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The Effect of Curcumin-Black Pepper on Body Fat Composition and Lipid Levels in Overweight Male Adults

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ABSTRACT

Objective: *This project aims to investigate the effect of curcumin-black pepper on the body fat composition and the lipid profiles of overweight adults.* ***Methods:*** *This randomized, placebo-controlled trial was conducted with 66 overweight males. Participants were randomly divided into two groups. Group A (32) received curcumin and black pepper dietary supplements. Group B (34) received a placebo.* ***Results:*** *Unlike the placebo, taking curcumin-black pepper resulted in significant improvements in High-Density Lipoprotein (HDL) (p<0.001) and significant reductions in body weight, Body Mass Index (BMI), Triglycerides (TG), Low-Density Lipoprotein (LDL), cholesterol, and fat composition (p<0.001) but not in visceral fat.* ***Conclusions:*** *A compound of curcumin-black pepper showed promising findings for improving lipid profiles, body weight, and body fat. This compound reduces body fat composition and serum lipids among overweight male adults. Further studies may be required to clarify the mechanism and effects of this compound on other physiological aspects.*

Keywords: Obesity, Overweight, Curcumin, Lipid profile, Body composition

INTRODUCTION

Obesity, a growing medical health problem, is associated with many serious medical complications, such as diabetes, cancer, coronary heart disease, and kidney failure, which all carry significant risks of sudden death [1-5].

Many approaches have been used to address this health issue. One of the most popular is the use of herbs and dietary supplements, which can have a positive impact on the effort to lose weight [6]. Healthy nutrition and exercise still play a key role in controlling an individual's body weight (and BMI) but there are certain advantages to some supplements that simply cannot be overlooked. One of these food items is curcumin.

Curcumin has long been recognized for its beneficial effects on human health. It has been used for many years as an herbal spice in traditional meals in Asia as well as in the Middle East. Curcumin is a known anti-inflammatory substance and has been used for the treatment of degenerative arthritis, rheumatoid arthritis, and various other systematic inflammatory conditions [7-9]. However, the health-related benefits of curcumin have not been fully achieved because of poor bioavailability and slow absorption [10].

As far as the direct effects of curcumin on body weight and cholesterol levels are concerned, it has been noticed that the greater the bioavailability, the more profound the benefits [11]. However, Hewlings et al., discuss how these effects are indirect instead of direct [12]. The initial stages of the inflammation process might be associated with Metabolic Syndrome (MES) and curcumin can help improve the metabolism rate by blocking the inflammation process. Conditions such as hyperglycemia, or the presence of high levels of low-density lipoproteins in the blood, can be treated too. Further, curcumin is a highly effective remedy for visceral obesity [13]. Chatterjee and Moddi state that a reduction in high blood pressure and adipogenesis suspension are the two main systematic benefits of curcumin [14]. Modulation of the enzyme expression of genes and lipoprotein metabolism effects has also been seen. A reduction in plasma triglycerides is achieved by boosting the activity of the enzymes involved in lipoprotein metabolism by adding curcumin, thought to provide an additional beneficial effect when it comes to weight loss [15].

Hewlings et al. argues that low-grade, systematic inflammation is associated with the release of pro-inflammatory cytokines [12]. These cytokines are also associated with cardiovascular disease and diabetes. Addressing inflammation through curcumin can help fight such diseases. Further, its beneficial effects on human health more broadly have also been witnessed. Kuptniratsaikul's research establishes the properties of low-grade curcumin in a randomized control trial [16]. The results show that the cholesterol-lowering property of curcuminoids is significantly more effective than the placebo. Serum cholesterol, non-HDL-C and LDL-C, lipoprotein, and triglyceride levels have all been lowered with the addition of 1 g curcumin and 10 mg piperine to enhance absorption. Panahi et al., discuss the effects of serum curcumin on Lp (a), non-HDL-C, total cholesterol, and triglycerides, revealing that they remain significant provided that Body Mass Index (BMI) and lipids baseline values are adjusted [17]. The same study also concludes that oxidative stress is reduced among its subjects. Prominent improvement in serum SOD activity among the study group was reported in contrast to the placebo group.

Because of its health benefits, and its metabolic properties, curcumin has gained attention from healthcare providers and researchers. However, recent studies have revealed that most of the health benefits of curcumin arise because of its ability to reduce systematic inflammation and its antioxidant effects. When administrated with piperine to improve absorption, curcumin has proven effects on cholesterol reduction. Various metabolic and oxidative reactions are affected by curcumin. Conditions that are positively affected include hyperlipidemia, MES, arthritis, and anxiety. At the same time, muscular soreness and exercise-related inflammation are also decreased. Finally, everyday performance levels, focus, and mental activity improve. It can be assumed that a low dose of curcumin, given regularly, can provide numerous health benefits.

