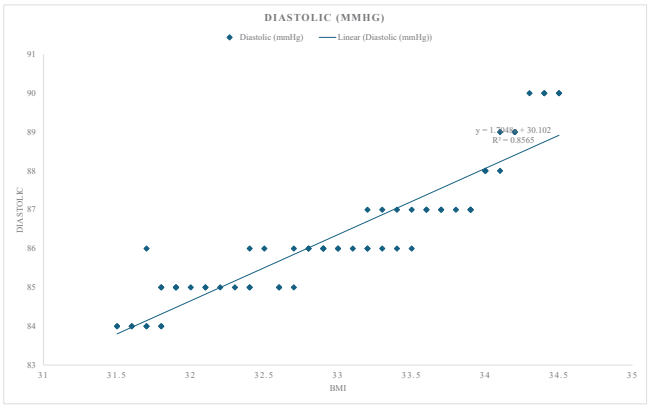


Fig 4.12. Association between BMI and Diastolic Pressure Post-Administration

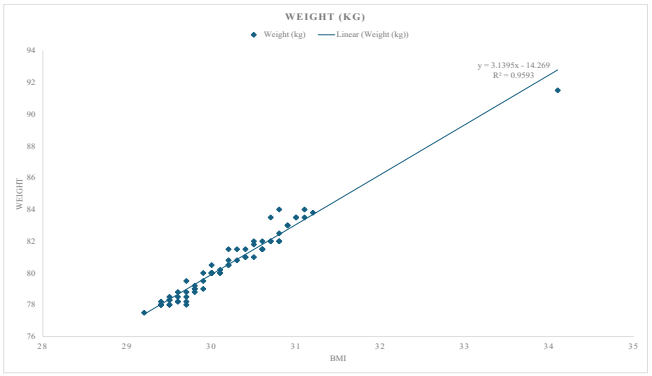


Fig 4. 13. Association between BMI and Weight

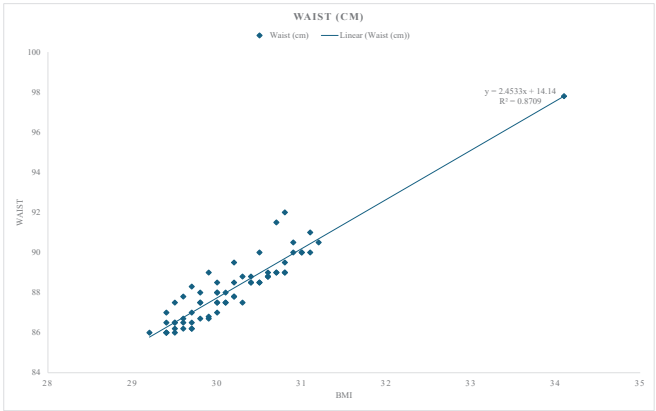


Fig 4.14. Association between BMI and Waist Circumference

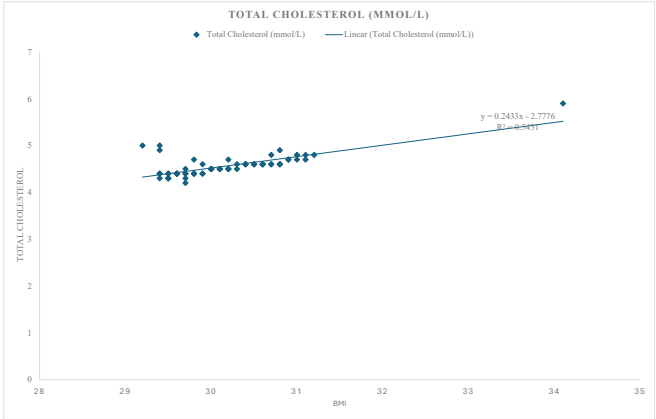


Fig 4. 15. Association between BMI and Total Cholesterol

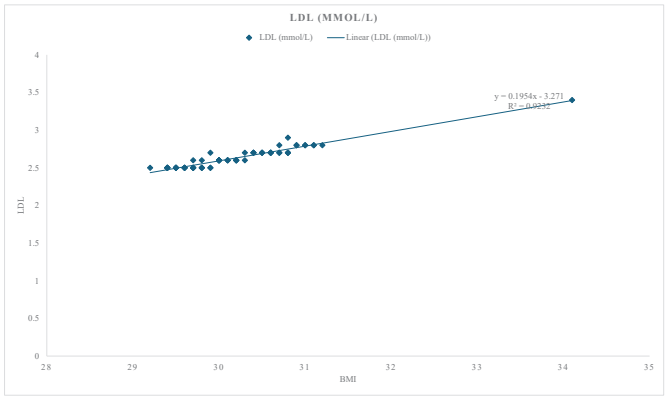


Fig 4.16. Association between BMI and LDL-C

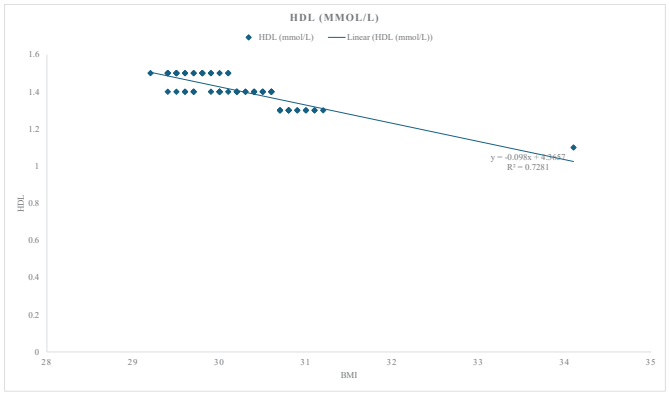


Fig 4.17 Association between BMI and HDL-C

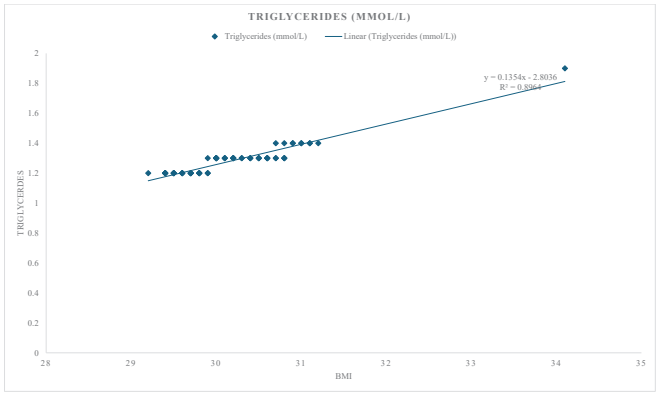


Fig 4.18. Association between BMI and Triglycerides

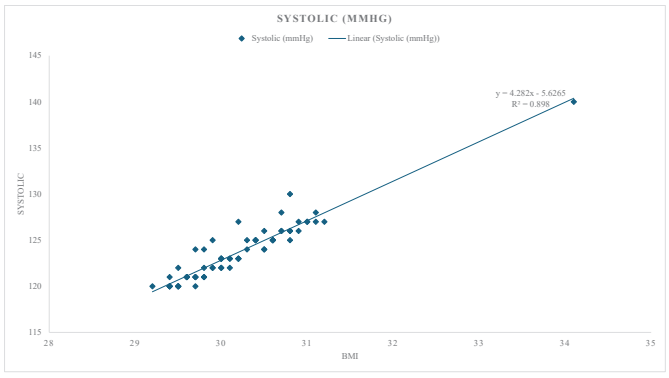


Fig 4.19. Association between BMI and Systolic Pressure

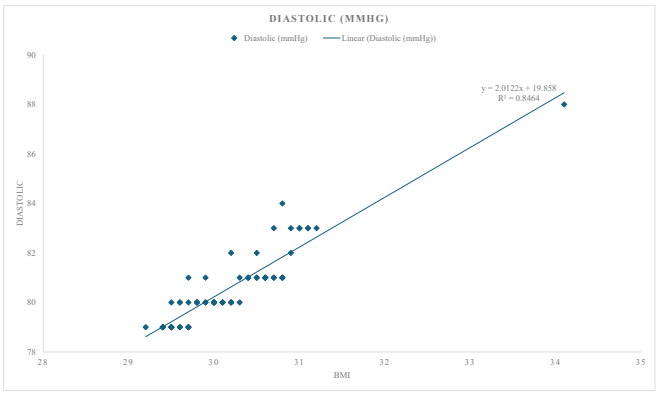


Fig 4.20. Association between BMI and Diastolic pressure

Discussion

This study supports the hypothesis that slimming tea, particularly the green tea (Epigallocatechin gallate)a Polyphenolhas a significant effect on the weight of obese subjects; it has shown that it could be used to reduce the weight and the body mass index of overweight subjects. This is in tandem with the earlier study on the role of green tea catechins in promoting weight loss and improving metabolic health. The bioactive compounds in green tea, especially epigallocatechin gallate (EGCG), have thermogenic and fat oxidation properties that are beneficial for weight management[7,6].

The thermogenic hypothesis suggests that green tea catechins increase energy expenditure by promoting fat oxidation and inhibiting the enzyme catechol-O-methyltransferase (COMT), which degrades norepinephrine, a key hormone in fat metabolism [13]. The results of this study affirmed that these mechanisms can translate into clinically observable outcomes in subjects who are obese on polyphenol.

The study's findings show a statistically significant reduction in weight and BMI among participants who consumed slimming tea over a 12-week period. Participants in the slimming tea group experienced a weight reduction from 88.01 kg to 80.4 kg, with a corresponding decrease in BMI, while the pre group showed minimal or no changes. These results are consistent with empirical studies carried out by[14] and [8] which also found significant reductions in body fat and improvements in metabolic markers among individuals consuming green tea.

