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A Mediterranean and low-fat dietary intervention in non-alcoholic fatty liver disease patients: Exploring participant experience and perceptions about dietary change

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Abstract

Background: A Mediterranean diet (MD) appears to be beneficial in non-alcoholic fatty liver disease (NAFLD) patients in Mediterranean countries; however, the acceptability of a MD in non-Mediterranean populations has not been thoroughly explored. The present study aimed to explore the acceptability through understanding the barriers and enablers of the MD and low-fat diet (LFD) interventions as perceived by participating Australian adults from multicultural backgrounds with NAFLD.

Methods: Semi-structured telephone interviews were performed with 23 NAFLD trial participants at the end of a 12-week dietary intervention in a multicentre, parallel, randomised clinical trial. Data were analysed using thematic analysis.

Results: Participants reported that they enjoyed taking part in the MD and LFD interventions and perceived that they had positive health benefits from their participation. Compared with the LFD, the MD group placed greater emphasis on enjoyment and intention to maintain dietary changes. Novelty, convenience and the ability to swap food/meals were key enablers for the successful implementation for both of the dietary interventions. Flavour and enjoyment of food, expressed more prominently by MD intervention participants, were fundamental components of the diets with regard to reported adherence and intention to maintain dietary change.

Conclusions: Participants randomised to the MD reported greater acceptability of the diet than those randomised to the LFD, predominantly related to perceived novelty and palatability of the diet.

KEYWORDS

Australia, diet, low fat diet, Mediterranean diet, non-alcoholic fatty liver disease, perception

Research highlights

- Participants enjoyed taking part in the Mediterranean diet (MD) and low fat diet (LFD) interventions and perceived that they had positive health benefits from their participation.

- Participants randomised to the MD reported greater acceptability of the diet than those randomised to the LFD, predominantly related to perceived novelty and palatability of the diet.
- Compared with the LFD, the MD group placed greater emphasis on enjoyment and intention to maintain dietary changes.
- Novelty, convenience and the ability to swap food/meals were key enablers for the successful implementation for both of the dietary interventions.
- Flavour and enjoyment of food, expressed more prominently by MD intervention participants, were fundamental components of the diets with regard to reported adherence and intention to maintain dietary change.

INTRODUCTION

There has been extensive research surrounding the Mediterranean diet (MD) for the prevention and management of chronic diseases,[1] which has led to an increase in its popularity, including in non-Mediterranean countries such as Australia. However, the MD has not been studied in large scale clinical trials for the management of chronic diseases outside the Mediterranean region. The Mediterranean Dietary Intervention for Patients with Non-Alcoholic Fatty Liver Disease (MEDINA) trial is a 12 week, multicentre, parallel, randomised controlled trial comparing effects of a Mediterranean diet (MD) and a low-fat diet (LFD) on insulin resistance and hepatic steatosis in participants with non-alcoholic fatty liver disease (NAFLD).[2] The protocol and treatment effects for the MEDINA primary outcomes are reported elsewhere.[2,3] In the present study, we sought to understand how the respective prescribed diets and their components are perceived by a multicultural cohort where the LFD is likely more familiar given it is supported by national dietary guidelines and those of affiliated organisations (The Heart Foundation) and where the constituents of a MD are not so familiar and/or habitually consumed by the population. A LFD is currently promoted by health professionals and a MD is currently recommended for chronic disease management and NAFLD in European guidelines. Therefore, investigation of whether the MD and specific elements of the MD are acceptable and thus can be further explored in clinical trials as an acceptable dietary management strategy for chronic disease management, which has potential to be scaled up for implementation within a multicultural Australian cohort, is warranted. With regard to the MD, these findings may assist with the translation of the diet for other non-Mediterranean populations where chronic disease management through application of a MD may be indicated and where barriers have been identified for its implementation.[4]

The present study aimed to assess the acceptance of both the MD and LFD in a multicultural Australian population and to evaluate whether the MEDINA clinical trial achieved participant engagement and dietary behaviour change, as well as explore participants' perceptions of specific dietary components of the MD and LFD. The study will report on key factors that enable and hinder application of the two dietary interventions in a multi-ethnic Australian population with NAFLD, which can be considered when tailoring future interventions to maximise adherence.