Previous studies use curcumin alone with no other product to increase its bioavailability, which then has no significant impact on their results. Hewlings et al., find that when curcumin is mixed with a complex compound, such as black pepper, the activity of the resultant mixture significantly increases, and all the benefits of curcumin can emerge [12]. Black pepper can enhance curcumin absorption up to 400 times. Both curcumin and black pepper have active ingredients that make them antioxidant, anti-inflammatory, and disease preventive. Piperine, a bioactive compound of black pepper, is alkaloid-like capsaicin, the active component of which can be found in cayenne pepper and spicy powder.

There are currently two theories on how this works. The first claims that piperine makes it easier for curcumin to pass through the intestinal wall and, subsequently, into the bloodstream [18]. The second states that piperine may slow down the breakdown of curcumin in the liver; therefore, increasing blood levels [19]. As a result, combining curcumin with piperine develops potential health benefits. Some researchers claim that a combination of curcumin and piperine can help in the prevention of cancer, adding another benefit to the combination's arsenal.

This study evaluates the role of the curcumin-black pepper combination using the basic measure of standard blood tests taken by participants before and after the study. Moreover, for the first time, this project investigates the effect of highly bioavailable curcumin on body fat and visceral fat.

MATERIALS AND METHODS

This project involves a randomized, placebo-control trial conducted in June 2020. Sixty-six male overweight adult participants were included in the research. The subjects were divided at random into two groups.

The project ran for four weeks and the participants were aged 19 to 60 years and were overweight or obese. The exclusion criteria were as follows: aged less than 19 years or more than 60 years, a BMI of less than 25 kg/m2, hypertensive, diabetic, or suffering from cardiovascular disease. Written consent was obtained from all participants before the conducting of the research.

This research was approved by the Ethics Committee of Northern Border University (41/9).

For Group A, 32 participants were recruited. Every participant was given a capsule of curcumin-black pepper (500 mg turmeric and 5 mg black pepper) twice a day. Group B, of 34 participants, was given a placebo capsule similar to that taken by Group A.

All subjects provided blood samples of 5 ml before and after to test their lipid profiles (cholesterol, HDL, LDL, Very Low-Density Lipoprotein (VLDL), and triglyceride.

All subjects' heights were measured, and BMIs were calculated before and after the trials. BMIs were calculated as weight in kilograms divided by height in meters squared. Weight, body fat, and visceral fat were also recorded before and after the intervention. Body composition was analyzed using TANITA (Mc-780).

All anthropometric measures were performed by a clinical dietitian in a private and appropriate measurement room.

Statistical analysis was conducted using Statistical Package for Social Sciences Version 22.0 software. The variations and means were analyzed using a paired sample t-test.

RESULTS

The mean ± SD age of participants was 34.18 ± 9.72 years in the control (placebo) group and 40.59 ± 10.515 years in the treatment (curcumin-black pepper) group.

In the treatment group, the mean height was 168.41 ± 2.982 cm and the mean weight was 93.8 ± 45.8 kg.

The mean ± SD BMI of participants in the treatment group was 32.7 ± 29.2 kg/m2, and in the control group, it was 33.3 ± 3.3 kg/m2.

Table 1 shows the effects of the treatment and the placebo on body weight, BMI, TG, LDL, HDL, cholesterol, and fat composition.

In terms of body weight and BMI, this project found significant differences before and after the consumption of curcumin ($p>0.001$) but not in the placebo group. In the treatment group alone, the levels of TG and cholesterol decreased significantly after four weeks of using curcumin-black pepper ($p>0.001$).

Similar results were found when LDL and HDL were examined. Both variables showed significant improvements in the treatment group ($p>0.001$) but not in the placebo group. However, despite the visceral fat results showing some reduction with treatment, no significant results were found ($p=0.125$) in either group.

For the curcumin group, there was a significant average difference in body fat percentage before and after taking curcumin ($p>0.001$); this was also the case for visceral fat ($p>0.001$).

Table 1 shows the effects of the placebo and the curcumin treatment. For the placebo group, we note a decrease in LDL, but not a significant one. All other variables remained the same values. In the curcumin group, there was a significant average difference in fat percentage before and after taking curcumin ($p>0.001$); this was also the case for visceral fat, BMI, LDL, and TG before and after taking curcumin ($p>0.001$).

On average, fat percentages after treatment were 1.62 points higher than before (95% CI [1.1848, 2.0464]), visceral fat after treatment was 0.813 points higher than before (95% CI [0.563, 1.062]), BMIs after treatment was 0.968 points higher than before (95% CI [0.6861, 1.2499]), LDL after treatment was 13.323 points higher than before (95% CI [7.336, 19.309]), and TG after treatment was 17.645 points higher than before (95% CI [10.572, 24.718]).

For the placebo group, we note a decrease in LDL, but not a significant one; all other variables remained the same values.

