

World Journal of *Hepatology*

Monthly Volume 17 Number 1 January 27, 2025



EDITORIAL

Perazza F, Ravaioli F. Small bites, big impact: The importance of evening snacks in patients with advanced chronic liver disease. *World J Hepatol* 2025; 17(1): 101195 [DOI: [10.4254/wjh.v17.i1.101195](https://doi.org/10.4254/wjh.v17.i1.101195)]

Li T, Li YP. Innovative diagnostic tool aids screening for minimal hepatic encephalopathy in non-alcoholic cirrhosis patients. *World J Hepatol* 2025; 17(1): 101420 [DOI: [10.4254/wjh.v17.i1.101420](https://doi.org/10.4254/wjh.v17.i1.101420)]

REVIEW

Shi J, Zhu X, Yang JB. Advances and challenges in molecular understanding, early detection, and targeted treatment of liver cancer. *World J Hepatol* 2025; 17(1): 102273 [DOI: [10.4254/wjh.v17.i1.102273](https://doi.org/10.4254/wjh.v17.i1.102273)]

MINIREVIEWS

Qiu Y, Tang Q, Liu XQ, Xue YL, Zeng Y, Hu P. Hepatitis B core-related antigen as a promising serological marker for monitoring hepatitis B virus cure. *World J Hepatol* 2025; 17(1): 98658 [DOI: [10.4254/wjh.v17.i1.98658](https://doi.org/10.4254/wjh.v17.i1.98658)]

ORIGINAL ARTICLE

Retrospective Cohort Study

Carteri RB, Marroni CA, Ferreira LF, Pinto LP, Czermainski J, Tovo CV, Fernandes SA. Do Child-Turcotte-Pugh and nutritional assessments predict survival in cirrhosis: A longitudinal study. *World J Hepatol* 2025; 17(1): 99183 [DOI: [10.4254/wjh.v17.i1.99183](https://doi.org/10.4254/wjh.v17.i1.99183)]

El Labban M, Kotys J, Makher S, Pannala SSS, El Gharib K, Chehab H, Deeb L, Surani SR. Impact of liver cirrhosis on morbidity and mortality of patients admitted to the hospital with necrotizing fasciitis. *World J Hepatol* 2025; 17(1): 102270 [DOI: [10.4254/wjh.v17.i1.102270](https://doi.org/10.4254/wjh.v17.i1.102270)]

Retrospective Study

Jiang ML, Xu F, Li JL, Luo JY, Hu JL, Zeng XQ. Clinical features of abnormal α -fetoprotein in 15 patients with chronic viral hepatitis B after treatment with antiviral drugs. *World J Hepatol* 2025; 17(1): 100392 [DOI: [10.4254/wjh.v17.i1.100392](https://doi.org/10.4254/wjh.v17.i1.100392)]

Observational Study

Ullah H, Huma S, Yasin G, Ashraf M, Tahir N, Tahir Uddin Q, Shabana H, A R Hussein M, Shalaby A, Mossaad Alsayyad M, Said A, Farahat A, Hamed HI, Ayoub HSA, Imam MS, Elmahdi E. Comparison of different severity scores in correlating hemoglobin levels with the severity of hepatic decompensation: An observational study. *World J Hepatol* 2025; 17(1): 101212 [DOI: [10.4254/wjh.v17.i1.101212](https://doi.org/10.4254/wjh.v17.i1.101212)]

Soni J, Pathak N, Gharra M, Aswal D, Parikh J, Sharma P, Mishra A, Lalan D, Maheshwari T. Effectiveness of RESET care program: A real-world-evidence on managing non-alcoholic fatty liver disease through digital health interventions. *World J Hepatol* 2025; 17(1): 101630 [DOI: [10.4254/wjh.v17.i1.101630](https://doi.org/10.4254/wjh.v17.i1.101630)]

Prospective Study

Jespersen S, Fritt-Rasmussen A, Madsbad S, Pedersen BK, Krogh-Madsen R, Weis N. Prevalence of cardiometabolic co-morbidities in patients with *vs* persons without chronic hepatitis B: The FitLiver cohort study. *World J Hepatol* 2025; 17(1): 97797 [DOI: [10.4254/wjh.v17.i1.97797](https://doi.org/10.4254/wjh.v17.i1.97797)]

Randomized Controlled Trial

Cano Contreras AD, Del Rocío Francisco M, Vargas Basurto JL, Gonzalez-Gomez KD, Amieva-Balmori M, Roesch Dietlen F, Remes-Troche JM. Effect of alpha-lipoic acid and *Silybum marianum* supplementation with a Mediterranean diet on metabolic dysfunction-associated steatosis. *World J Hepatol* 2025; 17(1): 101704 [DOI: [10.4254/wjh.v17.i1.101704](https://doi.org/10.4254/wjh.v17.i1.101704)]

META-ANALYSIS

Xu XT, Jiang MJ, Fu YL, Xie F, Li JJ, Meng QH. Gut microbiome composition in patients with liver cirrhosis with and without hepatic encephalopathy: A systematic review and meta-analysis. *World J Hepatol* 2025; 17(1): 100377 [DOI: [10.4254/wjh.v17.i1.100377](https://doi.org/10.4254/wjh.v17.i1.100377)]

SCIENTOMETRICS

Zhu WY, Li X, Xie JL, Lu Q, Ma YJ, Zhu ZJ, Liu J. Hotspots and trends in stem cell therapy for liver fibrosis and cirrhosis: A bibliometric analysis. *World J Hepatol* 2025; 17(1): 96105 [DOI: [10.4254/wjh.v17.i1.96105](https://doi.org/10.4254/wjh.v17.i1.96105)]

Huang CY, Luo ZZ, Huang WP, Lin LP, Yao YT, Zhuang HX, Xu QY, Lai YD. Research hotspots and trends in gut microbiota and nonalcoholic fatty liver disease: A bibliometric study. *World J Hepatol* 2025; 17(1): 102034 [DOI: [10.4254/wjh.v17.i1.102034](https://doi.org/10.4254/wjh.v17.i1.102034)]

CASE REPORT

Chen ZQ, Zeng SJ, Xu C. Management of chylous ascites after liver cirrhosis: A case report. *World J Hepatol* 2025; 17(1): 100797 [DOI: [10.4254/wjh.v17.i1.100797](https://doi.org/10.4254/wjh.v17.i1.100797)]

Le KL, Tran MQ, Pham TN, Duong NNQ, Dinh TT, Le NK. Hepatic eosinophilic pseudotumor due to *Fasciola hepatica* infection mimicking intrahepatic cholangiocarcinoma: A case report. *World J Hepatol* 2025; 17(1): 101664 [DOI: [10.4254/wjh.v17.i1.101664](https://doi.org/10.4254/wjh.v17.i1.101664)]