METHODS

The MEDINA trial

The dietary intervention comprised three face to face consultations with an Accredited Practising Dietitian (APD) at weeks 0, 6 and 12 and three phone call reviews at weeks 2, 4 and 9. The MEDINA trial protocol and description of the diet are published elsewhere.[2] The dietary prescription was comprehensively designed and the details have been published elsewhere.[5] In brief, the diet was designed to be easy to follow and sustainable with an *ad libitum* approach focusing on positive coaching, emphasising foods encouraged for consumption rather than foods to avoid. All dietary consultations were administered to participants by an APD who was able to tailor the diet to cultural and personal preferences through recommendation of nutritionally appropriate suggestions and alternatives. The APDs administering the MD were independent from the LFD APDs to avoid any bias or contamination between study arms. All participants assigned to the MD were provided with written resources designed to support implementation of the diet and a hamper containing staple ingredients including extra virgin olive oil, nuts, legumes and oily fish. The LFD, representing mainstay recommendations, was the study 'control', with the number of appointments matched to adjust for intervention intensity and contact with a dietitian. The LFD group were provided with nutrition education and resources as determined by the APD running the consultations to replicate a typical outpatient dietetic consult. Participants in the LFD group were given a supermarket gift voucher to purchase some of the suggested food items.

Interviews

At the completion of the intervention, participants randomised to both the MD and LFD intervention groups were invited to participate in semi-structured interviews to investigate whether whole diet(s) were acceptable to participants and whether there were individual components of the diets that were deemed/perceived as more acceptable than others. The interview questions were developed by the research team with consideration of the potential determinants of success in the application of a dietary intervention. The interview questions are included in Table 1. The interview was divided into two key parts.

Part one of the interview was designed to evaluate the interventions through exploring participant perceptions of the overall trial experience and satisfaction associated with taking part in the MEDINA study. Data were collected to determine whether the appointment schedule and intervention design and delivery were executed in a manner that promoted attendance and participation in the respective dietary interventions, and whether participants perceived their involvement to be beneficial to their health or otherwise.

Part two of the interview explored participant acceptability of each of the interventions including key dietary recommendations. These data explore participants' views and experiences regarding specific aspects of the diet prescribed, as well as their desire and perceived ability to maintain dietary changes. Specific strategies employed by individual participants to implement each dietary change were also explored.

Participants and sampling

All participants who were enrolled and completed the trial in the overarching MEDINA RCT at the time that this sub-study was conducted (January 2015 to December 2016; 23 participants) were invited to take part in semi-structured interviews.

The interview structure

Interviews were held within 6 weeks of completing the MEDINA trial. The semi-structured interview was administered by a researcher not involved in the dietary counselling to minimise response bias by participants. Interviews were conducted via telephone to minimise participant burden and increase participation. The interview was field-tested with two researchers and then with the first participant recruited and modifications were made iteratively to the interview questions to improve clarity and face validity. Participants were provided with questions in advance to promote considered responses. During the interviews, participants were invited to share their experiences and perceptions without a rigid adherence to the scripted questions. Each interview lasted about 20 min. Interviews were de-identified and then transcribed by a researcher and cross checked by a second researcher.