Table 1 Fasting lipids, lipoprotein, and body fat (mean ± Standard Error of Mean (SEM)) before and after treatment

Variable	Treatment			Placebo		
	Before	After	p-value*	Before	After	p-value*
Weight	93.8 ± 45.8	91 ± 41.9	0	96.4 ± 9.9	96.4 ± 9.9	0.5
BMI	32.7 ± 29.2	31.7 ± 29.3	0.1	33.3 ± 3.3	33.3 ± 3.3	0.5
TG	242.78 ± 8.1	225.1 ± 7.2	0	246.7 ± 48.9	246.7 ± 48.7	0.6
LDL	167.1 ± 2.5	153.8 ± 2.3	0	166.4 ± 17.5	165.7 ± 17.9	0.1
HDL	34.6 ± 1.7	35.0 ±1.6	0	34.9 ± 5.3	34.9 ± 5.4	0.8
Cholesterol	216.2 ± 2.7	216.0 ± 2.3	0	219.1 ± 28.6	219.0 ± 28.8	0.6
Fat%	34.6 ± 17.3	33.0 ± 19.7	0	34.8 ± 2.2	34.8 ± 2.2	0.1
Visceral Fat	13.6 ± 3.8	12.7 ± 3.4	0.1	13.9 ± 1.6	13.9 ± 1.6	0.2

*Paired t-test: TG, LDL, HDL, cholesterol, BMI, visceral fat%, and weight

DISCUSSION

This study aimed to evaluate the possible roles of highly bioavailable forms of curcumin in managing lipid profiles and body composition. These findings are consistent with previous findings in animal and human studies [20,21]. In an animal study, curcumin was found to lower both triglyceride and body fat in hamsters. In another study, rats' body weight, LDL, and TG were significantly reduced after four weeks of curcumin supplements.

These results refer to numerous parameters in human metabolisms, such as BMI, LDL levels, HDL levels, body fat, and visceral fat, among others. Taghizadeh et al., conduct similar research using ginger, which is in the same herbal family as turmeric [21]. Taghizadah, et al. study find that those who receive ginger-like supplements have decreased serum insulin concentrations, a homeostatic model of assessment for insulin resistance, and increased quantitative insulin sensitivity, and plasma glutathione [21]. These results indicate direct and/or indirect health benefits when it comes to body weight, body fat percentage, and BMI, similar to the results of our study.

A large meta-analysis by Wei et al., researching four Randomized Control Trials (RCTs) with a total of 229 patients with non-alcoholic fatty liver disease, also enhances the viability of our findings [22]. In these four RCTs, curcumin was more likely to lower LDL-C, triglycerides, fasting blood sugar, HOMA-IR, body weight, and Aspartate Transaminase (AST) levels than the placebo, and the differences were statistically significant. In our study, we also found a statistically significant difference in body fat percentage before and after curcumin intake, which was not present in the placebo group. This is potentially the most important finding because of the adverse effects on human health that accumulated visceral fat has been proven to have. Provided that these findings can be verified, and given that curcumin is a non-toxic substance, it is safe to claim that curcumin-related products will play a key role in limiting the risks of fat and visceral fat percentages, in controlling the metabolism of toxic substances, in reducing high blood sugar levels, and in protecting human health overall. A preliminary study by Di Pierro, et al. highlight the potential role of bioavailable curcumin in weight loss and omental adipose tissue decrease in overweight people with MES [23].

In Di Pierro et al., curcumin is found to reduce body weight from 1.88% to 4.91%, and also to increase waist-circumference reduction (from 2.36% to 4.14%) [23]. Further, it increases hip circumference reduction from 0.74% to 2.51%, and improves the reduction of BMI significantly (from 2.10% to 6.43%) ($p<0.01$) [24].

Another study by Parsons, et al. researches the effects of curcumin on the body composition of patients with advanced pancreatic cancer, finding that weight loss resulting from fat and muscle depletion is accelerated among those treated with curcumin [24]. This finding, although consistent with the effects of curcumin on fat adiposity, supports that curcumin should not be administered to such patients because it risks lowering the number of their remaining days. Sarcopenia was another adverse effect noticed in these patients, decreasing their odds of survival. Overall, the results of this study were positive regarding anti-obesity research; however, they reinforced that curcumin supplements should not be given to patients diagnosed with advanced pancreatic cancer.

However, other research by Ortiz, et al. studying the recovery of bone and muscle mass in patients with chronic kidney disease who are on hemodialysis and taking curcumin supplements, showed that curcumin may have a positive effect in restoring muscle mass and bone density in such patients [24,25]. The metabolism is profoundly influenced by critical diet factors in these patients because of the malnutrition that always goes along with renal failure, and again, further research must be conducted and data acquired in this area as well. However, the beneficial effects of curcumin are consistent with those found in our study.

CONCLUSION

This study reveals that a curcumin-black pepper compound may play a role in decreasing body weight, causing significant reductions in lipid profiles and body fat, which may aid in the prevention of obesity and the development of treatments for it.

DECLARATIONS

Recommendations

The significant results of this study likely arise from the rich bioavailability and the high absorption of curcumin, as a result of adding black pepper to the compound. It can be concluded that the curcumin-black pepper compound reduces body fat composition and serum lipids among overweight male adults.

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

This research was approved by the Ethics Committee of Northern Border University (HAP-09-A-043) number (41/9) on 11 May 2020.

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