LETTER TO THE EDITOR

Kanda T, Sasaki-Tanaka R, Tsuchiya A, Terai S. Hepatitis B virus infection and its treatment in Eastern Ethiopia. *World J Hepatol* 2025; 17(1): 99209 [DOI: [10.4254/wjh.v17.i1.99209](https://doi.org/10.4254/wjh.v17.i1.99209)]

Majeed AA, Butt AS. Hepatitis B virus infection and metabolic dysfunction associated steatotic liver disease: Rising pandemic with complex interaction. *World J Hepatol* 2025; 17(1): 100968 [DOI: [10.4254/wjh.v17.i1.100968](https://doi.org/10.4254/wjh.v17.i1.100968)]

Emiroglu HH, Emiroglu M. Timing of post-vaccination tests in infants born to mothers with chronic hepatitis B virus infection. *World J Hepatol* 2025; 17(1): 101619 [DOI: [10.4254/wjh.v17.i1.101619](https://doi.org/10.4254/wjh.v17.i1.101619)]

Gou GE, Li T, Liu CR, Meng T, Li YP. Potential mechanisms and therapeutic prospects of the association between *Helicobacter pylori* infection and metabolic dysfunction-associated steatohepatitis. *World J Hepatol* 2025; 17(1): 101798 [DOI: [10.4254/wjh.v17.i1.101798](https://doi.org/10.4254/wjh.v17.i1.101798)]

Li C, Nan J, Xu BT. *Helicobacter pylori* infection as a contributing factor to metabolic dysfunction-associated steatohepatitis: A population-based insight. *World J Hepatol* 2025; 17(1): 103228 [DOI: [10.4254/wjh.v17.i1.103228](https://doi.org/10.4254/wjh.v17.i1.103228)]

Jin LY, Wang K, Xu BT. High metabolic dysfunction-associated steatotic liver disease prevalence in type 2 diabetes: Urgent need for integrated screening and lifestyle intervention. *World J Hepatol* 2025; 17(1): 103409 [DOI: 10.4254/wjh.v17.i1.103409]

ABOUT COVER

Editorial Board Member of *World Journal of Hepatology*, Maria Jesus Citores, PhD, Hospital Universitario Puerta de Hierro Majadahonda, Majadahonda 28222, Madrid, Spain. mariajesus.citores@salud.madrid.org

AIMS AND SCOPE

The primary aim of *World Journal of Hepatology* (*WJH*, *World J Hepatol*) is to provide scholars and readers from various fields of hepatology with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJH mainly publishes articles reporting research results and findings obtained in the field of hepatology and covering a wide range of topics including chronic cholestatic liver diseases, cirrhosis and its complications, clinical alcoholic liver disease, drug induced liver disease autoimmune, fatty liver disease, genetic and pediatric liver diseases, hepatocellular carcinoma, hepatic stellate cells and fibrosis, liver immunology, liver regeneration, hepatic surgery, liver transplantation, biliary tract pathophysiology, non-invasive markers of liver fibrosis, viral hepatitis.

INDEXING/ABSTRACTING

The *WJH* is now abstracted and indexed in PubMed, PubMed Central, Emerging Sources Citation Index (ESCI), Scopus, Reference Citation Analysis, China Science and Technology Journal Database, and Superstar Journals Database. The 2024 Edition of Journal Citation Reports® cites the 2023 journal impact factor (JIF) for *WJH* as 2.5; JIF Quartile: Q3. The *WJH*'s CiteScore for 2023 is 4.1 and Scopus CiteScore rank 2023: Hepatology is 41/82.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Yu-Qing Zhao*; Production Department Director: *Xiang Li*; Cover Editor: *Xiang Li*.

NAME OF JOURNAL

World Journal of Hepatology

ISSN

ISSN 1948-5182 (online)

LAUNCH DATE

October 31, 2009

FREQUENCY

Monthly

EDITORS-IN-CHIEF

Koo Jeong Kang

EXECUTIVE ASSOCIATE EDITORS-IN-CHIEF

Shuang-Suo Dang

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/1948-5182/editorialboard.htm>

PUBLICATION DATE

January 27, 2025

COPYRIGHT

© 2025 Baishideng Publishing Group Inc

PUBLISHING PARTNER

Department of Infectious Diseases, the Second Affiliated Hospital of Xi'an Jiaotong University

INSTRUCTIONS TO AUTHORS

<https://www.wjgnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjgnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjgnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

POLICY OF CO-AUTHORS

<https://www.wjgnet.com/bpg/GerInfo/310>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

PUBLISHING PARTNER's OFFICIAL WEBSITE

http://2yuan.xjtu.edu.cn/Html/Departments/Main/Index_21148.html



Observational Study

Effectiveness of RESET care program: A real-world-evidence on managing non-alcoholic fatty liver disease through digital health interventions

Jayesh Soni, Nikhilesh Pathak, Mihir Gharia, Devina Aswal, Jaymin Parikh, Prachi Sharma, Astha Mishra, Dhvni Lalan, Twinkle Maheshwari

Specialty type: Gastroenterology and hepatology

Provenance and peer review: Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's classification

Scientific Quality: Grade B

Novelty: Grade B

Creativity or Innovation: Grade B

Scientific Significance: Grade B

P-Reviewer: Yang XY

Received: September 23, 2024

Revised: November 11, 2024

Accepted: December 2, 2024

Published online: January 27, 2025

Processing time: 106 Days and 18.8 Hours



Jayesh Soni, Department of Gastroenterology, Digestive Disease Clinic, Mumbai 400092, Mahārāshtra, India

Nikhilesh Pathak, Department of Endocrinology, DPC Health and Diabetic Clinic, Delhi 110008, India

Mihir Gharia, Devina Aswal, Jaymin Parikh, Prachi Sharma, Astha Mishra, Dhvni Lalan, Twinkle Maheshwari, Medical Affairs, Tatvacare, Ahmedabad 380058, Gujarāt, India

Corresponding author: Mihir Gharia, Medical Affairs, Tatvacare, Plot No. 115/5, No. 51 TP Scheme Road, Ahmedabad 380058, Gujarāt, India. mihir10584@gmail.com

Abstract

BACKGROUND

Non-alcoholic fatty liver disease (NAFLD) management requires sustainable lifestyle modifications. This study aimed to evaluate the effectiveness of the RESET care plan, a comprehensive program that is an integrated personalized diet, exercise, and cognitive behavior therapy, delivered *via* MyTatva's digital health application enabled through a body composition analyzer (BCA) and smartwatch.

AIM

To evaluate the effectiveness of the comprehensive program delivered *via* MyTatva's digital health app enabled through internet of thing devices.