TABLE 1 Semi-structured interview schedule of questions

Sections	Questions
Part 1	**1.** Why did you decide to participate in the program? **2.** Was the program what you expected? **3.** Did you miss any appointments? If so, why? **4.** Were there enough appointments? Were the appointments too close together or too far apart? Did you find it difficult to attend your appointments? **5.** How easy was the diet to follow? Did you find the advice provided easy to follow? What was easy or difficult about the diet? **6.** How did you feel about setting goals during the program? **7.** Did you enjoy the diet? Why or why not? What aspects of the diet did you enjoy most? **8.** What did you find was challenging to change about your diet? Were there any particularly difficult parts that you found hard to include in your diet? Why? **9.** Did you feel satisfied while following the diet? (Satiety, were you ever hungry or felt deprived?) **10.** Did you find the written resources useful? Which handouts did you like the best/least? **11.** Did you achieve the results you hoped for OR Do you feel that you benefited from participation in this program. How/Describe. **12.** Do you feel you have/will continue with the changes made? **13.** How could we improve the program? **14.** Did you enjoy receiving a food hamper/voucher? Did you use everything in the hamper/what did you use this to purchase? Why/Why not? **15.** If you had the choice, would you see a dietitian again? Why/Why not? **16.** Is there anything else that you would like to comment on?
Part 2	*Questions asked for each diet specific category were*: **i.** Did you increase the amount consumed? **ii.** Have you or do you think you will maintain this change? **iii.** Have you enjoyed this change? **iv.** How have included this in your diet/what strategies of including this have you enjoyed? For the **Mediterranean Diet group** the following diet specific foods were asked about: **1.** Extra virgin olive oil **2.** Nuts **3.** Vegetables **4.** Fruits **5.** Legumes **6.** Fish **7.** Meat (reducing) **8.** Wholegrains For the **Low Fat Diet group** the following diet specific foods/ categories were asked about: **1.** Reduced fat items (dairy, trimmed meat and added fats). **2.** Vegetables **3.** Fruit **4.** Low fat cooking methods **5.** Wholegrains **6.** Portions

Ethics approval was obtained within the application for the overarching MEDINA trial and parameters of this qualitative study were included in the primary ethics approval through the participating hospitals, Alfred Health, Royal Melbourne and Eastern Hospitals and La Trobe University, Melbourne, Victoria, Australia. All participants provided informed consent. There were no additional incentives provided for participation in this aspect of the trial.

Data analysis

For part one, an approach using the principles of content analysis was employed through interpretation and coding of textual responses using a systematic evaluation. Content analysis specifically allows the quantification of qualitative data with caution as a proxy for significance.[6] The participant responses were collated, coded and summarised with key themes conveyed under distinct sub-headings that emerged from participant responses and were related to the overall structure of the dietary intervention.[7,8]

For part two, thematic analysis was used to manually code responses to the open-ended described by Braun and Clarke.[9] Each stage was carried out until no new themes were identified. Handwritten responses from researchers who conducted the interview were transcribed to electronic records. The data was then read and reviewed line by line and each discrete idea or concept was noted. Then, initial themes were noted and grouped. This involved reading the participant responses and looking for patterns of meaning and issues of potential interest within the data. This was conducted by one researcher and cross checked independently by a second. These themes were then further reviewed to check if they fit with initial concepts and with the entire data set. Then, themes were defined and refined. Examples and extracts were selected and reviewed to ensure that there was a clear description of themes before reporting the results.

RESULTS

Demographics

There were 25 participants recruited and randomised to either the MD or LFD arm of the overarching MEDINA trial at the time this research was conducted. Of these, two participants withdrew for family or medical reasons. Of the 23 participants who completed the intervention, all agreed to take part in the interviews. There were 12 participants in the LFD arm (six males) and 11 participants in the MD arm (five males). Main outcomes and dietary compliance are reported elsewhere but, briefly, the MEDAS score used to assess adherence to the MedDiet and the equivalent score for the LFD were applied to each group's respective food diaries. Compliance with the MedDiet improved by 2.7 units (mean ± SD) (6.5 ± 2.0 to 9.2 ± 1.9, out of a maximum possible score of 14) ($p < .0005$). In the LFD group, compliance with the prescribed diet improved by 1.0 unit (5.4 ± 2.0 to 6.4 ± 2.3, out of a maximum possible score of 9) ($p = .035$).[3]

The mean ± SD age for the overall group was 49.6 ± 15.9 years (range 21–73 years). Most participants recruited (68%) were born in countries other than Australia. Participants self-reported ethnicity as 44% Asian, 32% European, 16% Oceanian and 8% Middle Eastern.

Part one: Participant satisfaction

Participants reported that they were satisfied with the number and frequency of appointments. Many characteristic themes also emerged with a focus on barriers and enablers related to the delivery and uptake of the dietary interventions. Sub-themes and associated quotes are presented in Table 2.

