Republic of Iraq
Ministry of Higher Education
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Role of L-Carnitine Supplementation For Weight Loss. Review of The Published Literature

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Summary:

L-carnitine, also known as levocarnitine, is a naturally occurring amino acid structure that the body produces and often taken as a supplement.

It is involved in transporting fatty acids across the mitochondrial membrane, by forming a long chain acetylcarnitine ester and being transported by carnitine palmitoyltransferase I and carnitine palmitoyltransferase II. Carnitine also plays a role in stabilizing Acetyl-CoA and coenzyme A levels through the ability to receive or give an acetyl group. Since L-carnitine helps move more fatty acids into the cells to be burned for energy, this increase the body ability to burn fat and lose weight.

This study provides a systematic review and meta-analysis of randomized controlled trials, which have examined the effect of the carnitine on adult weight loss.

Nine studies were included in this review and the results of analysis of the trials revealed that subjects who received carnitine lost significantly more weight compare with controlled trials and show decrease in the body mass index.

We conclude that L Carnitine may have some beneficial in losing weight.

Introduction :

Carnitine is synthesized in the liver and kidneys. . (L-)carnitine decreases the intra mitochondrial acetyl-CoA/CoA ratio through trapping of acetyl groups and activation of the pyruvate dehydrogenase complex (5).This leads to simultaneous decrease in acetyl-CoA levels in the cytosol contributing to activation of the glycolytic pathway (6). (L-)carnitine, thus plays some roles in the glucose metabolism and may increase energy expenditure (7,8). Carnitine has an important role in lipid metabolism as well. It facilitates the transfer of long-chain fatty acids across the mitochondrial inner membrane as acylcarnitine esters and acts as an obligatory cofactor for ß-oxidation of fatty acids (9).

Because of these two effects of L-carnitine on glucose and lipid metabolism, it may help weight loss by increasing energy expenditure (10).

Supplementing carnitine as for weight-loss agent is based on the fact that regular oral ingestion of this substance leads to the increase of its intracellular concentration. This in turn activates fat oxidation and helps reduction of the body's fat reserves.

Methods:

Data source and search strategy:

A systematic review and meta-analysis of studies was conducted based on the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines (16). Comprehensive search strategies were used to identify reports of randomized controlled trials indexed in PubMed (from inception to May 2015), the Cochrane Library and Google scholar (from inception to May 2015).

Study selection :

The randomized controlled trial studies comparing the effects of (L-)carnitine and placebo on the subjects' weight loss were included. Studies carried out on animals and the ones with follow-ups of less than 30 d were excluded. (L-) carnitine is defined as accelerator of fatty acid oxidation in mitochondria.

Placebo was also defined as a medically ineffectual treatment similar to intervention supplementation in shape and colour. Weight change was considered as primary outcome. Other outcomes such as body mass index (BMI) change and body fat were considered as secondary outcomes.

Data extraction and quality assessment :

A data abstraction form was developed, and the reviewers extracted the outcomes of interest from the selected studies. General information (authors, title, journal of publication and date of publication), the study population characteristics (age, sex, race, health condition and BMI) and the study results (predefined outcomes) were extracted. Jadad scale (17) was used to appraise the included studies.

Results:

A total of 2,145 studies were retrieved through search databases . Having excluded the duplicates, the summaries of the 1,236 remaining studies were screened by the reviewers. At the end, nine studies were included in the review. Four of the studies had been conducted in Italy(18–21), and two in Iran (22,23). The other trials had been conducted in New Zealand (24), Australia (25) and Brazil(26).Of the total 911 individuals participated in the included trials, 449 had received carnitine, and the remaining 462 subjects had been allocated to placebo/control arm.

Inclusion and Exclusion Criteria

Nine trials were included in this review, but only six of them had reported the mean (standard deviation) of weight and five of them had reported mean (standard deviation) of BMI. One trial was excluded from meta-analysis because of reporting

findings with median and two of the remaining trials did not report neither BMI or weight outcomes properly.

Weight change:

Six trials had reported weight changes in control and intervention groups. Using inverse-variance method, a significantly greater loss in weight was observed in participants who received the carnitine compared with control group,

(MD: 1.33 kg; 95% CI: 2.09 to 0.57) I2 = 96%.

Body mass index change:

Five trials had used this outcome to report their findings. Our analysis indicates that using the carnitine leads to significantly lower BMI compared with subjects who had received control, (MD: 0.47 kg m2 ; 95% CI: 0.88 to 0.05) I2 = 93%.

Dosage and duration of consumption:

Duration of the trials included varied from 1-month to 1-year follow-up. Meta-regression analysis showed that the duration of consumption were negatively related to effect size (regression coefficient = 0.24; 95% CI: 0.38, 0.09 p = 0.002).

It means when the carnitine was used for longer time, it expected that the magnitude of weight loss will decrease.

The carnitine dosage varies from 1.8 g d1 to 4 g d1 in the trials. Meta regression analysis done emphasized that dose of the carnitine did not significantly change the effect size (regression coefficient = 0.06; 95% CI: 3.16, 3.28 p = 0

Sensitivity analysis:

Regarding the considerable heterogeneity among the included trials, it was found that most heterogenic trials in pool estimation of the outcomes were related to those studies that had low score in methodological quality assessment such as Villani et al. (12) and Barzegar et al. (22). However, the sensitivity analysis of these trials did not affect our final results.

Discussion:

Carnitine has been applied for prevention of cardiovascular disease (31), end-stage kidney diseases (32), dialysis-related hypertension (33), treatment of persistent depressive disorder (34) and treatment of non-alcoholic fatty liver disease (35). However, evidence regarding the anti obesity effects of the carnitine is still inconclusive. Here, we pooled the trials comparing the effect of carnitine and control on weight loss in adults. Weight and BMI were two variables that were considered as for assessing weight loss of the participants. We found that carnitine has had a decreasing impact onto weight and BMI in these trials. Positive influence of carnitine onto weight loss was found in chronic conditions such as diabetes and obesity. Our meta-regression analysis indicates that magnitude of weight loss would decrease over time. Although the analysis indicated that dosage of carnitine had positive, but not significant, impact on weight change, insufficient power of analysis precluded us to have any recommendation regarding the best dosage of the carnitine.

No study had systematically reviewed anti-obesity impact of the carnitine. There was, however, a narrative review, which had focused on metabolic function of the carnitine in human setting (36), but that study has not directly addressed clinical effect of carnitine. Evidence about pharmacotherapy of obesity have addressed the long-term impact of orlistat, sibutramine and rimonabant on weight loss in people (37,38). Although carnitine has a lower magnitude of weight loss than these drugs, unlike them, it does not suffer from some side-effects such as gastrointestinal issues, rising blood pressure, and pulse rate and increased risk of psychological disorder (39,40).

Conclusions:

We conclude that L Carnitine may have some beneficial in losing weight.

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