METHODS

This retrospective observational study analyzed deidentified data from 22 participants enrolled in the MyTatva RESET care program. Participants were divided into three groups: Group A, diet plan; Group B, diet + exercise plan; and Group C, diet + exercise + cognitive behavioral therapy plan. Participants were provided with a BCA and smartwatch for continuous monitoring of anthropometric parameters. Statistical analysis, including one-way ANOVA and post-hoc Tukey's Honest Significant Difference test, was conducted to compare mean changes in anthropometric parameters across the groups.

RESULTS

All intervention groups showed significant improvement across all anthropometric parameters. Group C showed the most significant improvements, with mean weight reduction of 7% or more (6.99 ± 2.98 kg, $7.00\% \pm 3.39\%$; $P = 0.002$) from baseline, a benchmark associated with improved NAFLD conditions. Post-hoc analysis revealed that Group C had significantly greater improvements than Groups A and B. Weight reduction was observed in 85.7% of Group A participants, 77.8% of Group B participants, and 100% of Group C participants.

CONCLUSION

The comprehensive RESET care plan achieved a 7% weight reduction in 12 weeks, demonstrating its effectiveness in managing NAFLD. These results support adopting digitally supported, patient-centric approaches for NAFLD treatment.

Key Words: Cognitive behavioral therapy; Digital health interventions; Diet and exercise regimens; Lifestyle modifications; Non-alcoholic fatty liver disease management

©The Author(s) 2025. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: This study evaluates the RESET care program, a comprehensive digital health intervention for managing non-alcoholic fatty liver disease (NAFLD). By integrating personalized diet, exercise, and cognitive behavioral therapy (CBT) through a mobile app supported by internet of things devices, the program offers continuous, tailored support for lifestyle modifications crucial to NAFLD management. Results demonstrate that participants receiving all three interventions (diet, exercise, CBT) achieved significant weight reduction and improved health outcomes. The RESET care program highlights the potential of digital tools in delivering accessible, scalable solutions for chronic disease management.

Citation: Soni J, Pathak N, Gharia M, Aswal D, Parikh J, Sharma P, Mishra A, Lalan D, Maheshwari T. Effectiveness of RESET care program: A real-world-evidence on managing non-alcoholic fatty liver disease through digital health interventions. *World J Hepatol* 2025; 17(1): 101630

URL: <https://www.wjgnet.com/1948-5182/full/v17/i1/101630.htm>

DOI: <https://dx.doi.org/10.4254/wjh.v17.i1.101630>

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) has emerged as a global health burden, affecting approximately 1 in 4 individuals worldwide. NAFLD ranges from simple steatosis (fat accumulation) to non-alcoholic steatohepatitis (NASH), and its global prevalence in the general population is estimated between 6.3% and 33%, with NASH affecting 3-5% [1,2]. Obesity is a major risk factor of NAFLD, with studies showing that the likelihood of developing NAFLD increases 5-fold at a body mass index (BMI) of 30-32.5 kg/m² and up to 14-fold at BMI of 37.5-40 kg/m² compared to a BMI of 20-22.5 kg/m² [3,4].

Effective NAFLD management requires both dietary and physical activity modifications. Healthy weight loss with sustained muscle mass plays a pivotal role, with a reduction of 3%-5% decreasing hepatic steatosis, 5%-7% improving NASH conditions, and 10% or more needed to reverse hepatic fibrosis [5]. Management also normalizes elevated liver enzymes (aspartate aminotransferase and alanine aminotransferase), enhances insulin sensitivity, and thereby reduces cardiovascular risk by improving endothelial function and increasing cardiorespiratory fitness [6]. However, diet or exercise alone is often not as effective as a combined approach. Integrating both balanced dietary changes and increased physical activity yields more sustainable improvements in NAFLD and overall metabolic health [1,7].

Traditional intervention methods usually involve in-person consultations, which often lack real-time and continuous patient monitoring. The recommendation of drastic changes in diet and exercise can also be overwhelming for patients, leading to low adherence rates. Many patients struggle to maintain these changes in the long-term due to a lack of continuous motivational support [8,9]. In recent years, the health ecosystem has witnessed a significant shift toward digital health platforms, which complement pharmacological treatments in chronic disease management, and increase scalability. These platforms provide continuous monitoring and personalized support, helping to bridge the gap between health care setups and patients [10]. Recent digital advances enable internet of things (IoT) devices to be integrated into such management plans to track health metrics, to address the limitations of traditional methods [11,12].

The MyTatva digital health application offers the RESET plan, a novel comprehensive approach for NAFLD management by integrating personalized support from nutrition, physiotherapy, and cognitive behavioral therapy (CBT) coaches. We aimed to evaluate the effectiveness of the RESET plan by analyzing the reduction in anthropometric parameters across three different digital intervention groups.

MATERIALS AND METHODS

Research objective

The primary objective of this study was to compare the effectiveness of the RESET care program's three intervention arms: Diet plan; diet + exercise plan; and diet + exercise + CBT plan.

Study design and participants

This retrospective observational study utilized deidentified data from 22 patients, automatically retrieved through MyTatva's app. Initially, physicians recommended MyTatva's RESET care plan to 32 patients, of which 27 consented to participate. However, 4 patients did not meet the eligibility criteria, leaving 22 participants for the analysis.

The RESET care program is a 12-week digital health intervention aimed at managing NAFLD, focusing on diet, exercise, and CBT. The program integrates IoT devices such as a body composition analyzer (BCA) machine and a smartwatch, which allow for the regular monitoring of each participant's anthropometric parameters.

Participants included adults aged 18-65 years with a BMI between 25 kg/m² and 40 kg/m², willing to use digital health technology (smartphone, BCA machine, and smartwatch), and able to provide informed consent during onboarding with the application. Participants needed to have stable internet access and basic technological knowledge. Participants with any secondary causes of hepatic steatosis (*e.g.*, significant alcohol consumption, viral hepatitis), advanced liver disease (*e.g.*, cirrhosis), or other significant liver conditions, as well as those participating in another weight loss program or clinical trial, pregnant or lactating individuals, or those with severe psychiatric conditions that could interfere with participation were excluded from the study.

In this retrospective analysis, participants were categorized into three groups of the RESET care program offered through the digital health app. Group A consisted of participants who used the application for personalized dietary guidance. Group B participants received both the personalized diet plans and the structured exercise routines. Group C comprised participants who received the comprehensive RESET care program, including dietary plans, structured exercise routines, and CBT modules. This categorization enabled the evaluation of the effectiveness of varying levels of digital health intervention in improving health outcomes, allowing for a real-world assessment of the program's impact.

Digital health program

Upon onboarding, the detailed baseline assessment included demographic information, ethnicity, medical history, family history, and current work status. Each intervention arm is designed to progressively enhance support and effectiveness, considering the unique needs of the participant (Figure 1).