Motivations

Weight loss, recommended participation from their specialist or fear of disease progression were the most frequently cited motivations for participation.

Perceptions on dietary prescription

The barriers highlighted by participants were predominantly related to their personal lives and fitting the prescribed diet into their schedule.

For the LFD group, there was a strong focus on restriction of foods being a barrier despite a reduction in energy not being a focus of the dietary prescription. Long-term maintenance of dietary changes was also perceived as a barrier. Only a minority of LFD participants indicated that the diet was not challenging and that the recommendations were familiar.

A minority of participants recounted feeling hungry; in both the MD and LFD groups, this was attributed to skipped meals or snacks. Accountability, simplicity of goals and contact with a dietitian were seen as key enablers for participants. Most participants reported that the food diary aided adherence through accountability.

Dietary intervention delivery techniques

Participants in the MD group reported that the diet was easy to follow and the resources, hamper, recipe book and some elements of the diet were specifically mentioned as making the diet easier to follow. The LFD group indicated they were happy with the supermarket

TABLE 2 Participant satisfaction: perceptions from part one of the semi-structured interview

Participant satisfaction categories	Themes	Examples of quotes from semi-structured interviews
Motivations	Weight loss	[I] need to lose weight (MD participant)
		[I] have always battled with weight loss (LFD participant)
Perceptions of dietary prescription	Time management	[I was] working full time and family made it difficult to concentrate on the diet but [I] really liked [the diet] (MD participant)
	Restriction	Breaking bad habits like eating sugary snacks after dinner and cutting out rice 'carbs' and potato chips was very hard- and not replacing (LFD participant)
	Satiety	[I] felt satisfied with the right amount of snacks like nuts and oats, [I] felt full and never hungry (MD participant)
		[I was] not 'deprived' unless [I] missed a meal, then [I] felt hungry (LFD participant)
	Psychological adjustment	[I] felt like [I] wasn't having enough, but [I] didn't feel lack of energy, just psychological 'need' for food (LFD participant)
Dietary intervention delivery techniques	Goal setting	Setting goals made [me] more conscious of what [I] was eating and drinking, a beneficial task' and; 'It was easy to set goals but keeping them was not so easy but seeing the dietitian frequently helped to keep up with goals (MD participant)
	Resource provision	[I] found the diet [could] be translated easily into [my] lifestyle and [I have] not enjoyed a low fat diet in the past and: initially [I] found it pretty easy, [the] recipe book and pamphlets made it easier (MD participant)
		The resources were fantastic, [I] loved the Med Diet cookbook, the recipes didn't deny [me] good food (MD participant)
	Dietary prescription	[I] would have preferred an actual diet plan, weekly, instead of the broader information that [I] was given (LFD participant)
Perceived benefits and sustainability	Improvements in health	Initially [my] goal was to lose weight, but [I] didn't actually lose too much, however [I] just went to the liver clinic recently and they noticed the changes in my liver function so [I] will keep to the diet given the outcomes (MD participant)
		[My] weight stayed the same but I felt better mentally and physically (MD participant)
	Weight loss	[I] don't think I got any benefit because [I] lost no weight and [my] fat mass increased (LFD participant)
	Maintenance	[I] will definitely continue the changes but probably not as strict as when [I] was on the study, but [I] will keep the main principles and strategies [I] learnt and: [I] have reverted back to some bad habits but [I am] trying to go back to the principles of the Med Diet (MD participant)
		Yes [I] will continue to decrease my sugar intake and eat more vegetables and fruit (LFD participant)

Abbreviations: LFD, low fat diet; MD, Mediterranean diet.

vouchers (which were supplied in place of the hamper and cookbook); participants reported that they used them predominantly to purchase fruit and vegetables.

Perceived benefits and sustainability

All participants indicated that they wanted to continue with the dietary changes made and the MD group in particular expressed that they were confident in their ability to maintain the diet. Interestingly, many participants reflected that, even without weight loss, they felt better or noticed improvements in their health outcomes at follow up medical appointments.

