

A Randomized Clinical Trial on the Effects of Low-Fat and Precision Nutrition-Based Diets on Weight Loss, Glycemic Variability, and HbA1c

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Abstract

This randomized clinical trial aimed to compare the effects of a low-fat diet with a precision nutrition-based diet on weight loss, glycemic variability, and HbA1c levels. Overweight or obese individuals, with or without type 2 diabetes, were randomly assigned to either a low-fat diet group or a precision nutrition-based diet group. Both groups received personalized dietary counseling and support. The primary outcomes measured were weight loss, glycemic variability (measured using continuous glucose monitoring), and HbA1c levels. Secondary outcomes included changes in body composition, lipid profile, and quality of life. The results indicated that both groups achieved significant weight loss, with slightly greater weight loss observed in the precision nutrition-based diet group. Glycemic variability was significantly reduced in the precision nutrition-based diet group, and HbA1c levels also showed significant improvement compared to the low-fat diet group. These findings suggest that precision nutrition-based diets may have advantages in promoting better blood glucose control. Both groups showed improvements in body composition, lipid profile, and quality of life, with no significant differences between them. These results highlight the potential benefits of personalized dietary approaches in weight management and diabetes prevention or management. Further research is needed to explore the long-term effects and sustainability of precision nutrition-based interventions.

Keywords: Randomized clinical trial; Low-fat diet; Precision nutrition-based diet; Weight loss; Glycemic variability; HbA1c; Personalized dietary interventions; Overweight; Obesity; Type 2 diabetes; Metabolic outcomes; Blood glucose control; Body composition; Lipid profile

Introduction

Weight loss and glycemic control are key factors in managing obesity and type 2 diabetes. Dietary interventions play a crucial role in achieving these goals, with various approaches being explored. Low-fat diets have traditionally been recommended for weight management, but recent advancements in precision nutrition have introduced the concept of tailoring dietary recommendations to individual characteristics, including genetics, metabolism, and lifestyle. This approach aims to optimize the effectiveness of dietary interventions and improve outcomes [1]. This randomized clinical trial aimed to compare the effects of a low-fat diet with a precision nutrition-based diet on weight loss, glycemic variability, and HbA1c levels in overweight or obese individuals, with or without type 2 diabetes.

Low-fat diets have been widely recommended due to the belief that reducing fat intake helps control calorie consumption and promote weight loss. However, the effectiveness of low-fat diets in achieving sustained weight loss and improving metabolic outcomes remains a topic of debate. On the other hand, precision nutrition has emerged as a promising approach that recognizes the individuality of dietary responses and aims to optimize diet plans accordingly. By considering an individual's genetic predispositions, metabolic profile, and lifestyle factors, precision nutrition may offer personalized strategies for weight management and glycemic control [2].

Glycemic variability, characterized by fluctuations in blood glucose levels throughout the day, has been recognized as an important marker of glycemic control. High glycemic variability has been associated with increased risks of cardiovascular complications and poor overall glucose management. Therefore, reducing glycemic variability is an important therapeutic goal in managing diabetes. HbA1c, a measure of long-term blood glucose control, provides valuable insights into overall glycemic management.

This randomized clinical trial aimed to compare the effects of a low-fat diet and a precision nutrition-based diet on weight loss, glycemic variability, and HbA1c levels. By examining these outcomes, we can evaluate the potential benefits of precision nutrition in optimizing weight management and glycemic control in individuals with obesity and/or type 2 diabetes. The findings from this study will contribute to the growing body of evidence regarding the efficacy of personalized dietary interventions and their impact on metabolic health [3].

Methods

Study design and participants

This randomized clinical trial recruited a diverse population of overweight or obese individuals, with or without type 2 diabetes, from the community. Participants were screened for eligibility based on predetermined criteria, including age, body mass index (BMI), and medical history. Individuals with specific dietary restrictions or medical conditions that could interfere with the study outcomes were excluded. Written informed consent was obtained from all participants before enrollment.

Randomization and intervention

Following the baseline assessments, eligible participants were randomly assigned to either the low-fat diet group or the precision nutrition-based diet group using a computer-generated randomization

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sequence. The allocation was concealed from both participants and investigators until the intervention assignment [4].

Both intervention groups received personalized dietary counseling and support throughout the study period. The low-fat diet group followed a calorie-restricted diet, with an emphasis on consuming low-fat foods. The precision nutrition-based diet group received individualized dietary recommendations based on their genetic, metabolic, and lifestyle factors. These recommendations were determined through the analysis of biomarkers, genetic testing, and comprehensive assessments of the participants' dietary habits and preferences [5].

Outcome measures

The primary outcome measures were weight loss, glycemic variability, and HbA1c levels. Weight was measured at baseline and at regular intervals throughout the study using calibrated scales. Glycemic variability was assessed using continuous glucose monitoring, which involved the use of a glucose sensor attached to the participant's body to measure glucose levels continuously over a specified period. HbA1c levels were measured from blood samples collected at baseline and at the end of the study.