Group A participants receive a personalized diet plan based on a unique Individual Dietary Intervention Strategy plan focusing on gradual and sustainable changes to their eating patterns. Participants in the diet plan option of the RESET care program received an introductory call from a dedicated diet coach to assess baseline parameters such as demographics, cultural dietary habits, lifestyle, preferences, and local food availability. This initial assessment ensured that dietary recommendations were practical and tailored to each participant's routine. A personalized diet chart was developed, focusing on subtle, sustainable changes to support healthier eating habits. Participant adherence was monitored at 15-day intervals through the application and follow-up calls, allowing the diet coach to track compliance and adjust as needed. For participants showing positive health improvements, the plan was advanced to include additional lifestyle changes, like reducing dining out and optimizing meal timing. For those facing challenges, initial efforts emphasized building foundational healthy habits before gradually incorporating more comprehensive dietary modifications.

Group B combined a personalized dietary plan with an exercise plan *via* the FITT approach tailored to individual physical activity levels and lifestyle requirements. This plan emphasizes incremental adjustments in both diet and exercise, supported by a 15-day follow-up by coaches. The personalized exercise plan in the RESET care program was developed based on participant baseline physical activity levels, job demands, and any physical limitations. For those with sedentary jobs, the plan included strategies like walking breaks, stretching exercises, and desk workouts. For participants who traveled frequently, adaptable routines suitable for various environments were provided. The plan focused on gradually increasing both the intensity and duration of activities to build endurance and strength progressively. Participant adherence and progress were monitored at 15-day intervals through the application and follow-up calls, allowing for timely adjustments to optimize their outcomes. As participants built endurance and demonstrated adherence, the plan was modified to include more vigorous exercises tailored to their growing fitness levels.

Group C integrated CBT with diet and exercise interventions. This comprehensive approach addresses psychological barriers to lifestyle changes, providing continuous support through regular CBT sessions. These sessions help participants develop coping strategies for stress, dysregulated eating behavior, and sedentary lifestyle, enhancing long-term adherence to these interventions.

After the 90-day intervention period, participants underwent a final assessment to evaluate changes in their anthropometric parameters.

Data collection and statistical analysis

To facilitate comprehensive data collection, patients were provided with a BCA machine. This device enabled auto-fetching of patients' BCA measurements regularly, ensuring continuous real-time monitoring of their data. The collected data were organized in a Microsoft Excel spreadsheet. Analysis was conducted using SPSS Ver. 25.0 (IBM Corp., Armonk, NY, United States). Quantitative data were expressed as means and standard deviations. Statistical analysis was performed to establish significance at a *P* value < 0.05, adhering to a 5% significance level. A one-way ANOVA was performed to compare mean changes in anthropometric parameters among the three intervention groups. Post-hoc

| | Group A | Group B | Group C |
|----------------------|--|---|--|
| Baseline assessment | Welcome call with diet coach Baseline assessment: Demographic information, regional and cultural dietary habits, availability of food resources | Onboarding call with health coach Collect baseline parameters covering dietary habits and physical activity routines Understand physical routine, sedentary behavior, types of physical activities, and job-related physical demands | Onboarding call with CBT coach Collect baseline parameters covering dietary habits, physical activity routines, and psychological factors Gather information on lifestyle, mood, job environment, stress levels, to assess the barriers in adopting healthier habits |
| Study plan | Formulate personalized diet plan using the IDIS (Individual Dietary Intervention Strategy) Plan Focus on gradual, sustainable changes Aims to reduce EDNP (Energy-Dense, Nutrient-Poor) foods and increase NRF (Nutrient-Rich Foods) intake Target specific behaviors for healthier eating habits | Formulate personalized diet plan using the IDIS Plan Develop personalized exercise plan based on assessment Include strategies for sedentary jobs (walking breaks, stretching exercises, desk workouts) Adapt exercise routines for jobs with regular travel | Develop tailored IDIS based diet and exercise plans Include CBT component to support a positive mindset, address psychological barriers, and teach coping strategies for stress and emotional eating (mindfulness, relaxation exercises, cognitive restructuring) |
| Follow-up evaluation | Monitor adherence with food diary updates Evaluate compliance and plan effectiveness Implement incremental plan adjustments to improve eating habits | Participants update food diaries and track BCA parameters using the MyTatva app and devices Evaluate compliance and plan effectiveness Gradually increase intensity and duration of physical activity & Diet plan | Offer continuous support, identify psychological and emotional influences, and provide tailored interventions for smooth and effective behavior change toward healthier lifestyle choices Incremental modifications to diet and exercise plan |

Figure 1 Comprehensive overview of the RESET care program intervention arms. Diet plan (Group A), Diet + exercise plan (Group B), and diet + exercise + cognitive behavioral therapy plan (Group C).

comparisons using Tukey's Honest Significant Difference (HSD) test were conducted to further investigate significant differences between groups.

Ethical considerations

The study received approval from the ACEAS-Independent Ethics Committee, with protocol number: MTNAFLD120324. The study was conducted in accordance with the Declaration of Helsinki and its subsequent revisions.

RESULTS

Patient demographic and baseline parameters

The study cohort consisted of 22 participants, with a distribution of 31.8% in Group A, 40.9% in Group B, and 27.3% in Group C. The mean age of participants was 45.59 ± 11.02 years, with the majority being obese (72.7%). The cohort included 63.6% males and was predominantly from South India (40.9%). Employment status varied, with 54.6% employed and residing within metropolitan areas. Detailed demographic and baseline parameters are provided in [Table 1](#).

Change in eating and exercise patterns

The overall cohort consisted of 31.8% vegetarians ($n = 7$) and 68.2% non-vegetarians ($n = 15$). Among the intervention groups, changes in participant dietary habits were evaluated by tracking the reduction in consumption of energy-dense, nutrient-poor (EDNP) foods and the increase in nutrient-rich foods (NRFs) over the course of the study. Participants also increased their consumption of fruits, vegetables, millet, eggs, chicken/fish, and pulses, as well as healthy fats like nuts and seeds ([Table 2](#)). Participants in all groups demonstrated a reduction in the consumption of refined and fried foods, sweets, high-salt snacks, meals from restaurants, and red meat ([Table 3](#)). At baseline, all groups had very low physical activity frequency; however, by the end of the study, there was a noticeable increase in physical activity across all groups, with Group C showing slightly better improvement.