Part two: Participant perceptions of dietary components

The second part of the semi-structured interview included a range of questions pertaining to the acceptability of the key dietary recommendations for each of

the respective dietary interventions. This included whether recommended dietary changes were made, experiences related to making the changes, and whether the participant was likely to maintain the changes. In addition, strategies used to implement these changes were explored.

Thematic findings

Participants were generally positive about their experience and were keen to share their strategies around implementing dietary changes, especially surrounding foods that they enjoyed. Similarly, dietary changes that involved foods that participants enjoyed were more likely to be reported as a change that would be maintained.

There were three main themes that emerged from the interviews. These were: (1) novelty, (2) convenience and (3) food swapping. These overarching themes were underpinned by two sub-themes; flavour and enjoyment which came through within each of the three main themes and were reflective of perceived adherence to and maintenance of the dietary changes. The relationship between these themes is summarised in the schematic in Figure 1.

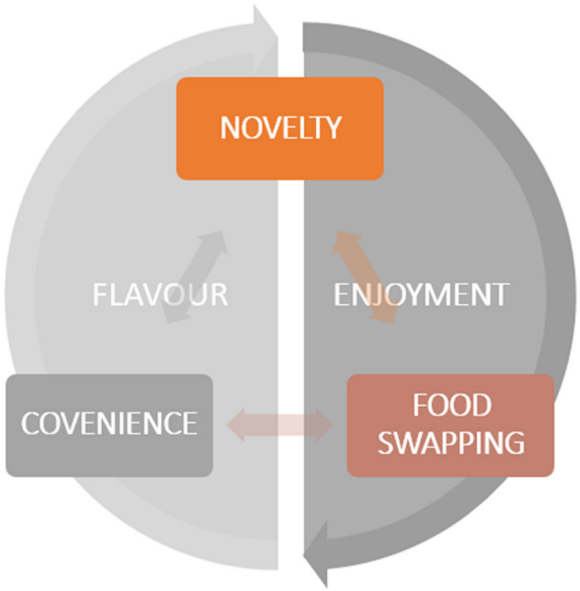

FIGURE 1 A schematic summarising the key themes that emerged from part two of the semi-structured interviews. Key themes: novelty, convenience and food swapping. Sub-themes: flavour and enjoyment.

1. ***Novelty*** *enhanced interest and engagement*

The notion of 'novelty' was used to capture dietary components that were perceived as new, innovative or unfamiliar. This theme encompasses the idea that participants responded with interest when the advice provided included 'new' or less commonly consumed foods, ingredients or recipes. This theme emerged in both the MD and LFD intervention groups, but was conveyed more strongly from MD participants who were less likely to be accustomed with the MD ideologies including the 'prescribed' ingredients, foods, recipes and overall dietary recommendations.

One participant from the MD group who previously did not consume extra virgin olive oil (EVOO) described the experience of introducing EVOO to their family through cooking, saying that:

> *[my] whole family made this change and will maintain it*

Another participant from the MD group talked about strategies to increase legume intake, which were not previously consumed. The participants also reported about foods, including legumes that it was helpful '*trying different recipes*'.

By contrast, dietary advice that focused on familiar foods, such as those that participants were already eating or dietary recommendations they had already received in the past, resulted in the perception that there was less scope for change. This perceived barrier about familiar recommendations was reported by the LFD group, which was not unexpected given that dietary recommendations in the LFD were consistent with the more familiar, Australian Dietary Guidelines. When one participant was asked whether they were able to successfully implement low fat cooking methods, they explained that there was little scope for change:

> *[I] used very little oil before anyway*

2. ***Convenience*** *enhanced accessibility and perceived maintenance*

The theme of convenience came through in response to questions about whether participants were able to implement and maintain dietary changes. They reported adopting strategies that made food more accessible within their day-to-day lives. The theme of convenience captures the views that foods, especially those that participants enjoyed, were made more available and as a result were consumed more frequently. Access to foods refers to accessibility within the home and workplace, as well as ensuring that, at meal times, there was something readily available to eat, involving minimal preparation. This theme around convenience was reported by the MD and LFD intervention group participants.