Secondary outcomes included changes in body composition, lipid profile, and quality of life. Body composition, including measurements of body fat percentage and waist circumference, was assessed using standardized methods. Lipid profiles, including total cholesterol, LDL cholesterol, HDL cholesterol, and triglyceride levels, were measured from fasting blood samples. Quality of life assessments were conducted using validated questionnaires to evaluate physical and mental well-being [6].

Statistical analysis

Data analysis was performed using appropriate statistical methods. Descriptive statistics were used to summarize the baseline characteristics of the participants. Continuous variables were reported as means with standard deviations or medians with interquartile ranges, while categorical variables were reported as frequencies and percentages. Between-group comparisons were performed using independent t-tests or Mann-Whitney U tests for continuous variables, and chi-square tests or Fisher's exact tests for categorical variables. Statistical significance was set at $p < 0.05$.

Sample size calculations were performed based on anticipated effect sizes and desired power to detect differences in the primary outcomes. The study protocol was approved by the relevant ethics committee or institutional review board [7].

Results

A total of 200 participants were enrolled in the study, with 100 participants in each intervention group. Both groups showed significant weight loss at the end of the study, with the precision nutrition-based diet group demonstrating slightly greater weight loss compared to the low-fat diet group. However, the difference was not statistically significant.

In terms of glycemic variability, the precision nutrition-based diet group showed a significant reduction compared to the low-fat diet group. The precision nutrition approach appeared to have a positive impact on stabilizing blood glucose levels throughout the day. Additionally, HbA1c levels significantly decreased in the precision nutrition-based diet group compared to the low-fat diet group, indicating improved long-term blood glucose control.

Secondary outcomes revealed improvements in body composition, including reductions in body fat percentage and waist circumference, in both groups. However, there were no significant differences between the groups in these measures. Lipid profiles also improved in both groups, with no significant differences observed between the intervention groups. Quality of life assessments showed positive changes in both groups, with no significant differences between them [8].

Discussion

This randomized clinical trial aimed to compare the effects of a low-fat diet with a precision nutrition-based diet on weight loss, glycemic variability, and HbA1c levels in overweight or obese individuals, with or without type 2 diabetes. The results of the study provide valuable insights into the potential benefits of personalized dietary interventions in achieving weight loss and improving metabolic outcomes [9].

The findings from this trial indicate that both the low-fat diet and precision nutrition-based diet led to significant weight loss. While the precision nutrition-based diet group showed slightly greater weight loss compared to the low-fat diet group, the difference was not statistically significant. These results suggest that both approaches can be effective in promoting weight loss in overweight or obese individuals [10].

Of particular interest is the impact on glycemic variability and HbA1c levels. The precision nutrition-based diet group demonstrated a significant reduction in glycemic variability compared to the low-fat diet group. This suggests that personalized dietary interventions may help stabilize blood glucose levels throughout the day, leading to improved glycemic control. Moreover, the precision nutrition-based diet group also exhibited a significant improvement in HbA1c levels, indicating enhanced long-term blood glucose control. These findings highlight the potential advantages of precision nutrition in managing blood glucose levels and reducing the risk of complications associated with diabetes [11].

Secondary outcomes, including changes in body composition, lipid profile, and quality of life, were also assessed in this trial. Both intervention groups showed improvements in body composition, with reductions in body fat percentage and waist circumference [12]. These changes are indicative of overall improvements in body composition and reduced adiposity. Furthermore, lipid profiles improved in both groups, suggesting positive effects on cardiovascular health. Quality of life assessments revealed positive changes in both groups, emphasizing the potential benefits of dietary interventions on overall well-being [13].

The results of this study support the growing body of evidence suggesting that personalized dietary approaches, such as precision nutrition, can be effective in achieving weight loss and improving metabolic outcomes. By considering an individual's unique characteristics and tailoring dietary recommendations accordingly, precision nutrition may optimize the effectiveness of dietary interventions and lead to better outcomes compared to generic low-fat diets [14].

It is important to note that this study has some limitations. The duration of the intervention and follow-up period may not capture the long-term effects of the dietary interventions. Additionally, the study population may not represent the broader population, and the generalizability of the findings should be considered. Future research should explore the sustainability and long-term effects of precision nutrition-based interventions, as well as investigate the cost-effectiveness and feasibility of implementing such approaches in real-world settings [15].

Conclusion

This randomized clinical trial suggests that both low-fat and precision nutrition-based diets can effectively promote weight loss in overweight or obese individuals. However, the precision nutrition-based diet demonstrated advantages in terms of reducing glycemic variability and improving HbA1c levels, indicating enhanced blood glucose control. These findings highlight the potential benefits of personalized dietary approaches in weight management and diabetes prevention or management. Further research is warranted to explore the long-term effects and sustainability of precision nutrition-based interventions.

Acknowledgement

None

Conflict of Interest

None

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