Change in anthropometric parameters

Changes in anthropometric parameters were assessed across all three intervention groups over a 90-day period. Par-

Table 1 Demographic and baseline parameters of study participants across intervention groups, *n* (%)

| Parameters | Total | Group A | Group B | Group C |
|--------------------------|---------------|---------------|---------------|--------------|
| Total | 22 (100) | 7 (31.8) | 9 (40.9) | 6 (27.3) |
| Male | 14 (63.6) | 5 (71.4) | 5 (55.5) | 4 (66.6) |
| Age in years | 45.59 ± 11.02 | 48.00 ± 12.03 | 45.89 ± 13.85 | 42.33 ± 2.94 |
| Overweight | 6 (27.3) | 1 (14.2) | 4 (44.4) | 1 (16.7) |
| Obese | 16 (72.7) | 6 (85.8) | 5 (55.6) | 5 (83.3) |
| Region | | | | |
| North India | 4 (18.2) | 1 (25.0) | 2 (50.0) | 1 (25.0) |
| South India | 9 (40.9) | 1 (11.2) | 4 (44.4) | 4 (44.4) |
| West India | 6 (27.3) | 2 (33.3) | 3 (50.0) | 1 (16.7) |
| East India | 3 (13.6) | 3 (100.0) | 0 (0) | 0 (0) |
| Employment status | | | | |
| Student | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| Housewife | 4 (18.2) | 0 (0) | 2 (50.0) | 2 (50.0) |
| Employed | 12 (54.6) | 4 (33.3) | 6 (50.0) | 2 (16.7) |
| Self-employed | 3 (13.6) | 2 (66.7) | 1 (33.3) | 0 (0.00) |
| Retired | 3 (13.6) | 1 (33.3) | 0 (0) | 2 (66.7) |
| Residence | | | | |
| Within metropolitan area | 22 (100) | 7 (31.8) | 9 (40.9) | 6 (27.3) |
| Dietary pattern | | | | |
| Vegetarian | 7 (31.8) | 4 (57.1) | 2 (28.6) | 1 (14.3) |
| Non-vegetarian | 15 (68.2) | 3 (20) | 7 (46.7) | 5 (33.3) |

Table 2 Changes in the frequency of nutrient-rich foods and exercise habits across the intervention groups

| Parameters | Group A | | Group B | | Group C | |
|---|--------------|--------------|--------------|--------------|-------------|--------------|
| Frequency (times per month) | Baseline | End of study | Baseline | End of study | Baseline | End of study |
| Fruit | 5.57 ± 1.17 | 10.71 ± 3.40 | 7.78 ± 3.40 | 10.89 ± 3.17 | 8.16 ± 2.78 | 12.16 ± 2.92 |
| Vegetables (salads/kachumber/homemade soups) | 12 ± 3.46 | 16.71 ± 3.54 | 11.33 ± 3.16 | 15.44 ± 2.69 | 6.17 ± 3.97 | 10.5 ± 4.37 |
| Millets (Bajra/Jowar/Nachni <i>etc.</i>) | 10.28 ± 3.03 | 15 ± 2.16 | 10.44 ± 3.84 | 13.55 ± 4.06 | 7.17 ± 3.06 | 11 ± 4.19 |
| Eggs | 5.57 ± 7.02 | 7.57 ± 9.47 | 8.11 ± 5.03 | 9.89 ± 6.27 | 9.16 ± 4.67 | 12 ± 6.06 |
| Chicken/fish | 4.57 ± 5.76 | 6 ± 7.83 | 8.44 ± 5.91 | 10.44 ± 6.83 | 7.67 ± 4.54 | 10.67 ± 5.89 |
| Dals/pulses/sprouts (moong, matki, chawli, chole, rajma) | 8.71 ± 4.34 | 11.42 ± 3.86 | 11.44 ± 4.63 | 13.89 ± 3.51 | 8.17 ± 3.19 | 15 ± 3.63 |
| Nuts and seeds (almonds, walnuts, flaxseeds, sunflower seeds, chia seeds) | 3 ± 2.16 | 7.28 ± 2.98 | 4.22 ± 3.56 | 7.88 ± 3.98 | 2.33 ± 1.75 | 6.33 ± 1.75 |
| Milk and milk products | 6.57 ± 2.57 | 9.71 ± 3.19 | 7.33 ± 3.04 | 9.78 ± 3.11 | 8.17 ± 2.56 | 12.67 ± 4.41 |
| Exercise (walk, jog, yoga, pranayama, dance, sports) | 3.71 ± 3.19 | 7.14 ± 3.33 | 2.33 ± 2.12 | 10.78 ± 2.38 | 4.33 ± 1.86 | 12.83 ± 1.94 |

Participants in Group C showed the most significant improvements, with a mean weight reduction of 6.99 kg, BMI reduction of 2.18 kg/m², subcutaneous fat reduction of 1.26%, and visceral fat reduction of 2.16%. These findings indicate that the comprehensive intervention in Group C was the only intervention group that achieved a mean weight reduction of 7% from baseline with 33.33% of participants having achieved a body weight reduction of ≥ 7%. The detailed changes for each anthropometric parameter captured through the BCA machine are presented in [Table 4](#), while the percentage reductions are illustrated in [Figure 2](#).

Table 3 Changes in the frequency of energy-dense, nutrient-poor across the intervention groups

| Parameters | Group A | | Group B | | Group C | |
|--|--------------|--------------|--------------|--------------|--------------|--------------|
| Frequency (times per month) | Baseline | End of study | Baseline | End of study | Baseline | End of study |
| Refined food items (bread, pav, biscuits, cookies, rusk, toast, Khari, <i>etc.</i>) | 11.7 ± 3.9 | 8 ± 2.44 | 12.78 ± 6.06 | 8.33 ± 3.94 | 12.67 ± 7.11 | 8.33 ± 4.96 |
| Fried food (Puri, Kachori, Tikki, Bhature, Pakoras, Samosas, <i>etc.</i>) | 11 ± 3.31 | 7.28 ± 2.69 | 11.67 ± 6.12 | 7.22 ± 4.32 | 11.00 ± 2.60 | 6.67 ± 1.63 |
| Sweets (Laddu, Jalebi, Kulfi, Chocolate, Kheer, <i>etc.</i>) | 7.28 ± 4.34 | 5.85 ± 3.53 | 8.11 ± 5.32 | 5.22 ± 3.59 | 8.00 ± 3.22 | 6 ± 1.67 |
| High-salt snacks (Namkeen, Bhujia, Pickles, Papad, <i>etc.</i>) | 8.42 ± 3.25 | 5.28 ± 2.56 | 12.11 ± 8.22 | 7.33 ± 4.58 | 9.5 ± 6.15 | 7.5 ± 4.23 |
| Restaurant meals and/or takeouts | 12.28 ± 5.02 | 7.14 ± 2.6 | 8.44 ± 3.00 | 4.11 ± 1.69 | 14.83 ± 5.15 | 7.33 ± 3.67 |
| Red meat (mutton) | 3.42 ± 3.35 | 2 ± 1.91 | 3.88 ± 2.42 | 2.33 ± 0.86 | 5.16 ± 3.43 | 2.16 ± 1.32 |