In the MD and LFD groups, participants reported purchasing frozen vegetables, eating '*simple things like salads*' and one participant from the MD group

explained that they prepare their salads in advance for the entire week:

> *[I] prepare a Greek salad at the start of the week and store it in the fridge, then [I] eat salad everyday*

Others noted purchasing cans of tuna or legumes and freezing foods as convenience items which facilitated adherence to the prescribed diets.

3. ***Food swapping*** *enhanced the sense of simplicity and achievability*

Participants across both dietary intervention groups often spoke about food swapping. This theme encompasses the idea that recommended foods were swapped for foods previously consumed as a part of habitual diets.

In the MD group, there were an abundance of strategies listed that utilised the concept of food swapping. For EVOO, participants talked about using the oil to replace butter or margarine in their cooking, one participant explaining:

> *[I] use [olive oil] as a dressing on Chinese greens as a replacement for vegetable oil*

Food swapping was also a popular strategy for increasing vegetable and fish consumption and for reducing meat consumption. One participant in the MD group stated:

> *[I] replaced meat with legumes or chickpea casseroles*

In the LFD group, this idea of food swapping was adopted to select low fat alternatives, or in reference to using low fat cooking methods.

The notion of food swapping was related to a greater sense of simplicity and ability to achieve dietary changes and where food swapping was reported participants were also more likely to indicate that they would maintain the dietary change.

In addition to the three main themes, there were two sub-themes that developed from the analysis: flavour and enjoyment. These sub-themes ran consistently throughout the interviews and underpinned all three of the main themes. When discussing dietary changes participants described that they were more likely to adopt and maintain changes based on whether the food tasted good (flavour) and this in turn predicted whether they enjoyed it.

4. ***Flavour and enjoyment*** *enhanced acceptability, number of strategies surrounding implementation and perceived maintenance*

When referring to novelty, convenience or food swapping, participant enjoyment of the food was often associated with flavour. If a food was perceived as having a favourable flavour, the participant was more likely to enjoy the food, and enjoyment was often associated with wanting to and being able to, maintain the dietary change(s). There was a high rate of positive responses from both the MD and LFD group when asked if they enjoyed the dietary changes. However, there were stronger descriptions around flavour and reinforcement of enjoyment of the diet from the MD group.

Some of the language that reinforced these ideas is explored below. A summary of the key words used by participants that assisted in the development of each key theme and sub-theme is included in Table 3. For the inclusion of EVOO one participant in the MD group stated:

> *[I] love [the olive oil]*

A participant in the MD group also talked about increasing vegetables in their diet, highlighting their enjoyment:

> *[I] include vegetables with every meal, now when there are no vegetables [I] notice and [I] miss them.*

This was also reported by a MD participant in reference to increasing fish consumption:

> *[I] enjoyed this change a lot*

When asked if they would maintain the dietary change they responded convincingly; '*yes definitely*'.

Conversely, palatability of the LFD was also a perceived barrier to success:

> *The hardest part was adjusting to the new diet, stuff just didn't taste quite the same*

TABLE 3 Main terms that were derived from participant responses for each key and sub-theme

Category	Terms described in participant responses
Key themes	
Novelty	changed, different, new
Convenience	quick, easy, convenient, simple
Food swapping	changed, swap, replace, adjustments
Sub-themes	
Flavour	flavour, taste, palatable, delicious
Enjoyment	enjoy, love, satisfying, favourite, nice

and:

> *[I] didn't miss the old diet too much, [I] got used to [the dietary changes] easily, but it was a bit boring at times*

and:

> *[I] got used to the diet, but it was nothing special, [the diet] was bland*

Those who did not like the flavour of a food were not likely to perceive that they would sustain the dietary changes made. A participant in the MD group talked about eating more legumes and said:

> *[I] didn't enjoy them*

They went on to explain that there was '*no flavour*' and they would '*probably not*' maintain the change.

Greater overall enjoyment was also associated with reporting a larger number of strategies surrounding implementation and maintenance of the dietary changes.