The study also reveal that the green tea has statistically significant effect on both the systolic and diastolic pressure, ($p<0.001$); showing a decrease of systolic of pre administration 136.17±0.39 to post administration 123.41±0.31 and diastolic of pre administration 86.35±0.21 to post administration 80.35±0.16.Also, in addition to weight loss, slimming tea was expected to influence lipid metabolism, as the lipid metabolism hypothesis suggests that green tea catechins reduce fat absorption and improve lipid profiles [10].

However, the results of this study showed that while slimming tea had a noticeable effect on weight, BMI, blood pressure; some lipids such as Total Cholesterol and Triglyceride showed slight statistical difference with ($p<0.001$),however, its impact onHDL-cholesterol and LDL cholesterol, were not statistically significant ($p >0.052$).

This outcome is not in tandem with some studies, such as[11] which reported significant reductions in cholesterol levels following green tea consumption. One possible explanation for this discrepancy could be the relatively short duration of the study (12 weeks), as longer-term interventions may be necessary to observe changes in overall lipid metabolism.

Observed weight loss in the subject on slimming tea can be attributed to the thermogenic and fat oxidation properties of green tea catechins. These bioactive compounds increase the rate of fat oxidation, particularly in visceral fat, which is associated with a higher risk of metabolic disorders such as insulin resistance and cardiovascular disease [15]. The consistent reduction in weight over time as shown in postadministration group supports the idea that regular consumption of slimming tea enhances fat metabolism, leading to sustained weight loss.

It is worthy to note that while the study focuses on the slimming tea group, individual variability in response to green tea was evident. Factors such as genetics, habitual caffeine intake, and bioavailability of catechins may influence how well individuals respond to or tolerate green tea [10,16]. For example, participants with a high baseline intake of caffeine may have developed a tolerance, leading to a reduced thermogenic response to green tea. Additionally, variations in gut microbiota and dietary habits may have impacted the absorption and utilization of catechins, contributing to differences in weight loss outcomes among participants.

The findings in this study also reveal some gaps in the current literature, particularly regarding the long-term sustainability of weight loss achieved through slimming tea consumption. While this study demonstrated significant short-term weight reduction, further research is needed to explore the effects of prolonged consumption of slimming tea on both weight, BMI, blood pressure and lipid metabolism. Additionally, the impact of other types of slimming teas, such as oolong and Pu-erh, remains underexplored, and future studies should investigate their potential for obesity management.

Conclusion

In conclusion, this study provides compelling evidence that slimming tea is an effective intervention for weight loss in individuals with obesity. The results of this study demonstrate that participants who consumed slimming tea(catechin) experienced significant reductions in both body weight, BMI ad blood pressure over the 12-week period compared to the pre administration group.

However, the study did not find significant effects of slimming tea on some lipids, indicating that its influence on lipid metabolism may be limited in the short term. While slimming tea appears to be effective for weight loss, future studies should explore its long-term effects on other metabolic parameters and health outcomes.

Recomendations

Based on the findings of this study, the following recommendations are proposed:

1. Further Research on Long-Term Effects: Future studies should extend the duration of the intervention to assess the long-term effects of slimming tea on weight maintenance and other health markers such as cholesterol levels, blood pressure, and glucose metabolism. A longer follow-up period would provide more insight into the sustainability of the observed weight loss.

2. Larger Sample Size: To increase the power of statistical analysis, future studies should aim for a larger sample size. This would not only provide more robust data but also improve the generalizability of the findings to a wider population. Larger studies could also explore potential differences in the effectiveness of slimming tea based on demographic variables such as age, gender, and baseline BMI.

3. Investigating Mechanisms of Action: While this study focused on the outcomes of slimming tea consumption, future research should explore the underlying mechanisms by which slimming tea promotes weight loss. Studies investigating the active compounds in slimming tea, their effects on metabolism, fat oxidation, and appetite regulation would provide valuable insights into how slimming tea exerts its effects.

4. Exploration of Other Health Benefits: Given that the study found limited effects on cholesterol levels, future research should explore whether slimming tea has broader health benefits beyond weight loss. This could include investigating its effects on inflammatory markers, insulin sensitivity, and cardiovascular health in individuals with obesity or metabolic syndrome.

5. Practical Application in Obesity Management: Healthcare providers and nutritionists may consider incorporating slimming tea as part of a comprehensive weight management program for individuals struggling with obesity. However, it should be emphasized that slimming tea is most effective when combined with a healthy diet and regular physical activity for long-term success.

Authors Involment

ASP, involved in the conception of the topic, collation of data and writing of manuscript. ODO, involved in analysis of samples and collation of data. GSM, was involved in the collation and analysis of data,. OHB, involved in supervision of the work. All authors have read the manuscript and have agreed to the publication of the manuscript.

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Conflict Of Interest

None.

Funding

None.

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