Table 4 Change in anthropometric parameters across three groups

| Parameters | Change in anthropometric parameters | | | | | |
|--------------------------|-------------------------------------|---------------|---------------|---------------|----------------|---------------|
| | Group A | | Group B | | Group C | |
| | Baseline | 90 days | Baseline | 90 days | Baseline | 90 days |
| Weight (kg) | 87.61 ± 16.06 | 85.61 ± 15.55 | 82.61 ± 9.29 | 79.90 ± 8.64 | 101.10 ± 17.85 | 94.11 ± 17.38 |
| BMI (kg/m ²) | 33.08 ± 4.03 | 32.25 ± 3.60 | 30.14 ± 2.26 | 29.14 ± 1.93 | 32.90 ± 3.02 | 30.72 ± 3.41 |
| Muscle mass | 54.66 ± 11.25 | 53.94 ± 11.66 | 54.66 ± 11.25 | 53.94 ± 11.66 | 54.66 ± 11.25 | 53.94 ± 11.66 |
| Subcutaneous fat | 24.38 ± 1.82 | 23.92 ± 1.82 | 22.44 ± 2.16 | 21.74 ± 2.10 | 23.68 ± 2.06 | 22.42 ± 2.97 |
| Visceral fat | 15.05 ± 3.61 | 13.95 ± 3.32 | 12.34 ± 2.27 | 11.11 ± 1.97 | 15.30 ± 2.65 | 13.14 ± 3.17 |

BMI: Body mass index.

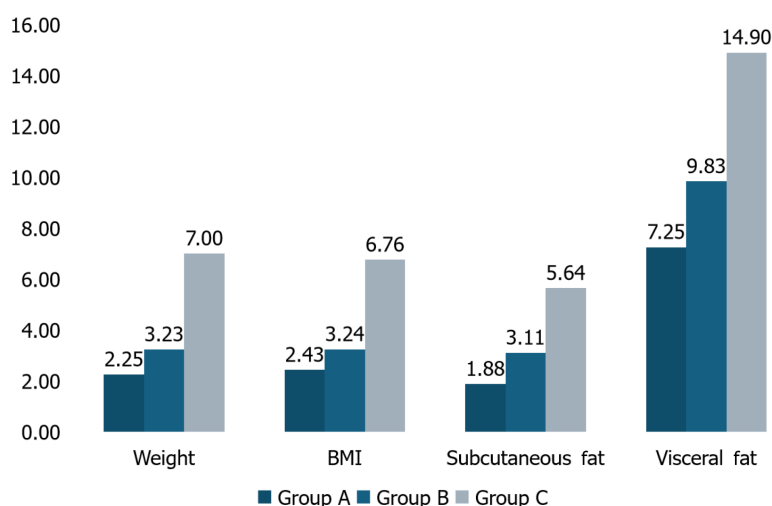


Figure 2 Reduction anthropometric parameters across three groups (Group A: diet plan, Group B: Diet + exercise plan, Group C: Diet + exercise + cognitive behavioral therapy plan).

Statistical findings

A one-way ANOVA was performed to compare the mean changes in anthropometric parameters among the three intervention groups. The results of the ANOVA indicated significant differences among the groups for all parameters: Weight ($P = 0.00050$); BMI ($P = 0.00003$); subcutaneous fat ($P = 0.00198$); and visceral fat ($P = 0.00015$). Detailed ANOVA results are provided in Table 5. To further investigate which groups differed significantly from each other, post-hoc comparisons using Tukey's HSD test were conducted. Tukey's HSD revealed that Group C had significantly greater im-

Table 5 ANOVA and Tukey Honest Significant Difference test results for changes in anthropometric parameters across all intervention groups

| Parameter | P value | Significant pairwise comparisons ¹ |
|-------------------------|---------|---|
| Weight change | 0.00050 | C > A, C > B |
| BMI change | 0.00003 | C > A, C > B |
| Subcutaneous fat change | 0.00198 | C > A, C > B |
| Visceral fat change | 0.00015 | C > A, C > B |

¹Tukey's Honest Significant Difference.

BMI: Body mass index.

provements in all anthropometric parameters compared to both Group A and Group B.

DISCUSSION

Participants in the comprehensive RESET care program (Group C) showed superior weight reduction and improvements in anthropometric parameters compared to Group A and Group B. The program's effectiveness highlights the enhanced benefits of combining diet, exercise, and CBT for better NAFLD outcomes. Additionally, Group C had a slightly younger average age and a higher percentage of employed participants, which suggests that younger, employed individuals might be more motivated to integrate lifestyle changes effectively.

Diet plays a crucial role in the management of NAFLD, as excessive intake of EDNP foods can lead to fat accumulation in the liver through increased *de novo* lipogenesis, exacerbating hepatic steatosis, inflammation, and insulin resistance [13]. In contrast, NRFs, high in essential nutrients, fiber, healthy fats and antioxidants, help reduce hepatic fat accumulation, improve liver function, enhance insulin sensitivity, and combat inflammation [14,15]. The review findings by Perumpail *et al* [16] and Chai *et al* [17] support the significant roles of diet and exercise in managing NAFLD. Both reviews highlight that low-carbohydrate diets are more effective than low-fat diets in improving hepatic fat content, reducing BMI and triglycerides, and enhancing metabolic indicators [18]. The Mediterranean and Paleo diets emerged as promising regimens for NAFLD patients, leading to improved BMI and liver function [19]. In the present study, the RESET program's dietary component provided personalized, structured nutritional guidance, which supported participants in adopting healthier eating habits. These changes were particularly notable in the reduction of EDNP foods and the increased consumption of NRFs. Additionally, the 25% reduction in red meat consumption among the non-vegetarian participants is significant, as high red meat intake is associated with an increased risk of NAFLD [20].

Regular physical activity, such as 40-45-minute sessions three times a week, enhances metabolic health and reduces liver fat content [21]. Combining dietary modifications to compliment structured physical activity resulted in the most significant improvements in hepatic fat content, BMI, and other metabolic parameters. Chai *et al* [17] reported that participants in the diet-only group experienced an average BMI reduction of 1.5 kg/m² over 6 months. The diet combined with exercise group showed an even greater BMI decrease of 2.0 kg/m², highlighting the enhanced effectiveness of combining diet and exercise for comprehensive NAFLD management. Similarly, in the present study, we observed that the Group B participants reported more significant reductions in weight and BMI compared to Group A.

In the study by Wong *et al* [22], a 52-week lifestyle intervention involving diet and regular exercise group achieved a mean weight reduction of 5.6 kg and a BMI reduction of 1.5 kg/m², with 67% of non-obese and 61% of obese patients experiencing remission of NAFLD. Montemayor *et al* [23] reported that a combination of a customized hypocaloric diet and enhanced physical activity showed significant reductions in intrahepatic fat, BMI, and liver stiffness. Specifically, the mean weight reduction was 6.8 kg and BMI reduction was 2.6 kg/m² in the Mediterranean diet-physical activity group. Comparatively, in the present study, the reduction in BMI was 1 kg/m², achieved in 12 weeks.