DISCUSSION

The present qualitative study aimed to explore participants' experiences and their perceptions of the adoption of dietary recommendations when taking part in an intervention study that aimed to assess the effects of improving diet quality through the adoption of a LFD or a MD in patients with NAFLD (the MEDINA trial). The study is novel in that it assessed acceptability of the interventions which are seldom captured in dietary RCTs. Participants across both dietary intervention groups reported that they enjoyed being involved in the study and felt that they adopted several of the dietary recommendations and they also perceived that they would maintain them beyond the 12-week intervention period. Interestingly many participants reflected that, even without weight loss, they felt better or noticed improvements in their health outcomes at follow up medical appointments.

The results of the present align with the guidelines described in the Theoretical Domains Framework of behaviour change because this study, using qualitative methodology, identifies determinants of behaviour to support implementation problems and support future intervention designs.[10] Key aspects of the intervention delivery that participants felt supported their dietary adherence were goal setting, provision of education resources and food hampers. Goal setting and resources have been reported throughout several dietary interventions including the MD as desirable and effective delivery techniques.[11–13] Other studies support this idea that adherence is likely to be improved when participants are provided with shopping lists, meal plans and recipes.[14] Food hampers, supplied to the MD participants in this trial, have been employed and endorsed in seminal research trials including the Primary Prevention of Cardiovascular Disease with a Mediterranean Diet study (PREDIMED), as an effective strategy for increasing dietary compliance.[14–17]

Cost of the diet was not mentioned by any of the study participants, which was unexpected given that this is often a perceived barrier for the adoption of 'healthier' diets.[18,19] This was in contrast to an Australian study in healthy individuals where affordability was mentioned as a perceived barrier for MD adherence, and it was also a perceived barrier in a study conducted in Northern Europe where participants had a high risk of cardiovascular disease, although both cohorts had not participated in a clinical trial and were healthy individuals, not specifically those with chronic disease.[19,20] However, participants in the present study did mention a lack of time for meal preparation and difficulty in reducing the intake of refined snacks as barriers, consistent with studies published in both healthy participants and those with chronic disease.[21–24]

When individual dietary recommendations that related to each of the interventions were explored the first theme, novelty was reflected in responses from participants in both the MD and LFD groups; however, it was a more prominent theme in the MD group participants. Dietary recommendations provided for the MD are substantially different (e.g., higher in unsaturated fats) compared to the familiar Australian Dietary Guidelines and this may explain why participants perceived these recommendations as novel. Although there has been a substantial amount of research assessing the MD, much of this has been in Mediterranean populations, and there is a lack of qualitative literature assessing the perceptions of a MD in multicultural populations and indeed those with chronic disease. One previous study reported that participants thought the MD intervention 'widened their food horizons'; this idea supports the importance of novelty that emerged in the current cohort.[25] Furthermore, in the present study, participants described the MD as novel, and this was in part because it was not a common dietary recommendation. This could be explained by lack of application by healthcare providers, a theory that is supported by a study in healthcare providers regarding the MD. Specifically, healthcare providers reported that they had limited education and knowledge to provide advice regarding the Mediterraean dietary pattern and specifically expressed concerns about the ability to implement MD in a multicultural setting.[26]

Convenience, the second theme that emerged was expressed strongly by both the MD and LFD groups. Having access to the recommended, healthy foods with minimal preparation time (such as pre-prepared meals and canned foods) was a feature that appeared to

support participants to adopt dietary changes. This finding is well supported by evidence indicating that convenience is a key factor in driving food choice and probably dietary maintenance.[27–29] Convenient foods were also more likely to be considered by participants as a dietary change that would be maintained. Lack of time has been noted as a key barrier and therefore convenient options assist with overcoming this challenge.[20,21] Participants involved in this trial were supplied with resources and education encouraging convenience.[5]

Interestingly, the third theme, food swapping, was reported by many participants who replaced foods that formed part of their habitual diet with recommended foods from the dietary intervention. This theme emerged for both groups and reiterates that dietitians should make suggestions around dietary changes that align with habitual diets. This is supported by the idea that it is not often realistic to completely overhaul an individual's diet, and recommended changes should be small and sustainable as an important and effective behaviour change technique.[30]