All intervention groups were effective in managing NAFLD; however, Group C showed a weight reduction of 7% (6.99 ± 2.98 kg) and a BMI reduction of 6.76% (2.18 ± 0.99 kg/m²). The enhanced effectiveness of the overall plan can be attributed to the combined benefits of diet and physical exercise, along with the psychological support provided by the CBT coach, which addresses behavioral barriers to adherence and promotes lasting lifestyle changes. Similarly, the study conducted by Moscatiello *et al* [24] demonstrates that participants who received CBT sessions experienced a significant weight loss of 5.6% over 2 years, compared to only 1.4% in the diet-only group. The study conducted by Montesi *et al* [25] demonstrated the effectiveness of CBT in the management of NAFLD with a significant reduction in BMI (-2.04 ± 1.42 kg/m²) in the CBT + exercise group compared to those who received CBT support only (-1.09 ± 1.68 kg/m²).

When combined with diet and exercise, CBT provides a comprehensive approach, resulting in significant weight and BMI reductions, and promoting long-term, sustainable improvements in anthropometric parameters. Our study's intra-group analysis further supports this, showing significant reductions in anthropometric parameters across all intervention groups over the 12-week duration, with the highest reductions observed in Group C. The digitally delivered RESET care program offers a personalized approach based on root-cause analysis, tailoring interventions to individual needs and integrating CBT to ensure sustained lifestyle changes.

One of the main challenges in implementing the digital health intervention was ensuring participants' consistent engagement with the application and monitoring tools, especially for those less familiar with technology. To address this, participants received thorough onboarding, including guidance on using the application, BCA, and smartwatch. Regular follow-up calls from health coaches helped maintain engagement, provide technical support, and encourage adherence to the program. For those who struggled with lifestyle changes, coaches emphasized gradual habit-building to foster long-term commitment to the intervention. The RESET care program offers potential economic benefits by reducing the need for frequent in-person visits, lowering travel costs, and saving time for participants. While initial setup costs for digital tools and training are necessary, the program's scalability and potential to improve long-term health outcomes, particularly by preventing NAFLD complications, suggest that it may offer significant cost savings in managing chronic liver conditions. The small sample size restricts the generalizability of the findings and highlights the need for larger, long-term studies to assess the program's effectiveness on a broader scale. Additionally, the reliance on self-reported dietary data may introduce reporting biases, and the study lacks insights into the individual contributions of each component, such as exercise-only or CBT-only interventions. Long-term follow-up is necessary to confirm the sustainability of the results.

CONCLUSION

The RESET care program is effective in NAFLD management, through promoting healthy weight loss and significant improvements in other anthropometric parameters. This addresses a critical need for a scalable, multifaceted approach to NAFLD management, by providing personalized, real-time monitoring through tailored interventions. This program could serve as a valuable tool for clinicians in remotely monitoring patients with chronic conditions like NAFLD, enhancing overall management and care.

ACKNOWLEDGEMENTS

We would like to thank all those who contributed to this research. We also appreciate the insights and contributions of our biostatistical consultant, whose expertise was instrumental in the analysis and interpretation of the data.

FOOTNOTES

Author contributions: Soni J and Pathak N conducted patient enrollment and data collection; Parikh J and Sharma P wrote, and edited the manuscript; Aswal D and Gharia M supervised the study; Mishra A created the images and graphics; Lalan D and Maheshwari T assisted with data analysis and manuscript revisions.

Institutional review board statement: The study received approval from the ACEAS-Independent Ethics Committee with protocol number: MTNAFLD120324.

Informed consent statement: Upon onboarding to MyTatva app, all participants were informed about the use of the digital health app and associated monitoring tools. They provided consent to participate and agreed to the collection and use of their data for research purposes.

Conflict-of-interest statement: The authors declare no conflicts of interest.

Data sharing statement: No additional data are available for this study. The dataset analyzed was fully anonymized, and no further information can be provided beyond the results presented in this manuscript.

STROBE statement: The authors have read the STROBE Statement-checklist of items, and the manuscript was prepared and revised according to the STROBE Statement-checklist of items.

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country of origin: India

ORCID number: Mihir Gharia 0000-0001-8321-7966; Devina Aswal 0009-0000-7305-0824; Jaymin Parikh 0000-0001-8249-6836; Prachi Sharma 0009-0006-9811-0276; Astha Mishra 0009-0005-7420-2507; Twinkle Maheshwari 0000-0002-4237-0742.

S-Editor: Qu XL

L-Editor: A

P-Editor: Zhao YQ

REFERENCES

- 1 Hydes TJ, Ravi S, Loomba R, E Gray M. Evidence-based clinical advice for nutrition and dietary weight loss strategies for the management of NAFLD and NASH. *Clin Mol Hepatol* 2020; **26**: 383-400 [PMID: 32674529 DOI: 10.3350/cmh.2020.0067]
- 2 Pouwels S, Sakran N, Graham Y, Leal A, Pintar T, Yang W, Kassir R, Singhal R, Mahawar K, Ramnarain D. Non-alcoholic fatty liver disease (NAFLD): a review of pathophysiology, clinical management and effects of weight loss. *BMC Endocr Disord* 2022; **22**: 63 [PMID: 35287643 DOI: 10.1186/s12902-022-00980-1]
- 3 Seaw KM, Henry CJ, Bi X. Relationship between Non-Alcoholic Fatty Liver Disease and Visceral Fat Measured by Imaging-Based Body Composition Analysis: A Systematic Review. *Livers* 2023; **3**: 463-493 [DOI: 10.3390/livers3030033]
- 4 Loomis AK, Kabadi S, Preiss D, Hyde C, Bonato V, St Louis M, Desai J, Gill JM, Welsh P, Waterworth D, Sattar N. Body Mass Index and Risk of Nonalcoholic Fatty Liver Disease: Two Electronic Health Record Prospective Studies. *J Clin Endocrinol Metab* 2016; **101**: 945-952 [PMID: 26672639 DOI: 10.1210/jc.2015-3444]
- 5 Hannah WN Jr, Harrison SA. Lifestyle and Dietary Interventions in the Management of Nonalcoholic Fatty Liver Disease. *Dig Dis Sci* 2016; **61**: 1365-1374 [PMID: 27052013 DOI: 10.1007/s10620-016-4153-y]
- 6 Keating SE, Sabag A, Hallsworth K, Hickman IJ, Macdonald GA, Stine JG, George J, Johnson NA. Exercise in the Management of Metabolic-Associated Fatty Liver Disease (MAFLD) in Adults: A Position Statement from Exercise and Sport Science Australia. *Sports Med* 2023; **53**: 2347-2371 [PMID: 37695493 DOI: 10.1007/s40279-023-01918-w]
- 7 Zhai H, Chen C, Wang N, Chen Y, Nie X, Han B, Li Q, Xia F, Lu Y. Blood lead level is associated with non-alcoholic fatty liver disease in the Yangtze River Delta region of China in the context of rapid urbanization. *Environ Health* 2017; **16**: 93 [PMID: 28859656 DOI: 10.1186/s12940-017-0304-7]
- 8 Ahmed MH, Abu EO, Byrne CD. Non-Alcoholic Fatty Liver Disease (NAFLD): new challenge for general practitioners and important burden for health authorities? *Prim Care Diabetes* 2010; **4**: 129-137 [PMID: 20299294 DOI: 10.1016/j.pcd.2010.02.004]
- 9 Zelber-Sagi S, Moore JB. Practical Lifestyle Management of Nonalcoholic Fatty Liver Disease for Busy Clinicians. *Diabetes Spectr* 2024; **37**: 39-47 [PMID: 38385102 DOI: 10.2337/dsi23-0009]
- 10 Zhou R, Gu Y, Zhang B, Kong T, Zhang W, Li J, Shi J. Digital Therapeutics: Emerging New Therapy for Nonalcoholic Fatty Liver Disease. *Clin Transl Gastroenterol* 2023; **14**: e00575 [PMID: 36854062 DOI: 10.14309/ctg.0000000000000575]
- 11 Motz V, Faust A, Dahmus J, Stern B, Soriano C, Stine JG. Utilization of a Directly Supervised Telehealth-Based Exercise Training Program in Patients With Nonalcoholic Steatohepatitis: Feasibility Study. *JMIR Form Res* 2021; **5**: e30239 [PMID: 34402795 DOI: 10.2196/30239]
- 12 Akbar FN, Choirida SR, Muttaqin AZ, Ekayanti F, Hendarto H. Telemedicine as an Option of Healthcare Services in monitoring Non Alcoholic Fatty Liver Disease (NAFLD) Patients Facing COVID-19 Pandemic [DOI: 10.20944/preprints202401.2153.v1]
- 13 Aboubakr A, Stroud A, Kumar S, Newberry C. Dietary Approaches for Management of Non-Alcoholic Fatty Liver Disease: A Clinician's Guide. *Curr Gastroenterol Rep* 2021; **23**: 21 [PMID: 34654976 DOI: 10.1007/s11894-021-00827-0]
- 14 Kořínková L, Pražienková V, Černá L, Karnošová A, Železná B, Kuneš J, Maletínská L. Pathophysiology of NAFLD and NASH in Experimental Models: The Role of Food Intake Regulating Peptides. *Front Endocrinol (Lausanne)* 2020; **11**: 597583 [PMID: 33324348 DOI: 10.3389/fendo.2020.597583]
- 15 Dehghanseresht N, Jafarirad S, Alavinejad SP, Mansoori A. Association of the dietary patterns with the risk of non-alcoholic fatty liver disease among Iranian population: a case-control study. *Nutr J* 2020; **19**: 63 [PMID: 32605646 DOI: 10.1186/s12937-020-00580-6]
- 16 Perumpail BJ, Cholanckeril R, Yoo ER, Kim D, Ahmed A. An Overview of Dietary Interventions and Strategies to Optimize the Management of Non-Alcoholic Fatty Liver Disease. *Diseases* 2017; **5** [PMID: 29065499 DOI: 10.3390/diseases5040023]
- 17 Chai XN, Zhou BQ, Ning N, Pan T, Xu F, He SH, Chen NN, Sun M. Effects of lifestyle intervention on adults with metabolic associated fatty liver disease: A systematic review and meta-analysis. *Front Endocrinol (Lausanne)* 2023; **14**: 1081096 [PMID: 36875459 DOI: 10.3389/fendo.2023.1081096]
- 18 Henney AE, Gillespie CS, Alam U, Hydes TJ, Cuthbertson DJ. Ultra-Processed Food Intake Is Associated with Non-Alcoholic Fatty Liver Disease in Adults: A Systematic Review and Meta-Analysis. *Nutrients* 2023; **15** [PMID: 37242149 DOI: 10.3390/nu15102266]
- 19 Abenavoli L, Di Renzo L, Boccuto L, Alwardat N, Gratteri S, De Lorenzo A. Health benefits of Mediterranean diet in nonalcoholic fatty liver disease. *Expert Rev Gastroenterol Hepatol* 2018; **12**: 873-881 [PMID: 30033779 DOI: 10.1080/17474124.2018.1503947]
- 20 Zelber-Sagi S, Ivancovsky-Wajzman D, Fliss Isakov N, Webb M, Orenstein D, Shibolet O, Kariv R. High red and processed meat consumption is associated with non-alcoholic fatty liver disease and insulin resistance. *J Hepatol* 2018; **68**: 1239-1246 [PMID: 29571924 DOI: 10.1016/j.jhep.2018.01.015]
- 21 van der Windt DJ, Sud V, Zhang H, Tsung A, Huang H. The Effects of Physical Exercise on Fatty Liver Disease. *Gene Expr* 2018; **18**: 89-101 [PMID: 29212576 DOI: 10.3727/105221617X15124844266408]
- 22 Wong VW, Wong GL, Chan RS, Shu SS, Cheung BH, Li LS, Chim AM, Chan CK, Leung JK, Chu WC, Woo J, Chan HL. Beneficial effects of lifestyle intervention in non-obese patients with non-alcoholic fatty liver disease. *J Hepatol* 2018; **69**: 1349-1356 [PMID: 30142427 DOI: 10.1016/j.jhep.2018.08.011]
- 23 Montemayor S, Bouzas C, Mascaró CM, Casares M, Llompарт I, Abete I, Angullo-Martinez E, Zulet MÁ, Martínez JA, Tur JA. Effect of Dietary and Lifestyle Interventions on the Amelioration of NAFLD in Patients with Metabolic Syndrome: The FLIPAN Study. *Nutrients* 2022; **14** [PMID: 35684022 DOI: 10.3390/nu14112223]
- 24 Moscattiello S, Di Luzio R, Bugianesi E, Suppini A, Hickman IJ, Di Domizio S, Dalle Grave R, Marchesini G. Cognitive-behavioral treatment of nonalcoholic fatty liver disease: a propensity score-adjusted observational study. *Obesity (Silver Spring)* 2011; **19**: 763-770 [PMID: 20966900 DOI: 10.1038/oby.2010.254]
- 25 Montesi L, Caselli C, Centis E, Nuccitelli C, Moscattiello S, Suppini A, Marchesini G. Physical activity support or weight loss counseling for nonalcoholic fatty liver disease? *World J Gastroenterol* 2014; **20**: 10128-10136 [PMID: 25110440 DOI: 10.3748/wjg.v20.i29.10128]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: office@baishideng.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