Underlying the three key themes were the sub-themes: flavour and enjoyment. Taste or flavour is also a commonly reported inhibitor of implementing and maintaining healthier dietary patterns and poor (or lack of) flavour was particularly recounted as a barrier from LFD group participants.[24] Participants who reported that the food was palatable also described that they enjoyed the dietary change. This theme emerged from both dietary intervention groups; however, there was more prominent language and reinforcement from the MD group. The MD is renowned for its palatability, which is a known driver of adherence.[31,32] Reasons to support the flavour and enjoyment of the MD include its high fat composition, which leads to richer tastes and satiety,[5] and this may explain why more participants in this group felt that they could sustain the diet.

The main themes derived from this work, are tied together, as shown in the schematic in Figure 1 where the fundamental components surrounding successful implementation of a dietary intervention in NAFLD participants are summarised. This 'plate' shaped model is a tool that may guide the design of future dietary interventions in clinical trials and dietary delivery techniques. This model emphasises the importance of balance between the enablers: novelty, convenience and food swapping, as well as ensuring that dietary advice encompasses flavour and enjoyment. This is especially important because lifestyle intervention is the only demonstrated therapy for people with NAFLD. The generalisability of this model to other chronic disease cohorts is not known and requires application and evaluation within these cohorts.

One of the strengths of this qualitative analysis is that consistent responses were received and participants answered a breadth of questions that provided an overview of both the acceptability of the dietary intervention based on structure and also specifically surrounding dietary components. This qualitative analysis was also conducted in a unique setting assessing a Mediterranean diet in free-living Australians and therefore evaluates the feasibility of implementing the cuisine and ingredient changes (i.e., cooking with olive oil). Furthermore, these interviews were administered by a researcher who was not involved in providing the dietary counselling and so participants were less likely to present biased responses reflecting what they assumed the researcher would like to hear and the researcher was less likely to ask leading questions.

The limitations of the study relate to the semi-structured interview process; alternatively, a focus group discussion may have facilitated a deeper exploration into some of the barriers and enablers of the dietary intervention. In addition, more background information, such as previous consultations with a dietitian and experience with goal setting, may have provided additional context to participant responses. Measures of self-efficacy were not conducted and may have provided additional insight to the data collected. Finally, contamination between dietary arms is also likely to have occurred because LFD participants were aware of the 'experimental' MD arm and some were disappointed that they were not randomised into this group. Furthermore, the 3-month duration of the study was relatively short and assessment of actual, sustained, dietary changes was not compared with perception in the present investigation. Longer time frames are needed to assess the feasibility of long term maintenance.

CONCLUSIONS

The present study demonstrated that participants enjoyed taking part in both the MD and LFD interventions. The MD was accepted by an Australian, multicultural adult population and there was more emphasis on enjoyment of changes and intention to sustain dietary changes from participants in the MD group compared to the LFD group. Reported factors influencing the uptake and likely maintenance of dietary intervention included delivery techniques including goal setting, provision of resources and food hampers. Novelty surrounding recommendations and foods, convenience and use of food swapping were deemed key enablers to the successful implementation of a dietary intervention. Flavour and enjoyment of food were also fundamental components of the diets with regard to the perceived uptake and increased desire to maintain dietary change, therefore highlighting that dietary recommendations should be designed to be palatable. These findings should be considered in the design of dietary interventions for chronic disease management to ensure acceptable recommendations enhancing participant uptake.

AUTHOR CONTRIBUTIONS

Elena S. George conceptualised the study. Anjana Reddy was involved in data collection. Elena S. George carried out the analysis with support from Adrienne K. Forsyth to provide a consensus on the interpretation. Elena S. George drafted the manuscript. All authors critically reviewed and approved the final version of the manuscript submitted for publication.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

TRANSPARENCY DECLARATION

The authors affirm that this manuscript is an honest, accurate and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

ETHICAL STATEMENT

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the Alfred Health, Eastern Health, Melbourne Health and La Trobe University human research ethics committees. Written informed consent was obtained from all subjects/patients.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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